A Survey on the Nutrition Risk Level of Patients Subjected to Standard Practice of Enteral Nutrition Provision Admitted at the Intensive Care Unit of Cebu Doctors' University Hospital: A One-Year Retrospective Chart Review

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ABSTRACT
RESTROSPECTIVE - ANALYTICAL

Background: Enteral nutrition is nutrition provided through the gastrointestinal tract, which delivers nutrition distal to the oral cavity. Critically ill patients are at high nutrition risk thus the need for full nutrition assessment At present, NUTRIC score is one of the reliable assessment tools for quantifying risk of developing adverse outcome in critically ill patients, which may be modifiable by aggressive nutrition therapy.

Objectives: We assessed the nutrition risk levels as measured by NUTRIC score among admitted patients who were given enteral nutrition at the Intensive Care Unit of Cebu Doctors' University Hospital from June 2016 to June 2017.

Methodology: This is a one-year single-center cross-sectional retrospective chart review study on admitted ICU patients from June 2016 to June 2017. Categorical profiles were expressed in frequency and percentage while those continuous variables were described in mean and standard deviations. Moreover, incidence rate of nutrition risk levels of patients was computed. In comparing the required and actual feeding amount of patients was compared using the Paired t-test wherein a p-values lesser than 0.05 alpha were considered significant. IBMSPSS ver 21 was used as software.

Results: This study has shown that 86.4% of the patients admitted in this institution's ICU were started on early enteral feeding within 24 to 48 hours of ICU admission. From the subjects given EN, only 21 (5.8%) were able to achieve the energy requirement. In those subjects who did not achieve the required energy requirement, there is an associated increased length of stay in the ICU (p-value of 0.045). Based on NUTRIC score, out of 52 patients included in this study, 39 patients (75%) were identified to be at low risk while 13 subjects (25%) were at high risk for a 28-day mortality.

Conclusion: Early initiation of enteral nutrition was being practiced among patients admitted to ICU in our institution. However, majority of patients given enteral feeding were not given the required energy requirement. The ICU patients who were given early nutrition feeding were associated with decreased length of ICU stay.

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INTRODUCTION

Most of the patients admitted in the intensive care unit (ICU) have acute critical illness placing them at high nutrition risk. Critical illness is usually associated with catabolic state due to systemic inflammatory response along with complications of infection, multi-organ failure leading to prolonged hospitalization and increased risk for morbidity and mortality.

Previously, nutritional support for the critically ill was regarded as an adjunct to medical therapy in order to help preserve lean body mass and provide support during stress. At present, nutrition has been made into a therapy in itself where feeding is thought to aid in correcting the metabolic response to stress, prevent oxidative cellular injury and help modulate immune responses. [1]

Recent studies have shown that early initiation of enteral nutrition (EN) defined as within 24 to 48 hours from admission favorably improved patient outcomes. [1] Providing early enteral nutrition is seen as a proactive therapeutic strategy, which may lessen disease severity, reduce complications as well as decrease length of stay in the ICU.

In this light, this study aims to survey the timing of initiation of enteral feeding in admitted patients in the ICU. The study also aims to determine whether adequate caloric- energy requirements have been provided through the enteral route for this subset of population with nutrition risk.

REVIEW OF LITERATURE

Generally, patients admitted in the intensive care unit are critically ill requiring vital organ support have anorexia and may be unable to feed volitionally by mouth.' This subset of patients is at risk of accumulating rapid energy deficits, which leads to lean-tissue wasting and are associated with adverse outcomes.[2] In acute critical illness, the catabolic response is more pronounced than in healthy fasting persons due to superimposition of energy deficit on severe inflammatory and endocrine stress response as well as immobilization. Those with severe musculoskeletal wasting and weakness during critical illness are associated with a prolonged need for mechanical ventilation and rehabilitation. [3]

Previous studies have revealed that the degree of energy deficit accumulation in the critically ill patients is strongly associated with length of stay in the ICU thus increasing incidence of infectious complications and risk of death. Nutrition has become a primary therapeutic intervention to prevent deterioration, loss of body mass and improve outcome of critically ill patients. Considerations in nutrition therapy include the timing of initiation, targeted amount of macronutrients and its route of delivery. A widespread consensus among recent international guidelines has recommended that enteral nutrition is preferred in the critically ill patients without a contraindication. The use of enteral nutrition compared to parenteral nutrition significantly reduced the rate of infectious complications as well as length of ICU stay.[4]

In critically ill patients unable to maintain volitional intake, the guidelines also recommended to initiate nutrition support therapy in the form of early enteral nutrition within 48 hours. [1] It has been stated in the guidelines that all hospitalized patients must undergo an initial nutrition screen within 48 hours of admission.

