

Original

## Detection of nosocomial malnutrition is improved in Amazon region by a standard clinical nutrition education program

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### Abstract

**Background:** In Brazil hospital malnutrition is highly prevalent, physician awareness of malnutrition is low, and nutrition therapy is underprescribed. One alternative to approach this problem is to educate health care providers in clinical nutrition. The present study aims to evaluate the effect of an intensive education course given to health care professionals and students on the diagnosis ability concerning to hospital malnutrition.

**Materials and methods:** An intervention study, based on a clinical nutrition educational program, offered to medical and nursing students and professionals, was held in a hospital of the Amazon region. Participants were evaluated through improvement of diagnostic ability, according to agreement of malnutrition diagnosis using Subjective Global Assessment before and after the workshop, as compared to independent evaluations (*Kappa* Index, *k*). To evaluate the impact of the educational intervention on the hospital malnutrition diagnosis, medical records were reviewed for documentation of parameters associated with nutritional status of in-patients. The SPSS statistical software package was used for data analysis.

**Results:** A total of 165 participants concluded the program. The majority (76.4%) were medical and nursing students. Malnutrition diagnosis improved after the course (before  $k = 0.5$ ; after  $k = 0.64$ ;  $p < 0.05$ ). A reduction of false negatives from 50% to 33.3% was observed. During the course, concern of nutritional diagnosis was increased ( $\chi^2 = 17.57$ ;  $p < 0.001$ ) and even after the course, improvement on the height measurement was detected ( $\chi^2 = 12.87$ ;  $p < 0.001$ ).

**Conclusions:** Clinical nutrition education improved the ability of diagnosing malnutrition; however the pri-

### MEJORA DEL DIAGNÓSTICO DE DESNUTRICIÓN HOSPITALARIA A TRAVÉS DE UN PROGRAMA DE EDUCACIÓN EN NUTRICIÓN CLÍNICA EN LA REGIÓN AMAZÓNICA

### Resumen

**Antecedentes:** En el Brasil, la desnutrición en hospitales es alta, la conciencia médica al respecto de la desnutrición es pequeña y la terapia nutricional es poco receitada. Una de las alternativas para tratar el problema es educar a los profesionales de la salud en nutrición clínica. El presente estudio tiene por objetivo evaluar el efecto de un curso intensivo para profesionales y estudiantes de la salud, en su habilidad de diagnosticar la desnutrición en hospitales.

**Materiales y métodos:** Un estudio de intervención con base en un programa de educación clínica fue ofrecido a estudiantes y profesionales de medicina y de enfermería y realizado en un hospital de la región Amazónica. Los participantes fueron evaluados a través del mejor rendimiento de su capacidad diagnóstica, conforme los diagnósticos de desnutrición utilizando Evaluación Subjetiva Global, antes y después del curso. Para determinar el impacto de la intervención educacional en el diagnóstico de la desnutrición hospitalaria, se revisaron las historias clínicas en busca de parámetros asociados al estado nutricional de los pacientes hospitalizados. El programa de estadística SPSS fue usado para el análisis de datos.

**Resultados:** Un total de 165 participantes concluyeron el programa. La mayoría (76,4%) eran estudiantes de medicina y enfermería. El diagnóstico de la desnutrición mejoró después del curso (antes  $k = 0,5$ ; después  $k = 0,64$ ;  $p < 0,05$ ). Se observó una reducción de falsos negativos de 50% para 33,3%. Durante el curso, la conciencia sobre el diagnóstico nutricional aumentó e, incluso después del curso, mejoró la determinación de las medidas de altura.

**Conclusiones:** El programa de educación clínica mejoró la capacidad de diagnosticar la desnutrición, sin embargo, el impacto mayor fue sobre los estudiantes de

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mary impact was on medical and nursing students. To sustain diagnostic capacity a clinical nutrition program should be part of health professional curricula and be coupled with continuing education for health care providers.

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Key words: *Education-nutrition. Hospital malnutrition. Nutritional assessment. Nutritional therapy. Amazon region.*

## Introduction

Since the first description three decades ago, hospital malnutrition has been studied and analyzed, yet it remains highly prevalent in several regions around the world.<sup>1,6</sup>

Nutritional intervention can revert or minimize the high risk of complications associated with malnutrition,<sup>2,4,8,9</sup> such as infection and morbidity and can diminish overall health costs by decreasing hospital stay and improving outcomes.<sup>6,7,10-12</sup> Diagnoses of nutritional deficiencies and malnutrition, however, are often missed by medical<sup>1,2,5</sup> and nursing staff.<sup>13-15</sup>

Educational efforts to improve health care practitioners' ability to identify malnutrition constitute the primary means to reduce this problem.

