APPLICATION FORM

Title of Entry:	Enhancing Enteral Nutrition Provision to the Critically Ill Patient through an Interdisciplinary Approach
Division:	Large Organizations
Award:	Excellence in Care
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Date Implemented: **Date Results Achieved:**	05/01/2012 03/31/2017
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Executive Summary

Title: Enhancing Enteral Nutrition Provision to the Critically Ill Patient through an Interdisciplinary Approach.

Description of the problem: At times patients are unable to take food by mouth due to swallowing difficulties following head injury, respiratory distress requiring mechanical ventilation, or head/neck cancer. These patients can be fed with enteral nutrition (EN), a liquid nutrition fed into the stomach or small intestine through a tube. Traditionally in the hospital, EN is ordered based on an hourly rate (e.g. 50 mL/hr). However, EN can be withheld for multiple hours a day for surgeries or procedures. Withheld EN and other factors impending EN provision result in suboptimal EN provision, which is associated with poorer outcomes during hospitalization and post discharge: increased mechanical ventilation duration,[1] longer ICU and hospital length of stays,[2] increased mortality,[1,2] reduced physical function at 3 months post-discharge,[3] and decreased likelihood of being discharged home (compared to a rehabilitation center).[4] Malnutrition is also associated with higher 30-day readmission rates and hospital costs.[5]

Evidence: Internationally, patients only receive an average of 61.2% (51% in the U.S.) of prescribed EN due to delayed initiation, holding EN for surgeries, EN intolerance, delayed EN order and delivery, etc.[6] The international prevalence of iatrogenic malnutrition in the ICU is 74% (87% in the U.S.).[6] EN initiation from ICU admission takes an average of 38.8 hours (51.6 hours in U.S.)[6] though professional guidelines recommend initiating within 24-48 hours.[7]

Baseline Data: In 2012 we conducted an observational study to determine adequacy of and barriers to EN provision. On average, we were only providing 49% of prescribed EN with the greatest barriers being withholding EN for airway management, procedures or surgeries.

Intervention: Since 2012, an interdisciplinary team, with representation from Nursing, Medical Staff, Administration, and Nutrition, has taken on multiple nutrition initiatives within our neuro ICUs to increase the provision of EN:

- Prioritizing nutrition at admission
- Creating an EN par level on each ICU
- Implementing a daily volume-based EN regimen
- Adding our supplemental protein modular to the medical administration record (MAR)
- Limiting fasting times
- Granting registered dietitians (RDs) EN order adjusting privileges

Results: In the past 5 years we have increased prescribed EN provision by 63% (49% at baseline in 2012 to 80% in 2017). These positive outcomes have highlighted the collaborative effort of the interdisciplinary team. Because these nutrition initiatives have been so well received and supported by physicians, nurses, pharmacists, dietitians, and Administration, our ICU patients have been able to receive more optimal nutrition.

Assessment

We conducted a baseline prospective observational study within our neuro-intensive care units from May to October 2012. The study was approved by our IRB (expedited review). We included all adult patients admitted with diagnosis of brain injury requiring mechanical ventilation and EN as a sole nutrition source. Patients were excluded if pregnant or moribund (death within 48 hours of admission). Etiologies for EN interruptions were ascertained via oral communication, written documentation within the medical chart, and electronic documentation within the electronic health record from the multidisciplinary team. Data collection regarding EN administration and EN interruptions was initiated at the time of neuro-ICU admission and continued for either a maximum of seven consecutive days; until the patient no longer required mechanical ventilation; or until the patient expired.

Out of the 34 patients, 7 were excluded for the following reasons: 3 patients were extubated within 14 hours, 3 patients were moribund, and 1 patient's pump malfunction (prohibiting accurate daily pump records). Patients were divided into two groups by percentage of received EN: > 60% goals (Group 1) and $\leq$ 60% goals (Group 2). Out of the included 27 patients, 8 patients never received EN. Excluding those 8 patients, patients received a mean of 819 calories, or 49.48% of prescribed calorie goals. Median time to initiate EN was 32.1 hours. Reasons for EN interruptions are listed in the chart below.

EN Interruption*	**Group 1 (n=7)**	**Group 2 (n=20)**
Gastrointestinal intolerance	4	2
EN started at goal rate: Yes(1)/No(0)	4	6
Tube displacement	1	3
Tube clogged	1	0
Procedures	6	4
Surgery or cancelled surgery**	5	16
Airway management (intubation/extubation) or failed airway management**	7	20
Wrong EN order placed (versus what was recommended by dietitian)	3	2
EN order placement delay	1	0
Total	**29**	**56**

*Interruptions were limited to one occurrence per patient.

