



**Critical Care  
Nutrition**

[www.criticalcarenutrition.com](http://www.criticalcarenutrition.com)

# **Final Site Report**

## **Improving the Practice of Nutrition Therapy in the Critically ill: An International Quality Improvement Project**

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## Interpreting Your Site Report

The International Nutrition Survey is a period-prevalence survey of nutrition practices in Intensive Care Units (ICUs) throughout the World. Since May 2008, your ICU has been involved in collecting data for this survey. This site report summarizes your site's performance and will allow you to compare your nutrition practices to other ICUs within your own country or region ('Sister Sites') and all the ICUs in the database ('All Sites'). You will also be able to compare your performance to the recommendations of the Canadian Critical Care Nutrition Clinical Practice Guidelines (CPGs) (1).

The first few pages describe ICU and patient characteristics. This helps you to identify the similarities and differences in the structure and patient case-mix of your ICU compared to other ICUs and will help you to interpret your site report in the context in which you work.

Pages 8-12, outline the adequacy of nutrition therapy and enteral nutrition at your site and provides an overall assessment or summary of your performance in providing nutrition.

Subsequent pages outline the recommendations of the Canadian Critical Care Nutrition CPGs. After each recommendation is stated, a figure or table illustrates how your site performed for every nutrition practice related to that specific recommendation. The language of summary recommendations should be interpreted as follows:

<b>"Strongly recommended"</b>	If there was no reservations about endorsing an intervention.
<b>"Recommended"</b>	If evidence was supportive but there were minor uncertainties about the safety, feasibility, or costs of the intervention.
<b>"Should be considered"</b>	If the supportive evidence was weak and/or there were major uncertainties about the safety, feasibility, or costs of an intervention.

## Glossary of terms

<b>Your site:</b>	this represents the mean or median of all the data from your site. This is often depicted in the figures by a clear block and --- dissecting the sister and all sites range bar.
<b>Sister sites:</b>	refers to the average of all the data from ICUs within your own country or region (see page 3).
<b>All sites:</b>	refers to the average of all the data from all the ICUs in the database.
<b>Range:</b>	refers to the highest and lowest site percentages or averages.
<b>Q1:</b>	refers to the first quartile point from either your / sister / all sites.
<b>Q3:</b>	refers to the third quartile point from either your / sister / all sites.
<b>N:</b>	number of ICU sites / patients / ICU days as indicated.
<b>NA:</b>	not applicable, no relevant data entered for this data point.
<b>PCT:</b>	percent.
<b>n/N:</b>	number of observations per total observations for your / sister / all sites.

(1) Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P and the Canadian Critical Care Clinical Practice Guidelines Committee (2003) "Canadian Clinical Practice Guidelines for Nutrition Support in Mechanically Ventilated, Critically Ill Adult Patients". *J Parenter Enteral Nutr* 27;355-373. For current version of the Guidelines, see [www.criticalcarenutrition.com](http://www.criticalcarenutrition.com)

## Participating ICUs

‘Sister sites’ refers to the average of all the data from hospitals within your country or region and are classified as follows:

<b>Sister Sites</b>	<b>Countries</b>	<b>Number of ICUs</b>
Canada	Canada	34
United States of America	USA	44
Europe and South Africa	UK	7
	Ireland	3
	Italy	3
	Portugal	1
	South Africa	3
Australia and New Zealand	Australia	22
	New Zealand	4
Latin America	Brazil	3
	Colombia	3
	Mexico	1
	Paraguay	1
	Perú	1
	Venezuela	1
India	India	5
China	P. R. China	20
	Taiwan	1

‘All Sites’ refers to the average of all the data from all the ICUs in the database (n=157).

**Table 1. Characteristics of Participating ICUs**

Number of ICUs	Your Site n=1	Sister Sites n=34	All Sites n=157
<b>Hospital Type</b>			
Teaching	Yes	25 (73.5%)	122 (78.7%)
Non-teaching	-	9 (26.5%)	33 (21.3%)
<b>Size of Hospital (beds)</b>			
mean (range)	456	516 (134-1275)	617 (108-3000)
<b>Multiple ICUs in Hospital</b>			
	No	14 (41.2%)	84 (53.5%)
<b>ICU Structure</b>			
Open	-	3 (8.8%)	42 (26.8%)
Closed	Yes	30 (88.2%)	113 (72.0%)
Other	-	1 (2.9%)	2 (1.3%)
<b>Case Types</b>			
Medical	Yes	28 (82.4%)	140 (89.2%)
Surgical	Yes	29 (85.3%)	140 (89.2%)
Trauma	Yes	13 (38.2%)	93 (59.2%)
Pediatrics	Yes	3 (8.8%)	17 (10.8%)
Neurological	Yes	22 (64.7%)	109 (69.4%)
Neurosurgical	Yes	13 (38.2%)	89 (56.7%)
Cardiac Surgery	Yes	8 (23.5%)	55 (35.0%)
Burns	No	5 (14.7%)	29 (18.5%)
Other	No	3 (8.8%)	17 (10.8%)
<b>Presence of Medical Director</b>			
	Yes	32 (94.1%)	150 (95.5%)
<b>Size of ICU (beds)</b>			
mean (range)	21	16 (8-30)	17 (5-48)
<b>Presence of Dietitian(s)</b>			
	Yes	33 (97.1%)	128 (81.5%)
<b>Full Time Equivalent Dietitian (per 10 beds)</b>			
mean (range)	0.5	0.4 (0.3-0.7)	0.4 (0.0-2.2)

**Legend**

Type of Hospital: A teaching hospital is a hospital that provides training to medical students and residents. Hospitals that have only occasional medical students/residents, are considered non-teaching hospital.

ICU Structure: Open ICUs are sites where patients are under the care of an attending physician (e.g. internist, family physician, surgeon) with intensivists (i.e. physician with training in critical care) consulted as necessary. Closed ICUs are sites in which patients are under the care of an intensivist, or care is shared between the intensivist and another attending physician.

Full Time Equivalent Dietitian: This is a measure of the amount of time the dietitian is dedicated to the ICU relative to a full-time position e.g. a FTE of 1.0 refers to a dietitian working in a 10 bedded ICU full-time or four dietitians working half-time in a 20 bedded ICU. A FTE of 0.5 means that the dietitian is in a 10 bedded ICU half-time, or two and a half days a week.

**Table 2. Patient Characteristics**

Number of Patients	Your Site n=20	Sister Sites n=624	All Sites n=2850
<b>Personal Information</b>			
<b>Age (years)</b>			
median [Q1,Q3]	62.5 [49-72]	63.0 [49-74]	62.0 [48-73]
<b>Sex</b>			
Male	11 (55.0%)	382 (61.2%)	1796 (63.0%)
Female	9 (45.0%)	242 (38.8%)	1054 (37.0%)
<b>Admission Information</b>			
<b>Admission Category</b>			
Medical	16 (80.0%)	418 (67.0%)	1756 (61.6%)
Surgical: Elective	3 (15.0%)	75 (12.0%)	405 (14.2%)
Surgical: Emergency	1 (5.0%)	131 (21.0%)	689 (24.2%)
<b>Admission Diagnosis</b>			
Cardiovascular / Vascular	7 (35.0%)	118 (18.9%)	501 (17.6%)
Respiratory	3 (15.0%)	195 (31.3%)	747 (26.2%)
Pancreatitis	0	7 (1.1%)	40 (1.4%)
Gastrointestinal	0	68 (10.9%)	391 (13.7%)
Neurologic	1 (5.0%)	54 (8.7%)	339 (11.9%)
Sepsis	5 (25.0%)	61 (9.8%)	241 (8.5%)
Trauma	3 (15.0%)	44 (7.1%)	289 (10.1%)
Metabolic	0	20 (3.2%)	72 (2.5%)
Hematologic	0	4 (0.6%)	18 (0.6%)
Renal	0	14 (2.2%)	46 (1.6%)
Gynecologic	0	3 (0.5%)	5 (0.2%)
Orthopedic	0	6 (1.0%)	15 (0.5%)
Bariatric Surgery	0	1 (0.2%)	3 (0.1%)
Burns	0	10 (1.6%)	30 (1.1%)
Other	1 (5.0%)	19 (3.0%)	113 (4.0%)
<b>Apache II Score</b>			
median [Q1,Q3]	20 [15.5-26]	23.0 [18-29]	22.0 [17-28]
<b>Presence of ARDS</b>			
n/N (PCT)	0	55/624 (8.8%)	320/2850 (11.2%)
<b>Outcome</b>			
<b>Length of ICU Stay (days)</b>			
median [Q1,Q3]	15.8 [11.2-20.6]	11.6 [6.8-19.9]	10.4 [5.9-18.6]
<b>Length of Hospital Stay (days)</b>			
median [Q1,Q3]	41.2 [12.5-44.3]	21.2 [12.4-37.9]	19.9 [11.9-32.4]
<b>Length of Mechanical Ventilation (days)</b>			
median [Q1,Q3]	11.8 [7.6-13.9]	8.3 [3.8-15.6]	7.0 [3.5-14.3]
<b>Patient Died (within 60 days)</b>			
n/N (PCT)	2/20 (10.0%)	181/622 (29.1%)	756/2844 (26.6%)

