

Review Article

Home artificial nutrition: a three-year survey in southern Italy

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ABSTRACT: Objective: To evaluate the prevalence of home artificial nutrition in the Campania region of southern Italy and the characteristics of patients treated, 3 years after a specific regional regulation on home artificial nutrition issued in 2005.

Results: The overall number of patients on home artificial nutrition increased from 355 in April 2005 to 440 (+24%) in April 2006 and 600 in April 2007 (+36.4% in 2007 vs 2006). The total number of patients on home parenteral nutrition increased from 156 to 163 in April 2006 (+4.5%) and to 197 in April 2007 (+21% in 2007 vs 2006), while the number of patients on home enteral nutrition increased from 199 to 267 (+34%) in April 2006 and to 381 in April 2007 (+43% in 2007 vs 2006). Home parenteral nutrition patients in April 2006 and April 2007 were mostly cancer patients (64% in 2006 and 59% in 2007), whilst those on home enteral nutrition were mostly affected by neurological diseases (75% in 2006 and 80% in 2007). The home enteral nutrition/home parenteral nutrition ratio in adults was 1.3/1 in April 2005, 1.6/1 in 2006, and 1.9/1 in 2007, nearing the expected national mean ratio of 5/1.

Conclusions: Regional regulation on home artificial nutrition has increased its prevalence in the Campania region, in particular for patients requiring home enteral nutrition, although home enteral nutrition remains underprescribed in comparison with national standards. (*Nutritional Therapy & Metabolism* 2009; 27: 16-22)

KEY WORDS: Home artificial nutrition, Enteral nutrition, Parenteral nutrition

INTRODUCTION

In March 2005 the regional government issued a specific regulation in order to promote home artificial nutrition (HAN) in the Campania region in southern Italy (1). The regulation reported the indications for HAN and authorized clinical centers, considering (a) the territorial distribution, (b) the affiliation to hospitals of national relevance, (c) the team members' experience, and (d) their affiliation to the Italian Society of Artificial Nutrition and Metabolism (SINPE).

The characteristics required to be approved as a HAN center comply with the indications of SINPE and the Italian Society of Dietetics and Clinical Nutrition (ADI), which were ratified by the Italian Ministry of Health (2). Three types of centers have been identified on the basis of the medical care delivered. Level 1 centers are authorized to prescribe only enteral nutrition (EN) and should have at least 1 physician every 60 patients, 1 dietician, and 1 professional nurse. Level 2 centers are authorized to prescribe EN and parenteral nutrition (PN) to all patients except those affected by benign chronic intestinal failure (CIF). They should have at

least 1 physician every 30 patients, 1 dietician, 1 professional nurse, 1 pharmacist, and the availability of day-hospital and ordinary hospitalization. Level 3 centers may prescribe EN and PN also for patients with benign CIF and/or requiring galenic parenteral solutions. Staff includes 1 physician every 15 patients, 1 dietician, 1 professional nurse, 1 pharmacist expert in artificial nutrition, the availability of hospitalization in specialized wards and a laboratory for the study of the intestinal function and nutritional status of CIF patients. Furthermore, 2 centers have been specifically identified for pediatric HAN.

The national survey of April 2005 promoted by SINPE showed an overall mean prevalence for HAN of 156.6 cases/million population, with a very large variability between regions, the lowest being 28.1 cases/million population in Sicily and the highest 519.8 cases/million population in Marche (3, 4).

The corrected prevalence, i.e., the prevalence corrected for the representativeness of the sample studied, was estimated to be 195.6 cases/million population. As far as Campania is concerned, the prevalence of HAN was in the lower range of the national distribution, with

63.8 cases/million population. However, the data collected in 2005 in Campania were incomplete, lacking, in most cases (42% of HPN and 62% of HEN), information on the primary disease of the HAN patients. The aim of this study was to evaluate, 3 years after the advent of specific regional regulation, the annual trend of HAN in Campania, the number and characteristics of patients treated, and the type and route of HAN prescribed, thus updating the 2006 survey (5). This survey may also represent an example of how to monitor diseases and relative public health interventions in a regional setting, which is the current model of medical care in our country.