Patients at higher nutrition risk in an intensive care unit however require a full nutrition assessment. Many screening and assessment tools are used to evaluate nutrition status, such as the Mini Nutritional Assessment, the Malnutrition Universal Screening Tool, the Short Nutritional Assessment Questionnaire, the Malnutrition Screening Tool, and the Subjective Global Assessment. Only the NRS 2002 and the NUTRIC score determine both nutrition status and disease severity.[5]

The energy requirements should be determined to achieve goals of nutrition therapy. The ASPEN guidelines suggested the use of indirect calorimetry when available but in its absence, a simplistic weight-based equation (25-30kcal/kg/day) is to be used to determine energy requirements.[1]

In recent studies, critically ill patients with accumulating degree of energy deficit have been strongly associated with the duration of stay in the ICU. This is linked with an increased occurrence of infectious complications and risk of death. Hypermetabolism and malnourishment are common in patients admitted to the intensive care unit. This subset of patients receives specialized nutrition therapy to attenuate the effects of malnourishment. However, the optimal amount of energy to deliver is unknown. It has been suggested that full calorie feeding improves clinical outcomes but other studies have concluded that caloric intake may not be important in determining outcome. [6]

SIGNIFICANCE OF THE STUDY

In recent years, nutrition has become a vital component of therapy especially in the critically ill patients where there is rapid energy deficit accumulation. This subset of patients is at high nutrition risk, which is strongly associated with poor recovery and adverse outcomes. Our local institutions have started to practice incorporating nutrition as a primary therapeutic intervention. Unfortunately, there are concerns as to the timing of initiation, route of delivery and the targeted amount of macronutrients. In the current guidelines and studies, enteral nutrition is preferred over parenteral nutrition in critically ill patients without contraindications. The timing of enteral nutrition initiation is within 24-48 hours of ICU admission with a targeted 25-30 kcal/kg/day. This study would like to determine the institution's current standard practice on enteral feeding, its timing of initiation, the amount of macronutrients provided for and the selected population's nutrition risk. It is the researcher's intent to provide information that may serve as a guide in this institution's future enteral nutrition protocol/s in the critically ill patients.

OBJECTIVES

General Objective

The objective of this study is to determine the nutrition risk levels as measured by NUTRIC score among admitted patients who requires feeding via enteral route at the Intensive Care Unit of Cebu Doctors' University Hospital from June 2016 to June 2017.

Specific Objectives:

1. To determine the timing of initiation of enteral feeding in patients admitted in the ICU:
   - a. Within 24 hours
   - b. Within 48 hours
   - c. Within 3 to 5 days
   - d. More than 5 days
2. To compute the desired caloric-energy requirement of admitted patients requiring feeding via enteral route in the ICU
3. To determine the actual caloric intake provided to admitted patients requiring feeding via enteral route in the ICU
4. To compare the computed caloric requirements versus actual caloric intake given during the patients' ICU admission
5. To determine the rate of high risk nutrition among admitted patients requiring feeding via enteral route in the ICU using the NUTRIC score

MATERIALS AND METHODS

Research Design

This was a one-year single-center cross-sectional retrospective chart review study taken from the medical records of patients admitted in the Intensive Care Unit of Cebu Doctors' University Hospital from June 2016 to June 2017.

Research Locale

The study was conducted at the Intensive Care Unit of Cebu Doctors' University Hospital.

Research Subjects

This study included admitted patients in the ICU on enteral feeding from June 2016 to June 2017 who were included in the selection process which employed purposive sampling technique using the following inclusion and exclusion criteria.

Inclusion criteria:

1. All patients admitted at the ICU with a length of stay (LOS) of more than 3 days
2. Patients 18 years old and above
3. Patients who received enteral feeding during their ICU admission

Exclusion criteria:

1. Patients who did not receive enteral nutrition during the ICU stay due to contraindications to enteral nutrition, instability, or death

Sample Size Determination

A total of 393 patients were admitted in the Intensive Care Unit from June 2016 to June 2017. Out of these patients, only 52 patients were able to fulfill the inclusion criteria. For this study, the following laboratory work-up were included: complete blood count, serum sodium, serum creatinine, serum total bilirubin level and an arterial blood gas (ABG). From the 393 patients, 245 had incomplete laboratory results required for the computation of the APACHE, SOFA and NUTRIC score systems. A total of 243 patients did not have serum total bilirubin levels while 2 patients lacked arterial blood gas. As to the duration of stay in the ICU, a total of 69 patients had a length of stay of less than 3 days. For those that had complete laboratory results, 3 of these patients were not given enteral feeding. Two of the patients had contraindications to enteral feeding while the third patient was provided with parenteral nutrition. A total of 24 charts lacked the needed data required for this study.