**Table 3. Patient Nutrition Assessment Information**

Number of Patients	Your Site n=20	Sister Sites n=624	All Sites n=2850
<b>Height (meters)</b>			
median [Q1,Q3]	1.7 [1.6-1.8]	1.7 [1.6-1.8]	1.7 [1.6-1.8]
<b>Weight (kg)</b>			
median [Q1,Q3]	80.0 [53.3-95.7]	76.0 [65.0-90.0]	74.7 [64.0-88.0]
<b>BMI (kg m2)</b>			
median [Q1,Q3]	26.6 [21.8-30.9]	26.5 [23.0-30.9]	25.5 [22.6-29.7]
<b>Weight Used in Calculate of Nutrition Prescription</b>			
Actual (ABW)	10 (50.0%)	315 (50.5%)	1216 (42.7%)
Estimated	7 (35.0%)	82 (13.1%)	486 (17.1%)
Ideal (IBW) based on Hamwi formula	0	5 (0.8%)	124 (4.4%)
Ideal (IBW) based on BMI 20-25 Kg/m2	0	54 (8.7%)	260 (9.1%)
Adjusted by 25% (ABW x 0.25 + IBW)	1 (5.0%)	124 (19.9%)	386 (13.5%)
Adjusted by 40% (ABW x 0.4 + IBW)	0	0 (0.0%)	1 (0.0%)
Adjusted average ((ABW + IBW) x 0.5)	0	0 (0.0%)	76 (2.7%)
No weight used in calculation	0	3 (0.5%)	33 (1.2%)
No assessment completed	1 (5.0%)	15 (2.4%)	49 (1.7%)
Other, please specify	1 (5.0%)	26 (4.2%)	219 (7.7%)
<b>Method used to calculate Energy Requirements</b>			
Harris Benedict Equation	0	164 (26.2%)	293 (10.2%)
Schofield Equation with no adjustment for stress and activity	0	0 (0.0%)	45 (1.6%)
Schofield Equation with adjustment for stress and/or activity	0	0 (0.0%)	351 (12.3%)
Mifflin-St. Jeor Equation	0	2 (0.3%)	28 (1.0%)
Ireton-Jones Equation	17 (85.0%)	60 (9.6%)	183 (6.4%)
Weight based: <20 Kcal/Kg	0	18 (2.9%)	130 (4.5%)
Weight based: 20-24 Kcal/Kg	0	102 (16.3%)	477 (16.7%)
Weight based: 25-29 Kcals/Kg	2 (10.0%)	247 (39.4%)	984 (34.4%)
Weight based: 30-35 Kcal/Kg	1 (5.0%)	20 (3.2%)	285 (10.0%)
Weight based: 35-40kcal/kg	0	3 (0.5%)	6 (0.2%)
Provide 1200 – 1499 Kcal as standard	0	1 (0.2%)	10 (0.3%)
Provide 1500-2000 Kcal as standard	0	2 (0.3%)	38 (1.3%)
Indirect calorimetry	0	3 (0.5%)	11 (0.4%)
No assessment completed	0	4 (0.6%)	18 (0.6%)
Other, please specify	0	1 (0.2%)	5 (0.2%)
<b>Prescribed Energy Intake (kcal)</b>			
median [Q1,Q3]	1968 [1673-2160]	1800.0 [1584-2040]	1800.0 [1512-2014]

<b>Prescribed Protein Intake (g)</b> median [Q1,Q3]	86 [74.5-99.5]	94.0 [78-109]	82.5 [70-99]
<b>Prescribed Energy Intake by Weight (kcal/kg)</b> median [Q1,Q3]	26.9 [22.2-29.4]	24.1 [20.6-26.7]	24.4 [20.2-27.3]
<b>Prescribed Protein Intake by Weight (g/kg)</b> median [Q1,Q3]	1.2 [1.0-1.3]	1.2 [1.0-1.5]	1.1 [0.9-1.3]

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**Legend**

BMI: Body Mass Index.

Prescribed energy/protein intake: kilocalories / grams provided by the goal regimen (i.e. maximum rate/volume determined at the initial assessment) for EN/PN according to the dietitians or physicians recommendation.

## Overall Performance at Your Site

Nutritional adequacy, defined as the amount of calories or protein received divided by the maximum amount prescribed at the initial assessment, expressed as a percentage, is a summary measure of your site's performance. As the recommendations of the Canadian Critical Care Nutrition CPGs focus on use of EN in preference to PN strategies to optimize delivery and minimize the risks of EN, adequacy of appropriate nutrition therapy and adequacy of EN are the primary measures of your success in following the Canadian Critical Care Nutrition CPGs. (See legend for full definition of nutritional adequacy).

Figures 1.1 – 1.4 summarizes your overall performance in providing nutrition by day in the ICU compared to other ICUs. Figure 1.5 summarizes the mean adequacy over the first 12 days of ICU stay compared to other ICUs. For benchmarking purposes, the numbers above the bars in Figure 1.5 tell you where you ranked or were placed out of your sister and all sites (i.e. 1/157 corresponds to the best performing site\*). Table 4 provides additional information about your practices by providing data on adequacy of total nutrition (EN+PN+propofol) and adequacy of EN in patients who only received EN.

\*This ranking is not the same as the site ranking for the Best of the Best Award (See page 27).

### Legend

Figure 1.1 Adequacy of Calories from Appropriate Nutrition:

The amount of calories received by EN, appropriate PN (i.e presence of contraindication to EN), and propofol as a percentage of the maximum calories prescribed at baseline assessment in ALL patients.

- Days without EN / appropriate PN are included and are counted as 0% adequacy, regardless of presence of prescription.
- Only days that follow permanent progression to exclusive oral intake are excluded.

Figure 1.2 Adequacy of Protein from Appropriate Nutrition

The amount of protein received by EN and appropriate PN (i.e presence of contraindication to EN) as a percentage of the maximum calories prescribed at baseline assessment in ALL patients.

- Days without EN / appropriate PN are included and are counted as 0% adequacy, regardless of presence of prescription
- Only days that follow permanent progression to exclusive oral intake are excluded.

Figure 1.3 Adequacy of Calories from EN

The amount of calories received by EN as a percentage of the maximum calories prescribed at baseline assessment in ALL patients.

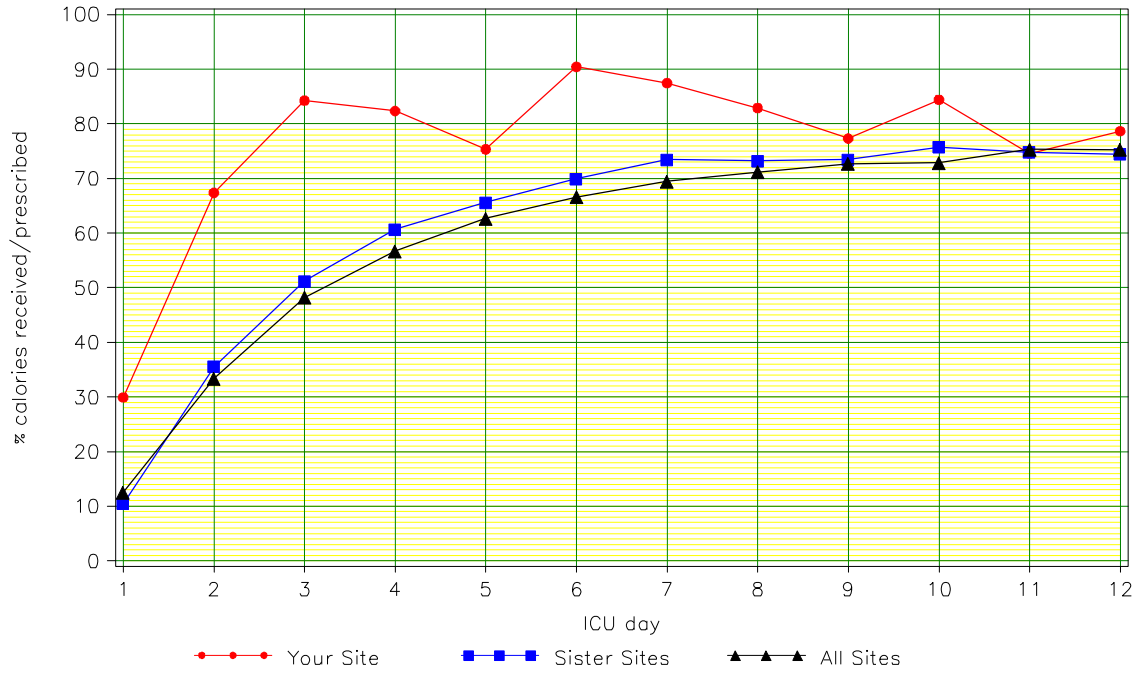
- Days without EN are included and are counted as 0% adequacy, regardless of presence of prescription
- Only days that follow permanent progression to exclusive oral intake are excluded.

