Nutrición Hospitalaria

Nutr Hosp. 2014;30(6):1344-1349
ISSN 0212-1611 • CODEN NUHOEQ
S.V.R. 318

Original / *Valoración nutricional*

Malnutrition in hospitalized patients receiving nutritionally complete menus: prevalence and outcomes

Alicia Calleja Fernández, Alfonso Vidal Casariego, Isidoro Cano Rodríguez y María D. Ballesteros Pomar

Unidad de Nutrición Clínica y Dietética. Sección de Endocrinología y Nutrición. Complejo Asistencial Universitario de León. España.

Abstract

Background: **The prevalence of malnutrition in hospitals ranges from 20 to 50% and the hospital diet could be a potential risk factor. The aim of the study was to determine the overall and per services prevalence of hospital malnutrition, and assess its impact on clinical outcomes in patients receiving nutritionally complete menus.**

Methodology: **Cross-sectional study in a university hospital. Nutritional status was assessed using Subjective Global Assessment (SGA), anthropometry, and biochemical parameters. For the assessment of outcomes during hospitalization, length of stay, rate of deaths, and readmissions were collected.**

Results: **201 patients were evaluated. The median age was 71.59 (IQR 21.43) years old, and 51.20% were women. According to the results obtained by SGA, 37.8% of individuals were well nourished (WN), 50.2% were at nutritional risk (NR), and 11.9% were malnourished (MN). The prevalence of malnourished (NR+MN) was higher in oncology-hematology and medical wards (80.0% and 70.5%) than in surgical ones (52.4%) (p = 0.047). The worse nutritional status was, the longer the length of stay [WN: 8.0 (IQR 8.0) days; NR: 12.0 (IQR 13.5) days; MN: 18.5 (IQR 18.5) days, p < 0.001).**

Conclusions: **The prevalence of malnutrition in the evaluated hospital was very high, being particularly striking in medical services, and doubling length of stay.**

(*Nutr Hosp*. 2014;30:1344-1349)

DOI:10.3305/nh.2014.30.6.7901

Key words: *Malnutrition. Nutritional assessment. Anthropometry. Length of stay.*

Correspondencia: Alicia Calleja Fernández.
Unidad de Nutrición Clínica y Dietética.
Sección de Endocrinología y Nutrición.
Complejo Asistencial Universitario de León.
Altos de Nava s/n.
24008. León (Spain).
E-mail: calleja.alicia@gmail.com

Recibido: 4-VIII-2014.
Aceptado: 6-IX-2014.

MALNUTRICIÓN EN PACIENTES HOSPITALIZADOS RECEPTORES DE DIETAS NUTRICIONALMENTE COMPLETAS: PREVALENCIA Y REPERCUSIÓN

Resumen

Introducción: **La prevalencia de malnutrición hospitalaria oscila entre el 20 y el 50% y las características de la dieta hospitalaria pueden contribuir a su desarrollo. El objetivo del estudio fue determinar la prevalencia de malnutrición hospitalaria general y por servicios y conocer su impacto en la evolución de los pacientes subsidiarios de dietas nutricionalmente completas.**

Metodología: **Estudio transversal realizado en un hospital universitario. Se empleó la Valoración Global Subjetiva (VGS), técnicas antropométricas y parámetros bioquímicos para la valoración nutricional. Para conocer el impacto en la evolución del paciente se estudiaron las complicaciones durante la hospitalización, la duración del ingreso hospitalario, tasa de fallecimiento y de reingresos hospitalarios.**

Resultados: **Fueron reclutados 201 pacientes. La mediana de edad fue 71,6 (RIC 21,43) años y el 51,2% eran mujeres. Según los resultados obtenidos con la VGS, el 37,8% estaba bien nutrido (BN), el 50,2% presentaba un riesgo nutricional (RN) y el 11,9% estaba malnutrido (MN). La prevalencia de malnutrición (RN+MN) fue superior en los Servicios de Oncología-Hematología y otros servicios médicos (80,0% and 70,5%) respecto a los quirúrgicos (52,4%) (p = 0,047). Un peor estado nutricional aumentó la estancia hospitalaria [BN: 8,0 (RIC 8,0) días; RN: 12,0 (RIC 13,5) días; MN: 18,5 (RIC 18,5) días, p < 0,001).**

