Critical Care Nutrition

www.criticalcarenutrition.com

Final Site Report

Improving the Practice of Nutrition Therapy in the Critically ill:
An International Quality Improvement Project
ABCDEFG HOSPITAL

Produced by:

Critical Care Nutrition,
Clinical Evaluation Research Unit,
Angada 4, Kingston General Hospital,
Kingston, ON. Canada K7L 2V7
Phone: 613-549-6666 ext 2812
e-mail: lemieuxm@kgh.kari.net

Interpreting Your Site Report

The International Nutrition Survey is a prospective survey of nutrition practices in Intensive Care Units (ICUs) throughout the World. Since September 2014, your ICU has been involved in collecting data for this survey. This site report summarizes your site's performance ('Your site') 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.

Next, you will find pages that 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:

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

Glossary of terms

Your site:	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.
Sister sites:	refers to the average of all the data from ICUs within your own country or region (see page 3).
All sites:	refers to the average of all the data from all the ICUs in the database.
Range:	refers to the highest and lowest site percentages or averages.
Q1:	refers to the first quartile point from either your / sister / all sites.
Q3:	refers to the third quartile point from either your / sister / all sites.
N:	number of ICU sites / patients / ICU days as indicated.
NA:	not applicable, no relevant data entered for this data point.
PCT:	percent.
n/N:	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".

Participating ICUs

'All Sites' refers to the average of all the data from all the ICUs in the database (n=179).
'Sister sites' refers to the average of all the data from hospitals within your country or region and are classified as follows:

Sister Sites	Countries	Number of ICUs
Canada	Canada	8
Australia and New Zealand	Australia	38
	New Zealand	1
USA	United States	58
Europe and Africa	Ireland	1
	South Africa	6
	Switzerland	1
	United Kingdom	8
Latin America	Argentina	2
	Brazil	1
	Chile	1
	Colombia	6
	Uruguay	2
	Venezuela, Bolivarian Republic	1
Asia	India	11
	Japan	26
	Malaysia	1
	Philippines	1
	Singapore	6

Table 1. Characteristics of Participating ICUs

Number of ICUs	Your Site n=1	Sister Sites n=39	All Sites n=179
Type of Hospital			
Non-teaching	-	1 (2.6%)	29 (16.2%)
Teaching	Yes	38 (97.4%)	150 (83.8%)
Size of Hospital (beds)			
mean (range)	400	532 (180-929)	572 (60-1541)
Mulitiple ICU			
	No	10 (25.6%)	112 (62.6%)
ICU Type			
closed	Yes	36 (92.3%)	120 (67.0%)
open	-	3 (7.7%)	50 (27.9%)
other	-	0	9 (5.0%)
Case Types			
Medical	Yes	36 (92.3%)	140 (78.2%)
Neurological	Yes	25 (64.1%)	103 (57.5%)
Surgical	Yes	35 (89.7%)	141 (78.8%)
Neurosurgical	Yes	23 (59.0%)	98 (54.7%)
Trauma	Yes	19 (48.7%)	94 (52.5%)
Cardiac Surgery	Yes	20 (51.3%)	65 (36.3%)
Pediatrics	No	1 (2.6%)	9 (5.0%)
Burns	No	4 (10.3%)	28 (15.6%)
Other	Yes	8 (20.5%)	15 (8.4%)
Medical Director			
	Yes	38 (97.4%)	166 (92.7%)
Size of ICU (beds)			
mean (range)	38	19 (5-58)	18 (4-58)
Dietitian Work			
	Yes	39 (100%)	158 (88.3%)
Full time equivalent dietitians (per 10 beds)			
mean (range)	0.1	0.3 (0.1-0.8)	0.5 (0.1-2.5)

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 hospitals.
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=790	**All Sites** n=3812
	Personal Information		
Age			
mean (range)	59.6 (32-85)	59.4 (16-93)	59.2 (16-102)
Sex			
Female	8 (40.0%)	279 (35.3%)	1368 (35.9%)
Male	12 (60.0%)	511 (64.7%)	2444 (64.1%)
	Admission Information		
Type of Admission			
Medical	10 (50.0%)	469 (59.4%)	2291 (60.1%)
Surgical Elective	3 (15.0%)	117 (14.8%)	509 (13.4%)
Surgical Emergency	7 (35.0%)	204 (25.8%)	1012 (26.5%)
Admission Diagnosis			
Non-operative Condition:			
0	1 (10.0%)	10 (2.1%)	53 (2.3%)
Cardiovascular/Vascular	1 (10.0%)	74 (15.8%)	331 (14.4%)
Respiratory	3 (30.0%)	150 (32.0%)	682 (29.8%)
Gastrointestinal	0	20 (4.3%)	110 (4.8%)
Neurologic	2 (20.0%)	63 (13.4%)	363 (15.8%)
Sepsis	0	64 (13.6%)	373 (16.3%)
Trauma	1 (10.0%)	19 (4.1%)	85 (3.7%)
Metabolic	0	37 (7.9%)	93 (4.1%)
Hematologic	0	3 (0.6%)	12 (0.5%)
Burns	2 (20.0%)	29 (6.2%)	189 (8.2%)
Operative Condition:			
0	0	20 (6.2%)	69 (4.5%)
Vascular/Cardiovascular	3 (30.0%)	84 (26.2%)	395 (26.0%)
Respiratory	0	16 (5.0%)	65 (4.3%)
Gastrointestinal	1 (10.0%)	101 (31.5%)	364 (23.9%)
Neurologic	2 (20.0%)	57 (17.8%)	261 (17.2%)
Trauma	3 (30.0%)	37 (11.5%)	288 (18.9%)
Renal	0	3 (0.9%)	13 (0.9%)
Gynecologic	0	0	2 (0.1%)
Orthopedic	1 (10.0%)	2 (0.6%)	16 (1.1%)
Bariatric Surgery	0	1 (0.3%)	2 (0.1%)
Burns	0	0	46 (3.0%)
Apache II Score			
mean (range)	16.6 (9-34)	21 (5-49)	21.3 (1-53)
SOFA score			
mean (range)	6.15 (2-10)	7.03 (0-17)	6.22 (0-18)
NUTRIC score			
mean (range)	3.2 (1-7)	4.3 (0-9)	4.09 (0-9)
Presence of ARDS			
Yes n/N (PCT)	2/20 (10.0%)	63/790 (8.0%)	404/3812 (10.6%)
	Outcome		
Length of Mechanical Ventilation (days, 60-day censored)			
median [Q1,Q3]	8.5 [4.6-15.4]	5.3 [2.5-10.6]	5.9 [2.8-12.1]
Length of Stay in ICU (days, 60-day censored)			
median [Q1,Q3]	12.1 [7.1-17.2]	8.4 [5.0-15.9]	10.0 [5.8-19.4]
Length of Stay in Hospital (days, 60-day censored)			
median [Q1,Q3]	22.0 [16.1-44.0]	18.5 [10.5-38.2]	20.5 [11.4-42.4]

Mortality (60-day censored)			
Yes n/N (PCT)	6/20 (30.0%)	170/790 (21.5%)	832/3812 (21.8%)

Legend
*Censored at 60 days.

