

Earlier consultation of patients to the nutrition support unit is associated with lowers length of hospital stay

Demet Yılmaz¹ , Meltem Türkoğlu¹ , Hanife Cüce² , Ayşe İlksen Eğilmez³ , Güray Güvercin⁴ ,
Gülsüm Gönülalan⁵ , Muhammet Cemal Kızırlanslanoglu⁶ 

¹Department of Diet and Nutrition, University of Health Science Turkey, Konya Training and Research Hospital, Konya, Turkey

²Department of Intensive Care Unit, University of Health Science Turkey, Konya Training and Research Hospital, Konya, Turkey

³Department of Anesthesiology and Reanimation, University of Health Science Turkey, Konya Training and Research Hospital, Konya, Turkey

⁴Department of Internal Medicine, University of Health Science Turkey, Konya Training and Research Hospital, Konya, Turkey

⁵Department of Internal Medicine, Division of Endocrinology and Metabolism, University of Health Science Turkey, Konya Training and Research Hospital, Konya, Turkey

⁶Department of Internal Medicine, Division of Geriatrics, University of Health Science Turkey, Konya Training and Research Hospital, Konya, Turkey

ORCID iDs of the authors: D.Y. 0000-0002-6654-7565, M.T. 0000-0002-4050-329X, H.C. 0000-0003-1211-4139, A.İ.E. 0000-0001-9072-0850, G.G. 0000-0001-6909-0073, Gülsüm G. 0000-0001-5465-944X, M.C.K. 0000-0002-7632-6811.

Cite this article as: Yılmaz D, Türkoğlu M, Cüce H, Eğilmez Aİ, Güvercin G, Gönülalan G, et al. Earlier consultation of patients to the nutrition support unit is associated with lowers length of hospital stay. Clin Sci Nutr 2020; 2(2): 68-73.

ABSTRACT

Objective: Owing to the increasing awareness regarding malnutrition, the number of nutrition support units has increased. However, given that a limited number of healthcare professionals work in the field of malnutrition area, strategies to increase the number of these healthcare professionals are warranted. To investigate the relationship between length of hospital stay (LOS) and the consultation time, defined as the duration between hospitalization and consultation to the nutrition support team.

Methods: Total 337 patients who consulted our team and were given enteral and/or parenteral nutritional support were enrolled. General characteristics, reasons for admission, consultation time, nutritional support method, and LOS were examined. The correlation between LOS and consultation time was investigated. Factors that were independently associated with the LOS were analyzed using a linear regression analysis model.

Results: The median patient age was 76 y (18–95 y); 53.7% of them were men, and 49.3% had at least one co-morbidity. The wards from which the patients consulted our team were intensive care (61.4%), non-surgical (32.6%), and surgical (5.9%) units. Further, 78% of the patients were at nutritional risk at the time of admission. The median LOS was 28 d (0–261 d). The median consultation time was 8 d (0–112 d). There was a significant, moderate, positive correlation between consultation time and LOS ($r=0.531$; $p<0.001$). Pressure ulcer, consultation time, nutritional risk, parenteral nutrition, and gastrostomy were independent factors associated with the LOS in the linear regression analysis model.

Conclusion: Early detection and management of malnutrition in hospitalized patients may offer benefit in terms of LOS. Our study showed that the earlier the patients are consulted by the nutrition support team, the lower is their LOS and vice versa.

Keywords: Length of hospital stay, malnutrition, nutrition support

Introduction

Malnutrition is defined as a condition accompanied by a change in body composition (decreased lean body mass) caused by nutritional deficiency and a decrease in the body cell mass, with a decline in the physical and mental functions and impaired clinical parameters (1).

The identification and treatment of malnutrition have significant effects on patient care and can reduce hospital costs (2, 3). Every hospitalized patient should be screened regularly for

malnutrition (4). During hospitalization, a patient's nutritional status deteriorates owing to the catabolic effects of acute inflammation along with iatrogenic hunger and anorexia (5, 6). Negative consequences related to hospital-based malnutrition pose a problem for healthcare services (7). As nutritional care can improve the clinical outcomes and reduce healthcare costs, increased attention to nutrition during hospitalization is vital for good-quality care (8).