In Brazil, nearly half (48.1%) of hospital patients present symptoms of malnutrition, nevertheless physician awareness of malnutrition is low<sup>2</sup> resulting in underprescription of nutrition therapy.<sup>2</sup> The Latin American Federation of Parenteral and Enteral Nutrition (FELANPE), in association to the Brazilian Society of Parenteral and Enteral Nutrition (SBNPE) addressed this problem and developed two effective courses: the TNT (Total Nutrition Therapy) and the CINC Course (Interdisciplinary Course in Clinical Nutrition).<sup>17</sup> These basic clinical nutrition courses were specifically targeted for physicians, dietitians, nurses and pharmacists.

The efficacy of the TNT course had been demonstrated recently in a survey showing increase of nutritional assessment and use of nutritional therapy among attending physicians.<sup>17</sup>

Located at the Amazon region, the Brazilian State of Acre (fig. 1) shares borders with Peru and Bolivia and is distant from the major metropolitan areas in Brazil. As such, it is typical of many poor (*per capita* income US\$1,800) sections of Brazil and of the Amazon. The state has nearly 600,000 residents and its capital, site of the teaching hospital of this study, concentrates nearly half (45%) of the State population.<sup>19</sup>

University health care education is relatively new in Acre. The nursing program of the Federal University of Acre (UFAC) was created in 1976, and has 168 students. The medical program of UFAC was recently created (2002), with 80 students. The Medical Residence Training Program was also recently created (2000), as a part of the Acre State government project to improve the local medical care. The Medical School of Federal University Medical School of Bahia (UFBA), an established academic center, advised the

medicina y enfermería. Para mantener la capacidad de diagnosticar, un programa en nutrición clínica debería formar parte del currículo de las profesiones de la salud junto a su programa de educación continuada.

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Palabras clave: *Educación-nutrición. Desnutrición en hospital. Evaluación nutricional. Terapia nutricional. Amazonia.*

Acre State government as how to improve regional medical practices.<sup>20</sup>

In this region, nutrition assessment was previously analyzed in 2002, when surgical patients of FUNDHACRE, evaluated at admission, exhibited 12.1% malnourishment, 31.5% of pre-obesity and 15.4% of obesity.<sup>21</sup> The relatively low index of malnourishment, however, does not reflect the general patient population discussed below, because the great majority of patients in the study were women operated for gynecological reasons.<sup>21,22</sup> Local professionals decided to improve malnutrition detection and treatment and in October 2003, initiated a new educational program: a theoretical and practical course on clinical nutrition, sponsored by UFBA/FUNDHACRE/UFAC. This course was based on three weekly classes program and offered to nursing and medical students and professionals with an initial enrollment of 195 participants.<sup>20</sup> The awareness of health care students and professionals about nutritional disorders was assessed before and after the course, and published the preliminary results.<sup>20</sup>

The present study aims to evaluate the influence of an intensive clinical nutrition educational program on the diagnosis ability of nutritional disorders among hospitalized adults and elderly patients in a hospital in the Brazilian Amazon region.



Fig. 1.—The State of Acre is located in the Brazilian Amazon region, frontier with Peru and Bolivia.

## Materials and methods

The course and evaluation of participants and results consisted in the present intervention study, performed from september 29 to october 15, 2003, in the town of Rio Branco in Acre State Hospital Foundation (FUNDHACRE), a 150-bed teaching hospital.

One month before the course, an advertising campaign using posters was done in all hospitals of Rio Branco and UFAC nursing and medicine courses. The Residency Training Program Coordination considered the participation at the course mandatory for 20 resident physicians. Potential candidates were selected for the course by personal interview. A detailed description of all activities performed during the program, including the practical classes and medical records audits was done, according to the recommendations from the Ethics in Research Board of FUNDHACRE. The enrollment of participants occurred after written informed consent.

The first Theoretical and Practical Course on Clinical Nutrition UFBA/FUNDHACRE/UFAC was a 16-hour workshop. It was developed as a multifaceted intervention, developed in three weekly consecutive classes: a) first practical class; b) theoretical class and c) second practical class.

During the first week, the classes were exposed to the practice of nutritional assessment, in which the participants evaluated the nutritional status of hospitalized patients, through the application of a questionnaire aimed at diagnosis of nutritional disorders.<sup>23</sup> During the first class, participants answered a questionnaire about awareness of nutritional care and received a book entitled "Nutritional Assessment of Adult and Aged".<sup>22</sup> The 195 initial participants were divided into four groups, in order to allow access to FUNDHACRE's clinical and surgical wards, distributed in four consecutive days. The nutritional assessments were performed by all participants, alone or in pairs, according to the number of hospitalized patients available. The patients were previously enrolled, always adults older than 20 years and with an informed consent for participating of the study. The same patient could be evaluated for several times, by different participants in consecutive days. As there is no consensus about the best method for assessment of nutritional status, several methods were used, combining subjective and objective factors,<sup>24</sup> including: a) subjective global assessment (SGA);<sup>25</sup> b) detailed physical examination, searching for signs of specific nutritional deficiencies; c) anthropometry: height, weight, body mass index (BMI), mid-arm circumference, triceps skinfold, mid-arm muscle circumference and d) biochemical assessment: serum albumin, total cholesterol, hematocrit, hemoglobin, total lymphocyte count. In the assessment of the elderly, in addition to the above measurements, were also evaluated: a) functional capacity;<sup>26,27</sup> b) geriatric depression scale<sup>28</sup> and c) Mini Nutritional Assessment (MNA).<sup>29</sup> All medical records were reviewed