Conclusiones: **La prevalencia de malnutrición hospitalaria fue muy elevada en el centro evaluado, duplicando la estancia media y estando especialmente presente en servicios médicos.**

(*Nutr Hosp*. 2014;30:1344-1349)

DOI:10.3305/nh.2014.30.6.7901

Palabras clave: *Malnutrición. Valoración nutricional. Antropometría. Estancia hospitalaria.*

Background

Over the last 40 years, multiple studies have been conducted worldwide showing that the prevalence of hospital malnutrition ranges from 20 to 50%[1,2,3,4,5,6], depending on the geographic area, the population studied, and the method and criteria used for the diagnosis. These results may be increased with cancer or ageing[7].

The situation in Spain is not much more encouraging, and different studies have found that the prevalence of hospital malnutrition also varies between 20 and 50%[8,9,10,11,12,13,14]. However, these data come from studies of restricted areas that do not capture the true magnitude of the health problem (prevalence and cost)[15]. In 2008, the first multicenter study to determine the prevalence and costs of hospital malnutrition was carried out in Spain, the PREDyCES® study (Prevalence of Hospital Malnutrition and Associated Costs in Spain) led by the Spanish Society of Parenteral and Enteral Nutrition (SENPE)[16]. The results highlighted that 23% of patients admitted in a Spanish hospital were at risk of malnutrition according to NRS-2002, that patients older than 70 years had significantly higher nutrition risk, and those over 85 years had the highest prevalence of malnutrition.

Studies like Schindler's show that patients classified as at nutritional risk had a significantly lower caloric intake than patients without risk[17]. There has also been shown that only 31% of hospitalized patients satisfy their energy and protein needs eating hospital food[18]. The Nutrition Day survey demonstrated that a decreased food intake is a risk factor for mortality in hospitalized patients[19].

The increased morbidity and mortality in malnourished patients reflects their clinical situation. Malnutrition affects length of stay, wound and fracture healing, lengthens inflammatory acute phase and decreases fibroblast proliferation, and collagen synthesis and angiogenesis. Malnutrition is associated with a high postoperative risk, especially for nosocomial infection (pneumonia), acute renal failure, and respiratory failure and increased days of mechanical ventilation and intensive care stay[20].

Our objective was to determine the overall and per services prevalence of hospital malnutrition among patients receiving nutritionally complete menus during hospitalization, and to evaluate the possible association with outcomes such as length of stay or complications.

Methods

An observational study in routine clinical practice conditions was designed. It was conducted at a tertiary university hospital, which has more than 800 beds. The study was approved by the Research Ethics Committee of the Hospital de León in July 2010.

A sample size of 181 patients was calculated for an estimated prevalence of malnutrition of 64%, and a precision of 7%, after a pilot study[21,22] using Epidat 3.1 (Panamerican Health Organization, Washington DC, USA). Inclusion criteria included adult patients of both genders hospitalized for at least 24 hours, subsidiary of theoretically complete nutritional menus (between 1400 to 2500 kcal, and between 58 to 117 g of protein), and capable of understanding participation in the study. The exclusion criteria comprised pregnancy, hospitalized patients for weight loss, those with eating behavior disorders, and all patients who did not meet the study criteria.

A group of 10 to 15 patients were recruited for each hospital ward. Once selected, the principal investigator informed each patient of the characteristics of the study and the voluntary nature of participation. All the patients were included after signing the informed consent document.

All patients were nutritionally assessed by Subjective Global Assessment (SGA). Furthermore, anthropometric assessment was performed at the bedside of the patient. Every patient was weighed standing, in light clothing and barefoot, using a digital scale OMRON TBF 500® (Tanita Corp., Kyoto, Japan) with which the percentage of fat mass and muscle mass were also obtained. The height was estimated by measuring the ulnar distance by the method described and validated by BAPEN[23]. This distance was measured in the dominant arm with a flexible tape, with an accuracy of 1 mm. To measure muscle strength a dynamometer Smedlay Dynamo Meter© (YOII / Tsutsumi / TMD, Tokyo, Japan) was used. The test was performed with the patient seated, using the non-dominant arm flexed at an angle of 90° at the elbow; the maximum value of three consecutive measurements with an accuracy of 0.5 kg was used. The detection of malnutrition and nutritional status assessment were performed only once at the time of patient inclusion in the study.

