# A Study on Correlation between Nutrition Delivery and Length of Stay in Critical Care Unit at a Tertiary Hospital

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**Abstract:** *Background: When admitted to the intensive care unit (ICU), critically ill patients experience significant calorie and protein deficits, which significantly contribute to longer hospital stays. Objective: To study the prescription and delivery gap in critical care nutrition in a tertiary hospital and its impact on length of stay. Methodology: It is a prospective observational study carried out in the critical care unit over a two - month period with 147 patients who were admitted to the acute medical care unit and needed a minimum three - day stay. The required information was obtained from the hospital's critical care unit and compared the length of the patient's ICU stay with nutrition delivery. Results: The majority of critically ill patients (76%) are at risk of malnutrition when they are admitted to the intensive care unit (ICU), and there is a notable discrepancy between actual and recommended delivery, which has been linked to longer ICU stays. Conclusion: There are several guidelines for the provision of nutrition support therapy in critically ill patients, but there should be specific strategies to implement the nutrition recommendations in critical care settings to improve nutrition practices. Early, ideal, and sufficient nutrition helps patients to achieve better overall outcomes*.

**Keywords:** Prospective observational study, critical care nutrition, length of stay, recommended delivery

## 1. Introduction

In critically ill patients, inadequate feeding (i. e., intakes less than losses or expenditures) is common, particularly for long - term intensive care unit (ICU) patients [1]. Using a general clinical assessment at the very least, critically ill patients should have their malnutrition screened as soon as they are admitted [2]. Low nutritional intakes are linked to poor outcomes in the critical care population, including longer lengths of stay (LOS) in the ICU or hospital, a higher incidence of complications (like infections), and ultimately a higher mortality rate [3]. Malnutrition is a common side effect of being hospitalized, particularly for patients who are very sick and are admitted to the intensive care unit (ICU). Between 1996 and 2005, the percentage of acute care patients who were malnourished ranged from 13 to 78% [4]. Malnutrition can be the result of both hyper metabolism and inadequate intake of energy and protein in these patients. Research showed that having some degree of malnutrition prior to admission to the ICU in seriously ill patients was able to compromise micro - and macronutrient reserves [5]. Conversely, overfeeding should be avoided as it can also raise the risk of complications [6]. The term "Nutri trauma" was coined by some writers to draw attention to the detrimental impacts of inadequate nutritional support [7].

Patients in ICU are from days, weeks, or even months. During this period, patients undergo phases of critical illness. A simplification of this concept would include an acute phase, a chronic phase, and a recovery phase. In such scenario nutrition care should probably be different in each phase, and targeted to address the evolution of the metabolic response to injury [8].

The nutritional status of the patient prior to admission, the endogenous nutrient production, autophagy and the energy balance of the patient during ICU hospitalization are the parameters to be considered before admission for administration of calories [9]. Protein intake recommendations are dependent upon patient clinical status. Sarcopenic patients with a substantial decline in muscle mass have increased mortality risk and high protein diet may improve their survival and 25 - 35Kcal/kg body weight is strongly recommended in critical illness [10]. The purpose of this study is to determine whether a difference in the recommended and actual delivery doses of calories and protein will have an impact on the length of stay of patients in critical care

## 2. Material and Methods

**Research Design:** Prospective observational investigation

**Study Sample:** Present research is a prospective observational study conducted in the critical care unit over a period of two months, involving 147 patients who were admitted to the acute medical care unit and required a minimum three - day stay. Utilizing the patient's case sheet, a typical validated nutrition screening [11] and assessment [12] and pertinent lab reports, the necessary data was retrieved from the hospital's critical care department. Nutrition adherence is finally computed with an impact on the length of

the patient's ICU stay. The data was gathered using a self - designed form. Average patients' nutrition intake is also tracked and recorded on daily basis. The calories requirement for critical care patients is typically 1200–2400 kcal per day, with an average of 1898 kcal, whereas the protein requirement is 43–104 gm per day, with an average of 69 gm.

**Study site:** The current study is a single - centre, hospital - based investigation conducted from June 2021 to July 2021 in the acute medical care unit, Yashoda Hospital, Secunderabad. Approval from the institutional ethical committee was obtained before the study began.

**Statistical analysis**: The categorical variables were described as n (%) and the p values are analysed using the chi - square test. BMI is measured as
Body Mass Index (BMI) = Weight (Kg) /Height (m$^2$)

## 3. Results

The age and gender distribution of the participants in this study are displayed in Table 1. A total of 147 people were examined. The present investigation revealed that approximately 60% of patients belong to the adult age group followed by the early adult group. Geriatric and adolescent made up the least number of patients. In the current study, 96 men and 51 women made up the total of 147 patients.