Malnutrition is associated with increased complications, such as pressure sores, nosocomial infections, and delayed healing; further, it raises the mortality rate, increases

the LOS, and elevates the healthcare costs (9). Therefore, nutritional evaluation should be performed for all patients at risk for malnutrition, and the required next steps should be identified and implemented.

Although awareness about malnutrition is progressively rising in our country, the number of physicians and other healthcare professionals who are equipped to manage patients with malnutrition remains inadequate, especially outside the centers in big cities. Although nutrition support units (NSUs) are present in almost all tertiary state hospitals, the rate of patient consultation to these units remains low. The importance of NSUs and their success in the clinical management of patients are indisputable. It is crucial to share the necessary clinical observations so that these units become more widely available.

NSUs have been functional at our hospital for about 2.5 y. The number of patients receiving consultation at these units is constantly increasing. In this study, we aimed to examine the relationship between the duration from the time of hospitalization to the time of consultation to our NSU (consultation period) and the LOS for patients who were hospitalized and consulted to the NSU.

Materials and Method

We retrospectively reviewed the hospital data of patients who were hospitalized at University of Health Sciences Turkey, Konya Training and Research Hospital, were evaluated daily by the consulting NSU, and provided enteral and parenteral nutrition support.

The data of patients consulted to the NSU at our hospital were entered into the hospital automation system by dietitians working in the NSU on the day of the consultation. The following information was recorded:

- Age
- Sex
- Weight (kg), (The weight of every patient consulted at the NSU was measured using a weighing machine, if possible. Alternatively, the weight was recorded as per the statement of the patient or her/his relative or measurement was made by the help of beds those have weighing scale in intensive care units).

Main Points

- The sooner the nutritional support team is consulted for patients with malnutrition or nutritional risk from their hospitalization, lower is the patient's hospital stay for the management of malnutrition.

- Height (cm), (The height of every patient consulted at the NSU was measured, if possible. Alternatively, the height was recorded as per the statement of the patient or her/his relative. The height of inpatients, especially intensive care patients was measured in bed using a tape measure).
- Body mass index (kg/m²)
- Underlying chronic diseases
- *Nutritional Risk Screening (NRS-2002)* scores filled by the clinic nurses on the day of hospitalization,
- The presence of pressure sore daily evaluated and recorded by clinic nurses on the day of hospitalization
- The reasons for hospitalization
- The dates of hospitalization
- The dates of consultation to the NSU
- Nutritional support suggestions of the NSU
- Nutritional support treatment methods applied to the patients (enteral, parenteral, gastrostomy status), whether feeding is interrupted (if yes, the reasons for interruption, such as interruption of enteral feeding for percutaneous endoscopic gastrostomy (PEG) insertion, PEG occlusion, PEG entry site infection, septic shock, interruption of feeding before invasive procedures, gastrointestinal system intolerance, and nutritional support treatment not desired by the patients or their relatives)
- Clinics and units those consulted of the patients to NSU
- Dates of discharge from the hospital.

Total 337 patients whose data were registered in the system were enrolled and analyzed retrospectively. The patients whose data were incomplete and who were not followed up daily at the NSU (it was observed that patients who were given oral nutrition solution support were not followed up daily) were not included. The data of patients who were receiving enteral or parenteral nutritional support were analyzed because they were followed up more closely and daily. As per the clinical and nutritional records of the 337 enrolled patients, all of them were identified as being at nutritional risk at the NSU.

"Nutritional risk screening-2002" (NRS-2002) scores were calculated by the clinic nurse to determine the nutritional status and were recorded in the hospital system. By using these scores, patients with a score of at least three were categorized as risky in terms of nutritional status (10). The NRS-2002 is one of the most commonly used screening tools to determine a patient's nutritional risk, especially in those who are hospitalized. It is a screening tool that has two stages and evaluates anthropometric data, food consumption information, and disease activities and ages of the patients; a score of 3 or more indicates that the patient is at risk of malnutrition (10, 11).

