Nutrition 58 (2019) 181–186

Contents lists available at ScienceDirect

Nutrition

journal homepage: www.nutritionjrnl.com

Applied nutritional investigation

Time trend prevalence of artificial nutrition counselling in a university hospital

Valeria Amato M.D., Carmela De Caprio M.D., Lidia Santarpia M.D., Ph.D. *, Annalba De Rosa M.D., Carolina Bongiorno M.D., Giovanna Stella M.D., Eliana De Rosa M.D., Roberto Iacone, Clelia Scanzano, Fabrizio Pasanisi M.D., Ph.D., Franco Contaldo M.D.

Internal Medicine and Clinical Nutrition Unit, Department of Clinical Medicine and Surgery, Federico II University Hospital, Naples, Italy

ARTICLE INFO

Article History:
Received 24 April 2018
Received in revised form 29 July 2018
Accepted 22 August 2018

Keywords:
Artificial nutrition counseling
Hospital malnutrition
Health care awareness

ABSTRACT

Objectives: The negative effects of malnutrition on the prognosis of hospitalized patients are well documented; however, less known is the awareness and knowledge of health care professionals about this complication. The aim of this study was to evaluate the trend of the requests for nutritional consultation in years and the prescription of artificial nutrition (AN), for adult patients at a university hospital in southern Italy in the years 2004, 2008, 2012, and 2016 to assess the progress of medical teams concerning awareness of hospital malnutrition.

Methods: This was a retrospective study that evaluated the time trend of nutritional consultation requests and related prescription of AN, for adult patients at a university hospital in southern Italy in the years 2004, 2008, 2012, and 2016. Of 112 233 inpatients, 2505 received a nutritional consultation with the prescription of AN.

Results: The number of patients on AN increased from 507 of 33 240 (1.52%) in 2004 to 730 of 29 195 (2.5%) in 2008 ($P < 0.001$), remaining almost stable in 2012 and 2016.

The request for AN was quite equally distributed between surgical (51.5%) and medical wards (48.5%), with a prevalence among patients with oncologic diseases (806 patients [65.6%]). As for nononcologic diseases, 20.4% involved the gastrointestinal tract and 6.3% the nervous system.

Throughout the 12 y of observation, parenteral nutrition was the main prescribed support (59.8%) followed by oral nutritional supplements (26.1%) and enteral nutrition (9.3%). Mean nutritional intervention duration was 11 d (±10.8 d).

Conclusions: The request of AN for hospitalized patients increased over time, probably owing to improved medical consciousness of the potential risks for malnutrition and the availability of a specialized clinical nutrition team.

Introduction

Protein energy malnutrition (PEM) in hospitalized patients is clearly associated with increased morbidity and mortality, prolonged hospitalization, more frequent readmissions, and increased health care costs [1–4]. Malnutrition in the hospital setting can develop as a consequence of insufficient nutrient intake, impaired absorption, increased metabolic demands during illness, increased catabolism, or a combination of some or all of these factors [5,6].

For these reasons, the awareness and knowledge of health care professionals about malnutrition and its related side effects should be constantly monitored and improved in hospital and after discharge [7,8].

This retrospective study evaluated the trend of the requests for nutritional consultation in years and the prescription of artificial nutrition (AN), for patients hospitalized at Federico II University Hospital in Naples, Italy (and Europe) in the years 2004, 2008, 2012, and 2016 to assess the progress of medical teams concerning awareness of hospital malnutrition.

Materials and methods

All patients hospitalized in the years 2004, 2008, 2012, and 2016 at the Federico II University Hospital in Naples, Italy, requiring a nutritional consultation were evaluated. Inpatients on the pediatric wards and of the intensive care unit (ICU)

CDC and FC were responsible for the conception and design of the study. VA drafted the article. LS revised the article critically for important intellectual content. ADR, CB, GS, EDR, RI, CS, acquired, analyzed, and interpreted the data. FP, FC gave final approval of the version to be submitted.