**Table 1:** Total study population distribution based on age and gender

| S. No | Age of the patient (Years) | Number of the individuals (N=147) | Percentage (%) |
|---|---|---|---|
| 1 | 0 - 19 | 06 | 4.1 |
| 2 | 20 - 39 | 44 | 29.9 |
| 3 | 40 - 49 | 34 | 23.1 |
| 4 | 50 - 59 | 26 | 17.7 |
| 5 | >60 | 37 | 25.2 |
| 6 | Female | 51 | 34.7 |
| 7 | Male | 96 | 65.3 |

The body mass index of the total studied population was presented in Figure 1, with only 12% falling into the normal BMI category and majority of patients were overweight and obese. When compared to patients with normal BMIs, 13% of patients are overweight, 47% are obese, and 2.3% are underweight. Table 2 display the findings of nutritional risk assessments of 147 patients which were completed within 24 hours of admission. Upon admission to the critical care unit 8.5% of patients were found to be normally nourished, while the majority, who were 90.3% more than normal were mildly malnourished followed by moderately nourished patients. Among the patients admitted, severely malnourished were the least. A detailed nutrition assessment conducted using the Subjective

**Table 2:** Total study population distribution based on nutritional screening

| S. No | Patients based on their nutritional status | Number of patients (N=147) | Percentage (%) |
|---|---|---|---|
| 1 | Normal | 12 | 8.5 |
| 2 | Mildly malnourished | 109 | 76.8 |
| 3 | Moderately malnourished | 19 | 13.4 |
| 4 | Severely malnourished | 02 | 1.4 |

**Table 3:** Total study population distribution based on nutritional assessment

| S. No | Level of nourishment | Number of patients (N=147) | Percentage (%) |
|---|---|---|---|
| 1 | Normal | 41 | 29.1 |
| 2 | Mildly malnourished | 57 | 40.4 |
| 3 | Moderately malnourished | 25 | 17.7 |
| 4 | Severely malnourished | 18 | 12.8 |

Global Assessment (SGA) tool. showed that, 29% and 70% of patients in the ICU are well - nourished and malnourished. Approximately 40% were mildly malnourished (Table 3). Table 4 and Figure 2 depicts that, due to a calorie and protein deficit, 33% and 48% of the 147 patients have spent more than five or seven days in the intensive care unit (ICU). The study results show that patient had not received the calorie and protein in accordance with recommendations. Patients who had a stay of less than four days in ICU were delivered with better calorie and protein than the others. The data shows that patients who spent more than ten days in the intensive care unit (ICU) were given approximately 15% and 25% less nutrition (in terms of calories and protein) than patients who only spent less than four days in the ICU. The study also revealed that patients who spent the same amount of time in the intensive care unit had received different nutrition levels. The statistical results shows that length of stay is not significantly correlated with calorie delivery (p=0.531) and protein delivery (p=0.0087).

## 4. Discussion

The benefits of medical nutrition have been brought to light by the literature that is currently available on nutrition during critical illness. In critically ill patients, nutrition is now regarded as a major supportive therapy. There is a physiological justification to regard nutrition in the post - ICU
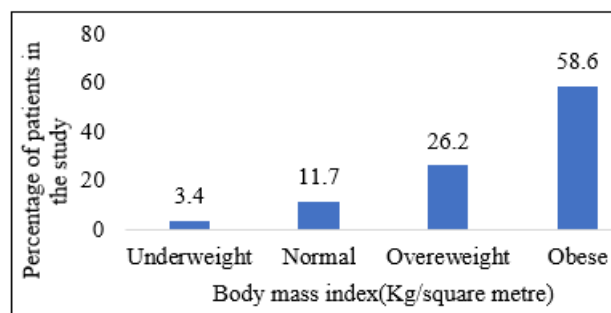


**Figure 1:** Percentage of patients in relation to their body mass index (Kg/m$^2$)
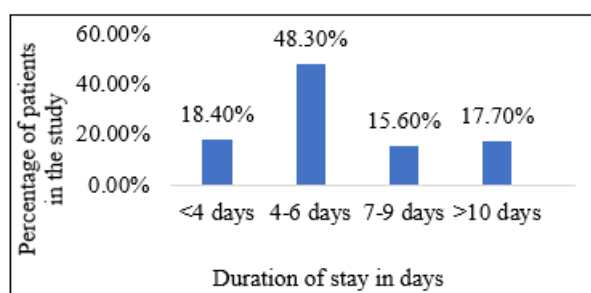


**Figure 2:** Percentage of patients in relation to their ICU stay

period as being just as important as during the ICU stay, despite the lack of evidence supporting the role of increased

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nutrition delivery in enhancing the recovery of critically ill survivors [13].