The duration between the dates of hospitalization and consultation to NSU was calculated and determined as the "consultation period". Feeding methods and treatment plans were retrospectively reviewed and recorded. The outcome of the hospitalization process (discharge, referral, hospitalization ongoing or death) was recorded with dates.

Approval for this study was obtained from the Necmettin Erbakan University Meram Faculty of Medicine Ethical Committee.

Statistical analyses

The data were analyzed using IBM Statistical Package for the Social Sciences version 22.0 (IBM SPSS Corp.; Armonk, NY, USA) software. Categorical variables are expressed as numbers and percentages; the normality of the numerical parameters was checked using the histogram and Kolmogorov-Smirnov tests. Normally distributed numerical parameters are presented as mean \pm standard deviation values, while the non-normal numerical parameters are expressed as median (minimum - maximum) values. Student's t- test was used for comparing the means of the two groups; the Mann-Whitney U test was used for comparing the medians, and the Chi-square or Fisher's exact tests were used for comparing the categorical variables. The correlation between the LOS and other numerical parameters was analyzed using the Spearman's correlation test. Parameters related to the LOS were evaluated with a linear regression analysis model. Statistical significance was accepted at $p < 0.05$.

Results

Total 53.7% of the 337 patients were men, and 49.3% had at least one chronic disease. The median patient age was 76 y (18–95 y). The most prevalent chronic diseases were neurological diseases (59.3%) and pulmonary diseases (42.4%). Patients from the intensive care units (61.4%), internal clinics (32.6%), and surgical clinics (5.9%) consulted to the NSU. The general characteristics of the patients are summarized in Table 1.

While 78% of the patients that were consulted were at nutritional risk, pressure sores developed in 54.3% of these patients. Enteral nutrition therapy was administered to 46.9% of the patients during their hospitalization. The most common reason for interruption of enteral nutrition was problems related to PEG (PEG opening, obstruction, and infection). Other reasons were gastrointestinal system intolerance, invasive procedures, septic shock, and refusal for nutritional therapy.

The consultation period and LOS were positively and significantly correlated ($r=0.531$; $p < 0.001$) (Figure 1). Other parameters related to the LOS were body mass index, NRS-2002 score, neurological diseases, pressure sore, nutritional risk during hospitalization, parenteral nutrition, and nutrition with PEG (Table 2). LOS was associated with

Table 1. General characteristics, co-morbidities, and other clinical properties of the patients

Properties	
Age, years, median (min-max.)	76 (18-95)
BMI, kg/m ² , median (min-max.)	25.4 (14.7-46.3)
Gender, male, n (%)	181 (53.7)
Co-morbidities, n (%)	
Neurologic disorders	200 (59.3)
Pulmonary disorders	143 (42.4)
Hypertension	103 (30.6)
Cardiovascular disorders	85 (25.2)
Diabetes mellitus	72 (21.4)
Malignancies	41 (12.2)
NRS-2002* score, median (min-max.)	3 (0-7)
Length of hospital stay, days, median (min-max.)	28 (0-261)
Consultation-time, days, median (min-max.)	8 (0-112)
Wards the patients were staying, n (%)	
Intensive care unit	207 (61.4)
Medical wards	110 (32.6)
Surgery wards	20 (5.9)
Last status of the patients, n (%)	
Dead	174 (51.6)
Discharged	101 (30.0)
Still staying in the hospital	33 (9.8)
Referred to the another hospital	29 (8.6)
Nutritional support strategies, n (%)	
Nasogastric feeding	247 (73.3)
Total parenteral nutrition	166 (49.3)
Nutrition via percutaneous endoscopic gastrostomy	120 (35.6)
Oral nutrition support	81 (24.0)
* measured at the time of admission to the hospital	

pressure sores, consultation period to NSU, nutritional risk during hospitalization, parenteral nutrition and PEG nutrition in the linear regression analysis model (Table 3).

Discussion

This retrospective study showed that there may be a relationship between the early consultation of patients to the nutritional support unit and a lower LOS. In contrast, nutritional risk, pressure sores, neurological diseases, parenteral nutrition, and gastrostomy during hospitalization were associated with a longer LOS.