Figure 1.4 Adequacy of Protein from EN

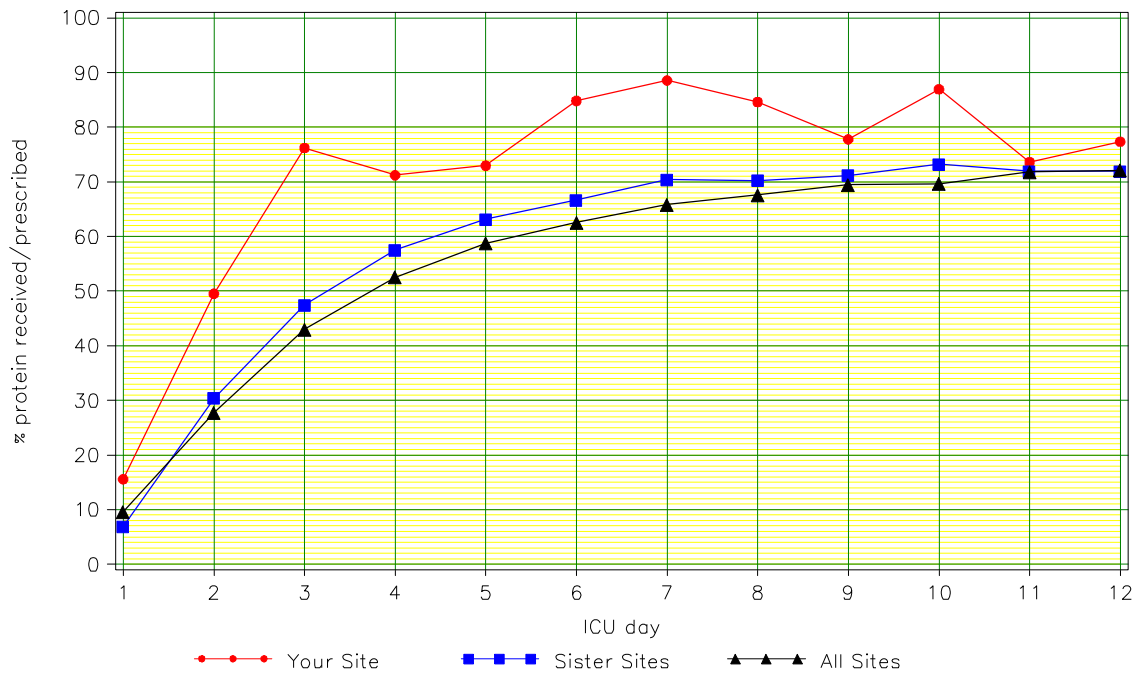
The amount of protein received by EN as a percentage of the maximum calories prescribed at baseline assessment in ALL patients.

- Days without EN are included and are counted as 0% adequacy, regardless of presence of prescription
- Only days that follow permanent progression to exclusive oral intake are excluded.

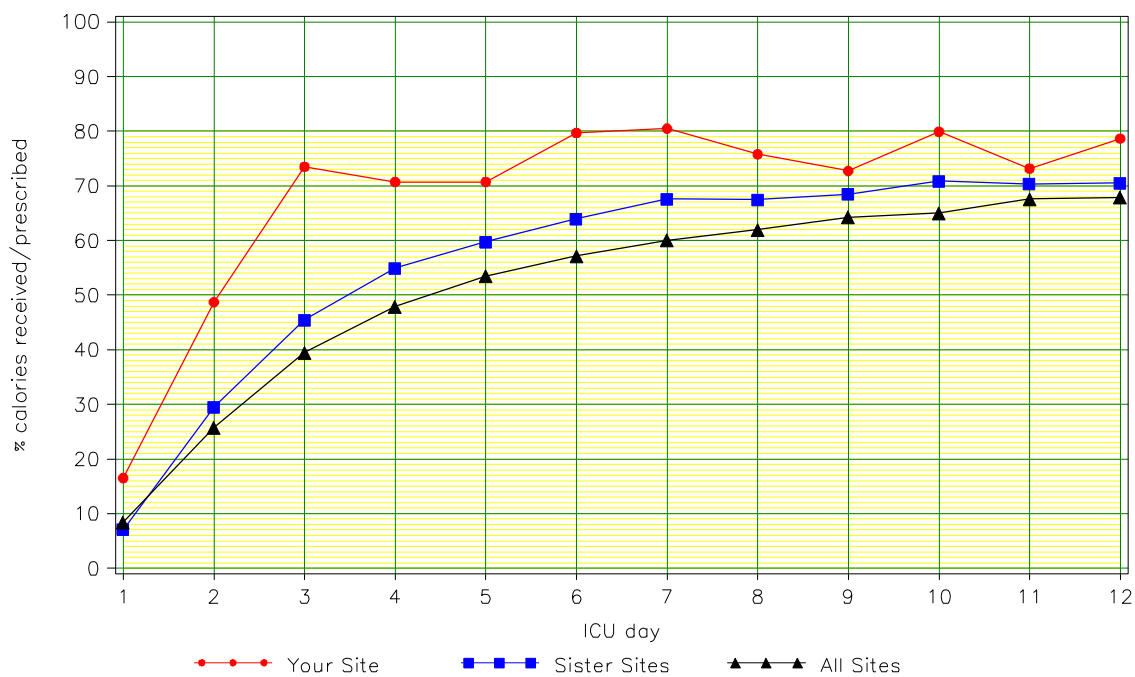
**Figure 1.1 Adequacy of Calories from Nutrition**



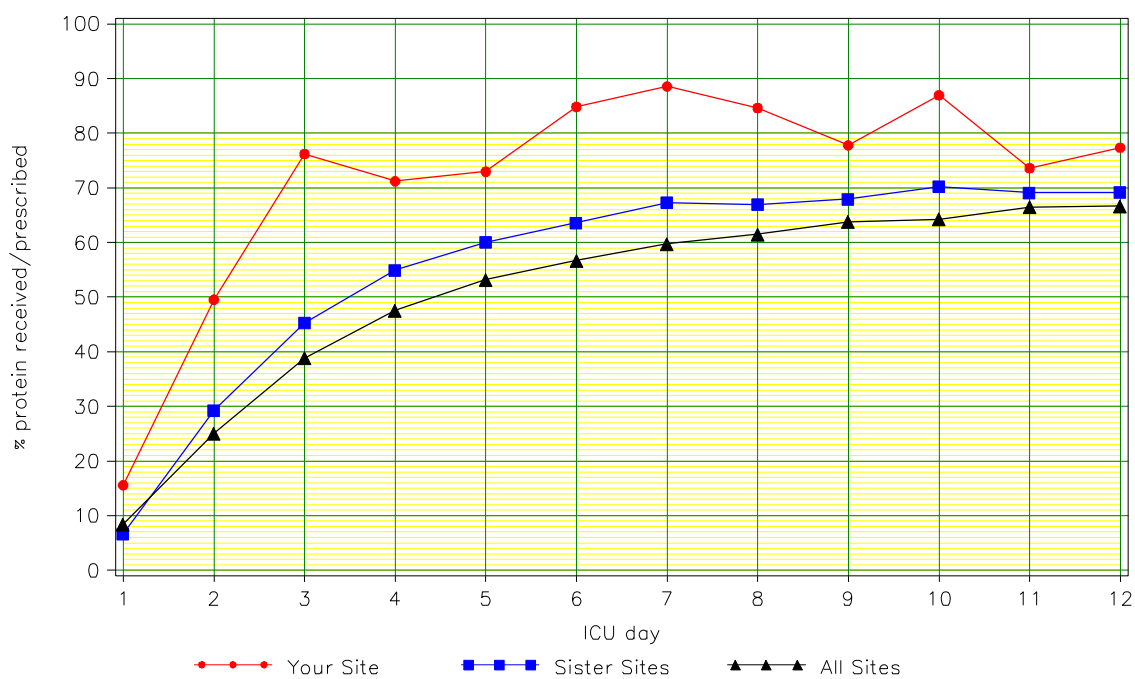
**Figure 1.2 Adequacy of Protein from Nutrition**