<b>Table I</b> <i>Contents discussed during the "first Theoretical and Practical Course on Clinical Nutrition UFBA/FUNDHACRE/UFAC", october 2003</i>	
<i>TOPICS</i>	
1.	Nutrition disorders in the hospital setting
2.	Nutritional Assessment
3.	Nutritional History
4.	Nutritional Physical examination
5.	Subjective Global Assessment
6.	Anthropometry
7.	Laboratory tests
8.	Multiple indexes
9.	Peculiarities of the aged and nutrition
10.	Practical guide for adult nutritional assessment (for regions with shortage of resources)
11.	Practical guide of old aged nutritional assessment (for regions with shortage of resources)

to investigate if any nutritional disorders had been registered.

Assessments realized by ten monitors previously were considered as controls. Four nursing students and six medical students had been trained in nutritional status assessment by the first author for six months before.

During the second week, the students were required to discuss about the theoretical subjects of the book, formerly distributed. The contents given were presented in table I. The objective of the theoretical class was to awaken the multidisciplinary health team about hospital malnutrition and to teach a nutritional status assessment, possible for regions with shortage of resources, but allowing diagnosing nutritional risk patients. Anthropometric measurements were taught.<sup>20</sup>

The opportunity to practice the evaluation of nutritional status of the hospitalized patients was repeated during the last week with the same methodology of the first practical classes. At the end the participants answered an evaluation questionnaire about the course's performance and their satisfaction.

The participants were evaluated through the improvement of diagnostic ability, analyzing the agreement (*Kappa* index) of diagnosis of malnutrition according to SGA<sup>25</sup> before and after the workshop, compared to the monitors (controls) previously trained. The SGA distinguishes the following categories of nutritional status: a) not malnourished; b) moderately malnourished or in nutritional risk and c) severely malnourished. In the present study, we added cases of moderately malnourished or in nutritional risk to the same category of severely malnourished in order to facilitate comparisons with two main categories remained: a) not malnourished and b) malnourished.

In order to evaluate the impact of the educational intervention on the concern about hospital malnutrition

**Table II**  
*Schooling of the participants of the Course of Clinical Nutrition, UFBA/FUNDHACRE/UFAC, october 2003*

Classes	Schooling (%)							Total
	Nursing students	Medical students	Nurses	Resident Physicians	Physicians	Others	Missing	
<i>First class</i>								
Previous test	97 (49.7)	52 (26.7)	20 (10.3)	15 (7.7)	3 (1.5)	5 (2.5)	3 (1.5)	195 (100.0)
Practical*	61 (42.4)	35 (24.3)	17 (11.8)	14 (9.7)	3 (2.1)	3 (2.1)	11 (7.6)	144 (100.0)
<i>Third class</i>								
Satisfaction test	86 (52.1)	46 (27.9)	14 (8.5)	11 (6.7)	3 (1.8)	4 (2.4)	1 (0.6)	165 (100.0)
Practical†	52 (44.4)	36 (30.8)	5 (4.3)	7 (6.0)	2 (1.7)	1 (0.9)	12 (10.3)	117 (100.0)

\*Nutritional assessments performed in 47 patients; †Nutritional assessments in 64 patients.

disorders it was performed an auditing of medical records for documentation of parameters associated with nutritional status (notifications about nutrition disorders, intolerance or alterations in diet consumption, gastrointestinal symptoms, any kind of nutritional assessment: height, weight in admission or during hospital stay and the institution of nutritional support) of in-hospital patients in a follow up period of four months. The objective was to evaluate if the course had influenced the concern of hospital malnutrition disorders. At the same time, from october 2003 until january 2004, for every two weeks, a cross-sectional evaluation of the nutritional statuses of all hospitalized patients were assessed by the ten monitors, using the same questionnaire applied during the course, including the measurement of biochemical markers following the methodology proposed for serial nutritional assessments.<sup>30</sup> A total of 217 patients were evaluated in 258 nutritional assessments. The nutritional status of the in-patients (in the moment of the assessment) was established according to hospital stay: a) within 72 hours: admission; b) from four to ten days and c) for more than ten days. The patients were asked four main objective questions: a) if they were still losing weight; b) if they were fasting (no nutritional intake for a period of 24 hours) during hospitalization and why; c) if they were suffering any kind of intolerance or alterations in diet consumption and d) if they presented persistent (for more than fifteen days) gastrointestinal symptoms (vomiting, nausea, diarrhea, anorexia, abdominal pain or distention). For the objective diagnosis of malnutrition, the Index Suggestive of Malnutrition (ISM), proposed by Waitzberg<sup>31</sup> was chosen. It is obtained by the sum of seven variables, including weight loss, anthropometric measures and biochemical tests. The patients whose results were  $\geq 3$  were considered malnourished.<sup>31,32</sup> If there were no available data in up to three variables, the ISM was calculated considering the punctuation zero for the missing value. The ISM classifies the patients in: malnourished and not malnourished.