Malnutrition and nutritional risk increase the LOS (12). However, both the conditions negatively affect the morbidity, mortality, LOS, and cost effectiveness, independent of other variables (13). In our study, the LOS in those with nutritional risk during hospitalization was more (32 d vs. 17 d as presented in Table 3).

Pressure sores are associated with morbidity and mortality, and they prolong the LOS. In a prospective study on about 2000 patients, pressure ulcers increased the LOS by about 4.3 d (14). Although the presence of pressure sores in a patient was related to higher LOS, the possibility of developing pressure sores increases in patients who are hospitalized for a long time (15). In our study, pressure sores increased the LOS independently. However, the presence of a neurological disease significantly prolonged the LOS, and one of the many reasons for prolonged hos-

Table 2. Factors significantly correlated and related to the length of hospital stay (LOS)

Parameters			
	rho		p
BMI	0.112		0.041
Consultation-time	0.531		<0.001
NRS-2002 score	0.243		<0.001
Differences of LOS, days, median (min-max)			
	Absent	Present	
Neurologic disorders	23 (0-261)	33 (0-451)	0.004
Pressure ulcer	22 (2-261)	32 (0-451)	0.001
Nutritional risk*	17 (0-94)	32 (0-451)	<0.001
Total parenteral nutrition	25 (0-261)	31 (3-451)	0.015
Percutaneous endoscopic gastrostomy	22 (0-126)	46 (0-451)	<0.001

*Nutritional risk was defined as NRS-2002 score ≥3 points at the time of hospitalization

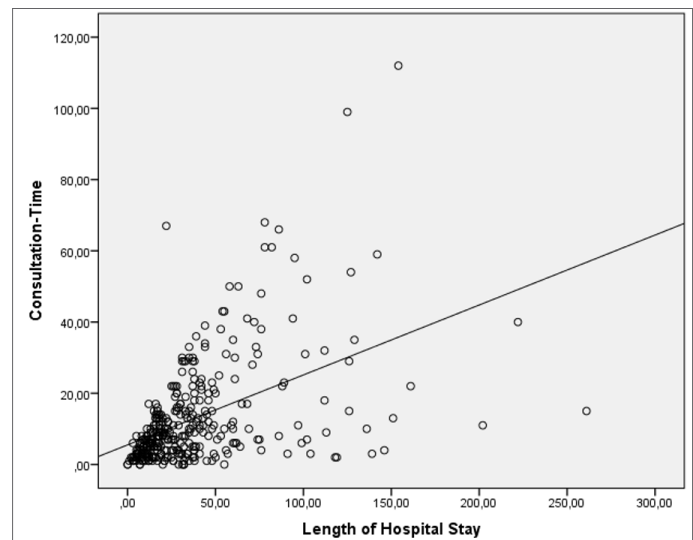


Figure 1. It was shown there was a positive, statistically significant correlation between LOS and consultation-time in this figure (rho=0.531 p<0.001)

Table 3. Linear regression analysis model showing independently associated factors for hospital length of stay

Parameters	Beta coefficient	t	95% CI	p
Pressure ulcer	8.427	2.177	0.813-16.041	0.030
Consultation-time	0.850	6.473	0.592-1.109	<0.001
Nutritional risk at the time of hospitalization	14.741	3.027	5.161-24.320	0.003
Total parenteral nutrition	8.229	2.129	0.627-15.832	0.034
Percutaneous endoscopic gastrostomy	34.470	8.011	26.005-42.934	<0.001

Linear regression analysis model was conducted by adding the parameters that were significantly related to LOS in univariate analysis. The parameters included in regression analysis were having neurologic and renal disorders, pressure ulcer, nutritional risk at the time of admission, total parenteral nutrition, percutaneous endoscopic gastrostomy, wards that the patients staying and consultation time. Stepwise model with backward regression was used. The last model (model 3) was presented in the table and this model was containing the parameters that having significant p values. The model had R square 0.344, ANOVA p value as <0.001.