* Corresponding author: Tel.: +39 081 746 2333; Fax: +39 081 746 2333.
E-mail address: lidia.santarpia@unina.it (L. Santarpia).

https://doi.org/10.1016/j.nut.2018.08.014

Table 1
Prevalence of hospitalized patients on artificial nutrition at Federico II University Hospital

Data	2004	2008	2012	2016	Total
Total inpatient admissions*	33 240	29 195	25 988	23 810	112 233
Number of patients on AN (%)	507† (1.52)	730† (2.5)	691 (2.65)	577 (2.42)	2505 (2.23)
Sex					
Men (%)	282 (55.5)	442 (60.6)	340 (49.2)	327 (56.5)	1391 (55.5)
Women (%)	225 (44.5)	288 (39.4)	351 (50.8)	250 (43.5)	1114 (44.5)
Age, y					
Mean ± SD; median (min/max)	59.6 ± 17.7; 64 (14/93)	60.8 ± 16.4; 63 (16/93)	57.6 ± 18.7; 63 (16/93)	60.8 ± 16.9; 63 (15/101)	59.3 ± 17.6; 61 (14/91)
Total					
Cancer/Noncancer patients n (%)	301/206 (59/41)	465/265 (64/36)	327/364 (47/53)	295/282 (51.1/48.9)	1388/1117 (55.4/43)
Surgery wards					
Patients, n (%)	293 (58)	346 (47)	353 (51)	236 (40.9)	1228 (51.5)
Cancer/Noncancer patients n (%)	212/81 (72/28)	251/95 (73/27)	214/139 (61/39)	129/107 (54.7/45.3)	806/422 (65.6/34.4)‡
Medical wards					
Patients, n (%)	214 (42)	384 (53)	338 (49)	341 (59.1)	1277 (48.5)
Cancer/Noncancer patients n (%)	89/125 (41.8/58.2)	214/170 (56/44)	114/224 (33.1/66.9)	166/175 (48.7/51.3)	583/694 (45.7/54.3)

SD, standard deviation.
*Excluded intensive care and pediatric patients.
†2008 vs 2004; $P < 0.0001$.
‡Cancer/Noncancer in surgery vs Cancer/Noncancer in medicine; $P < 0.0001$s.

were excluded. All patients were evaluated by a nutritionist and a dietitian, and the following data were collected:

- Demographic and clinical data: age, sex; primary disease, comorbidities, and complications
- Anthropometry: weight and height, body mass index (BMI; kg/m^2) when possible measured with a platform scale and an altimeter. In bedridden patients, height was derived by knee–heel length (KH), and weight was derived by KH, calf and arm circumferences, and subscapular skinfold thickness, using appropriate equations
- Blood parameters of nutritional interest: albumin, lymphocytes, pseudocholinesterase (PChE)
- Indication to withhold AN, type of AN prescribed, route of administration, duration of treatment, reasons for withdrawing
- Underlying clinical condition: classified as oncologic or nononcologic. The first group included head-neck cancer, upper and lower gastrointestinal (GI) tract cancer, peritoneal carcinomatosis, and lymphomas/leukaemia, and the second group included acute and chronic neurologic diseases, primary and secondary anorexia, and non-neoplastic (benign) GI diseases (short bowel syndrome), radiation enteritis, inflammatory bowel diseases [IBD], etc).

The prescribed AN therapy included parenteral nutrition (PN), enteral nutrition (EN), oral nutritional supplements (ONS), or mixed artificial nutrition (MN = PN + EN or PN + ONS).

Indications were anorexia, malabsorption, dysphagia, nausea or vomiting, occlusion or subocclusion, and postoperative status. Hospitalization in medical or surgical wards also was considered.

Main hematobiochemical parameters considered to define a patient's nutritional status were serum albumin, total lymphocyte count, and serum PChE. According to the 2000 guidelines from the Italian Society of Articifical Nutriton and Metabolism, serum albumin values <3 g/dL, PChE <5400 U/I, and lymphocytes <1200/mm^3 were considered to be indicators of moderate malnutrition [9].

