

## Original Article

# Home parenteral nutrition in advanced cancer patients: a four-years multicenter prospective observational study

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**ABSTRACT:** Home parenteral nutrition (HPN) in cancer patients remains a controversial issue. Since 2000 a multicenter observational study has been funded by the Health Council of the Piedmont Region. The protocol of the study was elaborated by a team of nutritionists, oncologists, and general practitioners; the aims were both institutional (to establish the incidence of HPN and the requirement of human resources) and clinical (to assess the effect of HPN on nutritional and performance status, quality of life, and survival time; to establish the incidence of HPN-related complications). In 5 years 730 patients were enrolled in the study. The incidence of HPN was 50 (Asti city and district) to 70 (Turin inner city) patients per million inhabitants per year; the point prevalence was 15 patients per million inhabitants; the need for dedicated human resources within the organizing model amounted to 1 fully dedicated physician every 30 patients on treatment per day. The main indications for HPN were intestinal subocclusion (50% of cases) and malnutrition (44%). Survival after 1, 2, 3 and >6 months from the beginning of HPN was 82%, 54%, 34% and 10%, respectively; predictive factors for survival were Karnofsky performance status ( $\geq 60$ ;  $p < 0.0097$ ) and serum albumin ( $\geq 3.5$  g/dL;  $p = 0.059$ ). Clinical results are shown for 160 patients studied after 2 months of HPN: no change in body mass index and performance status; improvement of PG-SGA (severe malnutrition: from 56% to 40%); quality of life unchanged in 57%, improved in 18%, and worsened in 25% of patients. (*Nutritional Therapy & Metabolism* 2007; 25: 31-9)

**KEY WORDS:** Advanced cancer, Home Parenteral Nutrition, Palliative care, Survival

## INTRODUCTION AND AIMS

The use of home parenteral nutrition (HPN) in patients with advanced cancer is still a matter of debate among different specialists, also from an ethical point of view. HPN is used in cancer patients whenever oral intake is insufficient or inadvisable, and serves to prevent malnutrition from being the cause of death and help prolong survival with acceptable quality of life (1).

When the digestive tract cannot be used because of anatomical or functional obstructions (state of occlusion or subocclusion) and the patient's clinical condition re-

quires it, parenteral nutrition (PN) can be applied. In cancer patients this situation mainly originates from chronic intestinal obstruction.

At present there are no guidelines regarding the indications for HPN in cancer patients who are not under active therapy and the matter itself is by its very nature subject to a certain discretion. According to the currently available data, the criteria for the inclusion of cancer patients in HPN programs are remarkably different among countries: they represent 5%, 40%, 60% and 69% of all HPN patients, respectively, in the UK (1), USA (2), Netherlands (1), and Italy (3). A proposal for

inclusion criteria has been made by an international committee under the patronage of the European Association for Palliative Care (4). A review article published in 2003 in the European Society for Parenteral and Enteral Nutrition (ESPEN) journal (5) identified a life expectancy of at least 2-3 months as the main factor determining the indication for HPN.

The only Italian study available on this matter reported a prevalence of HPN in advanced cancer patients of 17.5 per million inhabitants per year, with a median treatment duration of 8.6 weeks (range 3-16 weeks) (6).

In the Piedmont Region, home enteral nutrition and HPN for patients with chronic benign intestinal failure have been regulated by specific laws since 1986. Because of the lack of regulation regarding HPN in cancer patients, the Regional Health Council (Oncologic Programming Division), in collaboration with regional networks of dietetic and clinical nutrition and oncology units and with general practitioners, activated in 2000 a multicenter prospective observational study. The aims of the project were both clinical and institutional in order to elaborate a model for subsequent application to the entire region. The institutional aims included the incidence of HPN, the need for dedicated human resources, and costs; the clinical aims included changes in nutritional status and quality of life; adverse effects and complications of HPN treatment; survival rates and predictive factors for survival.

## METHODS

Six units of dietetic and clinical nutrition participated in the study: ASO S. Giovanni Battista, Turin (coordinating center); Mauriziano Hospital, Turin-IRCC Candiolo (Turin); San Giovanni Antica Sede Hospital, Turin; ASO S. Croce e Carle, Cuneo; ASO Maggiore della Carità, Novara; and ASL 19, Asti.