SUBJECTS AND METHODS

Data were collected by the Regional Coordinating Center located at the Federico II University Hospital, Departments of Internal Medicine and of Anesthesiology and Intensive Care. All centers authorized in 2005, 2006 and/or 2007 were recruited for the study and classified according to the levels of medical care proposed by the Ministry of Health for HAN centers and according to their provision of artificial nutrition also to inpatients.

By means of a structured questionnaire, all centers were asked whether they had been active in 2007, 2006 and/or 2005 and how many HPN, HEN and mixed (HPN plus HEN) cases they had treated in April 2005, 2006 and 2007. Patients were grouped according to the primary disease as oncological, neurological, benign CIF, and other diseases. They were also classified into 3 age categories: <18 years, between 19 and 75 years; >75 years. With regard to the route of administration, patients on HPN were distinguished into 2 groups according to the type of venous access (central or peripheral). Central access was always represented by a long-term central venous catheter, totally or partially implanted. Peripheral venous access referred to the use of short-term peripheral catheters (e.g., Angiocath). The type of parenteral mixtures infused, i.e., galenic or industrially available, was also considered.

Patients on HEN were subdivided according to the route of administration of the feeding solutions: nasogastric tube (NGT), nasojejunal tube (NJT), percutaneous gastrostomy (PEG) or jejunostomy (PEJ). Patients receiving oral nutritional supplements were excluded from the study.

Statistical analysis

Questionnaires were collected and analyzed by the Coordinating Center. The sample collected was actually

the whole regional population on HAN. Means, standard deviations (SD) and frequencies were used as descriptive statistics.

RESULTS

The Campania region counted 5.72 million inhabitants in 2005 (5.81 million in 2007), with a population density of 421/km² (427/km² in 2007), versus a national mean value of 179 (197.5 in 2007), of which 23.3% were <18 years of age (national mean: 18.1%) and 6.1% were >75 years of age (national mean: 9.1%).

Table I reports the number of HAN prescribing centers (14 in 2005, 16 in 2006 and 18 in 2007), their level (1st, 2nd, 3rd) according to the type of prescriptions authorized and whether they were active also as an inpatient service. Eight centers were level 3 and the remaining thirteen were level 2. Sixteen centers were also providing artificial nutrition for inpatients. Out of twenty-one Centers, seven in April 2005, five in April 2006, and three in April 2007 were inactive (i.e., without outpatients). In 2005 four centers had fewer than 5 patients on treatment; in April 2006 only one center and in April 2007 two centers had fewer than 5 patients on treatment. Patients followed by each center were also classified according to the prescription of parenteral, enteral or mixed HAN.

The overall number of patients on HAN increased from 355 in April 2005 to 440 (221 women and 219 men) in April 2006 (+23.9% versus 2005), and to 600 (320 women and 280 men) in April 2007 (+36.4% versus 2006). The overall increase from 2005 to 2007 involved mostly HEN patients: 199 in April 2005, 267 in the same month of the following year (+34.2% vs 2005), and 381 in April 2007 (+42.7% vs 2006). Patients on HPN were 156 in April 2005, 163 in April 2006 (+4.5% vs 2005), and 197 in April 2007 (+20.9% vs 2006).

Despite the lack of information on the primary disease in 2005, it is reasonable to hypothesize that this increase has been mostly due to the increased number of neurological patients enrolled in April 2006 (224) and April 2007 (303, +51.8% vs 2006). Table II describes patients on HAN followed in April 2006 and 2007 and classified according to the primary disease. Cancer patients were mostly on HPN whilst neurological patients received mostly HEN; in fact, 201/224 (89.7%) neurological patients in 2006 and 303/340 (89.1%) neurological patients in 2007 were on HEN. Among the cancer patients, 66.9% were on HPN and 32.5% on HEN in 2006; in 2007, 70% of patients were on HPN and 27.5% on HEN. The largest number of benign CIF patients were on HPN (94.1% in 2006 and 89.07% in 2007).