Results were expressed as the mean ± SD, frequencies, and percentages. Statistical analysis was performed with SPSS version 16 (SPSS, Chicago, IL, USA). The comparison between years for continuous variables considered was carried out by one-way analysis of variance. Differences among the years were reported when statistically significant; otherwise, data were expressed as the resulting sum of the 4 y. Statistical significance was reached for $P < 0.05$.

Results

Of 112,233 inpatients in 2004, 2008, 2012, and 2016, a total of 2505 inpatients received a nutritional consultation, always followed by the prescription of AN. The number of patients on AN increased from 2004 to 2008 ($P < 0.001$) and remained almost stable in the following years. The request for AN was quite equally distributed in surgical and medical wards (51.5% versus 48.5%), with a slight prevalence of oncologic diseases (65.6% oncologic versus 34.4% nononcologic patients) in surgery wards than in medicine wards (45.7% oncologic versus 54.3% nononcologic patients; $P < 0.001$). In addition, the distribution according to sex (55.5% men versus 44.5% women) and age (mean age 59.3 ± 17.6 y) was almost homogeneous in the years studied (Table 1).

Patients with oncologic and hematologic diseases required AN more frequently than other patients (1497 patients [59%]). Among nononcologic diseases, 20.4% (511) involved the GI tract, and 6.3% (159) the nervous system. Main indications for AN were anorexia (32.6%) and postsurgery nutrition (29.6%), followed by nausea/vomiting (14.9%), malabsorption/diarrhea (10.1%), dysphagia (6.7%), and occlusion/subocclusion (6.2%).

PN was the main prescribed support in all the 4 y studied (59.8%), followed by ONS (26.1%) and EN (9.3%). MN (PN + EN or PN + ONS) was prescribed in 4.8% of cases. By comparing the prevalence over time for each year of observation, a slight, but not significant, decrease in PN and an increase in EN was found, as recommended by national and international guidelines on AN (Table 2).

As far as BMI distribution, underweight, overweight, and even obese patients were well represented with a slight, although not significant, increase over the years (19.5% overweight and 4.9% obese in 2004 versus 23.9% overweight and 10.1% obese in 2016).

Regarding the main hematobiochemical nutritional indicators, 34% (848 of 2335) of the patients had serum albumin values <3 g/dL, 45% (793 of 1308) of the patients had PChE values ≤5400, and 24.4% (610 of 1157) had lymphocyte counts ≤1200/mm^3. Type 2 diabetes prevalence was 21.7% (544 of 2505 patients; Table 3).

Analyzing patients on PN, 57.8% (865 of 1497) were affected by onco-hematologic diseases and 24.9% (373 of 1497) by GI diseases. The main indication for PN in oncologic patients was postoperative nutrition (53.5% [143 of 865]), whereas in nononcologic patients, postoperative nutrition (25.2% [159 of 632]), anorexia (24.8% [157 of 632]), and malabsorption (24.1% [152 of 632]) had almost the same prevalence (Table 4).

Of patients on EN, 65% (151 of 232) had cancer and 35% had other diseases, with the prevalence being neurologic conditions (58% [47 of 81]). Main indications for EN were postoperative nutrition (60.3% [91 of 151]) and dysphagia (24.5% [371 of 151]) in patients with cancer and dysphagia (56.8% [46 of 81]) in those without (Table 4).

Table 2
Baseline diseases, indications to and type of prescribed artificial nutrition