Data Processing and Analysis:

Data was gathered by doing chart review at the institution's medical records for patients admitted to the ICU from June 2016 to June 2017 and properly selected according to the inclusion criteria. Computation for APACHE II, SOFA and NUTRIC scores were done using designated calculator application, *MDcalc* to minimize technical errors as well as avoid bias. Patients included in the study were then assessed for nutrition risk using the NUTRIC Score. Acquired data were tabulated and each patient included in the study was classified as Low Nutrition Risk or High Nutrition Risk.

The researcher computed the desired caloric-energy requirement of each selected patient using the ideal caloric requirement according to the recent ASPEN guidelines of 25 kcal/kg/day based on the patient's estimated body weight. This was compared to the actual caloric intake that each patient under this study has received during his or her ICU stay.

DEFINITION OF TERMS:

Malnutrition: An acute, subacute or chronic state of nutrition, in which varying degrees of overnutrition or undernutrition with or without inflammatory activity have led to a change in body composition and diminished function.

Enteral Nutrition (EN): Nutrition provided through the gastrointestinal tract via a tube, catheter or stoma that delivers nutrients distal to the oral cavity.

Nutrition Screening: A process to identify an individual who is malnourished or who is at risk for malnutrition to determine if a detailed nutrition assessment is indicated.

SOFA Score: The Sequential Organ Failure Assessment (SOFA) score is a mortality prediction score that is based on the degree of dysfunction of six organ systems and assigns a score based on the data obtained in each category as shown in the table below:

Criteria	0	+1	+2	+3	+4
Pa02/Fi02 (mmHg)		<400	<300	<200 and mechanically ventilated	< 100 and mechanically ventilated
Platelets (x ltfVuL)	-	< 150	< 100	<50	<20
Glassgow Coma Scale (GCS)	15	13-14	10-12	6r2	<6
Bilirubin (mg/dL)	-	1.2-1.9	2.0-5.9	6.0-11.9	> 12.0
Mean Arterial Pressure (MAP) or administration of vasopressors required (ug/kg/min)	No hypotension	MAP >70 mmHg	Dopamine < 5 or Dobutamine of any dose	Dopamine < 5 or Epinephrine <0.1 or Norepinephrine <0.1	Dopamine > 15 or Epinephrine > 0.1 or Norepinephrine >0.1
Creatinine (mg/dL) or Urine Output (ml/day)	<1.2	1.2-1.9	2.0-3.4	3.S-4.9	>5

This scoring system predicts ICU mortality based on laboratory results and clinical data gathered. The data was gathered using chart review and the score used for this research has been calculated using values taken within 24 hours of patient's ICU admission or using the worst value during the patient's ICU stay.

APACHE II Score: A severity of disease classification system, which uses a point score, based upon initial values of 12 routine physiologic measurements, age, and previous health status to provide a general measure of severity of disease. In this study, the required variables are taken using data taken within 24 hours of the patient's ICU admission.

Criteria	0	+1	+2	+3	+4	+5	+6	+7	+8
History of Severe Organ Failure or Immunocompromise: Heart Failure Class IV, Cirrhosis, Chronic Lung Disease; Dialysis-dependent; Immunosuppression	No	-	Yes, and elective post-operative patient	-	-	Yes, and non operative or emergency post-operative patient	-	-	--
Age (Years)	≤ 44	45-54	55-64	65-74	> 74	-	-	-	-
Temperature (°C)	36-38.4	34-35.9 38.5-38.9	32-33.9	30-31.9 39-40.9	< 30	> 40.9	-	-	-
Bilirubin (mg/dL)						-	-	-	-
Mean Arterial Pressure (mmHg)	70-109	-	50-69 110-129	130-159	< 50 > 159	-	-	-	-
Heart Rate (beats per minute)	70-109	-	55-69 110-139	40-54 140-179	< 40 > 179	-	-	-	-
Respiratory Rate (breaths per minute)	12-24	10-11 25-34	6-9	35-49	< 6 > 49	-	-	-	-
Arterial pH	7.33-7.49	7.50-7.59	7.25-7.32	7.15-7.24 7.60-7.69	< 7.15 > 7.69	-	-	-	-
Oxygenation (use PaO2 if FiO2 < 50% otherwise use A-a gradient)		A-a gradient < 200 (if FiO2 over 49%) or pO2 > 70 (if FiO2 < 50%)	A-a gradient 200-349	A-a gradient 350-499	A-a gradient > 499				
Serum sodium (mMol/L)	130-149	150-154	120-129 155-159	111-119 160-179	< 111 > 179	-	-	-	-
Serum potassium (mMol/L)	3.5-5.4	3-3.4 5.5-5.9	2.5-2.9	6-6.9	< 2.5 > 6.9	-	-	-	-
Creatinine (mg/dL)	0.6-1.4	-	< 0.6 1.5-1.9 and Chronic Renal Failure	2.0-3.4 and Chronic Renal Failure	> 3.4 and Chronic Renal Failure 1.5-1.9 and Acute Renal Failure		2.0-3.4 and Acute Renal Failure		> 3.4 and Acute Renal Failure
Hematocrit (%)	30-45.9	46-49.9	20-29.9 50-59.9	-	< 20 > 59.9	-	-	-	-
White Blood Cell (total/cubic mm in 1000's)	3.0-14.9	15-19.9	1.0-2.9 20-39.9	-	< 1.0 > 39.9	-	-	-	-
Glasgow Coma Scale (GCS) 1-15	15 – (GCS Score)								