Table 3. Patient Nutrition Assessment Information

Number of Patients	**Your Site** n=20	**Sister Sites** n=790	**All Sites** n=3812
Height (meters)			
mean (range)	1.7 (1.6-1.8)	1.7 (1.4-2.0)	1.7 (1.3-2.0)
Weight (Kg)			
mean (range)	76.7 (60.0-165.0)	82.0 (37.0-228.0)	76.3 (18.6-250.0)
BMI (kg m2)			
mean (range)	27.0 (19.6-50.9)	28.3 (14.1-62.1)	26.8 (9.1-74.7)
How was weight determined?			
Actual	4 (20.0%)	393 (49.7%)	2244 (59.1%)
Estimated	16 (80.0%)	397 (50.3%)	1555 (40.9%)
Weight used in calculation of goal calorie requirement			
Other (specify)	2 (10.0%)	16 (2.7%)	51 (1.6%)
Actual dry body weight	1 (5.0%)	219 (36.5%)	1505 (46.7%)
Ideal (IBW) based on Hamwi formula	0	7 (1.2%)	183 (5.7%)
Ideal (IBW) based on BMI 20-25 kg/m^2	1 (5.0%)	48 (8.0%)	415 (12.9%)
Adjusted by 25% (0.25(ABW - IBW) + IBW)	0	86 (14.3%)	191 (5.9%)
Adjusted by 40% (0.4(ABW - IBW) + IBW)	0	0	4 (0.1%)
Adjusted average (0.5(ABW + IBW))	0	47 (7.8%)	80 (2.5%)
No weight used in calculation	0	2 (0.3%)	9 (0.3%)
Estimated dry body weight	15 (75.0%)	151 (25.2%)	672 (20.8%)
Based on BMI	1 (5.0%)	21 (3.5%)	38 (1.2%)
Usual (UBW)	0	3 (0.5%)	76 (2.4%)
Weight used in calculation of goal protein requirement			
Other (specify)	2 (10.0%)	14 (2.3%)	59 (1.8%)
Actual dry body weight	1 (5.0%)	214 (35.7%)	1315 (40.8%)
Ideal (IBW) based on Hamwi formula	0	7 (1.2%)	348 (10.8%)
Ideal (IBW) based on BMI 20-25 kg/m^2	1 (5.0%)	53 (8.8%)	500 (15.5%)
Adjusted by 25% (0.25(ABW - IBW) + IBW)	0	92 (15.3%)	195 (6.1%)
Adjusted by 40% (0.4(ABW - IBW) + IBW)	0	0	6 (0.2%)
Adjusted average (0.5(ABW + IBW))	0	49 (8.2%)	79 (2.5%)
No weight used in calculation	0	2 (0.3%)	33 (1.0%)
Estimated dry body weight	15 (75.0%)	145 (24.2%)	576 (17.9%)
Based on BMI	1 (5.0%)	21 (3.5%)	40 (1.2%)
Usual (UBW)	0	3 (0.5%)	72 (2.2%)
Method used in calculation of Energy Requirements			
Harris Benedict Equation with no adjustment for stress and/or activity	0	0	45 (1.4%)
Harris Benedict Equation with adjustment for stress and/or activity)	0	24 (4.0%)	343 (10.6%)
Schofield Equations with no adjustment for stress and/or activity	1 (5.0%)	8 (1.3%)	15 (0.5%)
Schofield Equation with adjustment for stress and/or activity	19 (95.0%)	241 (40.3%)	277 (8.6%)
Weight based	0	324 (54.2%)	1746 (54.2%)
Provide 1200-1499 kcal as standard	0	0	8 (0.2%)

Method used in calculation of Energy Requirements			
Provide 1500-2000 kcal as standard	0	3 (0.5%)	32 (1.0%)
Indirect calorimetry	4 (20.0%)	4 (0.7%)	37 (1.1%)
Mifflin-St. Jeor Equation with no adjustment for stress and/or activity	0	1 (0.2%)	18 (0.6%)
Mifflin-St. Jeor Equation with adjustment for stress and/or activity	0	0	261 (8.1%)
Ireton-Jones Equation with no adjustment for stress and/or activity	0	29 (4.8%)	63 (2.0%)
Ireton-Jones Equation with adjustment for stress and/or activity	0	0	24 (0.7%)
Penn State Equation with no adjustment for stress and/or activity	0	41 (6.9%)	358 (11.1%)
Penn State Equation with adjustment for stress and/or activity	0	0	47 (1.5%)
Modified Penn State Equation with no adjustment for stress and/or activity	0	4 (0.7%)	124 (3.8%)
Modified Penn State Equation with adjustment for stress and/or activity	0	0	16 (0.5%)
Toronto Equation with no adjustment for stress and/or activity	0	1 (0.2%)	1 (0.0%)
Toronto Equation with adjustment for stress and/or activity	0	19 (3.2%)	19 (0.6%)
Other (specify)	0	12 (2.0%)	119 (3.7%)
Goal calorie requirement(kcal)			
median [Q1,Q3]	1800 [1754-2040]	1917.0 [1680-2140]	1800.0 [1544-2053]
Goal protein requirement(g)			
median [Q1,Q3]	91 [83-98]	87.0 [75-103]	87.0 [70-108]
Goal calorie requirement by weight(kcal/kg)			
median [Q1,Q3]	26.6 [22.8-29.6]	25.0 [21.3-26.9]	25.0 [21.4-27.8]
Goal protein requirement by weight(g/kg)			
median [Q1,Q3]	1.3 [1.1-1.4]	1.1 [1.0-1.3]	1.2 [1.0-1.4]

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 and on 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 summarize your overall performance in providing nutrition (EN + Appropriate PN + Propofol) 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/#AllSites corresponds to the best performing site*). Appropriate PN is defined as PN received when a true contraindication to EN was specified. 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.

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 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 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 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 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 Appropriate Nutrition