Disease state	2004Patientsn (%)	2008Patientsn (%)	2012Patientsn (%)	2016Patientsn (%)	TotalPatientsN (%)
Onco-hematologic	302 (59.6)	459 (62.9)	327 (47.3)	391 (67.8)	1479 (59)
Gastroenterologic	60 (11.8)	117 (16)	196 (28.4)	138 (23.9)	511 (20.4)
Neurologic	30 (5.9)	52 (7.1)	39 (5.6)	38 (6.6)	159 (6.3)
Others	115 (22.7)	102 (14)	129 (18.7)	10 (18.4)	356 (14.2)
Total patients	507	730	691	577	2505
Indications	2004	2008	2012	2016	Total
Anorexia	143 (28.2)	212 (29)	283 (41)	178 (30.8)	816 (32.6)
Dysphagia	20 (3.9)	30 (4.1)	22 (3.2)	95 (16.5)	167 (6.7)
Malabsorption/Diarrhea	43 (8.5)	75 (10.3)	72 (10.4)	63 (10.9)	253 (10.1)
Nausea/vomiting	85 (16.8)	142 (19.5)	84 (12.2)	61 (10.8)	372 (14.9)
Occlusion/subocclusion	45 (8.9)	53 (7.3)	28 (4.1)	29 (5)	155 (6.2)
Postsurgery	171 (33.7)	218 (30)	202 (29.2)	151 (26.2)	742 (29.6)
Total patients	507	730	691	577	2505
Type of AN	2004	2008	2012	2016	Total
Parenteral nutrition	319 (62.9)	453 (62.1)	400 (57.9)	325 (56.3)	1497 (59.8)
Enteral nutrition	35 (6.9)	52 (7.1)	66 (9.6)	79* (13.7)	232 (9.3)
Oral nutrional supplements	151 (29.8)	169 (23.1)	182 (26.3)	153 (26.5)	655 (26.1)
Mixed nutrition	2 (0.4)	56 (7.7)	43 (6.2)	20 (3.5)	121 (4.8)
Total patients	507	730	691	577	2505

AN, artificial nutrition.
*Enteral nutrition 2016 vs 2004; $P = 0.0003$.

Table 3
BMI distribution and baseline biochemical parameters of inpatients on AN

Data	2004	2008	2012	2016	Total
BMI (kg/m^2)					
<18.5 (%)	74 (14.6)	85 (11.6)	106 (15.3)	81 (14)	346 (13.8)
18.5–24.9 (%)	214 (42.2)	358 (49)	241 (34.9)	282 (48.9)	1095 (43.7)
25–29.9 (%)	99 (19.5)	135 (18.5)	112 (16.2)	138 (23.9)	484 (19.3)
≥30 (%)	25 (4.9)	48 (6.6)	49 (7.1)	58 (10.1)	180 (7.2)
Available information, n/N (%)	412/507 (81.3)	626/730 (85.8)	508/691 (73.5)	559/577 (96.9)	2105/2505 (84)
Albumin ≤3 g/dL, n (%)	201 (39.6)	244 (33.4)	189 (27.4)	214 (37.1)	848 (33.9)
Available information, n/N (%)	430/507 (84.8)	695/730 (95.2)	646/691 (93.5)	564/577 (97.7)	2335/2505 (93.2)
Lymphocytes ≤1200 n/mm^3, n (%)	49 (50)	102 (51.5)	191 (51.5)	268 (46.4)	610 (24.4)
Available information, n/N (%)	98/507 (19.3)	198/730 (27.1)	371/691 (53.7)	559/577 (96.9)	1157/2505 (46.2)
PChE ≤5400 U/L, n (%)	136 (60.2)	264 (68.4)	196 (58)	197 (55)	793 (45)
Available information, n/N (%)	226/507 (44.6)	386/730 (85.8)	338/691 (73.5)	358/577 (96.9)	1308/2505 (60.6)
Diabetes prevalence, n/N (%)	68/507 (13.4)	202/730 (27.7)	152/961 (22)	122/577 (21.1)	544/2505 (21.7)

AN, artificial nutrition; BMI, body mass index; PChE, pseudocholinesterase.

Finally, as far as the type of prescribed nutritional mixtures, all patients on EN received lactose and gluten-free, fiber-enriched industrial mixtures. PN patients received galenic personalized mixtures in 57.2% of cases and standardized industrial mixtures in 40.6%; moreover, during hospitalization, 2.2% of patients needed to pass from an industrial to a galenic mixture or vice-versa. Over all the years, there was a shift from galenic to industrial mixtures: From 79% of galenic prescriptions in 2004 to 37.5% in 2012, and from 21% of standard industrialized mixture prescriptions in 2004 to 56% in 2012 ($P < 0.0001$; Table 5).