NUTRIC Score: This is a scoring system designed to quantify the risk of critically ill patients developing adverse events that may be modified by aggressive nutrition therapy. Based on the scoring system, a score within 0-5 indicates low malnutrition risk while a score within 6-10 has an associated worse clinical outcome. Parameters involved in NUTRIC score determination will be gathered by chart review, the APACHE and SOFA scores will be determined first followed by the input of their respective scores included in the final computation for the NUTRIC score using *MDcalc* application. The final values will be tabulated according to its respective scoring system as shown in table below:

Criteria	0	+1	+2	+3
Age (Years)	<50	50-74	≥75	-
APACHE II Score	< 15	15-19	20-27	> 28
SOFA Score	< 6	6-9	≥ 10	-
Number of co-morbidities	0-1	≥ 2	-	-
Days in hospital to ICU	0	≥ 1	-	-

RESULTS

Standard Enteral Nutrition

General Characteristics of All Admitted Patients in the ICU

For this study, a total of 393 patients were admitted in the ICU from June 2016 to June 2017 with an average age of 63 years old, male sex, comprising majority of the population with 240 (61.1%) subjects. For associated co-morbidities, 138 (35.1%) subjects had at least one with hypertension as the leading co-morbidity affecting 70% of the study population. The average length of stay in the ICU is 6.93 days with a mean 3.48 days from hospital admission leading to ICU admission.

The study population had an overall positive outcome with 227 (58%) patients discharged improved while 134 (34%) patients expired, 18 (5%) went home against medical advice, 7 (2%) patients were transferred to another institution due to financial constraints, 4 (1%) discharged unimproved and 3 (1%) were directly discharged improved from the ICU

Table 1. General Characteristics of Admitted ICU Patients

General Characteristics	Descriptive (n=393)
Age, years – Average (sd)	63.07(17.86)
Sex	
Female	153(38.9%)
Male	240(61.1%)
Number of Co-Morbidities	
0	99(25.2%)
1	138(35.1%)
2	108(27.5%)
3	9(2.3%)
Co-morbidity Type	
Hypertension	206(70%)
Type 2 Diabetes Mellitus	144(49%)
Bronchial Asthma	18(6%)
Chronic Kidney Disease (CKD)	3(1%)
Chronic Obstructive Pulmonary Disease (COPD)	3(1%)
Length of ICU Stay (Days)	6.93(6.72)
Days from Hospital Admission to ICU Admission	3.48(9.26)
Outcome	
Died	134(34%)
Improved	227(58%)
Directly Discharged	3(1%)
HAMA	18(5%)
Transferred	7(2%)
Unimproved	4(1%)

Frequency and Time of Initiation for ICU Patients Given Enteral Nutrition

Out of 393 admitted ICU patients, 361 (91.9%) patients were provided with enteral nutrition (EN). Those started who were provided EN within 24 hours comprised 212 (59%) patients while 100 (28%) admitted patients received EN between 24 to 48 hours, the remaining subjects were given EN after 3 days of ICU admission.

Table 2: Time of Enteral Nutrition Initiation

Time of EN Initiation	Frequency	Percent
Within 24 hours	212	59%
Within 48 hours	100	28%
Within 3-5 days	39	10%
More than 5 days	10	3%
Total Patients on EN	361	100%

Actual versus Required Energy in kilocalories (heal) for Patients Given Enteral Nutrition

The mean value for the required kcal in this study was 1555.03 (SD 295.71) kcal while the mean actual kcal provided during the ICU admission in this study is 1495.87 (SD 399.32) kcal with a mean difference of 59.16 (SD 443.03) kcal. Only 21 (5.85%) patients in this study achieved the required 25kcal/kg/day energy requirement based on current guidelines for critically ill patients.