After the physical assessment, we reviewed the records of blood samples requested 48 hours prior to inclusion in the study. Nutritional biochemical parameters were collected in case they had been previously requested by the physician responsible for the patient. The parameters recorded included total protein, albumin, total cholesterol and lymphocytes. All these parameters were routinely determined in the laboratory of the center.

Complications during admission were collected from hospital discharge reports and medical records of patients, including length of stay, death rate and readmissions.

Hospital wards were grouped into five categories: medical (Cardiology, Dermatology, Gastroenterology, Internal Medicine, Nephrology, Neurology, Neumology, and Rheumatology), General Surgery, Orthopedics, other surgeries (Cardiac, Gynecology, Neurosurgery, Otolaryngology, Plastic, Vascular and Urology) and Oncology-Hematology.

Statistical analysis

The normal distribution of quantitative variables was examined by the Kolmogorov-Smirnov test. Those matching a normal distribution were summarized as mean and standard deviation (SD), and were compared with Student´s t test (for independent samples or dependent, as appropriate); when more than two groups were compared ANOVA test was used. Quantitative variables not following a normal distribution were summarized using median (Md) and interquartile range (IQR), and were compared using Mann-Whitney or Kruskal-Wallis test (when comparing more than two groups). The Wilcoxon test was used to compare medians. Categorical variables were summarized with percentages and compared with the χ^2 test. A p value lower than 0.05 was considered as significant.

Results

We evaluated 201 patients. The study population had a median age of 71.6 (IQR 21.4) years old and 51.2 % were women. According to the results obtained by the SGA, 37.8% of individuals were well nourished (WN), 50.2% were at nutritional risk (NR) and 11.9% were malnourished (MN).

The prevalence of malnutrition or nutritional risk was higher in men than in women (WN: Men 29.6% *vs*. Women 45.6%; NR: Men 54.1% *vs*. Women 46.6%; MN: Men 16.3% *vs*. 7.8% women, p = 0.029) and in those older than the median age (WN: older 29.0% *vs*. younger 46.5%; NR: older 55.0% *vs*. younger 45.5%; MN: older 16.0% *vs*. younger 7.9%, p = 0.021).

There were differences depending on the reason for admission. A higher prevalence of malnutrition was detected in patients admitted for constitutional symptoms, infection or cancer (p = 0.020). By contrast, there were no differences according to primary diagnosis (Fig. 1) (p = 0.284).

If we evaluate the prevalence of malnutrition taking into account the time elapsed from admission to the inclusion in the study, statistically significant differences were observed between patients assessed within 48 hours of admission and those who had remained hospitalized longer (Fig. 2). These differences were not observed if the patient remained hospitalized more days than the median (4.0 days) (p = 0.059) or 24 hours (p = 0.175). At the moment of nutritional assessment, hospital length of stay was 4.00 (IQR 4.00) days for WN, 5.00 (IQR 9.00) days for NR, and 14.00 (IQR 14.00) days for MN (p = 0.001).

The prevalence of NR and MN was found to be higher in medical and oncology-hematology services (80.0% and 70.5%) than in all surgical services (p = 0.047) (Fig. 3).

Baseline anthropometric and biochemical characteristics stratified by presence of malnutrition are presented in table I. The median length of stay was 11.0 (IQR 13.5) days. There were no statistically significant differences by gender (p = 0.460), primary diagnosis (p = 0.629), hospitalization wards (p = 0.548) or being older or younger than the median age (p = 0.229). The length of stay was increased as the nutritional status worsened (WN: 8.0 (IQR 8.0) days; NR: 12.0 (IQR 13.5) days, MN: 18.5 (IQR 18.5) days, p < 0.001).

The readmission rate was 5.5% and in-hospital death 1.5%. None of them was related to any of the factors studied (sex, principal diagnosis, admitting service, being older or younger than the median age and nutritional status of the patient by SGA) (p > 0.05).