Average nutritional intervention duration was 11 ± 10.8 d (median 7 d, range 1–133 d), without significant changes over all the years (data not shown).

In 2008, 2012, and 2016, nearly 55% of patients were withdrawn from AN because they returned to the natural oral route and almost 32% required home artificial nutrition (HAN; Table 6).

Discussion

The present study evaluated the demand, in a time length of 12 y, of AN intervention in a university hospital in southern Europe (Federico II University Hospital) to examine the trend regarding the awareness of this concern by medical and surgical teams. The choice to evaluate four sample years (2004, 2008, 2012, and 2016) allowed for the analysis of a long time span corresponding to the regular counseling of a clinical nutrition team for hospitalized patients. The study shows that the request for AN in hospitalized patients increased over time, particularly from 2004 to 2008, and then reached a plateau. This finding is probably due to improved knowledge of the potential risks for malnutrition as well as to the presence in the hospital of a dedicated clinical nutrition team.

Indeed, the study also suggested that in addition to providing a regular service, a dedicated AN team in general hospitals allows for more careful consideration and evaluation of patients' nutritional status. We have not measured this specific topic, but we have observed that both physicians and nurses are now paying more attention to secondary anorexia and nutritional/catabolic status of their patients, thus demonstrating that improved attention has been reached since the beginning of our intervention. These results were obtained in a relatively short period of time—in particular from 2004 and 2008. During this 4-year period, the following actions were taken by our team:

1. Training and updating courses on nutrition screening and nutritional support indication in several clinical conditions were

Table 4
Type of disease and main indications for PN and EN in a subgroup of oncologic and nononcologic patients for years 2004, 2008, 2012 and 2016

Parenteral nutrition											
Oncologic patients, n						Nononcologic patients, n					
Disease state	2004	2008	2012	2016	Total	Disease state	2004	2008	2012	2016	Total (%)
Onco-hematologic	209	299	196	161	865	GI	41	89	145	98	373 (59)
						Neurologic	6	18	11	10	45 (7.2)
						Others	63	47	48	56	214 (33.8)
Total (%)	209 (24)	299 (34.6)	196 (22.8)	161 (18.6)	865 (100)	Total	110 (17.4)	154 (24.4)	204 (32.3)	164 (25.9)	632 (100)
Indications	2004	2008	2012	2016	Total (%)	Indications	2004	2008	2012	2016	Total (%)
Anorexia	22	39	49	25	135 (15.6)	Anorexia	31	42	73	11	157 (24.8)
Dysphagia	2	2	1	19	24 (.,7)	Dysphagia	0	1	1	13	15 (2.4)
Malabsorption	11	22	11	14	58 (6.7)	Malabsorption	29	43	46	34	152 (24.1)
Nausea	33	59	9	8	109 (12.6)	Nausea	20	28	29	29	106 (16.8)
Occlusion/subocclusion	26	33	9	8	76 (8.7)	Occlusion/subocclusion	6	6	14	17	43 (6.8%)
Postop (%)	115 (55)	144 (48.2)	117 (59.7)	87 (54)	463 (53.7)	Postop	24	34	41	60	159 (25.2)
Total (%)	209 (24.2)	299 (34.6)	196 (55)	161 (55)	865 (100)	Total	110 (17.4)	154 (24.4)	204 (32.3)	164 (25.9)	632 (100)
Enteral nutrition											
Oncological patients, n						Nononcological patients, n					
Disease state	2004	2008	2012	2016	Total	Disease state	2004	2008	2012	2016	Total
Onco-hematology	22	30	44	55	151	GI	0	0	1	0	1
						Neurologic	9	13	9	16	47
						Other	4	9	12	8	33
Total (%)	22 (14.6)	30 (19.9)	44 (29.1)	55 (36.4)	151 (100)	Total (%)	13 (16)	22 (27.2)	22 (27.2)	24 (29.6)	81 (100)
Indications	2004	2008	2012	2016	Total (%)	Indications	2004	2008	2012	2016	Total (%)
Anorexia	0	3	0	1	4 (2.6)	Anorexia	3	2	5	3	13 (16)
Dysphagia	2	5	6	24	37 (24.5)	Dysphagia	5	13	8	18	44 (54.4)
Nausea	9	5	2	0	16 (10.6)	Nausea	4	5	4	0	13 (16)
Occlusion/subocclusion	2	1	0	0	3 (2)	Occlusion/ subocclusion	0	0	0	0	0
Postop	9	16	36	30	91 (60.3)	Postop	1	2	5	3	11 (13.6)
Total (%)	22 (14.6)	30 (19.9)	44 (29.1)	55 (36.4)	151 (100)	Total (%)	13 (16)	22 (27.2)	22 (27.2)	24 (29.6)	81 (100)