Table 3. Actual versus Required Energy Provision (kcal)

Energy Requirement	kcal	Standard Deviation
Required Kcal (25kcal/kg/day)	1555.03	295.71
Actual Kcal (kcal/kg/day)	1495.87	399.32
Difference (Required - Actual)	59.16	443.03
Feeding status	**n=361**	**Percentage**
Achieved energy requirement	21	5.8%
Did not meet energy requirement	340	94.2%

As reflected on Table 1, there were 361 patients who were given enteral nutrition, yet, only 21/361 (5,8%) had achieved the feeding requirement while the rest of the study group was underfed. As shown in Table 4, among those 21 cases provided with adequate energy requirement in kcal, 33% had at least two co-morbidities present, 67% had been fed within 24 hours, with an average ICU length of stay of 6.68 days and mortality rate was 49%.

Moreover, those 340 cases who did not meet the required kcal, 36% had at least 1 co-morbidity present, 58% were started EN within 24 hours of ICU admission, had an average ICU length of stay of 7.13 days, 61% who were discharged improved, and their mortality rate was 31%.

Cross-sectional analysis showed that high proportion of patients in underfed group started within 24 hours (58% vs 34%, p = 0.003), longer ICU length of stay (7.13 days vs 6.68 days, p = 0.045), and yet, most of them had higher rate of those who had improved condition (61% vs 49%). The differences in rates between underfed and those who had achieved feeding requirement were statistically significant. The results suggested that feeding requirement did not show sufficient requirement in influencing patient's improvement.

Table 4. Variables in Enteral Feeding Energy Requirements

Variables	Adherences to feeding requirement		p-value
	Adhered	Did not adhere	
Total	21	340	
No of morbidities			
1	11(52%)	123(36%)	0.236
2	7(33%)	95 (28%)	0.613
3	1(5%)	8(2%)	0.973
Time of EN Initiation			
Within 24 hours	14(67%)	198(58%)	0.003*
Within 48 hours	6(29%)	93(27%)	0.079
Within 3-5 days	1(5%)	37(11%)	0.231
More than 5 days	1(5%)	8(2%)	0.973
Length of ICU stay			
Average	6.68	7.13	0.045*
Standard deviation	9.80	6.31	
Outcome			
Died	10(48%)	104(31%)	0.019*
Improved	10(48%)	206(61%)	0.146
Direct Discharge	0(0%)	3(1%)	0.546
No improvement	0(0%)	4(1%)	0.485
HAMA	0(0%)	18(5%)	0.131
Transfer	1(5%)	5(1%)	0.638

Nutrition Risk Assessment using the NUTRIC Score

General and Admission Characteristics of Patients with NUTRIC Score Computation

In assessing the nutrition risk, only a total 52 eligible adult patients with completed NUTRIC score computation were included in the study. Among the study subjects, 62% were male with an average age of 62 years old (SD 17.55) and weight of 64kg (SD 19,24), The mean length of ICU stay was 6 days (SD 9.34) with a mean of 5 days (SD 7.1) from hospital to ICU admission. As to the presence of co-morbidities, 23 subjects (44%) had one co-morbidity: hypertension while 12 subjects (23%) had two co-morbidities, namely hypertension and type 2 diabetes mellitus. The frequency of co-morbidities are as follows: hypertension 44%, followed by diabetes mellitus 23%, and lastly bronchial asthma 8%.

Table 5. General Characteristics of Study Subjects with NUTRIC Score

General characteristics	Descriptive (n=52)
Demographics	
Age, mean years (sd)	61.79±17.55
Sex	
Female	20(38%)
Male	32(61.5%)
Weight, average kg(sd)	64.27±19.24
Admission characteristics	
Length of ICU Stay (Days), mean(sd)	6.30±9.34
APACHE Score, mean(sd)	21.22±9.08
SOFA Score, mean(sd)	7.97±3.36
Days from hospital admission to ICU, mean(sd)	4.64±7.1
No. of Co-Morbidities	
0	16(31%)
1	23(44%)
2	13(3%)
Co-morbidity Type	
Hypertension	31(44%)
Type 2 Diabetes Mellitus	12(23%)
Bronchial Asthma	4(8%)

Timing of Initiation of Enteral Nutrition for Patients with Computed NUTRIC Score

As to the timing of enteral nutrition initiation, 23 subjects (44%) were given enteral nutrition within 24 hours, 20 (38%) were started within 24 to 48 hours while 4 (8%) were given feeding within 3 to 5 days and 5 (10%) were started after 5 days of ICU admission.