Discussion

Hospitalized patients who receive a nutritionally complete menu have a high prevalence of malnutrition. This situation is particularly striking, because it could be hypothesized that these patients have a lower nutritional risk because they have a better provision of energy and protein, and usually patients who receive regular diets have less co-morbidities (dysphagia, malabsorption diseases or therapeutic fasting) that have been related to the development of malnutrition. For this reason, we ai-

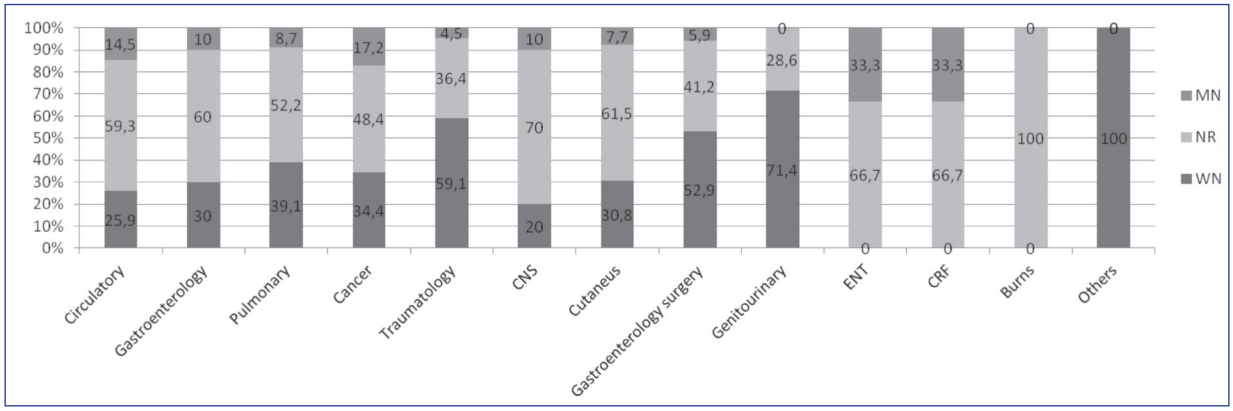

Fig. 1.—Nutritional status by principal diagnosis. SGA: Subjective global assessment; CNS: pathology related to the central nervous system; CRF: chronic renal failure. p = 0.460.

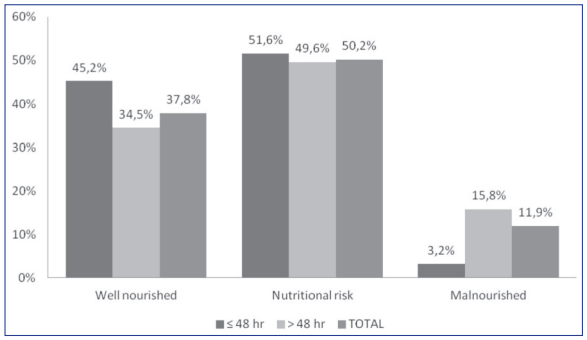

Fig. 2.—Prevalence of malnutrition by elapsed time since hospitalization (p = 0.030).

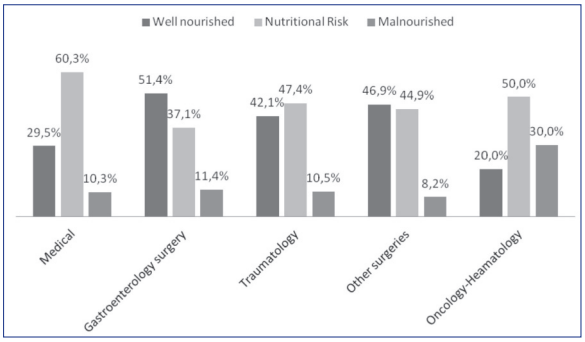

Fig. 3.—Nutritional status by regrouped hospitalized services.

med to investigate that particular group of patients with a theoretically lower risk of malnutrition.

When comparing the results of prevalence of malnutrition with other centers in the country[8-14], with the national multicenter study results[15], and other international studies[1-6], we can see that our study presents higher values of hospital malnutrition. There were different patient characteristics that were associated with the prevalence of malnutrition or nutritional risk. It was also found that men and older patients had a higher prevalence of malnutrition than women and younger patients.

The admitted patients in Oncology and Hematology wards often have a higher rate of malnutrition, compared with other services, but in general, our results indicate that medical patients have a higher rate of malnutrition. Other studies have found higher rates of malnutrition in surgical patients compared with those obtained in this study, but this could again be explained by our inclusion criteria. Usually, surgical patients –especially those of gastrointestinal surgery– are *nil per os*, receive artificial nutritional support or incomplete diets in their transition to normal diet. In this study, surgical patients with higher risk of malnutrition probably have not been recruited. Franklin et al. described the widespread use of fasting and liquid menus in patients after abdominal surgery in a center where there is a nutritional support team, suggesting the need to educate the surgical staff on nutritional topics to solve this serious problem[24].