The Statistical Program for Social Sciences (SPSS) for Windows (release 12.0) program was used for data

analysis. The continuous variables were studied as averages, standard deviations, minimal and maximal values. The qualitative variables were evaluated by their percent values. The agreement between the subjective diagnosis was obtained applying the *Kappa* Index (*k*).<sup>33</sup> The nominal variables were compared by the chi-square test, using the Yates correction as necessary, and the continuous variables by the Student's two-tailed t-test for independent samples. Statistical differences were considered significant when the type one error was less than 5% ( $p < 0.05$ ).<sup>33</sup>

## Results

From 195 initial participants a total 165 completed the program (table II).

The medical and nursing students participated actively in all moments of the course, not always observed among health professionals. In spite the mandatory nature of the course, 15 resident physicians who answered the initial test, 11 (73.3%) took the satisfaction test too, but of the 14 who participated of the nutritional assessments before the theoretical class, only seven (50.0%) participated of the second assessment. When asked about their previous contact with nutrition themes, 73.4% (11/15) of them declared that their greater contact was during their, although 46.7% (7/15) considered this contact superficial.<sup>20</sup> The same behavior was observed among the nurses; from the 20 starting nurses, 14 (70%) answered the satisfaction test, but of the 17 assessments only five (29.4%) were repeated. When asked if height is considered an important nutritional parameter, 65% (13/20) of the nurses participating of the present education intervention answered «no». Only three (1.5%) physicians participated.<sup>20</sup>

The absolute majority (96.7%) of the participants considered the education program a very important initiative, as follows: «Very good» (99/165; 60.0%), «Good» (34/165; 20.6%) and «Excellent» (30/165; 18.2%). Considering a scale (0 = very bad; 10 = excellent), the average grade for it was  $8.84 \pm 0.87$ .<sup>20</sup>

**Table III**  
*Diagnosis of malnutrition based on Subjective Global Assessment (recoded into two categories) made by the participants compared to controls during practical classes before and after the theoretical class*

Practical classes	Diagnosis by the participants	Diagnosis by the controls n (%)		
		Malnourished	Not malnourished	Total
First* k = 0.54	Malnourished	10 <sup>a</sup> (50.0)	3 (3.3)	13 (11.7)
	Not malnourished	10 (50.0)	87 (96.7)	97 (87.3)
	Total	20 <sup>a</sup> (18.0)	90 (82.0)	111 <sup>‡</sup> (100)
Second† k = 0.64	Malnourished	16 <sup>c</sup> (66.7)	4 (5.9)	20 (21.9)
	Not malnourished	8 (33.3)	63 (94.1)	71 (78.1)
	Total	24 <sup>d</sup> (26.4)	67 (73.6)	91 <sup>§</sup> (100)

\*First practical class before the theoretical class; †Second practical class after the theoretical class; a/b vs c/d:  $\chi^2 = 4.0$ ;  $p < 0.05$ . ‡Nutritional assessments performed in 47 patients, 34 incomplete comparisons; §Nutritional assessments in 64 patients, 26 incomplete comparisons.

Subjective diagnostic ability improved after the course (before  $k = 0.54$  regular; after  $k = 0.64$  good;  $\chi^2 = 4.0$ ;  $p < 0.05$ ) (table III). A reduction of false negatives from 50% to 33.3% was observed.

Every two weeks nutritional cross-sectional measurements were performed until a total of 258 assessments of 217 patients were done. The length of hospital stay in the moment of the assessment varied from one to 83 days ( $10.5 \pm 12.5$  days). There were 109 (42.2%) malnourished patients (based on ISM classification). According to the length of hospital stay, malnutrition was distributed as follows: 27% (21/77) at admission; 45% (41/92) from four to ten days of admission, and 53% (47/89) in patients staying for more than ten days at hospital ( $\chi^2 = 11.13$ ;  $p < 0.001$ ). The main symptoms leading to incapacity to eat were anorexia (105/258; 40.7%) and changes in diet acceptance (105/258; 40.7%). Forty five per cent kept losing weight during hospitalization. The median weight loss was of 9.6% ( $\pm 9.0\%$ ), being the maximum of 41.25%. There were significant differences in nutritional status among hospitalized middle-aged adults and elderly patients. The higher prevalence of malnutrition among elderly patients was due to loss of muscle mass and higher metabolic stress levels.<sup>34</sup>

Medical records were audited for any reference about patients' nutritional status noted by any member of the health multidisciplinary team (table IV). Although recording weight and height is included procedures at nursing admission protocol, height was taken only in five (7.4%) and weight in 49 (73.1%) of the 67 patients that were able to stand in a beam balance assessed during the course in October 2003. A significant improvement of frequency of admission height measurement was observed two months after the course ( $\chi^2 = 12.87$ ;  $p < 0.001$ ). References about patients' nutritional aspects increased significantly during the course in comparison to the following months ( $\chi^2 = 17.57$ ;  $p < 0.001$ ).