Table 6: Time of EN Initiation

Clinical profiles	Frequency	Percent
Time of EN Initiation		
Within 24 hours	23	44%
Within 48 hours	20	38%
Within 3-5 days	4	8%
More than 5 days	5	10%

APACHE II Score:

APACHE II score was developed to estimate ICU mortality based on a number of laboratory values and vital signs taking into account both acute and chronic disease. The data were based on values taken from the initial 24 hours of ICU admission. As shown below, a total of 23 subjects (44%) had a history of severe organ failure including those requiring respiratory support (16), chronic obstructive pulmonary disease (2), congestive heart failure NYHA IV (3), chronic liver disease (9), immunocompromised state (5) and chronic kidney disease on maintenance dialysis (3). Fifty-two percent had acute renal failure at the time of ICU admission. In assessing the mortality rate using APACHE score, parameters included the subject's vital signs and laboratory results. Table 3 below shows a mean Glassgow Coma Scale (GCS) score of 11.97 points (SD 4.14) and recorded vital signs with a mean temperature of 36.59°C (SD 1.02), mean arterial pressure (MAP) of 83.47mmHg (SD 12.28), heart rate of 96.30 beats per minute (SD 23.52) and a respiratory rate mean of 24.41 breaths per minute (SD 4.94). The laboratory results taken showed the following blood chemistry values: mean serum sodium of 133.76 mmol/L (SD 28.81), serum potassium of 4.18 mmol/L (SD 0.90) and serum creatinine of 2.2mg/dL (SD 1.65). In the complete blood count test results showed a mean hematocrit of 35.18% (SD 8.08) and white blood count of 16.99 x IOVL (SD 11.36). The arterial blood gas (ABG) results showed a meat) Fi02 of 51.26% (SD 26.80), A-a gradient of 241.22mmHg (SD 129) and Pa02 Of 138.42 mmHg (SD 81.27). In Table 9, APACHE II Score outcome from this study showed a mean of 20.09 (SD 8.69) with 16 subjects (31%) presenting a predicted 40% non-operative ICU mortality.

Table 7. APACHE II Score Variables Set A

Clinical profiles	Frequency	Percent
History of Severe Organ Failure/Immunocompromise	23	44%
Severe Organ Failure/Immunocompromise Type		
Requiring respiratory support	**16**	**31%**
Chronic Obstructive Pulmonary Disease	**2**	**4%**
Congestive Heart Failure NHYA IV	**3**	**6%**
Liver Disease	**9**	**17%**
Cirrhosis	3	6%
Upper Gastrointestinal Bleed secondary to Portal Hypertension	2	4%
Hepatic Failure	4	8%
Immunocompromised State	**5**	**10%**
Cancer S/P Chemotherapy	4	8%
Leukemia	1	2%
Chronic Kidney Disease on Maintenance Hemodialysis	**3**	**6%**
Acute Renal Failure		
No	25	48%
Yes	27	52%

Table 8. APACHE II Score Variables Set B

Laboratory/Vitals	Mean	Standard Deviation
Glassgow Coma Scale	11.97	4.14
Temperature	36.59	1.02
Mean Arterial Pressure	83.47	12.28
pH	7.34	0.10
Heart Rate	96.30	23.52
Respiratory Rate	24.41	4.94
Sodium	133.76	28.81
Potassium	4.18	0.90
Creatinine	2.20	1.65
Hematocrit	35.18	8.08
White Blood Count	16.99	11.36
A-a Gradient If FiO2 > 0.5 (mmHg)	241.22	129.00
PaO2 if FiO2 < 0.5 (mmHg)	138.42	81.27
FiO2	51.26	26.80

Table 9. APACHE II Score Outcome

Outcome profile	Descriptive (n=52)
APACHE II Score, mean(sd)	20.09±8.69
APACHE II Interpretation	
Non-Surgical Mortality	
6%	2(4%)
12%	1(2%)
Non-Operative Mortality	
6%	6(12%)
12%	5(10%)
22%	8(15%)
40%	16(31%)
51%	6(12%)
71%	4(8%)
82%	4(8%)

SOFA Score:

The Sequential Organ Failure Assessment (SOFA) Score is a tool to predict mortality risk and determine the level of organ dysfunction in ICU patients. The score was calculated using subject's clinical data and laboratory results taken within 24 hours of admission to ICU. As shown in Table 10 below, the level of hypotension was also taken into consideration with 22 study subjects not requiring vasopressors followed by those who needed the use of vasopressors of either dopamine > 15/^g/kg/min or norepinephrine > 0.1/ig/kg/min. The SOFA score showed a mean outcome of 8.64 (SD 3.41) with 18 subjects (35%) presenting a predicted 33% mortality.