Table III describes HPN patients grouped according to primary disease and age. Among pediatric patients the following prevalences were recorded: oncological (20% in April 2006 and 23% in April 2007), benign CIF (10% in 2006 and 35.3% in 2007), and other, generally genetic diseases (50% in 2006 and 35.3% in 2007). Among adults on HPN there was a high prevalence of patients with cancer (77.7% in 2006 and 68.4% in 2007), fol-

lowed by benign CIF (12.8% in 2006 and 14.3% in 2007). Finally, among older patients (aged over 75), we observed a high prevalence of cancer (57.1% in 2006 and 46.8% in 2007), followed by neurological diseases (26.5% in 2006 and 40.4% in 2007).

As far as HEN is concerned, there was a high prevalence of neurological patients in the pediatric group (84% in 2006 and 74% in 2007), followed by patients

TABLE I - HAN CENTERS IN CAMPANIA AND PATIENTS FOLLOWED BY EACH CENTER IN APRIL 2005, 2006 AND 2007

HAN centers	Level	Inpatient service (+/-)	HPN pts 2005	HEN pts 2005	Total 2005	HPN pts 2006	HEN pts 2006	HEN+ HPN pts 2006	Total 2006	HPN pts 2007	HEN pts 2007	HEN+ HPN pts 2007	Total 2007
AOU Federico II (NA)	***	+	40	36	76	42	47	0	89	47	41	0	88
ASL CE 1 (CE)	**	-	15	3	18	21	29	0	50	31	32	0	63
AORN S.G. Moscati (AV)	***	+	17	23	40	14	11	1	26	10	22	1	33
AOD Cotugno (NA)	***	+	0	2	2	6	2	0	8	1	3	0	4
PO Nola (ASL NA 4)	**	+	5	29	34	1	27	2	30	13	39	2	54
S.G. Moscati Aversa (ASL CE 2)	**	+	0	0	0	14	14	0	28	17	18	0	35
PO Sessa Aurunca (ASL CE 2)	**	+	0	0	0	9	9	0	18	8	14	0	22
PO Mercato S. Severino (ASL SA 2 OVEST)	**	+	8	25	33	3	34	0	37	2	30	0	32
Eboli (ASL SA 2 EST)	**	-	3	1	4	12	6	1	19	11	18	1	30
ASL AV 1 (AV)	**	-	21	7	28	2	10	0	12	2	9	0	11
PO S. Giuliano (ASL NA 2 Giugliano)	**	+	0	0	0	4	0	0	4	11	57	4	72
PO Umberto I Nocera Inferiore (ASL SA 1)	**	+	19	8	27	8	8	1	17	7	30	0	37
Santobono - Pausillipon Hospital (NA)	***	+	0	0	0	7	26	3	36	8	21	3	32
Pediatric Dep. AOU Federico II (NA)	***	+	7	30	37	7	1	2	10	7	2	1	10
Goip Han (CE)	***	+	11	26	37	4	25	0	29	3	11	1	15
Aorn Ruggi D' Aragona (SA)	***	+	2	0	2	0	0	0	0	-	-	-	-
Aorn G. Rummo (BN)	***	+	2	1	3	0	0	0	0	-	-	-	-
ASL NA 3 Frattamaggiore (NA)	**	+	6	8	14	0	0	0	0	-	-	-	-
ASL BN 1 (BN)	**	-	0	0	0	9	18	0	27	7	14	7	28
ASL NA 1 CTO	**	+	0	0	0	0	0	0	0	0	2	0	2
ASL NA 5	**	-	0	0	0	0	0	0	0	12	18	2	32
TOTAL	13**	8***	16	156	199	355	163	267	440	197	381	22	600