The institution of nutritional support was evaluated according to nutritional status and length of hospital

stay in the follow up period: a) at admission, considering the 21 (21/77; 27%) malnourished patients, only five (5/21; 23.8%) received nutritional therapy; b) from four to ten days: 11 (26.8%) of the 41 (41/92; 45%) malnourished patients received nutritional support and c) patients staying for more than ten days: 21 (44.6%) of the 47 (47/89; 53%) malnourished were treated. Taking in account the 109 malnourished patients, nutritional intervention was performed in 37 (33.9%) and of the 149 not malnourished, 24 (16.1%) received nutritional support. The prescription of nutritional therapy was greater in malnourished patients ( $\chi^2 = 11.09$ ;  $p < 0.001$ ).

Of the 258 patients interviewed, only 59 (22.9%) patients did not fast during hospital stay, 74 (28.7%) fasted occasionally and 117 (45.6%) fasted more often with a mean time of  $2.28 \pm 1.72$  days. Of them, 21 (17.9%) fasted for more than five days and in eight (3.1%) this data was missing. The principal reasons for fasting during hospitalization were: a) in preparation of blood or image exams: 122 (47.3%); b) for surgery: 57 (22.1%) and c) other reasons (anorexia, vomiting, incapacity): 13 (5.0%).

## Discussion

Hospital malnutrition is highly prevalent and is largely unrecognized by health professionals all over the world.<sup>1-6,36-38</sup>

In order to evaluate health care team awareness and to promote improvements in diagnostic ability to detect nutritional disorders improving the knowledge about the assessment of nutritional status, an education program, using a multifaceted intervention<sup>39-42</sup> including pre-course awareness test and post-course satisfaction tests, practical classes, interactive workshop based on a book<sup>23</sup> was undertaken in 16 hours during a fifteen day period.

The enrollment was open to all students or professionals in Nursing and Medicine, after explanation of the

**Table IV**  
References about nutritional aspects in 258 reviews of medical charts of in-patients of FUNDHACRE, from october 2003 to january 2004

Follow up	Medical records n (%)											
	References about patients' nutritional aspects				Admission Height				Admission Weight			
	Yes	No	Missing	Total	Yes	No	Missing	Total	Yes	No	Missing	Total
<i>October</i>												
Before <sup>1</sup>	25 <sup>a</sup>	22	-	47	3 <sup>f</sup>	43	1	47	17 <sup>b</sup>	30	-	47
Able to stand* = 26	(53.2)	(46.8)		(100.0)	(6.4)	(93.5)	(2.1)	(100.0)	(36.2)	(63.8)		(100.0)
After <sup>2</sup>	32 <sup>b</sup>	32	-	64	2 <sup>g</sup>	62	-	64	32 <sup>c</sup>	32	-	64
Able to stand* = 41	(50.0)	(50.0)		(100.0)	(3.1)	(96.9)		(100.0)	(50.0)	(50.0)		(100.0)
<i>November</i>												
Before <sup>1</sup>	22 <sup>c</sup>	46	4	72	15 <sup>h</sup>	56	1	72	31 <sup>m</sup>	40	1	72
Able to stand* = 49	(30.6)	(67.6)	(5.6)	(100.0)	(20.8)	(77.8)	(1.4)	(100.0)	(43.7)	(55.6)	(6.9)	(100.0)
<i>December</i>												
Before <sup>1</sup>	5 <sup>d</sup>	29	2	36	14 <sup>i</sup>	22	-	36	18 <sup>n</sup>	18	-	36
Able to stand* = 20	(13.9)	(80.6)	(5.6)	(100.0)	(38.9)	(61.1)		(100.0)	(50.0)	(50.0)		(100.0)
<i>January</i>												
Before <sup>1</sup>	4 <sup>e</sup>	35	-	39	8 <sup>j</sup>	31	-	39	14 <sup>o</sup>	25	-	39
Able to stand* = 28	(10.3)	(89.7)		(100.0)	(20.5)	(79.5)		(100.0)	(35.9)	(64.1)		(100.0)

<sup>1</sup>before the theoretical class; <sup>2</sup>after the theoretical class; \*number of patients able to stand in a beam balance; a vs b:  $\chi^2 = 0.11$   $p = 0.5$ ; a vs c:  $\chi^2 = 4.99$   $p < 0.05$ ; a vs d:  $\chi^2 = 12.5$   $p < 0.001$ ; a vs e:  $\chi^2 = 17.57$   $p < 0.001$ ; f vs g:  $\chi^2 = 0.71$   $p = 0.5$ ; f vs h:  $\chi^2 = 4.57$   $p < 0.05$ ; f vs i:  $\chi^2 = 12.87$   $p < 0.001$ ; f vs j:  $\chi^2 = 3.73$   $p = 0.1$ ; k vs l, m, n, o:  $\chi^2 0.0001 - 2.1$   $p = 0.9 - 0.1$ .

nature of the education program and research and obtaining written informed consent.