**Cancelled surgery or failed airway management in which EN had previously been held.

Intervention

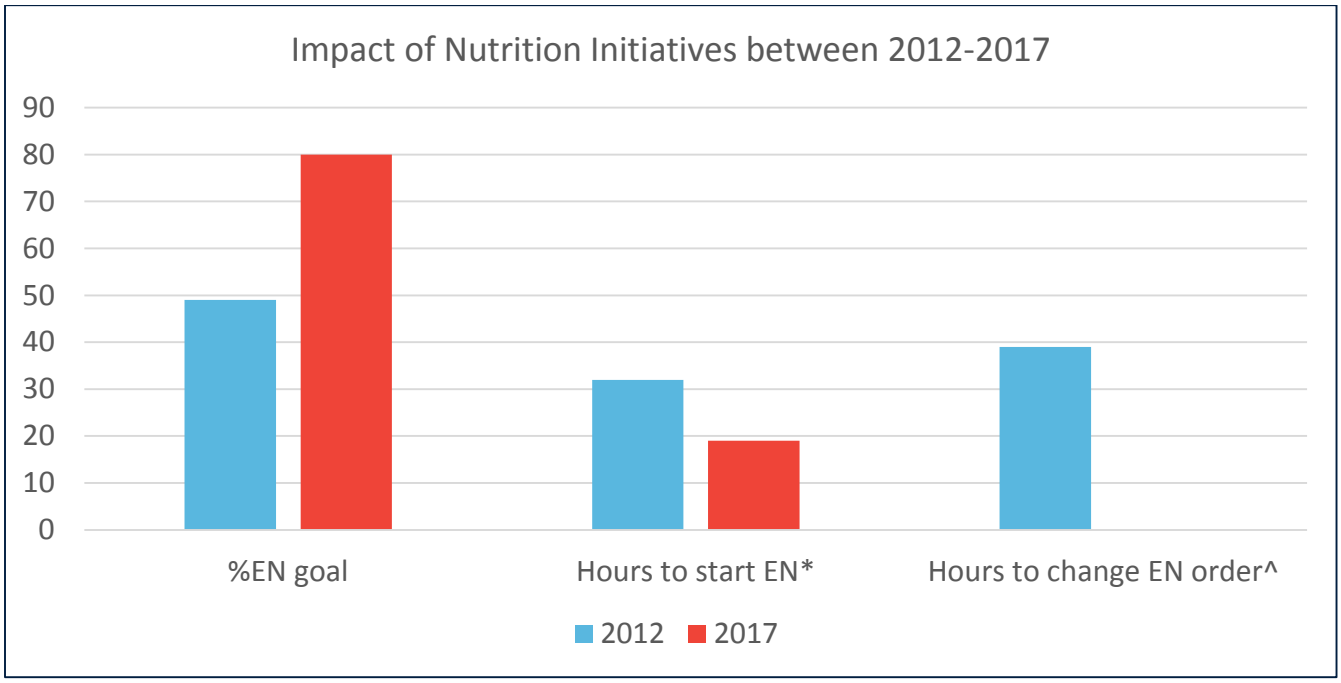
Between 2012 and 2017, we have implemented multiple EN initiatives:

1. **Prioritizing nutrition on admission (2012).** Physicians and nurse practitioners were educated to order EN initiation when placing other admitting orders.
2. **Creating an EN par level on each ICU (2013).** Previously, EN had to be delivered from a central location resulting in initiation delays. We established an EN par on each ICU so that nurses have access to EN at all times.
3. **Implementing a daily volume-based EN regimen (2013).** Instead of the traditional hourly EN rate regimen, we have empowered nurses to adjust EN rates throughout the day to reach a daily EN goal. A volume-based feeding schedule (Table 1) is present in each neuro-ICU room. The nurses are given a daily EN goal for each patient and can adjust the EN rate per the schedule to compensate for times when the EN is on hold. (The EN goal is on left side of schedule; the time of day is across the top; the intersection in chart of EN goal and time of day gives rate to meet daily goal.)
4. **Adding our supplemental protein modular to the medical administration record (MAR; 2014).** Previously, our protein modular was not on the MAR. Therefore, nurses were not prompted to provide the modular and did not have a place to document its provision within the medical record. This inhibited communication and ultimately resulted in protein modulars not being provided. Adding the modulars to the MAR prompts an administration time and requires sign-out to document provision.
5. **Limiting fasting times (2016).** EN is typically held at midnight for planned procedures/surgeries the following day. For the mechanically ventilated patient with airway protection, we hypothesized that aspiration risk from EN is low. We implemented a pilot program to continue EN until call to the operating room.
6. **Granting registered dietitians (RDs) EN order adjusting privileges (2017).** Previously, only physicians and nurse practitioners were allowed to place/adjust EN orders. RDs were only allowed to recommend a change in EN prescription. Our baseline data collection noted that it took an average of 39 hours from the time of the RD assessment to the order being placed to change EN. This resulted in suboptimal EN provision. We gained rights through the state and institution for RDs to adjust existing EN orders. EN changes are now placed by the RD at the time of nutrition assessment.