Table 10. SOFA Score Variables

Criteria	Descriptive (n=52)
PaO2 (mmHg)	138.42+81.27
FiO2, mean (sd)	51.26+26.80
Platelet, mean (sd)	189.58±109.33
Bilirubin, mean (sd)	5.34±8.21
Creatinine, mean (sd)	2.20+1.65
Glassgow Coma Scale, mean (sd)	11.97+4.14
Level of Hypotension	
0	22(42%)
1	8(15%)
2	2(4%)
3	3(6%)
4	17(33%)

Table 11. SOFA Score Outcome

SOFA Score Outcome	Descriptive (n=52)
SOFA Score, mean(sd)	8.64±3.41
SOFA score Interpretation (Mortality)	
<33%	11(21%)
33%	18(35%)
40-50%	14(27%)
95%	9(17%)

NUTRIC Score Results

The NUTRIC Score is a tool that can aid in identifying critically ill patients who can benefit from nutrition therapy. Table 12 shows the computation for the nutrition risk of the selected admitted ICU patients with an overall average score was 4.54 (SD 1.64) points which shows ~11% 28-day mortality. Out of the 52 patients included in this study, 39 patients (75%) were identified to be at low risk while remaining 13 subjects (25%) were at high risk for a 28-day mortality.

Table 12: NUTRIC Score

	Descriptive (n=52)
Overall average score (sd)	4.54(1.64)
Nutric Score Category and Interpretation (28-Day Mortality)	
High Risk	13(25%)
Low Risk	39(75%)

Enteral Feeding Required Kcal versus Actual Kcalfor Subjects with NUTRIC Score

For the subjects with completed NIJTRIC score, the mean required kcal based on 25kcal/kg/day is 1,668.11 kcal/day while the mean actual kcal given was 1,292.93 kcal/day with a percent difference of 22.49% with the actual kcal given lower than the required kcal amount. Using the paired T-test for comparison, the test of paired difference is significant at <0.001.

Table 13: Enteral Feeding Required Kcal versus Actual Kcal

Feeding requirement	Mean	Std.deviation
Required Kcal (25kcal/kg/day)	1,668.11	627.97
Actual Kcal (kcal/kg/day)	1,292.93	512.51
Difference	375.18	
Percent difference	actual Kcal is lower by 22.49% from required Kcal	
Test of paired difference	<0.001 (significant)	

Clinical Outcome

For the outcome of the study subjects enrolled, 27 subjects (52%) were discharged improved, 20 (38%) patients expired, 3 (6%) went home against medical advice while two (6.1%) were directly discharged from the ICU.

Table 14: Outcome Profile

Outcome profile	Descriptive (n=52)
Improved/Discharged	27(52%)
Direct discharged	2(4%)
HAMA	3(6%)
Died	20(38%)

DISCUSSION

Acute critical illness is associated with a catabolic state, which increases energy expenditure placing this subset of patients at high nutrition risk thereby increasing risk for longer hospital stay and poor outcomes. Inflammation and compensatory mechanisms lead to metabolic changes. These inflammatory-induced stress metabolic changes can lead to increased energy expenditure.[2]

Actual versus Required Kcal for Subjects on Enteral Nutrition (EN)

The current guidelines recommend giving 25-30 kcal/kg/day based on the patient's ideal body weight. In the study, only 21/361 (5.85%) patients provided with EN achieved the required 25 kcal/kg/day energy requirement based on current guidelines for critically ill patients. In the analysis done, it was noted that there was a high proportion of underfed patients although initiated on EN within 24 hours (58% vs 34%, p = 0.003) had longer duration of ICU stay (7.13 days vs 6.68 days, p = 0.045).

Achieving Actual Kcal for Subjects on Enteral Nutrition and Subsequent Outcome

A study done by Arabi et. al. concluded that providing enteral nutrition to deliver moderate nonprotein calories to critically ill patients was not associated with lower mortality compared to those given the required amount.[9] Similarly in our study, it has also shown that most of the patients who were not given the required kcal had a higher rate of improved condition (61% vs 49%). Given that the differences in rates between underfed and those who had achieved feeding requirement were statistically significant, this study revealed that feeding requirement adherence does not guarantee favorable outcome.