*first, **second, ***third; HPN, home parenteral nutrition; HEN, home enteral nutrition; pts, patients

TABLE II - PATIENTS ON HAN IN APRIL 2006 AND 2007 CLASSIFIED ACCORDING TO PRIMARY DISEASE

Primary disease	HPN pts 2006 n (%)	HEN pts 2006 n (%)	Total 2006 n (%)	HPN pts 2007 n (%)	HEN pts 2007 n (%)	Total 2007 n (%)
Cancer	105 (64%)	51 (19%)	156 (36%)	117 (59%)	46 (12%)	163 (27%)
Neurological	21 (13%)	201(75%)	222 (50%)	25 (13%)	303 (80%)	328 (55%)
Benign CIF	16 (10%)	0	16 (4%)	26 (13%)	0	26 (4%)
Other*	21(13%)	15 (6%)	46 (10%)	29 (15%)	32 (8%)	83 (14%)
Total	163 (100%)	267 (100%)	440 (100%)	197 (100%)	381 (100)	600 (100%)

* Genetic disorders, anorexia nervosa and other non-CIF diseases.

with other diseases (16% in 2006 and 24.7% in 2007). Among the adult population there was a high prevalence of neurological patients (79% in 2006 and 79% in 2007), followed by cancer patients (27.6% in 2006 and 17.4% in 2007). Older patients on HEN were mostly neurological patients (79% in 2006 and 83% in 2007), followed by cancer patients (Tab. IIIB).

Table IVA summarizes the type of venous access for

adult and pediatric patients on HPN, showing a similar trend for 2006 and 2007. Patients younger than 18 years all had central venous access (CVC); among adult patients there was a high prevalence of CVC access, with similar percentages in 2006 and 2007 (72.3% vs 75.9%). Among older patients, there was a slight preference for peripheral (57.1% in 2006 vs 66% in 2007) over central venous access (42.9% vs 34%). As far as

TABLE IIIA - PRIMARY DISEASE AND AGE DISTRIBUTION OF PATIENTS ON HPN IN APRIL 2006-2007

Primary disease	Patients						Total n (%)	
	0-18 years		19-75 years		>75 years		2006	2007
	2006	2007	2006	2007	2006	2007		
Cancer	4 (20.0%)	4 (23.5%)	73 (77.7%)	91 (68.4%)	28 (57.1%)	22 (46.8%)	105 (64.4%)	117 (59.4%)
Neurological	4 (20.0%)	1 (5.9%)	4 (4.3%)	5 (3.8%)	13 (26.5%)	19 (40.4%)	21 (12.9%)	25 (12.7%)
Benign CIF	2 (10.0%)	6 (35.3%)	12 (12.8%)	19 (14.3%)	3 (6.1%)	1 (2.1%)	17 (10.4%)	26 (13.2%)
Other	10 (50.0%)	6 (35.3%)	5 (5.3%)	18 (13.5%)	5 (10.2%)	5 (10.6%)	20 (12.3%)	29 (14.7%)
Total	20 (100%)	17 (100%)	94 (100%)	133 (100%)	49 (100%)	47 (100%)	163 (100%)	197 (100%)

TABLE IIIB - PRIMARY DISEASE AND AGE DISTRIBUTION OF PATIENTS ON HEN IN APRIL 2006-2007

Primary disease	Patients						Total n (%)	
	0-18 years		19-75 years		>75 years		2006	2007
	2006	2007	2006	2007	2006	2007		
Cancer	0 (0.0%)	0 (0.0%)	32 (27.6%)	29 (17.4%)	19 (20%)	17 (12.1%)	51 (19.1%)	46 (12.1%)
Neurological	46 (84%)	54 (74.0%)	78 (67.2%)	132 (79.0%)	76 (79%)	117 (83.0%)	200 (74.9%)	303 (79.5%)
Benign CIF	0 (0.0%)	1 (1.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.3%)
Other	9 (16%)	18 (24.7%)	6 (5.2%)	6 (3.6%)	1 (1.0%)	7 (5.0%)	16 (6.0%)	31 (8.1%)
Total	55 (100%)	73 (100%)	116 (100%)	167 (100%)	96 (100%)	141 (100%)	267 (100%)	381 (100%)