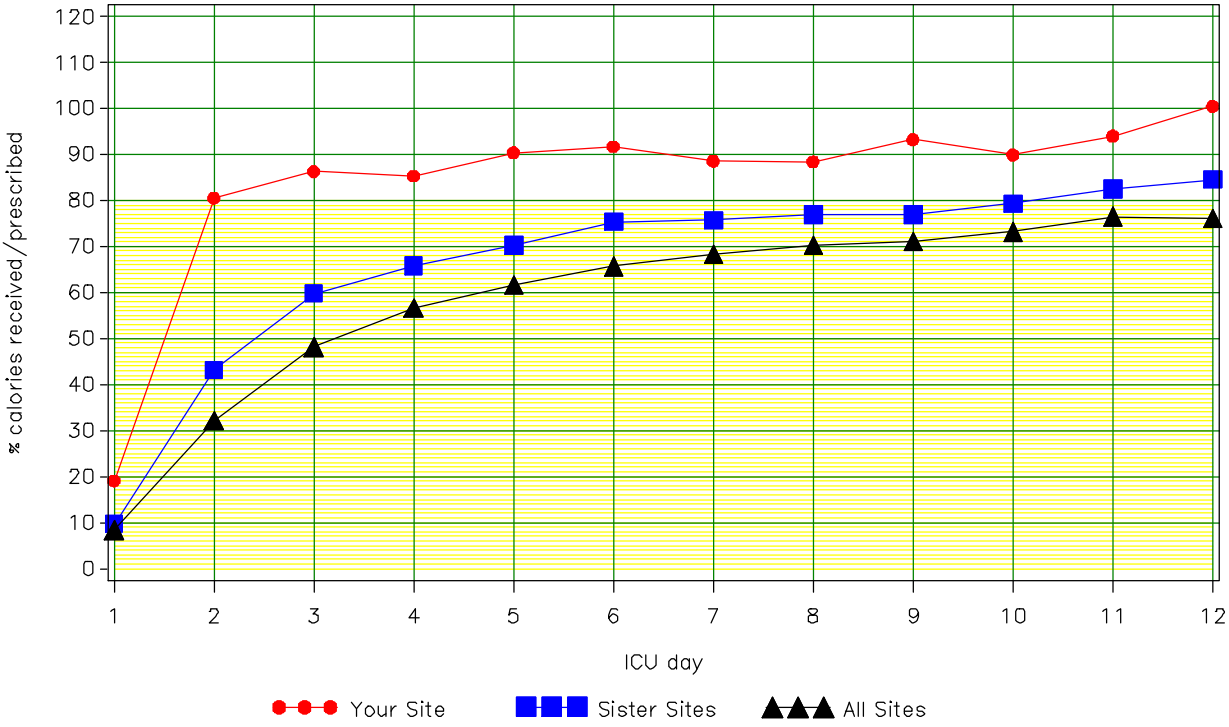


Figure 1.2 Adequacy of Protein from Appropriate Nutrition

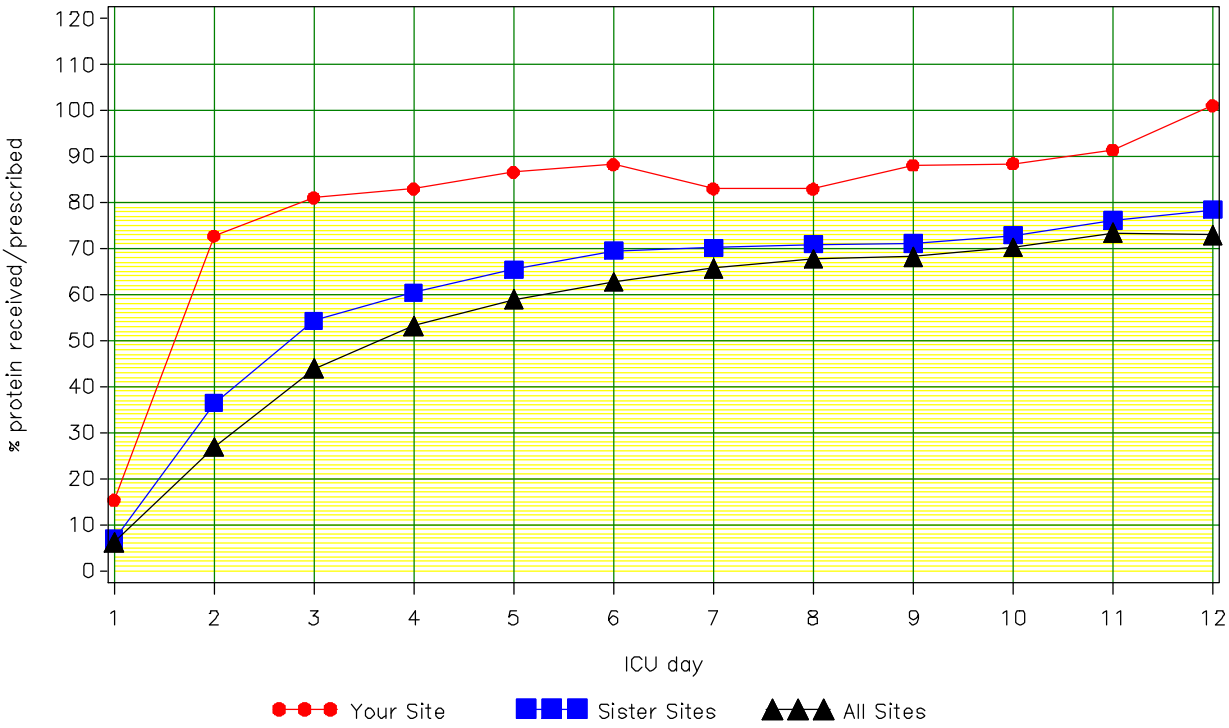


Figure 1.3 Adequacy of Calories from EN

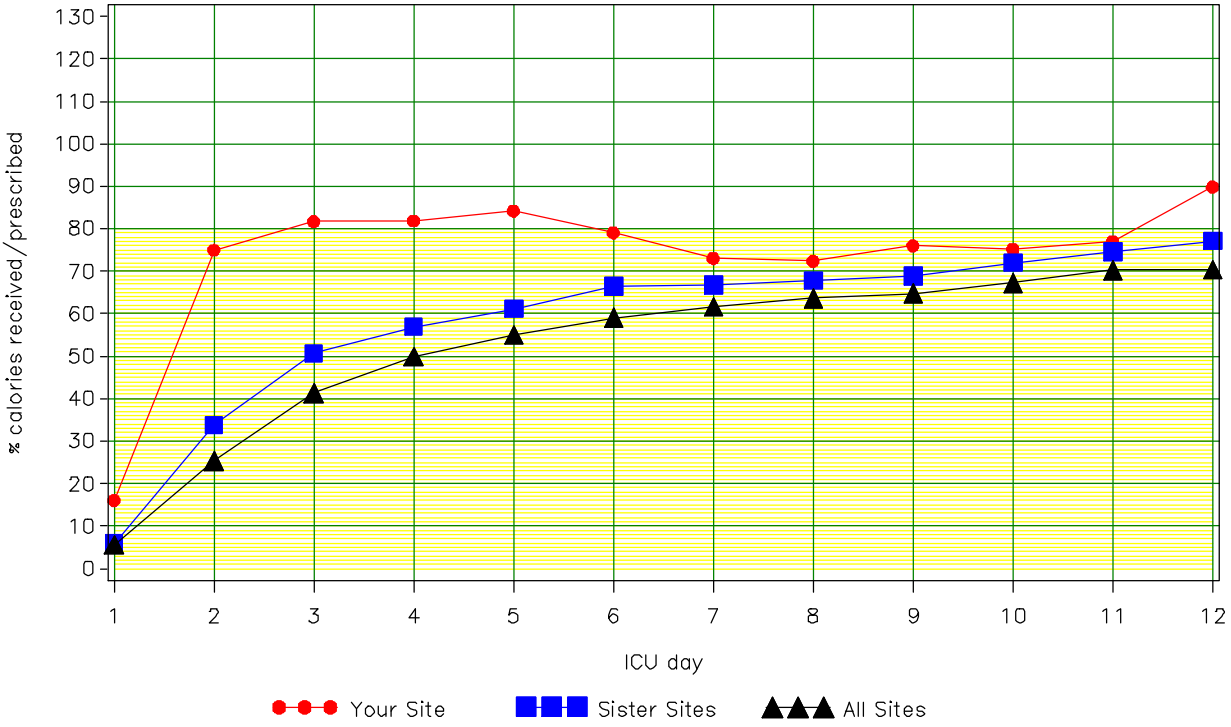
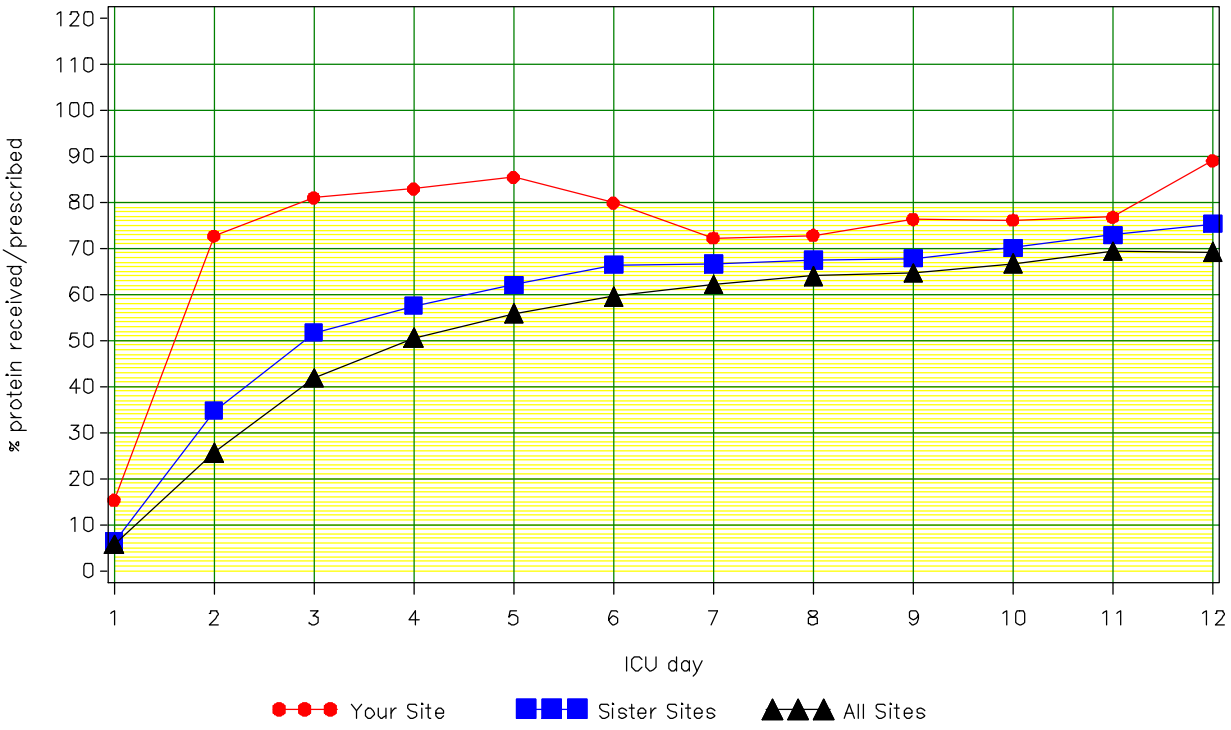


Figure 1.4 Adequacy of Protein from EN



Legend
'n/N': the ranking of your site performance compared to sister or all sites. (i.e. 1/166 corresponds to the best performing site).
'-----': mean of your site, the "error bar" indicates the highest and lowest site averages.
Calories and Protein from Nutrition are calculated as EN + Appropriate PN + Propofol.