Regarding the diagnoses, although the differences were not statistically significant, it was observed that the prevalence of malnutrition was increased especially in patients with tumor process, respiratory, circulatory and digestive.

All these results confirm those published in the literature reflecting determinants of malnutrition like advanced age, male sex, and some diseases such as cancer[6].

Concerning the prevalence of malnutrition and time elapsed from admission to the inclusion in the study, it was found that patients who remained hospitalized longer than 48 hours had a higher prevalence of malnutrition. These data were not observed if the patient remained more or less than 24 hours, but it was de-

Tabla I
Evaluation of anthropometric and biochemical parameters according to nutritional status.

	n	*Total*	*Well Nourished*	*Nutritional Risk*	*Malnourished*	*p*
Usual weight (kg)	191	71.49 (SD 14.17)	73.00 (SD 14.74)	70.76 (SD 14.17)	69.63 (SD 12.40)	0.476
Current weight (kg)	179	68.59 (SD 13.98)	73.62 (SD 14.05)	67.05 (SD 12.59)	58.24 (SD 12.52)	< 0.001*
Weight loss (%)	179	2.86 (IQR 8.09)	0.26 (IQR 3.71)	-5.40 (IQR 5.61)	-15.26 (IQR 12.72)	< 0.001*
Ulnar distance (cm)	199	24.05 (SD 1.90)	24.14 (SD 1.94)	23.97 (SD 1.88)	24.06 (IQR 1.93)	0.854
Height (cm)	199	161.46 (SD 8.00)	161.43 (SD 8.04)	161.16 (SD 7.94)	161.46 (SD7.64)	0.881
BMI (kg/m2)	177	26.28 (SD 5.10)	28.05 (SD 5.16)	25.76 (SD 4.60)	22.24 (SD 4.12)	< 0.001*
Dinamometry (kg)	198	21.75 (SD 11.24)	23.98 (SD 10.81)	20.81 (SD 11.48)	18.63 (SD 10.69)	0.063
Muscle mass (%)	112	31.46 (SD 5.46)	30.74 (SD 5.34)	31.52 (SD 5.61)	34.13 (SD 4.84)	0.156
Fat mass (%)	112	28.54 (SD 9.67)	31.34 (SD 8.41)	27.62 (SD 10.37)	21.07 (SD 6.77)	0.002*
Total proteins (mg/dL)	147	6.20 (SD 0.82)	6.28 (SD 0.76)	6.19 (SD 0.86)	6.08 (0.80)	0.643
Albumin (mg/dL)	113	3.63 (SD 0.69)	3.94 (SD 0.54)	3.57 (SD 0.67)	3.26 (0.84)	0.003*
Cholesterol (mg/dL)	114	157.00 (IQR 51.02)	166.00 (IQR 67.00)	156 (IQR 49.99)	155 (IQR 48.50)	0.756
Lymphocytes (cel/ml)	179	1400.00 (IQR 900.00)	1300 (IQR 1400)	1400 (IQR 1000)	1600 (IQR 650)	0.392

* Statistically significant difference.

termined that as the patient remained longer, the prevalence of malnutrition increased significantly. The patient receiving a nutritionally complete menu is beforehand a patient with a lower nutritional risk, with a usually limited length of stay, the diagnosis is benign, the complications are rare, and the treatment he or she receives is not very aggressive. In this way, patients who receive a nutritionally complete menu from the first 24 hours of admission could have a better nutritional diagnosis.

The length of stay has been associated in the study with the patient's nutritional status. These results agree with those observed in the literature[1,6,8], and if compared with PREDYCES® study results, little difference is detected in the malnourished patient's 11.7 days length of stay[15] and the 17 days in our study. The differences can be justified by the higher prevalence of malnutrition presented in this study regarding PREDyCES® study and supports the effect of malnutrition in the length of stay. The study of Somanchi et al., conducted on a sample of 400 patients and a malnutrition prevalence rate of 53%, showed that nutritional intervention from admission reduces length of stay by 1.93 days in well nourished patients and 3.2 days in patients with severe malnutrition, which would mean a reduction in costs[25].