**Figure 1.3 Adequacy of Calories from EN**



**Figure 1.4 Adequacy of Protein from EN**

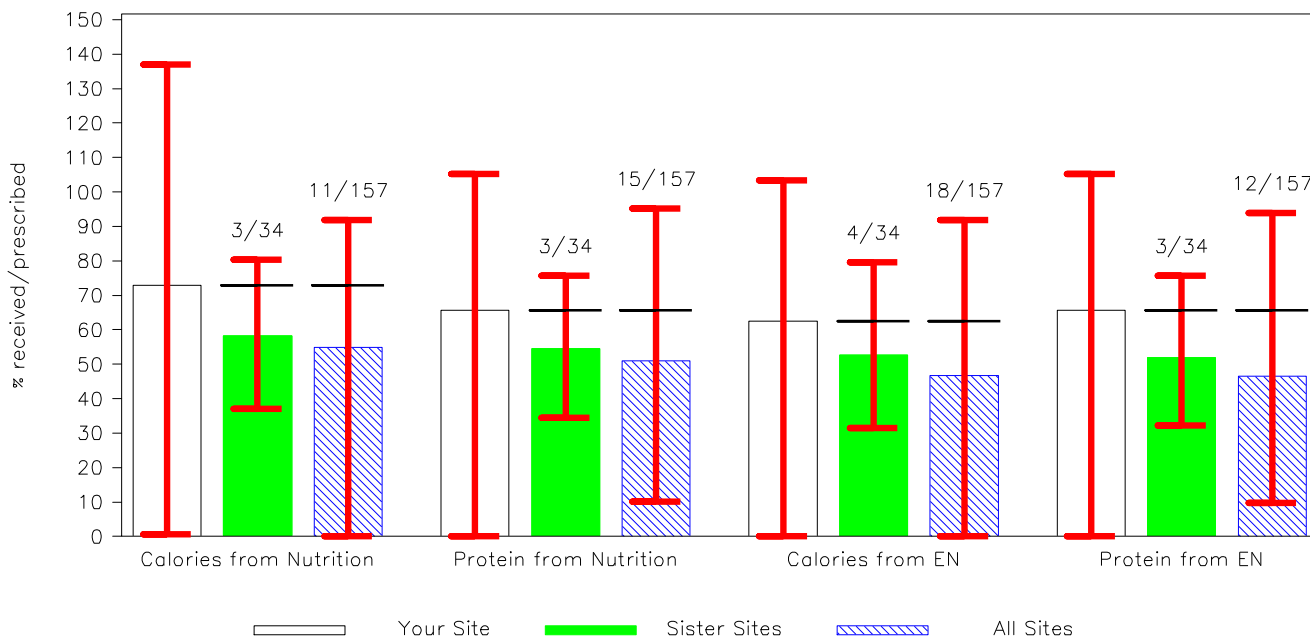


**Legend**

'n/N': the ranking of your site performance compared to sister or all sites. (i.e. 1/157 corresponds to the best performing site).  
 '-----': mean of your site, the "error bar" indicates the highest and lowest site averages.

**Figure 1.5 Overall Performance at Your Site**

ICUdays N	Calories from Nutrition			Protein from Nutrition			Calories from EN			Protein from EN		
	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites
214	5779	24735	215	5779	24795	215	5780	24765	215	5779	24799	



**Table 4. Overall Performance**

	Your Site	Sister Sites	All Sites
<b>Adequacy of Calories from Total Nutrition (EN+PN+propofol)</b>			
mean (range)	77.7%	61.9% (39.1%-80.3%)	62.8% (0.0%-102%)
<b>Adequacy of Protein from Total Nutrition (EN+PN)</b>			
mean (range)	72.9%	59.0% (37.2%-75.6%)	59.0% (10.0%-128%)
<b>Adequacy of Calories from EN in EN Only Patients</b>			
mean (range)	67.6%	56.0% (37.4%-81.2%)	51.7% (0.0%-91.9%)
<b>Adequacy of Protein from EN in EN Only Patients</b>			
mean (range)	70.8%	55.6% (38.1%-77.1%)	51.6% (11.8%-96.4%)
<b>Received Calories from Total Nutrition(EN+PN+propofol)</b>			
mean (range)	1466.3	1192.2 (782.8-1803.8)	1211.1 (91.1-2056.1)

<b>Received Protein from Total Nutrition (EN+PN)</b>			
mean (range)	64.6	62.7 (44.2-82.3)	57.3 (4.5-97.1)
<b>Received Calories from EN in EN only Patients</b>			
mean (range)	1312.0	1140.9 (791.4-1793.7)	1089.9 (91.1-2091.0)
<b>Received Protein from EN in EN only Patients</b>			
mean (range)	63.6	59.5 (39.7-81.3)	51.4 (4.5-96.2)

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## Type of Nutrition Support

### EN vs. PN

#### Recommendation:

When considering nutrition support for critically ill patients, we strongly recommend the use of enteral nutrition over parenteral nutrition.

**Table 5. Type of Nutrition (By Patient)**

Number of Patients	Your Site n=20	Sister Sites n=624	All Sites n=2850
<b>Type of Nutrition</b>			
EN Only	18 (90.0%)	513 (82.2%)	1892 (66.4%)
PN Only	0	20 (3.2%)	215 (7.5%)
EN+PN	2 (10.0%)	47 (7.5%)	476 (16.7%)
None	0	44 (7.1%)	267 (9.4%)

#### Legend

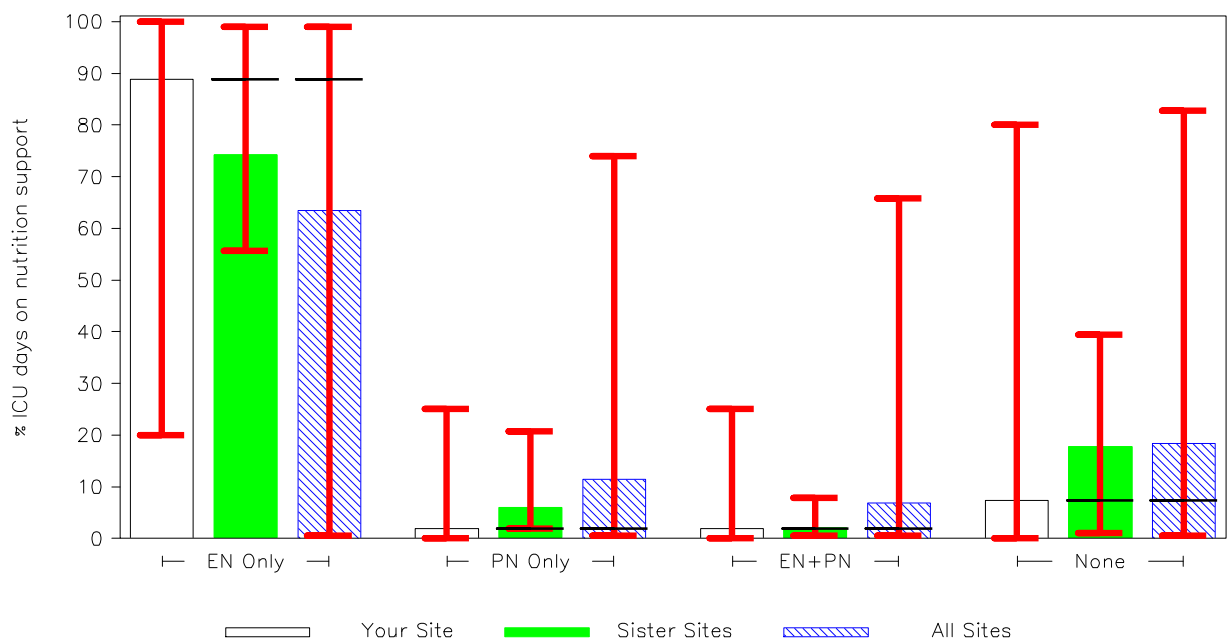
#### Figure 2. Type of Nutrition

Of all the patient days, the % on EN alone, PN alone, EN + PN and No nutrition

- Days on oral intake+EN are counted as EN, oral intake+PN as PN & EN+PN+oral as EN+PN
- Days on oral intake alone are excluded

**Figure 2. Type of Nutrition Support (by ICU days)**

ICU days N	EN Only			PN Only			EN+PN			None		
	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites
	192	4289	15749	4	345	2846	4	120	1689	16	1024	4559



## Early vs. Delayed EN

### Recommendation:

We recommend early enteral nutrition (within 24-48 hrs following admission) in critically ill patients.