The majority of the participants were students (149/195; 76.4%), 52.3% (78/149) from pre-clinical years without contact with patients yet.<sup>20</sup> However, students participated actively of all moments of the course. Active participation of health care professionals was smaller. The resistance on training health professionals has been already described. Patients' nutrition care was not a priority area for nurses<sup>15</sup> and they were only engaged in such care when time was available<sup>15</sup>. A complete lack of knowledge about hospital malnutrition is generalized among nurses and physicians, with little interest about the subject<sup>4,38</sup>. Even considering the smaller participation of health care professionals, their diagnostic ability improved significantly after the course and their level of satisfaction with their learning was high.

The absence of basic assessment with sub notification of nutritional aspects on patients' charts<sup>1-9,36,37</sup> is common. During the course period, a higher percentage (50.0%) of references about any nutritional aspects were found in the medical records, and also in the follow-up period very significant reductions of notes were observed (10.3% in the third follow up month;  $p < 0.001$ ), leading to the observation that the course increased nutritional concern.

Notwithstanding an interesting aspect was observed. Nursing admission protocol of FUNDHACRE includes the procedures of measuring height and weight. In the month of the course, of the 111 patients evaluated,

67 (60.3%) who could stand in a beam balance only five (7.4%) had their height and 49 (73.1%) their weight measured. It is an instigating phenomenon observed by several authors<sup>2-5</sup>, considering that the procedure of standing in the beam balance for measuring weight is similar to the one measuring for height.

Acuña et al.<sup>20</sup> demonstrated that 65% (13/20) of the nurses participating of the present education program were not concerned about patients' height. After the course, statistically significant improvement in the measurement of height ( $\chi^2 = 12.87$ ;  $p < 0.001$ ) was observed even for two months after the course, demonstrating that education can improve basic nutritional assessment.

In Brazil, a sectional, multicentric study with random choice of 4,000 patients, entitled Brazilian National Survey (IBRANUTRI)<sup>2</sup> was performed. This study revealed that almost half (48.1%) of hospitalized patients was malnourished and severe malnutrition was found in 12.5% of them. Hospital related malnutrition progressed in proportion to the duration of hospital stay; and only in 18.8% of the medical charts there was any report on nutritional status of the patient. Only 7.3% patients received nutritional therapy (6.1% enteral nutrition; 1.2% parenteral nutrition).<sup>2</sup> The authors concluded that the prevalence of malnutrition in hospitalized patients in Brazil is high, physician awareness of malnutrition is low, and nutrition therapy is underprescribed.<sup>2</sup> Based on this study, the Brazilian Public Health Department, with the cooperation of the Brazilian Society of Parenteral and Enteral Nutrition,

SBNPE, published rules for preparation and use of parenteral and enteral nutrition therapy. According to these, Brazilian hospitals are required to maintain a formally appointed multidisciplinary nutrition support team composed of physicians, nurses, dietitians and pharmacists to provide parenteral and enteral nutrition therapies.<sup>43,44</sup> In the present study, 258 nutritional assessments of hospitalized adults and aged were performed in a four month period. The prevalence of malnutrition was high. According to ISM malnutrition was present in 109 (42.2%) patients. The length of stay was related to significant increases of malnutrition over the time. The patients referred anorexia and changes in diet acceptance as main symptoms leading to incapacity to eat; so 116 patients (45.0%) kept losing weight during hospitalization. As a matter of fact, disease is one of the most important factors leading to a nutrient intake lesser than requirements<sup>4,7,8,24,38</sup> or to starvation.<sup>45</sup> In this study, 117 (45.6%) patients fasted often, with a mean time of time of  $2.28 \pm 1.72$  days. The principal reason for fasting was for diagnostic procedures (laboratory or image exams). A total of 21 (17.0%) fasted for more than five days, because of the inability of eating provoked by illness. Frequently nutritional deficiencies go untreated during hospitalization.<sup>1-9,38</sup> Of our 109 malnourished patients only 37 (33.9%) received any kind of nutritional intervention. Of the 21 patients starving for more than five days, only seven (33.3%) received nutritional support.