Figure 1.5 Overall Performance at Your Site

ICU	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
N	186	5997	31497	186	5997	31497	186	5997	31497	186	5997	31497

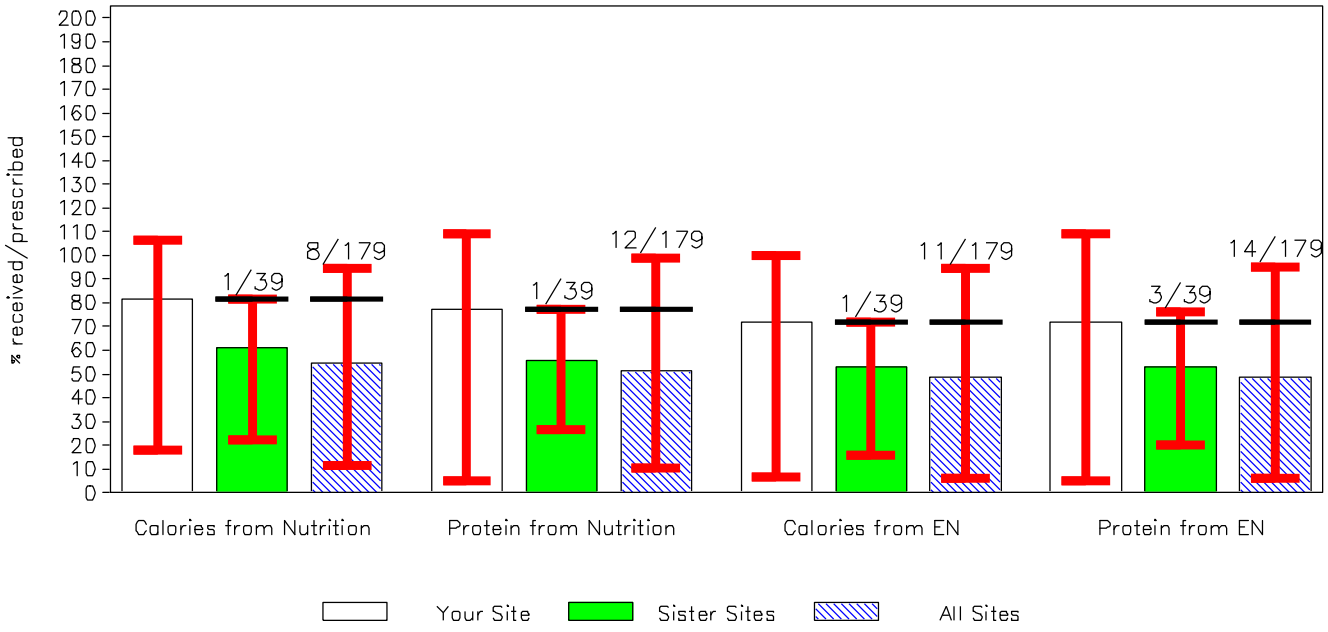


Table 4. Overall Performance

Number of ICU days	**Your Site** n=206	**Sister Sites** n=7284	**All Sites** n=37026
Adequacy of Calories from Total Nutrition (EN+PN+propofol) mean (range)	88.6%	63.6% (31.6%-88.6%)	57.6% (21.1%-94.4%)
Adequacy of Protein from Total Nutrition (EN+PN) mean (range)	84.4%	58.3% (32.7%-84.4%)	54.4% (14.7%-101%)
Adequacy of Calories from EN in EN Only Patients mean (range)	72.0%	56.9% (30.4%-72.0%)	51.8% (16.0%-94.3%)
Adequacy of Protein from EN in EN Only Patients mean (range)	72.0%	57.2% (32.5%-77.5%)	52.0% (16.3%-95.1%)
Received Calories from Total Nutrition(kcals, EN+PN+propofol) mean (range)	1669	1229 (533-1686)	1056 (330-2139)
Received Protein from Total Nutrition (g, EN+PN) mean (range)	77	53 (24-79)	51 (11-125)
Received Calories from EN in EN only Patients (kcals) mean (range)	1350	1101 (674-1504)	954 (271-2137)
Received Protein from EN in EN only Patients (g) mean (range)	65	52 (31-74)	49 (10-125)

Type of Nutrition Support

EN vs. PN

Recommendation:
When considering nutrition therapy for critically ill patients, we recommend the use of enteral nutrition over parenteral nutrition in patients with an intact gastrointestinal tract.

Dose of EN

Recommendation:
When starting enteral nutrition in critically ill patients, strategies to optimize delivery of nutrients (starting at target rate, volume-based feeding strategies, higher threshold of gastric residual volumes, use of prokinetics and small bowel feedings) should be considered.

Table 5. Type of Nutrition (By Patient)

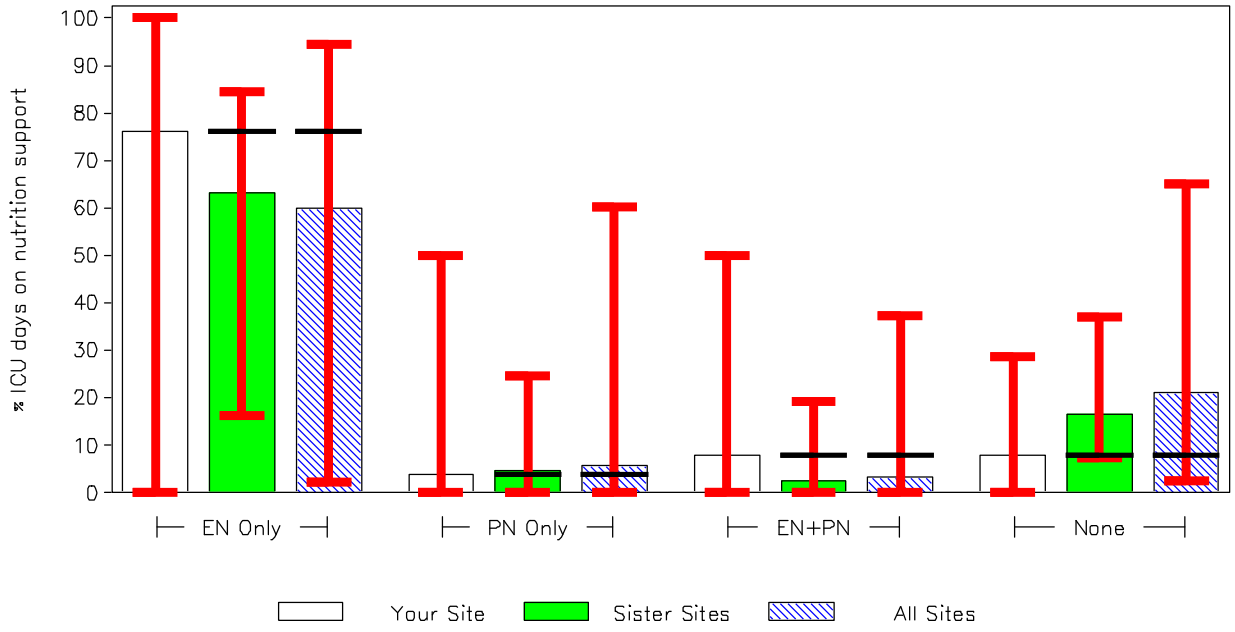
Number of Patients	**Your Site** n=20	**Sister Sites** n=790	**All Sites** n=3817
Type of Nutrition			
EN Only	17 (85.0%)	596 (75.4%)	2811 (73.7%)
PN Only	0	31 (3.9%)	182 (4.8%)
EN+PN	3 (15.0%)	58 (7.3%)	357 (9.4%)
None	0	105 (13.3%)	462 (12.1%)

Legend
'None' refers to number of patients with neither EN nor PN, regardless of oral intake.