It is known that precise and timely nutrition support is essential for good outcomes in a critical care setting. The current study demonstrates that patients who were malnourished had the lowest reported body mass index. Malnutrition in an intensive care unit is known to cause muscle atrophy, decreased function, poor wound healing, an increased risk of pressure injuries, and an extended hospital stay [14].

Present study shows that, the duration of hospitalization and the patient's clinical result are influenced by the recommended and actual protein and energy delivery. The prescribed and actual delivery of energy & protein has an impact on length of stay and clinical outcome of the patient.

In the current study energy delivery and protein delivery was less than the intended delivery to the critically ill patients [15]. A longer length of stay in the intensive care unit or hospital has been linked to nutrient deficiencies, which are also strongly associated with higher rates of morbidity and mortality in patients in critical condition [16]. It is commonly recognized that a patient's length of stay in critical care is influenced by a number of underlying factors in addition to the nutrition they receive [17]. The length of ICU stays, morbidity, and mortality may all be reduced with medical nutrition therapy. In order to avoid or reduce nutritional crises and to track nutritional therapy, it is crucial to promptly assess the nutritional status of critically ill patients [18]. A crucial component of an appropriate nutritional intervention that may shorten the duration of ventilator dependency, shorten hospital stays in intensive care units, and lower mortality rates is early nutritional screening [19].

**Table 4:** Total study population distribution based on length of ICU stay (LOS), Calorie and Protein deficit.

| S. No | Length of stay (Days) | No. patients with their corresponding stay percentage | Calorie deficit (Kcal/day) (p=0.531) | | | | Protein deficit (gm/day) (p=0.08) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Low | Medium | High | Total | Low | Medium | High | Total |
| 1 | <4 | No. patients | 06 | 09 | 12 | 27 | 06 | 10 | 11 | 27 |
| | | Percentage of stay (%) | 22.2 | 33.3 | 44.4 | 100 | 22.2 | 37.0 | 40.7 | 100 |
| | | Nutrition supplied | 1100 | 1050 | 1000 | 5288 | 52 | 50 | 49 | 197 |
| 2 | 4 - 6 | No. patients | 21 | 23 | 27 | 71 | 19 | 17 | 35 | 71 |
| | | Percentage of stay (%) | 29.6 | 32.4 | 38.0 | 100 | 26.8 | 23.9 | 49.3 | 100 |
| | | Nutrition supplied | 980 | 975 | 960 | 4520 | 48 | 47 | 46 | 174 |
| 3 | 7 - 9 | No. patients | 06 | 12 | 05 | 23 | 09 | 10 | 04 | 23 |
| | | Percentage of stay (%) | 26.1 | 52.2 | 21.7 | 100 | 39.1 | 43.5 | 17.4 | 100 |
| | | Nutrition supplied | 950 | 935 | 930 | 3710 | 44 | 42 | 40 | 144 |
| 4 | >10 | No. patients | 06 | 08 | 12 | 26 | 10 | 04 | 12 | 26 |
| | | Percentage of stay (%) | 23.1 | 30.8 | 46.2 | 100 | 38.5 | 15.4 | 46.2 | 100 |
| | | Nutrition supplied | 940 | 860 | 780 | 2825 | 39 | 37 | 35 | 126 |
| 5 | Total | No. patients | 39 | 52 | 56 | 147 | 44 | 41 | 62 | 147 |
| | | Percentage of stay (%) | 26.5 | 35.4 | 38.1 | 100 | 29.9 | 27.9 | 42.2 | 100 |

## 5. Conclusion

For critically ill patients' malnutrition is a serious concern and during an ICU stay, careful nutritional management should be done as it impacts the length of stay. It is believed that nutrition can improve patient outcomes therapeutically rather than just as an aid or support. Early, ideal, and sufficient nutrition helps shorten hospital stays while also improving patients' overall prognosis. The current study concludes that prompt, guideline - compliant nutrition delivery increases the reduction of length of stay in critically ill patients.

**Conflict of interest**: The authors have no conflict of interest.

## References

[1] Singer P, Blaser AR, Berger MM, Alhazzani W, Calder PC, Casaer MP, Hiesmayr M, Mayer K, Montejo JC, Pichard C. ESPEN guideline on clinical nutrition in the intensive care unit. Clin Nutr.2019; 38: 48–79.