pitalization in these patients may be the development of pressure sores secondary to immobility. Parenteral nutrition and higher LOS in patients treated with PEG may be associated with underlying severe disease and disease severity. In our study, it is seen that there is a patient profile with a high pressure sore during admission to the hospital. It may be possible to explain this situation as follows; Since NSU in our hospital has recently begun to accept patients actively, the patients consulted are mostly those who were hospitalized in the intensive care unit and who had neurological problems. Therefore, pressure sores are more commonly observed in this group with severe disease. In fact, if these patients could be contacted by the NSU in the early stages, these rates could be lowered with appropriate nutritional support.

Based on our results, early consultation to the NSU can shorten the LOS. The NSU is managed by a team that closely monitors the nutritional status of patients, determines the appropriate nutritional route and treatment plan, and thus helps the patients meet their daily calorie, protein, and micronutrient needs. Follow-up with early and effective diagnosis and treatment contributes positively to morbidity, mortality, health costs, and LOS (16, 17). With increasing awareness about malnutrition, the number of NSUs in hospitals increases. However, the low number of healthcare professionals, especially those dealing with malnutrition, is the most important obstacle toward the establishment of NSUs.

Research has shown that NSU intervention with a proactive nutritional support strategy is among the parameters that lower the LOS and mortality (18). However, studies have shown that NSUs are important units that should be emphasized in terms of creating a more effective strategy for combating malnutrition, decreasing hospital complications, and reducing LOS and costs (19-22). The emphasis in these studies is the early detection of patients under nutritional risk and the fight against malnutrition. It is emphasized that earlier intervention for malnutrition ensures better the clinical results. Our results differ from previous findings in that if support is received from the unit dealing with nutrition, the LOS may be shortened. Although the causality relationship could not be fully demonstrated owing to the retrospective nature of the study, our most important result was that if this patient group were consulted 1 day late, the LOS would be increased by about 0.9 d. We believe that our study paves the way for a more detailed examination of this subject with prospective and randomized studies.

Our study has certain limitations. The most important limitations are that this was a single-center, retrospec-

tive study that did not employ a control group. In addition, the inability to access the nutritional status data of patients during discharge is another important limitation, which evaluates the relationship between the consultation period to NSU and the duration of hospitalization. However, we believe that our results are valuable owing to the lack of sufficient studies on this subject in the literature. Multi-center, prospective controlled studies are needed in the future for more robust data on this subject.

Thus, prolonged hospital stay because of malnutrition can be prevented with effective NSUs in hospitals. It is important to increase the awareness regarding NSU among all healthcare professionals and in all hospitals.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Necmettin Erbakan University (Date: 08.02.2019, Decision No: 2019/1690).

Informed Consent: Due to the retrospective design of the study, informed consent was not taken.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Design – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Supervision – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Resources – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Materials – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Data Collection and/or Processing – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Analysis and/or Interpretation – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Literature Search – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Writing Manuscript – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.; Critical Review – D.Y., M.T., H.C., A.İ.E., G.G., G.G., M.C.K.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr* 2017; 36: 49-64. [\[Crossref\]](#)
2. Curtis LJ, Bernier P, Jeejeebhoy K, Allard J, Duerksen D, Gramlich L, et al. Costs of hospital malnutrition. *Clin Nutr* 2017; 36: 1391-6. [\[Crossref\]](#)
3. Barker LA, Gout BS, Crowe TC. Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. *Int J Environ Res Public Health* 2011; 8: 514-27. [\[Crossref\]](#)