Legend
Figure 2. Type of Nutrition Support (by ICU day)
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 day)

	EN Only			**PN Only**			**EN+PN**			**None**		
ICU days	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites
N	157	4600	22245	8	340	2082	16	185	1197	16	1205	7793



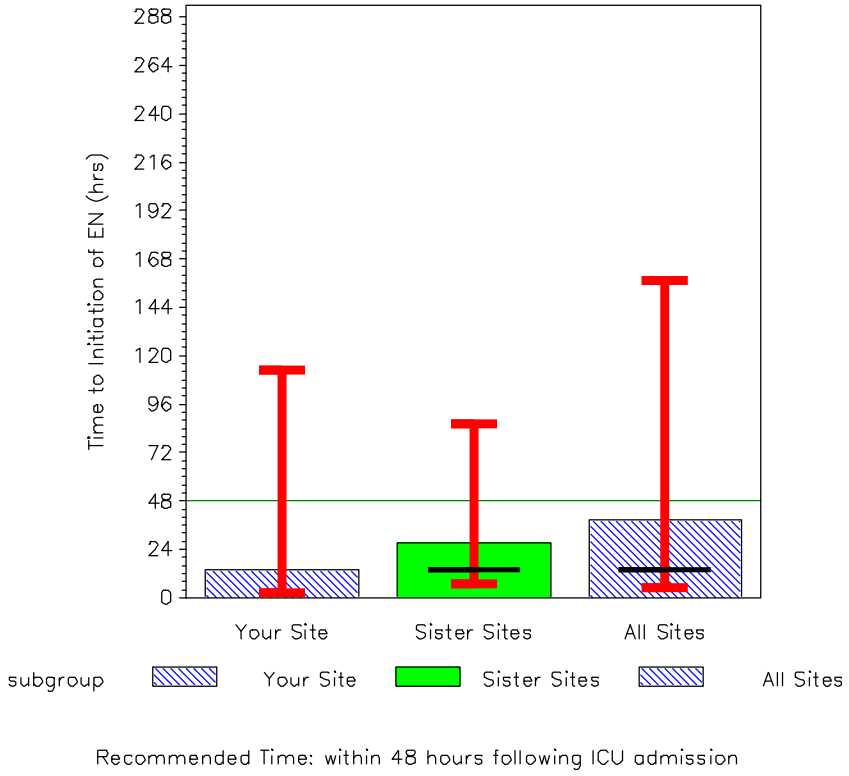
Early vs. Delayed EN

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

Figure 3.1 Timing of Initiation of EN

Number of patients	**Your Site** n=20	**Sister Sites** n=790	**All Sites** n=3812
Initiation of EN mean (range)	14 (2-113)	27 (0-260)	38 (0-1857)

Legend
Figure 3.1 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

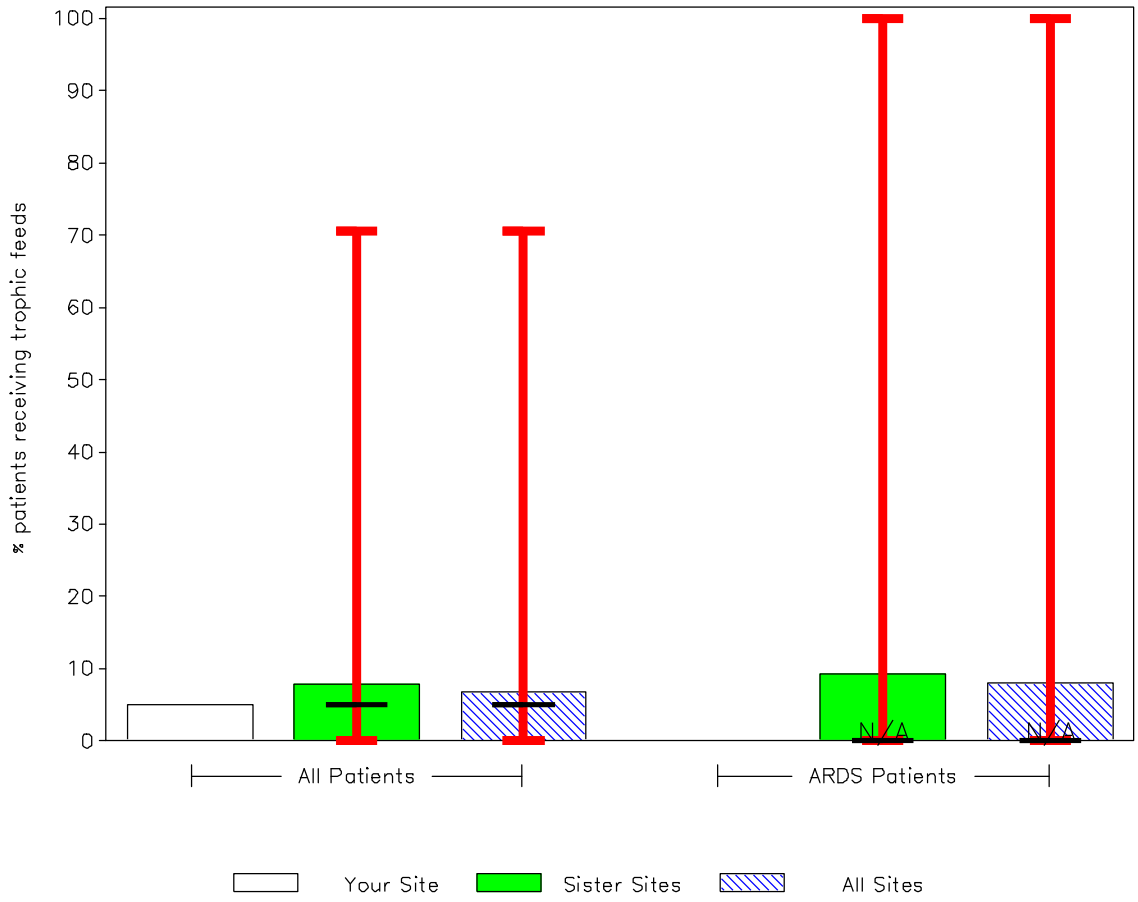


Intentional Underfeeding: Trophic Feeds vs Full Feeds

Recommendation:
In patients with Acute Lung Injury, an initial strategy of trophic feeds for 5 days should not be considered.

Figure 3.2 Initial EN Delivery Technique: Trophic Feeds

Patients	All Patients			ARDS Patients		
	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites
N	20	627	3007	2	54	351



Legend
Patients receiving trophic feeds at initiation of EN in ICU.
Patients that were started on EN before admission to ICU are excluded.

Composition of EN
Composition of EN: Immune Enhancing Diets: Arginine and Select Other Nutrients, Fish Oil/Borage Oil/Antioxidant and Protein

Recommendation:
a) We DO NOT recommend that diets supplemented with arginine and other selected nutrients be used for critically ill patients.
b) The use of an enteral formula with fish oils, borage oils and antioxidants in patients with acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) should be considered. There are insufficient data to make a recommendation on the supplementation of fish oils alone in critically ill patients.
c) When initiating enteral feeds, the use of whole protein formula (polymeric) in critically ill patients should be considered.

Table 7.1. Composition of Eneral Formulas

Enteral Formulas	Your Site	Sister Sites	All Sites
Arginine enriched formula	0	0.3% (0.0%-16.7%)	5.5% (0.0%-94.4%)
Fish oil enriched formula (all patients)	0	0	15.2% (0.0%-100%)
Fish oil enriched formula (ARDS patients)	0	0	23.7% (0.0%-100%)
Glutamine enriched formula (all patients)	0	0.2% (0.0%-16.7%)	1.6% (0.0%-38.2%)
Polymeric formulas	19/20 (95.0%)	99.2% (88.9%-100%)	87.1% (4.8%-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 and borage oil and antioxidant enriched formula in all patients
• Fish oil and borage oil and antioxidant enriched formula in ARDS patients
• Glutamine enriched formulas in all patients
• Polymeric formulas in all patients

EN: Probiotics

Recommendation:
The use of probiotics should be considered in critically ill patients

Table 7.2. Use of Supplemental Probiotics

	Your Site	Sister Sites	All Sites
Supplemental Probiotics	0	0.1% (0.0%-5.0%)	6.7% (0.0%-95.2%)

Legend
Of all patients, the average percent of patients EVER receiving supplemental probiotics

EN and/or PN Glutamine Supplementation

Recommendation:
a) We recommend that enteral glutamine NOT be used in critically ill patients.
b) When parenteral nutrition is prescribed to critically ill patients, we recommend parenteral supplementation with glutamine be used. There are insufficient data on the use of intravenous glutamine in critically ill patients receiving enteral nutrition but given the safety concerns we also recommend intravenous glutamine not be used in enterally fed critically ill patients.
c) We recommend that high dose combined parenteral and enteral glutamine supplementation NOT be used in critically ill patients.
d) There are insufficient data to make a recommendation on the use of enteral glutamine vs parenteral dipeptide supplementation However, given the concerns of glutamine supplementation in general, we strongly recommend that glutamine supplementation NOT be used in critically ill patients, hence we do not recommend the use of enteral glutamine or parenteral dipeptides.