**Table 6. Initiation of EN**

Number of Patients on EN	Your Site n=20	Sister Sites n=560	All Sites n=2368
<b>Initiation of EN</b>			
Prior to ICU admission	1 (5.0%)	37 (6.6%)	171 (7.2%)
0-24	15 (75.0%)	259 (46.3%)	983 (41.5%)
>24-48	4 (20.0%)	131 (23.4%)	525 (22.2%)
>48-72	0	64 (11.4%)	304 (12.8%)
>72	0	69 (12.3%)	385 (16.3%)

### Legend

Non-finalized patients are excluded

### Legend

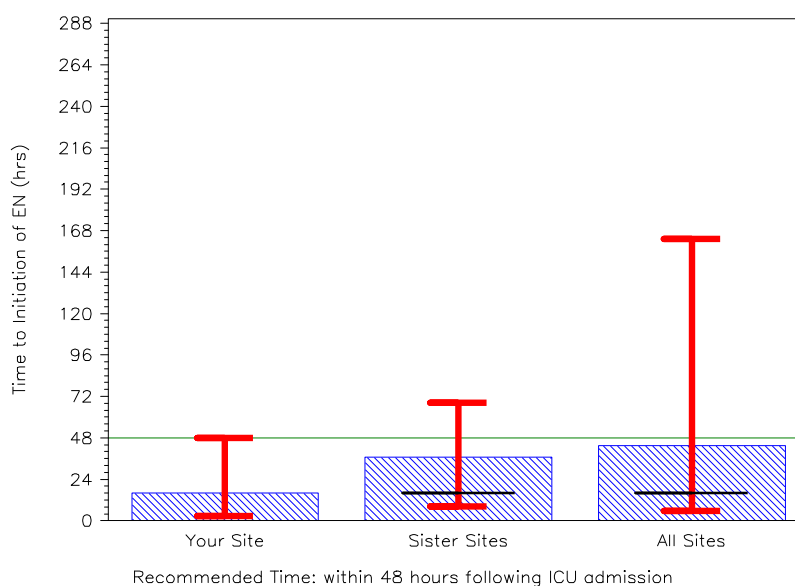
#### Figure 3. Timing of Initiation of EN

The timing of start of EN from admission to ICU (in hours) in patients on EN

- Patients that were started on EN before admission to ICU are excluded.
- Non-finalized patients are excluded

**Figure 3. Timing of Initiation of EN**

Patients	N	Your Site	Sister Sites	All Sites
		19	523	2197



## Composition of EN: Immune enhancing Diets: Arginine fish oils/borage oil and Glutamine Containing Diets

### Recommendation:

- a) We recommend that diets supplemented with arginine and other selected nutrients NOT BE USED for critically ill patients.
- b) We recommend the use of an enteral formula with fish oils, borage oils, and antioxidants in patients with acute respiratory distress syndrome (ARDS).
- c) When initiating enteral feeds, we recommend the use of whole protein formula (polymeric) in critically ill patients.

**Table 7.1. Composition of Enteral Formulas**

Enteral Formulas	Your Site	Sister Sites	All Sites
Arginine enriched formula	0	1.3% (0.0%-16.7%)	6.0% (0.0%-93.8%)
Fish oil enriched formula (all patients)	0	3.8% (0.0%-66.7%)	3.1% (0.0%-83.3%)
Fish oil enriched formula (ARDS patients)	NA	19.6% (0.0%-100%)	10.5% (0.0%-100%)
Glutamine enriched formula (all patients)	0	2.6% (0.0%-88.9%)	1.2% (0.0%-88.9%)
Polymeric formulas	19/20 (95.0%)	96.9% (81.3%-100%)	90.5% (0.0%-100%)

### Legend

Of the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving these formulas

- Arginine enriched formulas in all patients.
- Fish oil enriched formula in all patients
- Fish oil enriched formula in ARDS patients
- Glutamine enriched formulas in all patients
- Polymeric formulas in all patients

## Glutamine Supplementation

### Recommendation:

a) Enteral glutamine should be considered in burn and trauma patients. There are insufficient data to support the routine use of enteral glutamine in other critically ill patients.

b) When parenteral nutrition is prescribed to critically ill patients, parenteral supplementation with glutamine, where available, is recommended. There are insufficient data to generate recommendations for intravenous glutamine in critically ill patients who are receiving enteral nutrition.

**Table 7.2. Glutamine Supplementation**

Glutamine supplementation	Your Site	Sister Sites	All Sites
All glutamine supplementation	3/20 (15.0%)	3.3% (0.0%-88.9%)	7.6% (0.0%-88.9%)
EN glutamine supplementation	3/20 (15.0%)	3.3% (0.0%-88.9%)	3.1% (0.0%-88.9%)
IV/PN glutamine supplementation	0	0	4.7% (0.0%-88.2%)
<b>EN Patients</b>			
All glutamine supplementation	3/20 (15.0%)	3.4% (0.0%-88.9%)	6.0% (0.0%-88.9%)
EN glutamine supplementation	3/20 (15.0%)	3.4% (0.0%-88.9%)	3.4% (0.0%-88.9%)
IV/PN glutamine supplementation	0	0	2.8% (0.0%-83.3%)
<b>PN Patients</b>			
All glutamine supplementation	1/2 (50.0%)	6.0% (0.0%-50.0%)	21.9% (0.0%-100%)
EN glutamine supplementation	1/2 (50.0%)	6.0% (0.0%-50.0%)	5.6% (0.0%-100%)
IV/PN glutamine supplementation	0	0	16.9% (0.0%-100%)
<b>Burn Patients</b>			
All glutamine supplementation	NA	90.0% (88.9%-100%)	62.1% (0.0%-100%)
<b>Trauma Patients</b>			
All glutamine supplementation	0	2.3% (0.0%-33.3%)	7.4% (0.0%-100%)

### Legend

Of ALL the patients, the average number (or %) of patients EVER receiving glutamine supplementation.

Of ALL the patients, the average number (or %) of patients EVER receiving EN glutamine supplementation.

Of ALL the patients, the average number (or %) of patients EVER receiving IV/PN glutamine supplementation.

#### EN PATIENTS

Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving glutamine

supplementation.

Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving EN glutamine supplementation.

#### PN PATIENTS

Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving glutamine

supplementation.

Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving IV/PN glutamine supplementation.

#### BURN PATIENTS

Of ALL the BURNS patients the average number (or %) of patients EVER receiving glutamine supplementation.

#### TRAUMA PATIENTS

Of ALL the TRAUMA patients, the average number (or %) of patients EVER receiving glutamine supplementation.

## Selenium Supplementation

### Recommendation:

- a) The use of supplemental combined vitamins and trace elements should be considered in critically ill patients.  
 b) The use of IV/PN selenium supplementation alone or in combination with other antioxidants should be considered in critically ill patients.

**Table 7.3. Selenium Supplementation**

Selenium supplementation	Your Site	Sister Sites	All Sites
All selenium supplementation	0	4.1% (0.0%-55.6%)	4.5% (0.0%-95.0%)
EN selenium supplementation	0	3.3% (0.0%-55.6%)	2.4% (0.0%-88.9%)
IV/PN selenium supplementation	0	1.6% (0.0%-22.2%)	2.7% (0.0%-85.0%)
<b>EN Patients</b>			
All selenium supplementation	0	4.1% (0.0%-55.6%)	3.4% (0.0%-100%)
EN selenium supplementation	0	3.4% (0.0%-55.6%)	2.5% (0.0%-100%)
IV/PN selenium supplementation	0	1.4% (0.0%-22.2%)	1.4% (0.0%-66.7%)
<b>PN Patients</b>			
All selenium supplementation	0	4.5% (0.0%-100%)	10.4% (0.0%-100%)
EN selenium supplementation	0	0	3.3% (0.0%-100%)
IV/PN selenium supplementation	0	4.5% (0.0%-100%)	8.1% (0.0%-100%)

### Legend

Of ALL the patients, the average number (or %) of patients EVER receiving selenium supplementation.