Timing of Enteral Nutrition and Subsequent Outcome

In terms of the timing of enteral nutrition, the ASPEN guidelines have recommended that early EN should be initiated within 24 to 48 hours from ICU admission. This study revealed that majority of the ICU patients admitted in this institution had been receiving early EN. A total of 312/361 (86%) patients were initiated with early enteral nutrition within 24 to 48 hours from ICU admission. A total of 219/361 (61%) subjects on enteral nutrition were discharged improved. The results of our study were similar to a study done by Khalid, MD et al where it was shown that early enteral nutrition might be associated with lesser ICU mortality in patients whose condition is considered hemodynamically unstable. [10]

Nutrition Risk Assessment with NUTRIC Score and Patient Outcome

The results in a study done by Rhaman A, et. al., showed that there was an association between nutrition adequacy and a 28-day mortality as demonstrated by the NUTRIC score where the test for interaction had a p-value of 0.029. The study also revealed that patients with high NUTRIC score, there was a strong positive association between nutritional adequacy and 28 day survival. This association diminished with lesser NUTRIC score, [11] In our study, the computation for the nutrition risk of the selected admitted ICU patients with an overall average score was 4.54 (SD 1.64) points which showed ~ll% 28-day mortality. From the patients with NUTRIC score, majority with 39 patients (75%) were identified to be at low risk while the remaining 13 subjects (25%) were at high risk for a 28-day mortality.

The Joint Commission (United States) has mandated nutrition screening within 24 hours of admission in an acute critical care unit.[2] Identification of these critically ill patients for nutrition risk using the assessment tool, NUTRIC score can serve as a guide to nutritional intervention. There is noted variability as to patient risk for adverse outcomes related to malnutrition thus markers for both acute and chronic inflammation and starvation are considered. The NUTRIC score is a valid tool that can aid in identifying critically ill patients who will benefit from aggressive nutrition therapy. Scoring systems such as the APACHE II and SOFA score are good mortality prediction tools to aid in identifying critically ill patients who may benefit from aggressive therapeutic intervention including nutritional support. The study was unable to acquire the needed sample size to arrive at a conclusion regarding the institution's practice as to nutrition risk identification. It is however of note that the institution lacks the protocol needed to identify critically ill patients with high risk for mortality.

LIMITATIONS OF THE STUDY

One of the major limitations of this study is that the institution's ICU does not have protocol use of both APACHE and SOFA score systems, which are required in computing for the NUTRIC Score.

Laboratory tests needed for this study, included complete blood count (CBC), serum sodium, serum creatinine, serum total bilirubin and arterial blood gas (ABG). Unfortunately, most of the physicians do not routinely get serum bilirubin levels.

Second limitation is the use of estimated body weight in computing for the energy requirements in enteral nutrition. Ideally, it has been stated in the ASPEN guideline to use 25-30kcal/kg/day based on ideal body weight.

Another limitation is that there were a total of 24 charts that the researcher was not able to access due to unavailability or lack of content.

The small number of subjects included in this study reduces its validity.

CONCLUSION

In the one-year survey done of the institution's standard practice on enteral nutrition (EN) provision for admitted ICU patients based on the NUTRIC score, revealed that most of the admitted patients who were provided with EN were at low risk for a 28-day mortality. However, only 52/393 cases were included in the nutrition risk assessment using the NUTRIC score thus reducing the validity of the results.

It was also shown that majority of the cases were given early enteral nutrition within 24 to 48 hours of ICU admission in accordance to the recent guidelines. It is also noted that there is a possible association between achieving the required energy kcal of 25kcal/kg/day and lesser length of ICU stay.

It is the desire of the researcher that with proper use of APACHE and SOFA scoring systems, critically ill patients with increased risk for mortality can be identified and given immediate therapeutic intervention to avert poor outcomes. Also, these scoring systems can be used for nutrition screen using the NUTRIC score. Proper identification of patients with high nutrition risk can better modify possible adverse outcomes thru aggressive nutritional support if warranted.

RECOMMENDATIONS

1. This study would like to recommend early initiation of enteral feeding within 24 to 48 hours of ICU admission.
2. The study however, cannot verify the benefit of achieving required energy provision basing on 25kcal/kg/day until further indisputable evidence has been shown in larger studies.
3. This study would like to suggest a protocol for ICU admission that includes the use of mortality risk assessment scores namely APACHE and SOFA scoring system.
4. As part of the risk assessment, the researcher would like to suggest inclusion of the following laboratory tests in every ICU admission:
    a. CBC
    b. Serum Na
    c. Serum creatinine
    d. Serum total bilirubin
    e. Arterial Blood Gas
5. This study would also like to suggest nutrition risk screening and assessment with the use of an institutional-based Subjective Global Assessment (SGA) and the international NUTRIC Score system.
6. A long-term prospective cohort of enteral nutrition of the same population is suggested for our institution.

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