Table 7.3. Glutamine Supplementation

Glutamine supplementation	Your Site	Sister Sites	All Sites
All glutamine supplementation	2/20 (10.0%)	0.3% (0.0%-10.0%)	4.8% (0.0%-72.2%)
EN glutamine supplementation	0	0	3.9% (0.0%-72.2%)
IV/PN glutamine supplementation	2/20 (10.0%)	0.3% (0.0%-10.0%)	1.0% (0.0%-40.0%)
EN Patients			
All glutamine supplementation	2/20 (10.0%)	0.3% (0.0%-10.0%)	5.3% (0.0%-84.6%)
EN glutamine supplementation	0	0	4.2% (0.0%-84.6%)
IV/PN glutamine supplementation	2/20 (10.0%)	0.3% (0.0%-10.0%)	1.2% (0.0%-40.0%)
PN Patients			
All glutamine supplementation	2/3 (66.7%)	2.2% (0.0%-66.7%)	11.3% (0.0%-100%)
EN glutamine supplementation	0	0	5.6% (0.0%-100%)
IV/PN glutamine supplementation	2/3 (66.7%)	2.2% (0.0%-66.7%)	6.1% (0.0%-100%)
Burn Patients			
All glutamine supplementation	1/2 (50.0%)	3.4% (0.0%-50.0%)	23.0% (0.0%-100%)
Trauma Patients			
All glutamine supplementation	0	0	4.6% (0.0%-85.7%)

Legend
Does not include EN formulas containing glutamine
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
Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving EN glutamine supplementation.
Of ALL the patients EVER on EN (or EN+PN), the average number (or %) of patients EVER receiving IV/PN glutamine supplementation.
PN PATIENTS
Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving glutamine
Of ALL the patients EVER on PN (or EN+PN), the average number (or %) of patients EVER receiving EN 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.

PN Antioxidant Supplementation: Selenium

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 in critically ill patients should be considered.

Table 7.4. Selenium Supplementation

Selenium supplementation	Your Site	Sister Sites	All Sites
All selenium supplementation	5/47 (10.6%)	3.1% (0.0%-100%)	5.2% (0.0%-100%)
EN Patients			
EN selenium supplementation	5/43 (11.6%)	0.9% (0.0%-33.3%)	2.9% (0.0%-100%)
PN Patients			
IV/PN selenium supplementation	0	2.5% (0.0%-100%)	3.0% (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
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
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: feeding protocols

Recommendation:
A feeding protocol should be considered that incorporates strategies to optimize delivery of enteral nutrition in critically ill adult patients.
Note: Small bowel feeding, withholding for procedures and head of the bed elevation data were not collected for PEP uP sites.

Table 8. Feeding Protocols

Number of ICUs	Your Site n=1	Sister Sites n=39	All Sites n=179
Gastric Residual Volume (mls) mean (range)	500	271 (150-500)	301 (100-501)
Algorithms included in Protocol			
Motility agents	Yes	35 (97.2%)	102 (87.2%)
Small bowel feeding	No	28 (77.8%)	77 (65.8%)
Withholding for procedures	No	20 (55.6%)	71 (60.7%)
Head of bed elevation	No	26 (72.2%)	92 (78.6%)

Achieving Target Dose of EN

Recommendation:
Recommendations:
When starting enteral nutrition in critically ill patients, strategies to optimize delivery of nutrients (starting at target

Gastric Residual Volume

Recommendation:
Recommendations:
A gastric residual volume of either 250 or 500 mLs (or somewhere in between) and frequency of checking residuals either q4 or to optimize delivery of enteral nutrition in critically ill patients. There is insufficient data to make a recommendation to return gastric residual volumes up to a certain threshold in critically ill adult patients. Re-feeding GRVs up to a maximum

Motility Agents

Recommendation:
Recommendations:
In critically ill patients who experience feed intolerance (high gastric residuals, emesis), the use of a motility agent is recommended. Given the safety concerns associated with erythromycin, the recommendation is made for metoclopramide.

Small Bowel Feeding

Recommendation:
Recommendations:
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

Body Position

Recommendation:
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.

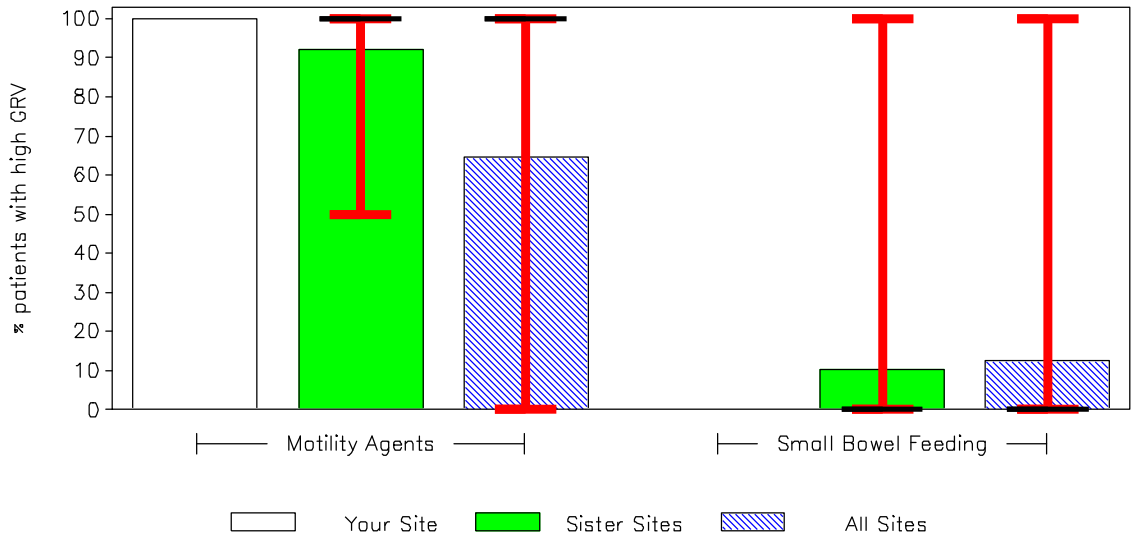
Small Bowel Feeding in Those on EN with Feeds Interrupted Due to High Gastric Residual Volumes
Of ALL the patients that were EVER on EN (or EN + PN), and EVER had feeds interrupted due to high gastric residual volumes during the study period, the percentage that received small bowel feeding.

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

	Motility Agents			Small Bowel Feeding			HOB Elevation (degrees)		
Patients	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites	Your Site	Sister Sites	All Sites
N	1	93	440	1	93	440	20	654	3168

Motility agents and Small bowel feeding



Head of Bed (HOB)