TABLE IVA - HPN ACCESS AND AGE DISTRIBUTION (APRIL 2006-2007)

Primary disease	Patients						Total n (%)	
	0-18 years		19-75 years		>75 years		2006	2007
	2006	2007	2006	2007	2006	2007		
Peripheral vein	0 (0.0%)	0 (0.0%)	26 (27.7%)	32 (24.1%)	28 (57.1%)	31 (66.0%)	54 (33.0%)	63 (31.9%)
Central venous catheter	20 (100.0%)	17 (100.0%)	68 (72.3%)	101 (75.9%)	21 (42.9%)	16 (34.0%)	109 (67%)	134 (68.1%)
Total	20 (100%)	17 (100%)	94 (100%)	133 (100%)	49 (100%)	47 (100%)	163 (100%)	197 (100%)

TABLE IVB - HEN ACCESS AND AGE DISTRIBUTION (APRIL 2006-2007)

Enteral access	Patients						Total n (%)	
	0-18 years		19-75 years		>75 years		2006	2007
	2006	2007	2006	2007	2006	2007		
PEG	49 (87.5%)	55 (75.3%)	82 (71.3%)	127 (76.0%)	40 (41.7%)	51 (36.2%)	171 (64%)	233 (61.2%)
PEJ	1 (1.8%)	1 (1.4%)	5 (4.3%)	3 (1.8%)	0 (0.0%)	3 (2.1%)	6 (2.2%)	7 (1.8%)
NGT	6 (10.7%)	17 (23.3%)	28 (24.3%)	37 (22.2%)	56 (58.3%)	86 (61.0%)	90 (33.8%)	140 (36.7%)
NJT	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.7%)	0 (0.0%)	1 (0.3%)
Total	56 (100%)	73 (100%)	115 (100%)	167 (100%)	96 (100%)	141 (100%)	267 (100%)	381 (100%)

PEG, percutaneous gastrostomy; PEJ, percutaneous jejunostomy; NGT, nasogastric tube; NJT, nasojejunal tube

the type of enteral access is concerned, among pediatric patients the PEG procedure was most prevalent (87.5% in 2006 vs 75.3% in 2007), followed by NGT (10.7% vs 23.3%) (Tab. IVB). Among adults there was a higher prevalence of PEG procedures (71.3% vs 76%) versus NGT placement (24.3% vs 22.2%). In older patients, NGT was more frequent than PEG (58.3% and 61% vs 41.7% and 36.2% in 2006 and 2007, respectively). PEJ and NJT were quite rarely used in all diseases and all age groups.

The HEN/HPN ratio in adults was 1.3/1 in 2005, 1.6/1 in 2006, and 1.9/1 in 2007 versus the national ratio of 5/1, while for pediatric patients it varied from 4.3/1 in 2005 to 2.75/1 in 2006 and 4.29/1 in 2007 versus a national mean value of 7/1, with an imbalance in favor of the use of HPN versus HEN at all ages.

As to the type of parenteral support, industrial preparations were used in 67% of patients and galenic preparations in the remaining 33%. Twenty-three (85%) of 27 patients aged below 18 years received galenic preparations against only 34 (23%) of the 146 adult patients.

A total of 355 patients (62.1 cases/million population) were followed by the authorized centers in 2005, 440 (76.9 cases/million population) in 2006, and 600 (109.5 cases/million population) in 2007; in particular, the prevalence was 27.3 cases/million for HPN and 34.8 cases/million for HEN in 2005; 28.4 cases/million for HPN and 46.7 cases/million for HEN in 2006, and 34.6 cases/million for HPN and 66.8 cases/million for HEN in 2007.