[2] Dvir D, Cohen J, Singer P. Computerized energy balance and complications in critically ill patients: An observational study. Clin Nutr.2006; 25: 37–44

[3] Villet S, Chiolero R, Bollmann MD, Revelly JP, Cayeux RNM, Delarue J, Berger MM. Negative impact of hypocaloric feeding and energy balance on clinical outcome in ICU patients. Clin Nutr.2005; 24: 502–509.

[4] Kubrak C, Jensen L. Malnutrition in acute care patients: a narrative review. Int J Nurs Stud.2007; 44 (6): 1036 - 54.

[5] Osooli F, Abbas S, Farsaei S, Adibi P. Identifying Critically Ill Patients at Risk of Malnutrition and Underfeeding: A Prospective Study at an Academic Hospital. Adv Pharm Bull.2019; 9 (2): 314 - 320.

[6] Klein CJ, Stanek GS, Wiles CE.3rd overfeeding macronutrients to critically ill adults: Metabolic complications. J Am Diet Assoc.1998; 98: 795–806.

[7] Yebenes JC, Campins L, Martinez de Lagran I, Bordeje L, Lorencio C, Grau T, Montejo JC, Bodi M, Serra - Prat M. Working Group on Nutrition and Metabolism of the Spanish Society of Critical Care Nutritrauma: A Key Concept for Minimising the Harmful Effects of the Administration of Medical Nutrition Therapy. Nutrients.2019; 11: 1775.

[8] Wischmeyer PE. The evolution of nutrition in critical care: how much, how soon? Crit Care.2013; 17 (1) 1 - 8.

[9] Nakamura K, Nakano H, Naraba H, Mochizuki M, Takahashi Y, Sonoo T, Hashimoto H. Novel protocol combining physical and nutrition therapies, Intensive Goal - directed Rehabilitation with Electrical muscle stimulation and Nutrition (IGREEN) care bundle. Crit Care.2021; 25: 415.

[10] Yasutaka Koga, Motoki Fujita, Takeshi Yagi, Masaki Todani, Takashi Nakahara, Yoshikatsu Kawamura, Kotaro Kaneda, Yasutaka Oda, Ryosuke Tsuruta, Early enteral nutrition is associated with reduced in - hospital mortality from sepsis in patients with sarcopenia, J Critic Care.2018; 47: 153 - 158.

[11] Kondrup J, Rasmussen HH, Hamberg O, Stanga Z. Nutritional risk screening (NRS 2002): A new method based on an analysis of controlled clinical trials. Clin Nutrition.2003; 22: 321–336

[12] Detsky AS, Mclaughlin JR, Baker JP, Johnston N, Whittaker S, Mendelson RA, Jeejeebhoy KN. What is Subjective Global Assessment of Nutritional Status? J parenteral and enteral nutrition.1987; 11 (1): 8 - 13.

[13] Bear DE, Wandrag L, Merriweather JL, Connolly B, Hart N, Grocott MPW. Enhanced Recovery After Critical Illness Programme Group Investigators The role of nutritional support in the physical and functional recovery of critically ill patients: A narrative review. Crit Care.2017; 21: 226

[14] Vincent JL, Marshall JC, Ñamendys Silva SA, François B, Martin Loeches I, Lipman J, Reinhart K, Antonelli M, Pickkers P, Njimi H, Jimenez E, Sakr Y. ICON investigators. Assessment of the worldwide burden of critical illness: the intensive care over nations (ICON) audit. Lancet Respir Med.2014; 2: 380–386.

[15] Lew CCH, Yandell R, Fraser RJL, Chua AP, Chong MFF, Miller M. Association between Malnutrition and Clinical Outcomes in the Intensive Care Unit: A Systematic Review. J Parenter Enter Nutrition.2017; 41: 744–758.

[16] Karpasiti T, Bear DE. The importance of nutrition to morbidity and mortality in critically ill patients. Inten Crit Care Nursing.2023; 76: 103365.

[17] Casaer MP, Van den Berghe G. Nutrition in the acute phase of critical illness. N Engl J Med.2014; 370: 1227–1236.

[18] Van Zanten ARH, De Waele E, Wischmeyer PE. Nutrition therapy and critical illness: practical guidance for the ICU, post - ICU, and long - term convalescence phases. Crit Care.2019; 21; 23 (1): 368.

[19] Berger, M. M., Singer, P. Comment: Early nutrition prescription in critically ill patients learnings from the FRANS study. Crit Care.2024; 27: 64.