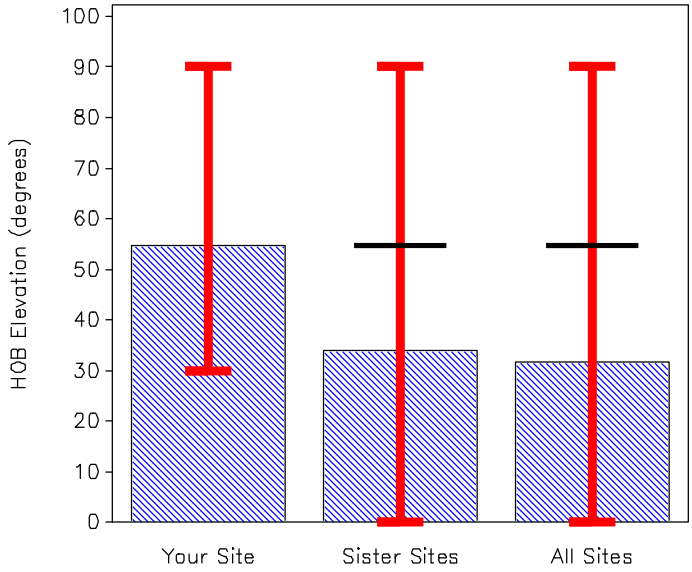


Table 9. EN Feeds Interrupted

Number of Patient-days on EN	**Your Site** n=173	**Sister Sites** n=4785	**All Sites** n=23442
EN Feeds Interrupted			
Yes n/N (PCT)	54/173 (31.2%)	1660/4784 (34.7%)	6633/23440 (28.3%)
Total duration of feed interruption (hours)			
median [Q1,Q3]	5.0 [3.0-10.0]	6.5 [3.0-11.0]	6.5 [3.0-12.0]
Reasons interruption			
Fasting for endotracheal extubation/intubation/trach procedure	20 (41.7%)	560 (37.9%)	1823 (31.8%)
Fasting for other bedside procedure	6 (12.5%)	114 (7.7%)	684 (11.9%)
Fasting for operating room procedure	9 (18.8%)	161 (10.9%)	802 (14.0%)
Fasting for radiology suite procedure	4 (8.3%)	217 (14.7%)	609 (10.6%)
Fasting for administration of medications	0	64 (4.3%)	214 (3.7%)
Intolerance to enteral feeding - high gastric residuals	1 (2.1%)	134 (9.1%)	655 (11.4%)
Intolerance to enteral feeding - increased abdominal girth or abdominal distension	0	28 (1.9%)	130 (2.3%)
Intolerance to enteral feeding - vomiting/emesis	6 (12.5%)	101 (6.8%)	330 (5.8%)
Intolerance to enteral feeding - diarrhea	0	5 (0.3%)	39 (0.7%)
Intolerance to enteral feeding - subjective discomfort	0	2 (0.1%)	44 (0.8%)
No enteral access available/enteral access lost, displaced or malfunctioning	7 (14.6%)	161 (10.9%)	544 (9.5%)
Inotropes, vasopressor requirement	0	1 (0.1%)	53 (0.9%)
Subject deemed too sick to continue enteral feeding	0	20 (1.4%)	111 (1.9%)
Enteral feeding formula not available	0	10 (0.7%)	21 (0.4%)
Necrotic bowel/gut ischemia)	0	4 (0.3%)	9 (0.2%)
New contraindication to EN	0	4 (0.3%)	32 (0.6%)
Trial of oral intake	1 (2.1%)	54 (3.7%)	189 (3.3%)
Other	3 (6.3%)	27 (1.8%)	169 (2.9%)

Combination of EN + 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.

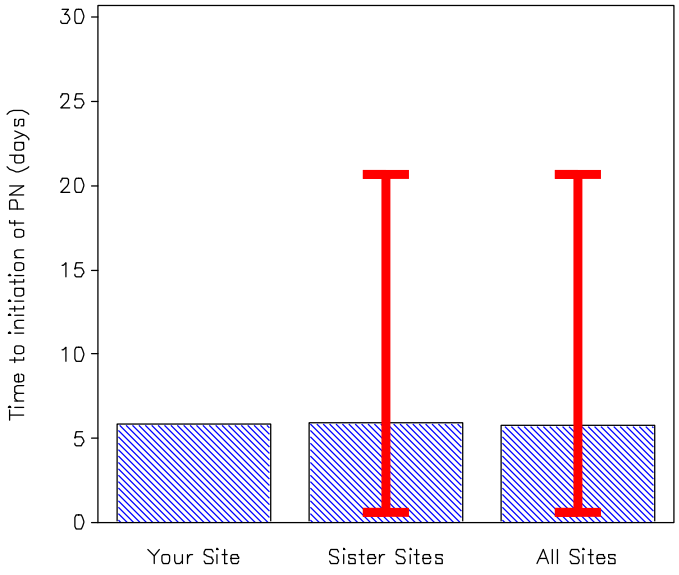
Early vs Delayed Supplemental Parenteral Nutrition

Recommendation:
We strongly recommend that early supplemental PN and high IV glucose not be used in unselected critically ill patients (i.e. low risk patients with short stay in ICU). 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.

Legend
Figure 5.1. Timing of Initiation of PN
Time to initiation of PN from ICU admission for all the patients that EVER received PN while already receiving EN.

Figure 5.1. Timing of Initiation of PN

Patients receiving PN after EN	Your Site	Sister Sites	All Sites
N	2	30	132



Legend

Figure 5.2. 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.

Figure 5.3. Percentage of patients received small bowel feeding before PN started
Of all the patients that EVER received combination EN+PN and had EN started prior to PN, and had feeds interrupted due to high gastric residual volumes, the percentage that received small bowel feeding

Figure 5.2. % of patients received motility agents PN started

Patients with EN+PN and HGRV	Your Site	Sister Sites	All Sites
N	1	17	71

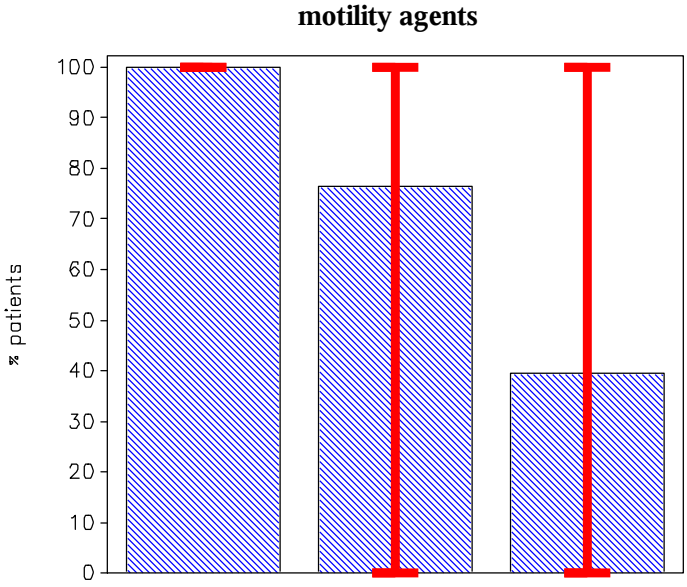
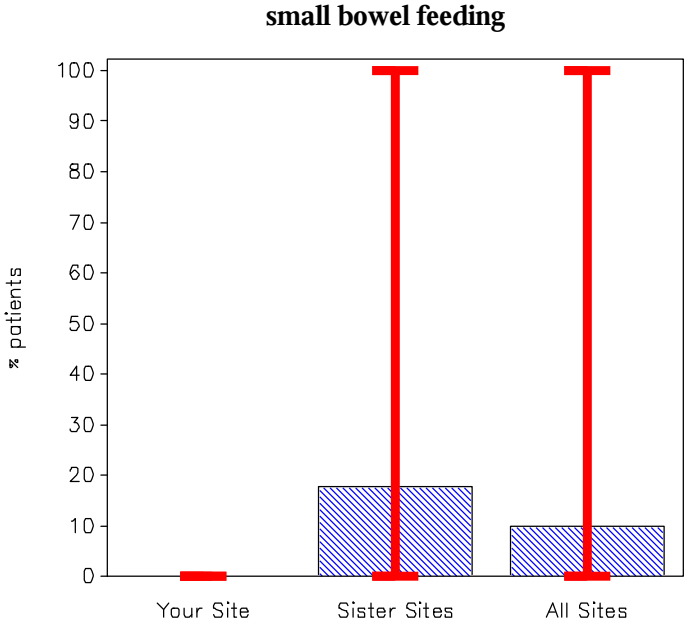


Figure 5.3. % of patients received small bowel feeding before PN started

Patients with EN+PN and HGRV	Your Site	Sister Sites	All Sites
N	1	17	71



PN vs. Standard Care

Recommendation:
In critically ill patients with an intact gastrointestinal tract, we recommend that parenteral nutrition not be used routinely, but early PN should be considered in nutritionally high-risk patients with a relative contraindication to early EN.