EN, enteral nutrition; GI, gastrointestinal; PN, parenteral nutrition; postop, postoperative.

Table 5
Parenteral nutrition: Type of prescribed mixtures

Type of mixtures	2004	2008	2012	2016	Total
Galenic* (%)	252 (79)	317 (70)	166 (41.5)	122 (37.5)	857 (57.2)
Industrial† (%)	67 (21)	113 (24.9)	222 (55.5)	182 (56)	608 (40.6)
Galenic ↔ Industrial (%)	0	23 (5.1)	12 (3)	40 (6.5)	32 (2.2)
Total	319	453	400	325	1497

*Galenic 2004 vs 2008, $P = 0.005$; 2012 vs 2008, $P < 0.0001$; 2012 vs 2004, $P < 0.0001$.
†Industrial 2004 vs 2012, $P < 0.0001$; 2008 vs 2012, $P < 0.0001$.

promoted for both physicians and nurses, and guidelines were drafted and distributed to all hospital wards.
2. A dietitian started to cooperate with the physician during the daily counseling in the wards.
3. The clinical nutrition service for inpatients, in particular preparation and distribution of the prescribed nutritional therapy, was better supported by the pharmacy department.
4. The apparent decrease of AN prescription between 2012 and 2016 is due to the decrease in the overall admission of inpatients. Ultimately, in fact, the percentages of patients treated with AN did not decrease, but remained substantially unchanged in the time.

Hospital malnutrition is a growing clinical burden that requires a dedicated clinical nutrition medical team that can properly identify and treat the condition [10,11].

The increased prevalence of hospital malnutrition also may be due to population aging and to increases in the incidence of cancer, neurologic diseases, and IBDs; the obesity epidemic, and the fact that PEM may be masked and not detected if not carefully investigated (i.e., sarcopenic obesity) [12–14]. Malnutrition is accompanied by an increased risk for clinical complications, including sepsis, pneumonia, pressure ulcers, and wound dehiscence, with a consequent increase in the duration and costs of hospitalization. Currently, it has been widely demonstrated that a strong

Table 6
Reasons for AN interruption

	2004	2008	2012	2016	Total
Discharge/Oral nutrition, n (%)	nd	388 (53.2)	386 (55.9)	321 (55.6)	1095 (54.8)
Home parenteral nutrition, n (%)	nd	227 (31.1)	222 (32.1)	189 (32.8)	638 (31.9)
Ward change, n (%)	nd	39 (5.3)	15 (2.2)	12 (2.1)	66 (3.3)
Deaths, n (%)	nd	32 (4.4)	10 (1.4)	13 (2.2)	55 (2.8)
NA Complications, n (%)	nd	6 (0.8)	1 (0.1)	3 (0.5)	10 (0.5)
Therapy change, n (%)	nd	38 (5.2)	57 (8.3)	39 (6.8)	134 (6.7)
Total, n (%)	nd	730 (100)	691 (100)	577 (100)	1998 (100)

AN, artifical nutrition; NA, not applicable; nd, no data.

association exists between the nutritional status and the severity of the disease [3–5,13,15].