The recording of complications during hospitalization was very limited, as only 25% of the reports reflected mechanical, infectious or surgical complications. This is an important limitation of the study because it does not allow to be reflected the relationship between malnutrition and clinical complications of the patient, as would have been desirable. This may be due to the low priority given to any of them and, in most cases, especially surgical patients, discharge reports tend to be condensed with and very little detail.

Regarding the 30 days readmission rate, the differences, according to nutritional status observed in previous research[26,27,28], have not been found in the current study. Finally, the death rate was low (1.5%) and not related to nutritional status, as in other studies[26], although it was more common in cancer and hematological patients.

In summary, the prevalence of hospital malnutrition in patients receiving a complete nutritional menu is high. The hospitalized patient at nutritional risk or malnourished is usually a male, elderly, hospitalized in a medical service, and suffering from a tumor. Hospital length of stay is increased as nutritional status worsens, which may indicate that the clinical situation is compromised, although not able to justify the registration of complications.

Acknowledgments

Department of Education, Spanish Government. FPU AP 2007-02026

Gerencia Regional de Salud de la Junta de Castilla y León "SACYL GRS 327/B/08".

Gerencia Regional de Salud de la Junta de Castilla y León "SACYL GRS 528/B/10".

Gerencia Regional de Salud de la Junta de Castilla y León "SACYL GRS 811/A/13".

References

1. Edington J, Boorman J, Durrant ER, Perkins A, Giffin CV, James R et al. The Malnutrition Prevalence Group. Prevalence of malnutrition on admission to four hospitals in England. *Clin Nutr*. 2000; 19: 191-195.
2. Naber TH, Schermer T, de Bree A, Nusteling K, Eggink L, Kruimel JW et al. Prevalence of malnutrition in nonsurgical hospitalized patients and its association with disease complications. *Am J Clin Nutr*. 1997; 66(5): 1232-1239.
3. Korfalii G, Gündogdu H, Aydintg S, Bahar M, Besler T, Moral AR, Oguz M, Sakarya M, Uyar M, Kilçturgay S. Nutritional risk of hospitalized patients in Turkey. *Clin Nutr* 2009; 28: 533-537.
4. Sorensen J, Kondrup J, Prokopowicz J, Schiesser M, Krähenbühl L, Meier R, Liberda M, EuroOOPS study group. EuroOOPS: An international, multicentre study to implement nutritional risk screening and evaluate clinical outcome. *Clin Nutr*. 2008; 27: 340-349.
5. Giryes S, Leibovitz E, Matas Z, Fridman S, Gavish D, Shalev B, Ziv-Nir Z, Berlovitz Y, Boaz M. MEasuring Nutrition risk in hospitalized patients: MENU, a hospital-based prevalence survey. *Isr Med Assoc J*. 2012; 14(7): 405-409.
6. Pirlich M, Schütz T, Norman K, Gastell S, Lübke HJ, Bischoff SC,et al. The German hospital malnutrition study. *Clin Nutr*. 2006; 25(4): 563-572.
7. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. *Clin Nutr* 2008; 27: 5-15.
8. Pérez de la Cruz A, Lobo Tamer G, Orduña Espinosa R, Mellado Pastor C, Aguayo de Hoyos E, Ruiz López MD. Malnutrition in hospitalized patients: prevalence and economic impact. *Med Clin (Barc)* 2004; 123: 201-206.
9. Sánchez López AM, Moreno-Torres Herrera R, Pérez de la Cruz AJ, Orduña Espinosa R, Medina T, López Martínez C. Prevalencia de desnutrición en pacientes ingresados en un hospital de rehabilitación y traumatología. *Nutr Hosp* 2005; 20: 121-130.
10. Gómez Ramos MJ, González Valverde FM, Sanchez Álvarez C. Estudio del estado nutricional en la población anciana hospitalizada. *Nutr Hosp* 2005; 20: 286-292.
11. De Luis D, López Guzmán A, Nutrition Group of Society of Castilla-León (Endocrinology Diabetes and Nutrition). Nutritional status of adult patients admitted to internal medicine departments in public hospitals in Castilla y León, Spain- A multi-center study. *Eur J Intern Med* 2006; 17: 556-560.
12. Martínez Olmos MA, Martínez Vázquez MJ, Martínez-Puga López E, del Campo Pérez V, Collaborative Group for the Study of Hospital Malnutrition in Galicia (Spain). Nutritional status study of in-patients in hospital of Galicia. *Eur J Clin Nutr* 2005; 59: 938-046.
13. Vidal A, Iglesias MJ, Pertega S, Ayúcar A, Vidal O. Prevalencia de desnutrición en servicios médicos y quirúrgicos de un hospital universitario. *Nutr Hosp* 2008; 23: 263-267.
14. Burgos R, Sarto B, Elío I, Planas M, Forga M, Cantón A. Prevalence of malnutrition and its etiological factors in hospitals. *Nutr Hosp*. 2012; 27(2): 469-476.
15. Álvarez Hernández, J, Burgos Peláez R, Planas Vilá M, Sociedad Española de Nutrición Parenteral y Enteral. Consenso multidisciplinar sobre el abordaje de la desnutrición hospitalaria en España. Barcelona: Editorial Glosa; 2011.
16. Planas Vila M, Álvarez Hernández J, García de Lorenzo A, Celaya Pérez S, León Sanz M, García-Lorda P, Brosa M. The burden of hospital malnutrition in Spain: methoDE and development of the PREDyCES® Study. *Nutr Hosp*. 2010; 25(6): 1020-24.