Of ALL the patients, the average number (or %) of patients EVER receiving EN selenium supplementation.

Of ALL the patients, the average number (or %) of patients EVER receiving IV/PN selenium supplementation.

#### EN PATIENTS

Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving selenium supplementation.

Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving EN selenium supplementation.

Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving IV/PN selenium supplementation.

#### PN PATIENTS

Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving selenium supplementation.

Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving EN selenium supplementation.

Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving IV/PN selenium supplementation.

## Strategies to optimize delivery and minimize risks of EN

### **Recommendation:**

*There are insufficient data from randomized trials to recommend the use of a feeding protocol in critically ill patients. If a feeding protocol is to be used, a protocol that incorporates prokinetics (metoclopramide) at initiation and tolerates a higher gastric residual volume (250 mls) should be considered as a strategy to optimize delivery of enteral nutrition in critically ill adult patients.*

**Table 8. Feeding Protocols**

Number of ICUs	Your Site n=1	Sister Sites n=34	All Sites n=157
<b>Feeding Protocol</b>			
Yes	Yes	29 (85.3%)	125 (79.6%)
<b>Gastric Residual Volume Tolerated in Protocol</b>			
mean (range)	200	230 (150-300)	208 (100-500)
<b>Algorithms included in Protocol</b>			
Motility agents	Yes	23 (88.5%)	83 (71.6%)
Small bowel feeding	Yes	19 (73.1%)	61 (52.6%)
Withholding for procedures	No	10 (38.5%)	57 (49.1%)
HOB Elevation	Yes	23 (88.5%)	93 (80.2%)
Other	No	10 (38.5%)	22 (19.0%)

### **Legend**

HOB: Head of Bed.

### **Motility Agents**

#### **Recommendation:**

*In critically ill patients who experience feed intolerance (high gastric residuals, emesis), the use of metoclopramide as a motility agent should be considered.*

### **Small Bowel Feeding**

#### **Recommendation:**

*Small bowel feeding compared to gastric feeding may be associated with a reduction in pneumonia in critically ill patients. In units where obtaining small bowel access is feasible, we recommend the routine use of small bowel feedings. In units where obtaining access involves more logistical difficulties, small bowel feedings should be considered for patients at high risk for intolerance to EN (on inotropes, continuous infusion of sedatives, or paralytic agents, or patients with high nasogastric drainage) or at high risk for regurgitation and aspiration (nursed in supine position). Finally, in units where obtaining small bowel access is not feasible (no access to fluoroscopy or endoscopy and blind techniques not reliable), small bowel feedings should be considered for those select patients who repeatedly demonstrate high gastric residual volumes and are not tolerating adequate amounts of EN delivered into the stomach.*

### **Body Position**

#### **Recommendation:**

*We recommend that critically ill patients receiving enteral nutrition have the head of the bed elevated to 45 degrees. Where this is not possible, attempts to raise the head of the bed as much as possible should be considered.*

**Legend**

**Motility Agents in Those on EN with Feeds Interrupted Due to High Gastric Residual Volumes**

Of ALL the patients that were EVER on EN (or EN + PN) and EVER had feeds interrupted due to high gastric residual volumes during the study period, the percentage that received motility agents.

**Small Bowel Feeding in Those on EN with Feeds Interrupted Due to High Gastric Residual Volumes**

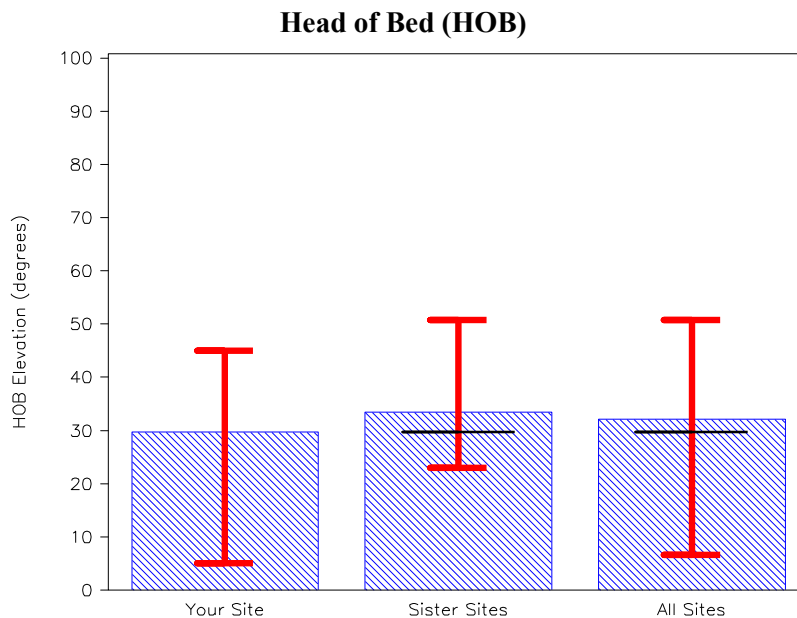
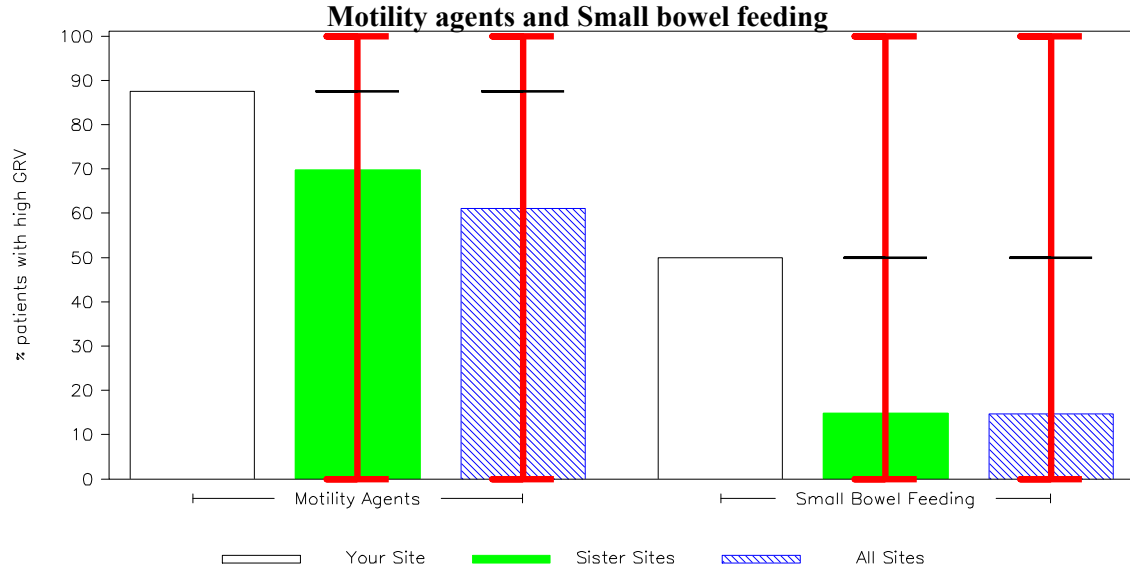
Of ALL the patients that were EVER on EN (or EN + PN) and EVER had feeds interrupted due to high gastric residual volumes during the study period, the percentage that received small bowel feeding.

**Body Position in Patients Receiving EN**

Of ALL the patients that were EVER on EN (or EN + PN), the mean of all the head of the bed elevation measurements.