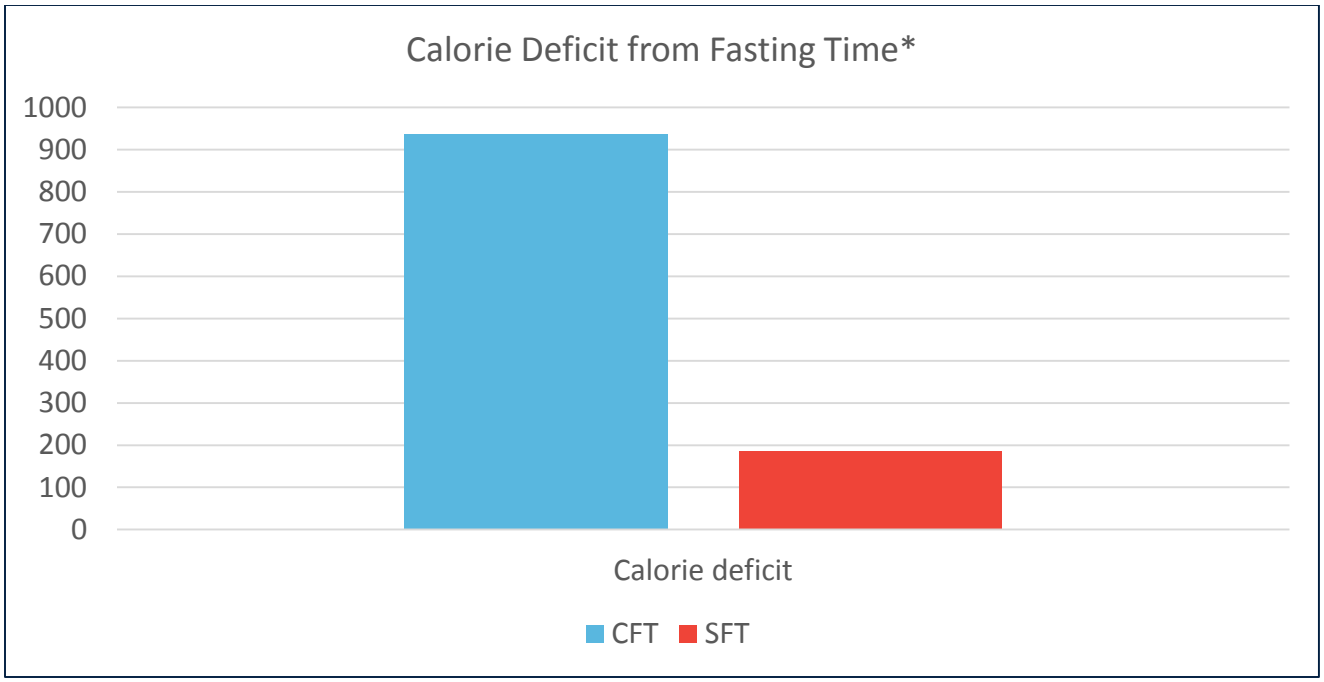
Between January and March 2017, we conducted a performance improvement project to determine adequacy of EN provision. Data collection points from the initial observational study were used. Eighty-two patients were included in the data collection.

Results

Through these initiatives over the past 5 years, we have increased EN provision by 63% (49% at baseline in 2012 to 80% in 2017). Most of this increase is attributed to the conversion to the daily volume-based feeding regimen. The creation of EN par levels and prioritization of addressing EN on admission has decreased the average time to initiate EN by 41% (32 to 19 hours from admission). Limiting fasting times to immediately prior to surgery has allowed for an additional provision of 752 calories/day from EN. Adding the protein modular to the MAR ensures that each pack (15 gm protein) is given as ordered. Adding RD order adjusting privileges has eliminated the 39 hour average time it took to implement the RD's recommendations. These privileges are also likely increasing provider and RD satisfaction through removing a task from the provider's workload and allowing RDs more control in managing nutrition care.