DISCUSSION

Our survey on the prevalence of HAN in Campania was carried out during the same month (April) in the last 3 years (2005-2007). It was inspired by the national survey promoted in 2005 by SINPE, which estimated a prevalence of 31.7/million population on HPN and 164.3 on HEN, amounting to a total of 196 patients on HAN per year (3, 4, 11, 12). The results of this regional survey may be a reasonable representation of the progress of HAN in Campania, also as a positive effect of a specific regulation issued by the regional government in 2005 (1). This regulation aimed to establish a regional network of qualified centers for HAN.

Among other things, it has been possible to compile a unique regional therapeutic protocol where all nutritional formulations, together with all facilities (sterile gloves, sterile lints, flow controllers, etc.) necessary for the administration of HPN are recorded. All solutions and facilities are distributed free of charge to patients through hospital pharmacies where HAN centers have been authorized or pharmacies of the Local Health Services providing for these patients.

This survey also gives information about the HAN centers active in Campania and the type of patients treated. The numbers and types of centers ac-

TABLE VA - PRIMARY DISEASE AND PARENTERAL ACCESS IN PATIENTS ON HPN IN APRIL 2007

Primary disease	Parenteral access		
	Central venous catheter	Peripheral vein	Total
Cancer	80 (59.7%)	37 (58.7%)	117 (59.4%)
Neurological	10 (7.5%)	15 (23.8%)	25 (12.7%)
Benign CIF	22 (16.4%)	4 (6.3%)	26 (13.2%)
Other	22 (16.4%)	7 (11.1%)	29 (14.7%)
Total	134 (100.0%)	63 (100.0%)	197 (100.0%)

TABLE VB - PRIMARY DISEASE AND ENTERAL ACCESS IN PATIENTS ON HEN IN APRIL 2007

Primary disease	Patients				
	PEG	PEJ	NGT	NJT	Total
Cancer	28 (12.0%)	6 (85.7%)	11 (7.9%)	1 (100.0%)	46 (12.1%)
Neurological	183 (78.5%)	1 (14.3%)	119 (85.0%)	0 (0.0%)	303 (79.5%)
Benign CIF	0 (0.0%)	0 (0.0%)	1 (0.7%)	0 (0.0%)	1 (0.3%)
Other	22 (9.4%)	0 (0.0%)	9 (6.4%)	0 (0.0%)	31 (8.1%)
Total	233 (100%)	7 (100%)	140 (100%)	1 (100%)	381 (100%)

PEG, percutaneous gastrostomy; PEJ, percutaneous jejunostomy; NGT, nasogastric tube; NJT, nasojejunal tube

tive in 2005, 2006 and 2007 have remained stable, with a general trend towards an increase in the number of patients treated, in particular those on HEN.

It is noteworthy that, despite the increase in 2006 and 2007, HEN remains underprescribed in Campania in comparison with national and European standards (7, 10). On the other hand, the prevalence of HPN is slightly higher than expected on the basis of national (31.7/million) and European data (14-19). According to the disease categories (and as expected), we found the highest prevalence of benign CIF and cancer among patients on HPN, while neurological diseases were mostly represented among HEN patients. Unfortunately, in our sample neurologically impaired patients on HPN are still more than expected. Such patients are often referred to the clinical nutrition teams with an already implanted catheter and a generally short life expectancy. In such cases it was preferred to use the already available central venous access rather than add another tube for enteral nutrition.

We also observed that most pediatric patients were receiving HAN through long-term accesses, i.e., PEG for HEN and tunnelled catheters for HPN. Nevertheless, we still observed quite a large number of patients, in particular elderly, receiving HPN through peripheral venous access.

In conclusion, the regulation issued by the regional government of Campania has certainly contributed to a better diffusion of HAN in the region. This conclusion is supported by the steadily increasing number of patients treated by the regional centers from 2005 to 2007, mostly due to the increased number of HEN patients. Future surveys will be aimed at evaluating also the effectiveness and possible complications of HAN.

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