When indicated, AN can improve the effectiveness or reliability of specific treatments for the underlying disease, prevent the development of malnutrition, and promote healing in surgical patients [16,17]. A report produced by the Committee of Ministers of Health Council of Europe in 2002 demonstrated the need to raise awareness of health professionals about the possibility of an effective treatment of PEM through an adequate, timely screening and nutritional support [18].

The prevalence of malnutrition in hospitalized patients has been extensively evaluated worldwide and results are still well rooted and widespread. To our knowledge, only a few studies point out directly the awareness of hospital malnutrition and the most common mean used to study this situation is a survey of medical or surgical staff, nurses, or even of the patients.

The result is rather univocal, proving poor awareness and an underestimation of the issue, both when considering single specialties (e.g., oncology, surgeons, geriatrics) and other hospital wards. For example, only 5.7% of Italian Association of Medical Oncologists members participated in an Italian survey that evaluated the attitude toward malnutrition among oncologists [19,20]. The low response rate reflected the lack of interest in malnutrition and its consequences on patient outcome. Unfortunately, a direct comparison with our study is not possible, mainly owing to the different methods used to explore this issue.

More than half of inpatients requiring AN were underweight or normal weight; 19.3% were overweight, and 7.2% were obese. Although not statistically significant, over the years, a growing number of overweight and obese patients were observed, in agreement with the increasing obesity epidemic [12,13].

Modality of AN support (PN, EN, or ONS) has been primarily in agreement with the clinical condition at baseline and its complications (i.e., dysphagia, diarrhea, malabsorption, etc), also according to the pre-existing (mostly PN) venous access.

The prevalent prescription of PN is related mostly to the clinical condition of the inpatients: Nearly 30% were major abdominal surgery patients, 16.3% had GI inflammatory diseases, 14.9% had GI toxicity as a result of antineoplastic therapy, and 6.3% had intestinal occlusion.

In addition, in some cases, particularly oncologic and hematologic patients, the choice between the enteral or parenteral route of administration may depend on the primary disease site (causing mechanical dysphagia or intestinal obstruction) and the side effects of anticancer treatments (nausea, vomiting, diarrhea for GI toxicity). Often, the presence of an already implanted central venous catheter addressed the choice toward the PN route. [18]

Furthermore, in most postoperative inpatients with an unstable metabolic/hydroelectrolite balance, the PN route has been indicated and, when necessary, galenic mixtures have been prescribed.

The slight trend in the reduced number of PN patients in favor of the increase of EN patients suggests an improved adherence to the guidelines for AN, although much remains to be done [16,17].

As far as the type of nutritional mixtures (industrial versus galenic), the decrease in the prescription of galenic mixtures was probably due to the current larger choice, as far as macro- and micronutrients, of the composition of commercially available industrial mixtures.

When comparing the duration of AN intervention between the different groups of patients, no significant differences were shown. The observation in this manuscript concerned the time spent as inpatients only; however, when needed, patients continued on HAN as needed (31.9%, as reported in Table 6).

This retrospective observational study had some limitations. First, the nutritional status and the consequent nutritional support in the ICU was not evaluated because of its own management. Therefore, there is a lack information on the nutritional status of most acute patients. We did not report an AN complications rate, although this was not particularly relevant at our preliminary observation. Finally, the study regarded mostly a direct evaluation of the attention given by the inward health professional to the clinical (artificial) nutrition intervention.

On the other hand, the strength of this study was mostly related to the length of the observation (12 y).

The cost evaluation of nutritional therapy did not fall into the aims of the present study. However, because malnourishment in patients undeniably is associated with increased costs, longer hospital stay, and more intensive treatment, the evaluation of the cost-to-benefit ratio, provided the accuracy of the indication or prescription, should be undertaken.

As far as clinical nutrition outcome, because patients in the ICU were excluded from the study, the natural feeding rehabilitation or prescription of HAN have been considered.

Conclusion

The improved awareness over the years by hospital staff of the presence of malnutrition and the efficacy of AN treatment strongly supports the integration of medical school courses with information on nutritional screening and assessment, nutritional treatments (in particular AN), and a reorganization of regular courses and updating of meetings to constantly increase attention given to this relevant clinical issue.

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