**Figure 4. Strategies to optimize delivery and minimize risks of EN**

Patients N	Motility Agents			Small Bowel Feeding			HOB Elevation (degrees)		
	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites
	8	175	683	8	175	683	20	560	2368



## EN in combination with PN

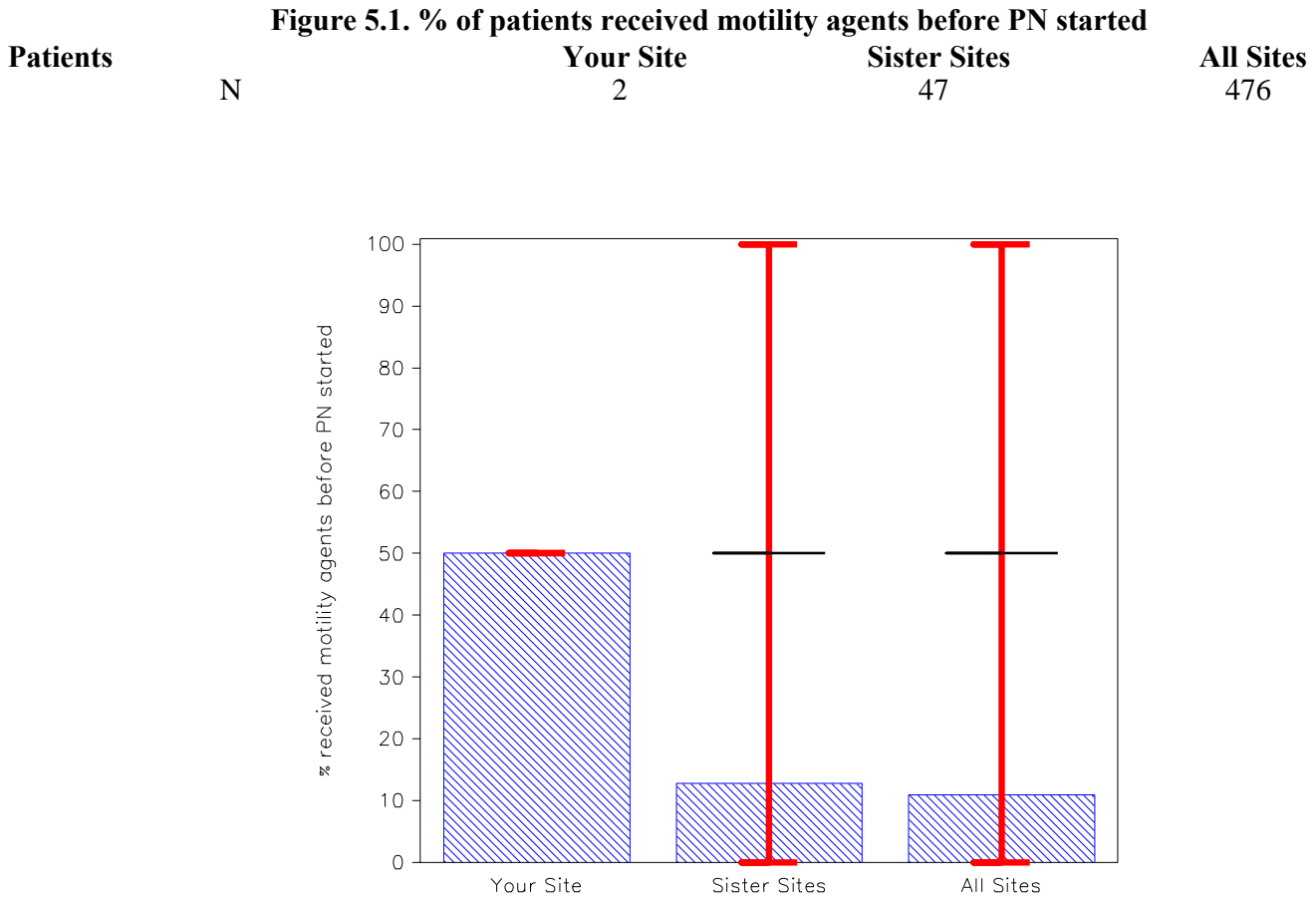
### Recommendation:

For critically ill patients starting on enteral nutrition, we recommend that parenteral nutrition not be started at the same time as enteral nutrition. In the patient who is not tolerating adequate enteral nutrition, there are insufficient data to put forward a recommendation about when parenteral nutrition should be initiated. Practitioners will have to weigh the safety and benefits of initiating PN in patients not tolerating EN on an individual case-by-case basis. We recommend that PN not be started in critically ill patients until all strategies to maximize EN delivery (such as small bowel feeding tubes, motility agents) have been attempted.

### Legend

#### Figure 5.1. Percentage of patients received motility agents before PN started

Of all the patients that EVER received combination EN+PN and had feeds interrupted due to high gastric residual volumes, the percentage that received motility agents before PN started.

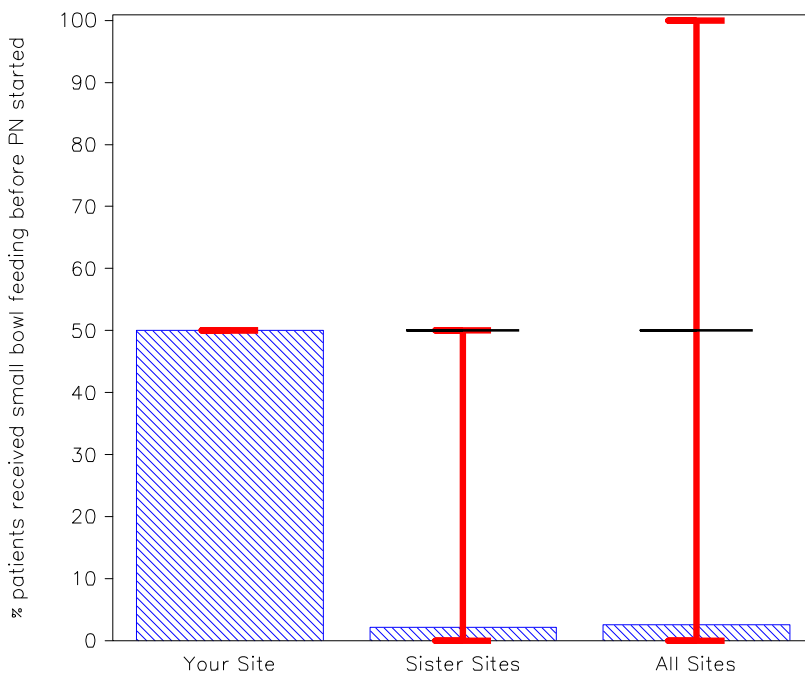


**Legend**

**Figure 5.2. Percentage of patients received small bowel feeding before PN started**

Of all the patients that EVER received combination EN+PN and had feeds interrupted due to high gastric residual volumes, the percentage that received small bowel feeding before PN started.

<b>Patients</b>		<b>Your Site</b>	<b>Sister Sites</b>	<b>All Sites</b>
N		2	47	476



## PN vs. Standard Care

### **Recommendation:**

*In critically ill patients with an intact gastrointestinal tract, we strongly recommend that parenteral nutrition not be used routinely.*

**Table 9. Reason EN not Provided**

Number of Patients on PN	Your Site n=2	Sister Sites n=67	All Sites n=687
<b>Reason EN not received</b>			
No Clinical Reason	0	12 (17.9%)	180 (26.2%)
Mechanical bowel obstruction*	0	3 (4.5%)	30 (4.4%)
Bowel ischemia*	0	5 (7.5%)	30 (4.4%)
Small bowel ileus*	0	4 (6.0%)	38 (5.5%)
Small bowel fistulae*	0	2 (3.0%)	37 (5.4%)
Gastrointestinal perforation*	0	7 (10.4%)	47 (6.8%)
Short Gut Syndrome*	0	4 (6.0%)	43 (6.3%)
Hemodynamic instability	0	2 (3.0%)	38 (5.5%)
Proximal bowel anastomosis / anastomotic leak	0	2 (3.0%)	60 (8.7%)
Not tolerating enteral feeding	1 (50.0%)	13 (19.4%)	113 (16.4%)
No access to gastrointestinal tract	0	2 (3.0%)	25 (3.6%)
Pancreatitis	0	2 (3.0%)	34 (4.9%)
Gastrointestinal bleed	0	6 (9.0%)	63 (9.2%)
Gastrointestinal surgery	0	12 (17.9%)	118 (17.2%)
Malabsorption (e.g. high stool output)	1 (50.0%)	2 (3.0%)	8 (1.2%)
EN / oral diet provided in addition to PN	1 (50.0%)	9 (13.4%)	66 (9.6%)
Other, please specify	0	11 (16.4%)	64 (9.3%)

### **Legend**

Of all the patients that ever received PN (or EN+PN), the reason EN was not provided. Patient may have >1 reason why EN not provided.

\*Considered as true contraindication to EN for assessment of appropriate PN in nutritional adequacy calculation (see page 8).