*Hours to start EN from ICU admission.
^Hours to change EN order from time of RD nutrition assessment.



*Fasting time of withholding EN prior to procedures/surgeries; CFT (conventional fasting time, >6 hours); SFT (shortened fasting time, <6 hours).

Adaptability

The large success of our nutrition initiatives was due to multiple smaller achievements over 5 years. Therefore, similar institutions should not undervalue the role of small changes. Our undertakings can easily be replicated in other organizations. This requires a culture of receptivity to new processes and an interdisciplinary approach. At a physician level, addressing EN initiation at admission and tolerance at daily rounds is vital. Physician's prioritization of nutrition encourages other disciplines to prioritize it as well. At a pharmacy level, allowing nutrition-related modulars on the MAR ensures these products are provided. At a nursing level, nurses should be granted the rights to adjust EN rates throughout the day to compensate for times when EN is held. They should also be given access to the tools they need (here, EN formulas via a floor par level). At the RD and administration level, RDs (the nutrition experts) should be granted institutional rights to adjust EN orders to better optimize the nutrition regimen.

New initiatives require time to adapt. Our biggest hurdle has been the shift from hourly EN rates to daily goals. We have encouraged the RDs, physicians and nurses to all play a part in ensuring daily EN goals are met. Nurses are in charge of addressing percentage EN goal at nursing shift change and reporting the percentage at daily rounds. Physicians are to ask the previous day's percentage goal at rounds. RDs are checking EN pump histories to determine the adequacy provided. Routine follow-up is essential to addressing concerns and providing education when needed.

Supporting Appendices

Table 1. Volume-based Feeding Schedule.

	Current time																							
mL remaining in 24h	**12 A**	**1 A**	**2 A**	**3 A**	**4 A**	**5 A**	**6 A**	**7 A**	**8 A**	**9 A**	**10 A**	**11 A**	**12 P**	**1 P**	**2 P**	**3 P**	**4 P**	**5 P**	**6 P**	**7 P**	**8 P**	**9 P**	**10 P**	**11 P**
2000	83	87	91	95	100	105	111	118	125	133	143	150	150	150	150	150	150	150	150	150	150	150	150	150
1950	81	85	89	93	98	103	108	115	122	130	139	150	150	150	150	150	150	150	150	150	150	150	150	150
1900	79	83	86	90	95	100	106	112	119	127	136	146	150	150	150	150	150	150	150	150	150	150	150	150
1850	77	80	84	88	93	97	103	109	116	123	132	142	150	150	150	150	150	150	150	150	150	150	150	150
1800	75	78	82	86	90	95	100	106	113	120	129	138	150	150	150	150	150	150	150	150	150	150	150	150
1750	73	76	80	83	88	92	97	103	109	117	125	135	146	150	150	150	150	150	150	150	150	150	150	150
1700	71	74	77	81	85	89	94	100	106	113	121	131	142	150	150	150	150	150	150	150	150	150	150	150
1650	69	72	75	79	83	87	92	97	103	110	118	127	138	150	150	150	150	150	150	150	150	150	150	150
1600	67	70	73	76	80	84	89	94	100	107	114	123	133	145	150	150	150	150	150	150	150	150	150	150
1550	65	67	70	74	78	82	86	91	97	103	111	119	129	141	150	150	150	150	150	150	150	150	150	150
1500	63	65	68	71	75	79	83	88	94	100	107	115	125	136	150	150	150	150	150	150	150	150	150	150
1450	60	63	66	69	73	76	81	85	91	97	104	112	121	132	145	150	150	150	150	150	150	150	150	150
1400	58	61	64	67	70	74	78	82	88	93	100	108	117	127	140	150	150	150	150	150	150	150	150	150
1350	56	59	61	64	68	71	75	79	84	90	96	104	113	123	135	150	150	150	150	150	150	150	150	150
1300	54	57	59	62	65	68	72	76	81	87	93	100	108	118	130	144	150	150	150	150	150	150	150	150
1250	52	54	57	60	63	66	69	74	78	83	89	96	104	114	125	139	150	150	150	150	150	150	150	150
1200	50	52	55	57	60	63	67	71	75	80	86	92	100	109	120	133	150	150	150	150	150	150	150	150
1150	48	50	52	55	58	61	64	68	72	77	82	88	96	105	115	128	144	150	150	150	150	150	150	150

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