4. Kirkland LL, Kashiwagi DT, Brantley S, Scheurer D, Varkey P. Nutrition in the hospitalized patient. *J Hosp Med* 2013; 8: 52-8. [\[Crossref\]](#)
5. Kirkland LL, Shaughnessy E. Recognition and Prevention of Nosocomial Malnutrition: A Review and A Call to Action! *Am J Med* 2017; 130: 1345-50. [\[Crossref\]](#)
6. Evans WJ. Skeletal muscle loss: cachexia, sarcopenia, and inactivity. *Am J Clin Nutr* 2010; 91: 1123S-7S. [\[Crossref\]](#)
7. Avelino-Silva TJ, Jaluul O. Malnutrition in hospitalized older patients: management strategies to improve patient care and clinical outcomes. *Int J Gerontol* 2017; 11: 56-61. [\[Crossref\]](#)
8. Hsu PH, Lee CH, Kuo LK, Kung YC, Chen WJ, Tzeng MS. Higher energy and protein intake from enteral nutrition may reduce hospital mortality in mechanically ventilated critically ill elderly patients. *Int J Gerontol* 2018; 12: 285-9. [\[Crossref\]](#)
9. Correia MIT, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. *Clin Nutr* 2003; 22: 235-9. [\[Crossref\]](#)
10. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M, Education- al, et al. ESPEN guidelines for nutrition screening 2002. *Clin Nutr* 2003; 22: 415-21. [\[Crossref\]](#)
11. Bolayir B, Arik G, Yeşil Y, Kuyumcu ME, Varan HD, Kara Ö, et al. Validation of Nutritional Risk Screening-2002 in a Hospitalized Adult Population. *Nutr Clin Pract* 2019; 34: 297-303. [\[Crossref\]](#)
12. Stratton RJ, King CL, Stroud MA, Jackson AA, Elia M. 'Malnutrition Universal Screening Tool' predicts mortality and length of hospital stay in acutely ill elderly. *Br J Nutr* 2006; 95: 325-30. [\[Crossref\]](#)
13. Gomes F, Emery PW, Weekes CE. Risk of malnutrition is an independent predictor of mortality, length of hospital stay, and hospitalization costs in stroke patients. *J Stroke Cerebrovasc Dis* 2016; 25: 799-806. [\[Crossref\]](#)
14. Graves N, Birrell F, Whitby M. Effect of pressure ulcers on length of hospital stay. *Infect Control Hosp Epidemiol* 2005; 26: 293-7. [\[Crossref\]](#)
15. Han D, Kang B, Kim J, Jo YH, Lee JH, Hwang JE, et al. Prolonged stay in the emergency department is an independent risk factor for hospital-acquired pressure ulcer. *Int Wound J* 2020; 17: 259-67. [\[Crossref\]](#)
16. Zhang H, Wang Y, Jiang Z-M, Kondrup J, Fang H, Andrews M, et al. Impact of nutrition support on clinical outcome and cost-effectiveness analysis in patients at nutritional risk: a prospective cohort study with propensity score matching. *Nutrition* 2017; 37: 53-9. [\[Crossref\]](#)
17. Lopes MCBR, Ceniccola GD, Araújo WMC, Akutsu R. Nutrition support team activities can improve enteral nutrition administration in intensive care units. *Nutrition* 2019; 57: 275-81. [\[Crossref\]](#)
18. Park YE, Park SJ, Park Y, Cheon JH, Kim TI, Kim WH. Impact and outcomes of nutritional support team intervention in patients with gastrointestinal disease in the intensive care unit. *Medicine (Baltimore)* 2017; 96: e8776. [\[Crossref\]](#)
19. Reber E, Strahm R, Bally L, Schuetz P, Stanga Z. Efficacy and Efficiency of Nutritional Support Teams. *J Clin Med* 2019; 8: 1281. [\[Crossref\]](#)
20. Gariballa S, Forster S, Walters S, Powers H. A randomized, double-blind, placebo-controlled trial of nutritional supplementation during acute illness. *Am J Med* 2006; 119: 693-9. [\[Crossref\]](#)
21. Ha L, Hauge T, Spenning AB, Iversen PO. Individual, nutritional support prevents undernutrition, increases muscle strength and improves QoL among elderly at nutritional risk hospitalized for acute stroke: a randomized, controlled trial. *Clin Nutr* 2010; 29: 567-73. [\[Crossref\]](#)
22. Hegerova P, Dedkova Z, Sobotka L. Early nutritional support and physiotherapy improved long-term self-sufficiency in acutely ill older patients. *Nutrition* 2015; 31: 166-70. [\[Crossref\]](#)