Other important factor associated to malnutrition is age. Older patients tended to exhibit malnutrition more often. In hospitalized geriatric patients the prevalence of malnutrition was high and it was associated to depression, functional incapacity, and reflected by reductions in biochemical markers, loss of muscle mass and increase in the length of hospital stay.<sup>35</sup>

Then, expressive increases in malnutrition associated with longer hospital stays<sup>2</sup> are related to under prescription of nutritional therapy.<sup>1-7,13,38</sup> The purpose of the educational program was to awaken health care providers about nutritional disorders in the hospital setting, not to teach about nutritional support. In fact only three physicians and 15 Resident physicians attended the classes, but despite the fact that only one third of our patients received nutritional therapy, our results were superior to the one (7.3%) observed in Brazil,<sup>2</sup> maybe reflecting the influence of educational interventions.

Active clinical nutrition educational programs are important to improve the quality of nutritional care, promoting changes in health professional behaviors,<sup>39-42</sup> but the challenge consists in attracting their participation since they have little time to dedicate to activities out of their routine. Perhaps an alternative solution should consider the training of the university students who present available time and show enthusiasm and interest in learning.

Sustainability of the change was observed for a short time during the follow up period. This suggests that educational programs in short periods of time fails to

keep improvement<sup>46</sup> and that health professionals education has to be a continuous, persisting process, ideally considering the potential benefits for the patients.

## Conclusion

Health professionals' awareness of malnutrition is superficial, leading to missing diagnosis and under-prescription of nutritional therapy. Clinical nutrition educational programs improve the ability of diagnosing hospital malnutrition, but the sustainability of changes should be maintained with continuing education. Nutrition education, including practical procedures, should be available to health care students and professionals to maintain awareness of the pervasive problem of patient malnutrition in hospitals.

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## References

1. Butterworth CE Jr. The skeleton in the hospital closet. *Nutr Today* 1974; 9:4-8.
2. Waitzberg DL, Caiffa WT, Correia MITD. Hospital Malnutrition: the Brazilian National Survey (IBRANUTRI): a study of 4,000 patients. *Nutrition* 2001; 17:573-80.
3. Correia MITD, Campos ACL. Prevalence of hospital malnutrition in Latin America: the multicenter ELAN study. *Nutrition* 2003; 19:823-25.
4. Pérez JIU, César MJP, Benavent EG, Álvarez-Estrada AM. Detección precoz y control de la desnutrición hospitalaria. *Nutr Hosp* 2002; 17:139-46.
5. McWhirter JP, Pennington CR. Incidence and recognition of malnutrition in hospital. *Brit Med J* 1994; 308:945-48.
6. Coats KG, Morgan SL, Bartolucci AA, Weinsier RL. Hospital-associated malnutrition: a reevaluation 12 years later. *J Am Diet Assoc* 1993; 93:27-33.
7. Waitzberg DL, Baxter YC. Cost of patients under nutritional therapy: from prescription to discharge. *Curr Opin Clin Nutr Metabol Care* 2004; 7:189-98.