17. Schindler K, Pernicka E, Laviano A, Howard P, Schütz T, Bauer P, et al. How nutritional risk is assessed and managed in European hospitals: a survey of 21,007 patients findings from the 2007-2008 cross-sectional nutritionDay survey. *Clin Nutr* 2010; 29: 552-559.
18. Thibault R, Chikhi M, Clerc A, Darmon P, Chopard P, Genton L et al. Assessment of food intake in hospitalised patients: A 10-year comparative study of a prospective hospital survey. *Clin Nutr* 30; 2011: 289-296.
19. Hiesmayr M, Schindler K, Pernicka E, Schuh C, Schoeniger-Hekele A, Bauer P, et al. Decreased food intake is a risk factor for mortality in hospitalised patients: The NutritionDay survey 2006. *Clin Nutr* 28; 2009: 484-491.
20. Schneider SM, Veyres P, Pivot X, Soummer AM, Jambou P, Flippi J, Van Obberghen E, Hebuterne X. Malnutrition is an independent factor associated with nosocomial infections. *Br J Nutr* 2004; 92: 105-111.
21. Calleja-Fernández A, Ballesteros-Pomar MD, Vidal-Casariego A, Fariza-Vicente E, Brea-Laranjo C, Cano-Rodríguez I. Prevalencia de Desnutrición y Relación con la Estancia Hospitalaria en un Servicio de Cirugía General. *Nutr Hosp* 2009; 24 (sup 1): 23.
22. Vidal Casariego A, Calleja Fernández A, López Gómez JJ, Brea Laranjo C, Fariza Vicente E, Ballesteros Pomar MD. Comparación de diferentes herramientas de cribado nutricional en pacientes de cirugía general y medicina interna. *Endocrinol Nutr* 2009; 56: 98.
23. British Association for Parenteral and Enteral Nutrition (BAPEN). (2003) http://www.bapen.org.uk/pdfs/must/must_page6.pdf (accessed on 8/21/2013).
24. Franklin GA, McClave SA, Hurt RT, Lowen CC, Stout AE, Stogner LL. Physician-Delivered Malnutrition: Why do patients receive nothing by mouth or a clear liquid diet in a university hospital setting? *J Parenter Enteral Nutr* 2011; 35(3): 337-42.
25. Somanchi M, Tao X, Mullin GE. The facilitated early enteral and dietary management effectiveness train in hospitalized patients with malnutrition. *J Parenter Enteral Nutr* 2011; 35: 209-216.
26. Lim SL, Ong K CB, Chan YH, Loke WC, Ferguson M, Daniels L. Malnutrition and its impact on cost of hospitalization, length of stay, readmission and 3 year mortality. *Clin Nutr* 2012; 31(3): 345-350.
27. Lobo G, Ruiz MD, Pérez de la Cruz AJ. Desnutrición hospitalaria: relación con la estancia media y la tasa de reingresos prematuros. *Med Clin (Barc)* 2009; 132: 377-384.
28. Sullivan DH, Walls RC. Protein-energy undernutrition and the risk of mortality within six years of hospital discharge. *J Am Coll Nutr* 1998; 17: 571-578.