## Strategies to optimize benefits and minimize risks of PN

### Dose of PN

#### **Recommendation:**

*In critically ill patients who are not malnourished, are tolerating some EN, or when parenteral nutrition is indicated for short term use (< 10 days), low dose parenteral nutrition should be considered. There are insufficient data to make recommendations about the use of low dose parenteral nutrition or withholding lipids in the following patients: those requiring PN for long term (> 10 days), obese critically ill patients, and malnourished critically ill patients. Practitioners will have to weigh the safety and benefits of low dose PN/withholding lipids on an individual case-by-case basis in these latter patient populations.*

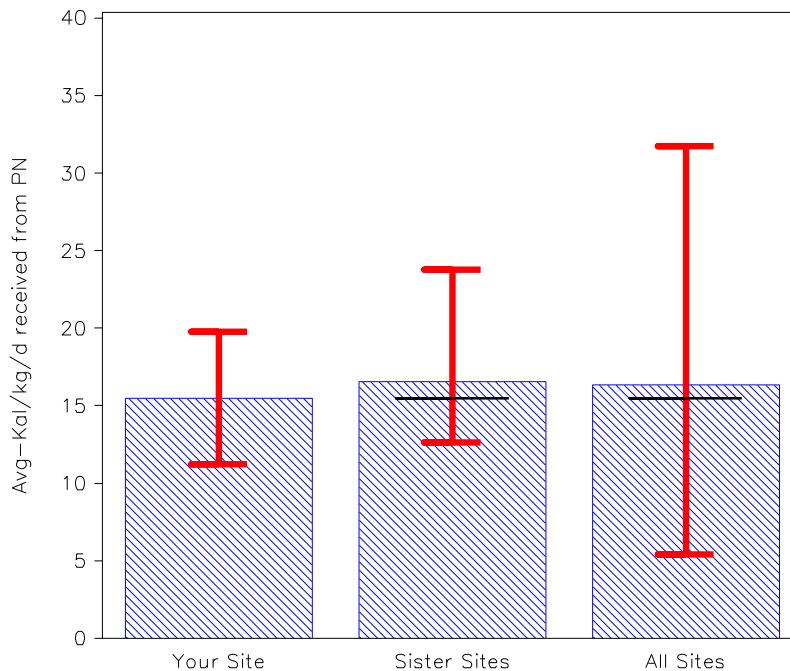
#### **Legend**

##### **Calories Received from PN (Kcal/kg/day)**

In those patients that were EVER on PN (or EN + PN), the average Kcals received from PN per kilogram per day.

**Figure 6. Calories Received from PN (Kcal|Kg|Day)**

Patients	N	Your Site	Sister Sites	All Sites
		2	67	691



## Use of Lipids

### **Recommendation:**

*In critically ill patients who are not malnourished, are tolerating some EN, or when parenteral nutrition is indicated for short-term use (<10 days), withholding lipids high in soybean oil should be considered. There are insufficient data to make a recommendation about withholding lipids high in soybean oil in critically ill patients who are malnourished or those requiring PN for long term (>10 days). Practitioners will have to weigh the safety and benefits of withholding lipids on an individual case-by-case basis in these latter patient populations.*

**Table 10. Use of Lipids**

Number of Patient-days on PN	Your Site n=8	Sister Sites n=465	All Sites n=4561
<b>Lipids received</b>			
Lipid Free	8 (100%)	87 (18.7%)	731 (16.0%)
Soybean oil based (LCTs)	0	378 (81.3%)	1839 (40.3%)
MCT/LCT physical mixture	0	0 (0.0%)	882 (19.3%)
MCT/LCT structured form	0	0 (0.0%)	438 (9.6%)
Olive Oil based	0	0 (0.0%)	395 (8.7%)
Fish Oil based	0	0 (0.0%)	16 (0.4%)
Mixture of soy oil, MCTs, and fish oil	0	0 (0.0%)	15 (0.3%)
Mixture of soy oil, MCTs, olive oil, and fish oil	0	0 (0.0%)	8 (0.2%)
Other	0	0 (0.0%)	237 (5.2%)

### **Legend**

Type of PN: in those patients ever on PN (or EN+PN) the days on PN receiving specific type of lipids.

## Intensive insulin therapy

### Recommendation:

*In surgical critically ill patients receiving nutrition support, intensive insulin therapy to tightly control blood sugars between 4.4-6.1mmol/l should be considered. There are insufficient data to make a recommendation regarding intensive insulin therapy in other critically ill patients. In all critically ill patients, we recommend avoiding hyperglycemia (blood glucose >10 mmol/l) by minimizing iv dextrose + using insulin administration when necessary.*

**Table 11. Glycemic Control Protocol**

Number of Patient-days	Your Site n=202	Sister Sites n=5600	All Sites n=23811
<b>Glycemic Control Protocol</b>	Yes	31 (91.2%)	140 (89.2%)
<b>Target of Blood Glucose: Lower (mmol/l)</b>			
median [Q1,Q3]	4.0	4.5 [4.0-5.0]	4.4 [4.0-5.0]
<b>Target of Blood Glucose: Upper (mmol/l)</b>			
median [Q1,Q3]	9.0	8.0 [7.0-8.0]	8.0 [6.7-8.3]
<b>Morning Blood Glucose (mmol/l)</b>			
median [Q1,Q3]	7.9 [6.6-9.1]	7.2 [6.1-8.7]	7.1 [6.0-8.5]
<b>Insulin Received (units)</b>			
median [Q1,Q3]	59.0 [35.1-86.5]	41.4 [16.0-76.5]	36.0 [15.0-68.0]
<b>Total days with Hypoglycemic Events*</b>			
n/N (PCT)	8/222 (3.6%)	171/6224 (2.7%)	734/26661 (2.8%)

\*Total days with Hypoglycemic events: Study day with at least one hypoglycemic event (i.e. blood glucose <3.5 mmol/l).

**Figure 7 Patient-days with blood glucose>10 mmol/l**



**Figure 7.: Blood glucose levels (patient days with blood glucose > 10 mmol/l)**

Of ALL patients the % of patient days with blood glucose > 10 mmol/l EXCLUDING Day 1 after admission to the ICU.

## Best of the Best 2008

Although the hard work and dedication of all ICUs who participate in the international nutrition survey is appreciated, in 2008, we wish to recognize the ICU that achieved the highest nutritional adequacy for their submitted patients and adheres to the recommendations of the Canadian Critical Care Nutrition CPGs, through the Best of the Best Award.

To be eligible for this award, participating ICUs must meet the following criteria:

1. Entered data on a total of 20 critically ill patients.
2. Completion of a baseline nutrition assessment (i.e. nutrition prescription).
3. Must have implemented a feeding protocol
4. No missing data or outstanding queries.
5. Prepared to permit CCN to source verify the entered data.

The Best of the Best ICU will be selected according to the following criteria:

Determinant	Weighting*
Overall Adequacy of EN plus appropriate PN	10
% patients receiving EN	5
% of patients with EN initiated within 48 hours	3
% of patients with high gastric residual volumes (HGRV) receiving motility agents	1
% of patients with HGRV receiving small bowel tubes	1
% of patient glucose measurements greater than 10 mmol/L (excluding day 1; fewest is best)	3

For each of the above determinants, all eligible sites will be ranked and the top performing site will be awarded 83 points, the next top site 82 points, the third performing site, 81 points etc. For each determinant, the ranking points will be multiplied by the weights and summed up to generate the total points per site.

The Best of the Best Award will be announced pending finalization of the site reports and source verification of entered data.

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\* The relative weightings reflect the importance of the overall findings (adequacy) and the strength of clinical recommendations: “strongly recommend”=5, “recommend”=3, “should consider”=1

## **Disseminating the Results of Your Site Report**

Your ICU has committed a significant amount of time to participate in the International Survey. We have committed a significant amount of time and resources to produce these site reports. We encourage you to use it as a unique benchmarking opportunity to highlight your strengths and weaknesses, and inform quality improvement initiatives.

The following are a few suggestions of useful forums from which to disseminate the site reports:

- Print off and copy the site report and distribute to key stakeholders.
- Meet with ICU management and/or Hospital administration.
- Lead a small group interactive workshop with local doctors and nurses to strategize on ways to improve your performance.
- Produce and post a poster outlining your main strengths and weaknesses and suggested changes.

Various resources designed to assist you in local dissemination of the site report are available under 'Tools and Training Kits' on the Critical Care Nutrition website ([www.criticalcarenutrition.com](http://www.criticalcarenutrition.com)).

Thank you for your support with the International Nutrition Survey. We look forward to working with you again.

*Critical Care Nutrition Team*

*December 2008*