8. Correia MITD, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stays and costs evaluated through a multivariate model analysis. *Clin Nutr* 2003; 22:235-39.
9. Kamath SK, Lawler M, Smith AE, Olson R. Hospital malnutrition: a 33-hospital screening study. *J Am Diet Assoc* 1986; 86:203-06.
10. Weinsier RL, Hunker EM, Krumdiek CL, Butterworth Jr CE. Hospital malnutrition: a prospective evaluation of general medical patients during the course of hospitalization. *Am J Clin Nutr* 1979; 32:418-26.
11. Akner G, Cederholm T. Treatment of protein-energy malnutrition in chronic nonmalignant disorders. *Am J Clin Nutr* 2001; 74:6-24.
12. Zaloga GP. Improving outcomes with specialized nutrition support. *JPEN* 2005; 29(S):49-52.
13. Cresci G. Targeting the use of specialized nutritional formulas in surgery and critical care. *JPEN* 2005; 29(S):92-5.
14. Hoffer LJ. Clinical nutrition: 1. Protein-energy malnutrition in the inpatient. *CMAJ* 2001; 165:1345-49.
15. Lassen KO, Kruse F, Bjerrum M, Jensen L, Hermansen K. Nutritional care of Danish medical inpatients: effect on dietary intake and the occupational groups' perspectives of intervention. *Nutr J* 2004; 3:12.
16. Corish CA. Pre-operative nutritional assessment. *Proc Nutr Soc* 1999; 58:821-29.
17. Waitzberg DL, Campos ACL. Nutrition support in Brazil: past, present and future perspectives. *JPEN* 2004; 28:184-91.
18. Waitzberg DL, Correia MITD, Echenique M, Ize-Lamache L, Soto JK, Mijares JM. Total Nutritional Therapy: a nutrition education program for physicians. *Nutr Hosp* 2004; 19:26-31.
19. Acuña K. Effect of an education program on the diagnosis of nutritional disorders in adults and aged interned in a tertiary hospital in the Amazon region (Rio Branco, Acre). [Doctoral Thesis]. Bahia Federal University Medical School, 2006.
20. Acuña K, Muniz P, Formiga C, Bastos G, Camilo M, Hashimoto R, Ney-Oliveira F, Waitzberg DL, Cruz T. A proposal for clinical nutrition education for health care university students and professionals in the Amazon. *Nutr Hosp* 2004; 19:353-61.
21. Acuña K, Portela M, Costa-Matos A, Bora L, Teles MR, Waitzberg DL, Cruz T. Nutritional Assessment of Adult Patients Admitted to a Hospital of the Amazon Region. *Nutr Hosp* 2003; 18:138-46.
22. Acuña K. Nutritional Assessment of Adult Patients Admitted to a Hospital of the Amazon Region [Dissertation]. Bahia Federal University Medical School, 2002.
23. Acuña K, Cruz T. Nutritional Assessment of the Adult and Aged. National Agency of Sanitary Vigilance, ANVISA, Sentinel Hospital, FUNDHACRE, Rio Branco, Acre, 2003.
24. Waitzberg DL, Correia MITD. Nutritional assessment in the hospitalized patient. *Curr Opin Clin Nutr Metabol Care* 2003; 6:531-38.
25. Detsky AS, McLaughlin JR, Baker JP, Johnston N, Whittaker S, Rena A. What is Subjective Global Assessment of Nutritional Status? *JPEN* 1987; 11:8-13.
26. Katz S, Down TD, Cash HR. Progress in the Development of the Index of ADL. *Gerontologist* 1970; 10:20-30.
27. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist* 1969; 9:179-86.
28. Yesavage JA, Brink TL, Rose TL. Development and validation of a geriatric depression screening scale. *J Psych Res* 1983; 17:37-49.
29. Guigoz Y, Vellas B, Garry PJ. Mini Nutritional Assessment: a practical assessment tool for grading the nutritional state of elderly patients. *Facts Res Gerontology* 1994; 2(S):15-59.
30. Smith LC, Mullen JL. Nutritional Assessment and Indications for Nutritional Support. *Surg Clin North Am* 1991; 71:449-57.
31. Waitzberg DL. Avaliação nutricional de pacientes no pré e pós-operatório de cirurgia de aparelho digestivo. Método antropométrico e laboratorial (Dissertation). São Paulo University Medical School, 1981.
32. Bottoni A, Oliveira GPC, Ferrini MT. Avaliação nutricional: exames laboratoriais. In: Waitzberg DL. Nutrição Oral, Enteral e Parenteral na Prática Clínica. São Paulo: Atheneu, 2000, pp. 279-94.
33. Pereira MG. Epidemiologia: Teoria e Prática. Rio de Janeiro: Guanabara Koogan, 1995.
34. Acuña K, Cruz T, Waitzberg DL. Comparison of the nutritional status of hospitalized adults and elderly in the Amazon region (abstract). *Clin Nutr* 2005; 24:540.
35. Acuña K, Cruz T, Waitzberg DL. Malnutrition is associated to depression in elderly patients in acute care teaching hospital of the Amazon region (abstract). *Clin Nutrition* 2005; 24:541.
36. Kudsk KA, Tolley EA, DeWitt C. Preoperative albumin and surgical site identify risk for major postoperative complications. *JPEN* 2003; 27:1-9.
37. Corish CA, Kennedy NP. Protein-energy undernutrition in hospital in-patients. *Brit J Nutr* 2000; 83:575-91.
38. Goiburu ME, Alfonzo LF, Aranda AL, Riveros MF, Ughelli MA, Waitzberg DL, et al. Nivel de conocimiento en nutrición clínica en miembros del Equipo de Salud de Hospitales Universitarios del Paraguay. *Nutr Hosp* 2006; 21:591-5.
39. Bero LA, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thomson MA. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. *BMJ* 1998; 17:465-8.
40. Rycroft-Malone J, Kilson A, Harvey G, McCormack B, Seers K, Titchen A. Ingredients for change: revisiting a conceptual framework. *Qual Saf Health Care* 2002; 11:174-80.
41. Björvell C, Thorel-Ekstrand I, Wredling R. Development of an audit instrument for nursing care plans in patient record. *Qual Health Care* 2000; 9:6-13.
42. Davis D, O'Brien MAT, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A. Impact of formal continuing medical education. *JAMA* 1999; 282:867-74.
43. Brasil, Ministério da Saúde. Portaria 272 Regulamento técnico para terapia de nutrição parenteral. Diário Oficial, 8 de abril de 1998.
44. Brasil, Ministério da Saúde. Portaria 337 Regulamento técnico para terapia de nutrição enteral. Diário Oficial, 14 de abril de 1999.
45. Haider M, Haider SQ. Assessment of protein-calorie malnutrition. *Clin Chem* 1984; 30:1286-99.
46. Smith WR. Evidence of the effectiveness of techniques to change physician behavior. *Chest* 2000; 118(S):8-17.