Table 10. Reason PN Initiated

Number of Patients on PN	**Your Site** n=3	**Sister Sites** n=90	**All Sites** n=539
Reason PN Initiated			
Other (specify)	0	3 (3.3%)	62 (11.5%)
Mechanical bowel obstruction *	0	8 (8.9%)	28 (5.2%)
Bowel ischemia *	0	7 (7.8%)	21 (3.9%)
Small bowel ileus *	1 (33.3%)	10 (11.1%)	43 (8.0%)
Small bowel fistulae *	0	0	3 (0.6%)
Gastrointestinal perforation *	0	11 (12.2%)	62 (11.5%)
Short gut syndrome *	0	0	3 (0.6%)
Hemodynamic instability	0	0	43 (8.0%)
Proximal bowel anastomosis	0	1 (1.1%)	6 (1.1%)
Not tolerating enteral feeding	1 (33.3%)	14 (15.6%)	94 (17.4%)
No access to small bowel	0	1 (1.1%)	13 (2.4%)
Pancreatitis	0	4 (4.4%)	8 (1.5%)
Gastrointestinal bleed	0	1 (1.1%)	18 (3.3%)
Gastrointestinal surgery	1 (33.3%)	30 (33.3%)	88 (16.3%)
No clinical reason	0	0	47 (8.7%)

Legend
Of all the patients that ever received PN (or EN+PN), the reason PN was initiated.
*Considered as true contraindication to EN for assessment of appropriate PN in nutritional adequacy calculation (see page 8).

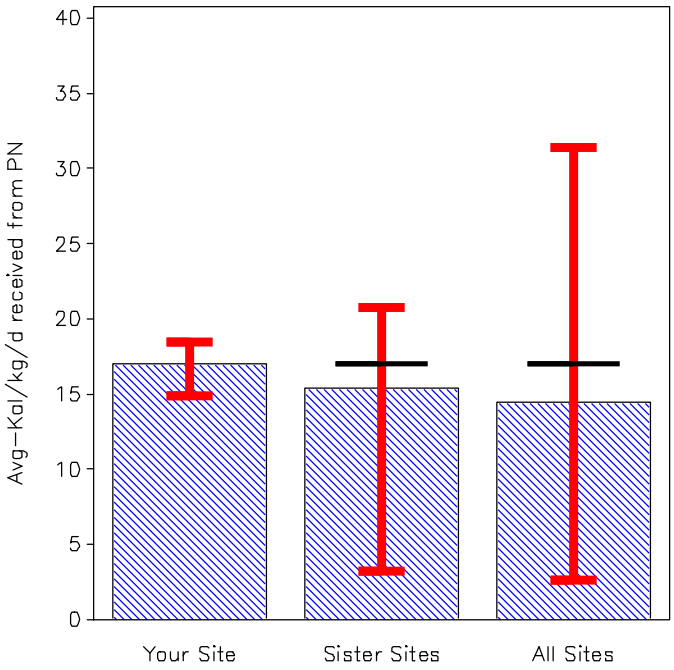
Strategies to optimize benefits and minimize risks of PN: Dose of PN

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 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 on PN	Your Site	Sister Sites	All Sites
N	3	89	538



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 omega-6 fatty acids/soybean oil should be considered. However, there are insufficient data to make a recommendation on the type of lipids to be used that reduce the omega-6 fatty acid/soybean oil load in critically ill patients receiving parenteral nutrition. As well, 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.

Type of Lipids

Recommendation:
When parenteral nutrition with intravenous lipids is indicated, IV lipids that reduce the load of omega-6 fatty acids/soybean oil emulsions should be considered. However, there are insufficient data to make a recommendation on the type of lipids to be used that reduce the omega-6 fatty acid/soybean oil load in critically ill patients receiving parenteral nutrition.

Table 11. Use and Type of Lipids

Number of Patient-days on PN	**Your Site** n=24	**Sister Sites** n=525	**All Sites** n=3279
Lipids received			
Olive oil based	24 (100%)	250 (47.6%)	436 (13.3%)
Soybean oil based	0	76 (14.5%)	832 (25.4%)
MCT/LCT Physical mixture	0	0	218 (6.6%)
Mixture of soy oil, MCTs, olive oil, and fish oil (SMOF)	0	176 (33.5%)	538 (16.4%)
Fish oil based	0	0	0
Other/Unknown	0	0	74 (2.3%)
Lipid free	0	23 (4.4%)	1181 (36.0%)

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:
We recommend that hyperglycemia (blood sugars > 10 mmol/L) be avoided in all critically ill patients. We recommend a blood glucose target of around 8.0 mmol/L (or 7-9 mmol/L), rather than a more stringent target range (4.4 to 6.1 mmol/L) or a more liberal target range (10 to 11.1 mmol/L). There are insufficient data to recommend low carbohydrate diets in conjunction with insulin therapy for critically ill patients.

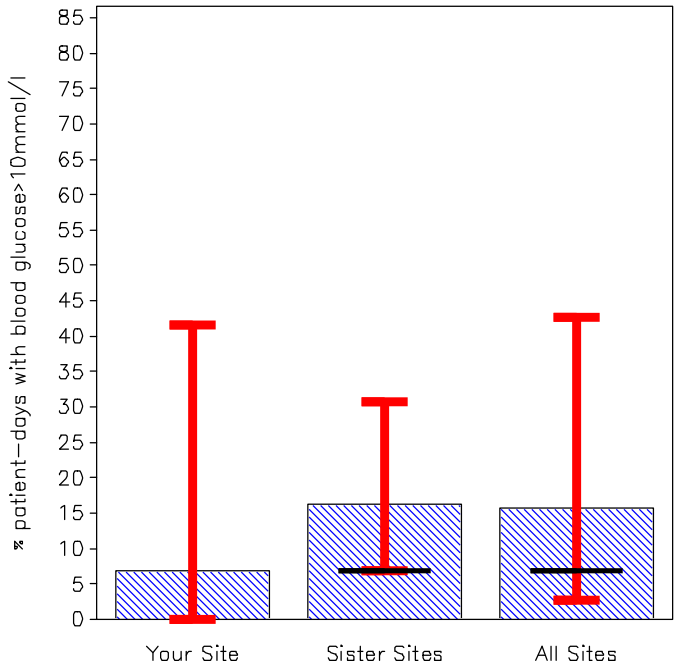
Table 12. Glycemic Control Protocol

Number of Patient-days	**Your Site** n=186	**Sister Sites** n=6494	**All Sites** n=33214
Glycemic Control Protocol Yes	33 (84.6%)	148 (82.7%)	
Target of Blood Glucose: Lower(mmol|l) median [Q1,Q3]	4.0	6.0 [4.0-6.0]	5.6 [4.4-6.7]
Target of Blood Glucose: Upper(mmol|l) median [Q1,Q3]	9.0	10.0 [9.9-10.0]	10.0 [8.3-10.0]
Morning Blood Glucose(mmol|l) median [Q1,Q3]	7.8 [6.9-8.7]	7.8 [6.6-9.3]	7.6 [6.4-9.2]
Insulin Received (units) median [Q1,Q3]	60.0 [26.0-108.0]	54.0 [26.0-95.0]	24.0 [8.0-56.0]
Total Hypoglycemic Days Yes n/N (PCT)	0/201	55/7032 (0.8%)	352/35751 (1.0%)

Legend
Day 1 after admission to the ICU is excluded.
Total days with Hypoglycemic events: Study day with at least one hypoglycemic event (i.e.blood glucose <3.5 mmol/l).

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

Patient-days	Your Site	Sister Sites	All Sites
N	206	7284	37026



Legend
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 2014

Although the hard work and dedication of all ICUs who participate in the international nutrition survey is appreciated, in 2014 we wish to recognize the ICU that achieved the highest nutritional adequacy for their finalized 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 by a specific deadline.
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 is 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 feeding	1
% of patient glucose measurements greater than 10 mmol/L (excluding day 1; fewest is best)	3

The top performing ICUs and recipients of the 2014 Best of the Best Award are:
1st place overall: The Alfred ICU, Melbourne, Australia
2nd place overall, 1st among burn sites: Sunnybrook Health Sciences Centre Ross Tilley Burn Center, Toronto, Canada
3rd place overall, 2nd among burn sites: Milpark Hospital Burn Unit, Johannesburg, South Africa

Congratulations!

---

* 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 your site report 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 (such as information on strategies to improve practices, a variety of quality improvement tools in the "toolkit" and publications and presentations) are available under 'Resource Centre' on the Critical Care Nutrition website (www.criticalcarenutrition.com).

Thank you for your support with the International Nutrition Survey. The next opportunity to audit your nutrition practice will be announced via our website (www.criticalcarenutrition.com), the Critical Care Nutrition Google Group and the INS mailing list. We look forward to working with you again.

Crititcal Care Nutrition Team
July 2015