The protocol was elaborated by a board including representatives of the regional networks of dietetic and clinical nutrition units and of oncology, and representatives of the general practitioners (GPs); it defines inclusion and cessation criteria, and the aspects of treatment handled by nutritionists; an informative leaflet of the clinically relevant aspects of the treatment, to be provided to GPs at the start of HPN, was prepared.

### Team in charge

The team in charge is composed of a clinical nutritionist (responsible for nutritional treatment), an oncologist/palliatist, and a GP (responsible for oncological and clinical management, respectively). The responsibilities

of the team are:

- to establish the indication and the treatment plan
- to share the monitoring of patients
- to decide on the cessation of treatment.

### Inclusion criteria

To be included in the study, patients must have the following characteristics:

- contraindication or intolerance to oral or enteral nutrition (highest tolerated amount: 25% of the requirements)
- life expectancy >30-60 days
- Karnofsky performance status:  $\geq 50$
- control or absence of pain
- absence of severe functional alteration of vital organ function
- clinical and environmental conditions compatible with home therapy
- favorable opinion regarding treatment from the team in charge
- be included in the home care program provided by the Local Health Board (ASL).

### Responsibilities of the dietetic and clinical nutrition unit

The dietetic and clinical nutrition unit is responsible for the nutritional program. The protocol defines:

- the method of nutritional status assessment used at the beginning of HPN and during monitoring:

- percent change of actual vs usual body weight
- difference (%) of actual vs ideal body weight (Lorentz formula)
- Patient-Generated Subjective Global Assessment of Nutritional Status (PG-SGA) (7): normally nourished patients (A), moderately undernourished patients (B) or severely undernourished patients (C)
- blood tests: blood count, albumin, urea, glucose, creatinine, electrolytes
- the assessment of residual oral feeding, if present
- the nutritional program
  - definition of requirements, based on SINPE Guidelines, and on the clinical evaluation of the specific patient
  - preferential use of standard formulated bags
- methods of delivery
  - hours and speed of infusion
  - preferential use of a simple flux regulator
- evaluation of performance status and quality of life
  - Karnofsky Index (KI)
  - Therapy Impact Questionnaire (TIQ) (8)
- diagnosis and treatment of the main complications

- fluid-electrolyte alterations
  - metabolic alterations
  - catheter and vein complications
- the monitoring program
- to be held monthly, except for special needs
- availability by telephone
- a clinical nutritionist must be available 8 hours a day, 5 days a week for the GP and the home nursing service.

The first evaluation is made at the hospital or at home, depending on the patient's clinical condition. Program activation takes place at home, with the participation of the clinical nutritionist, the GP and the home service nurse. Follow-up is carried out by the clinical nutritionist, in hospital or at home, depending on the patient's clinical condition. The medical records, including any changes in the nutritional program, are passed on to the GP and the nurse. Home delivery of the required materials takes place every 15 days.

### **Nursing and material management**

With the help of the nurses of the territorial services of the Local Health Boards (ASLs) participating in the project, a manual for the management of the venous line was prepared. Catheter complication rates are regularly monitored. The territorial nursing services are in charge of venous line management at home and of training a relative or caregiver in autonomous management of the line, when they consider it appropriate.

The Local Health Board is in charge of delivering all materials to the home (PN bags, flux regulator or peristaltic pump, medical equipment) according to the prescription of the dietetic and clinical nutrition unit.

### **Evaluation of incidence, workload and costs**

Because every new treatment requires a certain degree of awareness on the part of the staff involved, it was planned to calculate the incidence (new patients admitted to treatment per million inhabitants per year) when requests had reached a stable trend. The populations of Turin inner city (900,000 inhabitants) and Asti ASL (200,000 inhabitants) were chosen because the study project allows to be reasonably sure that in these areas the needs were fully covered.

The costs related to human resources dedicated to HPN by the dietetic and clinical nutrition units were evaluated considering the number of hours spent by physicians and dieticians proportionally to the number of patients/day in charge. The other costs of HPN (traveling allowances for home visits by clinical nutrition

physicians, fees of territorial nurses, provision and delivery of materials), which may vary depending on the local organization, were not reported.

### **Statistics**

Statistical analysis was performed with the program StatsDirect for Windows (version 2.4.5). Descriptive statistical data were expressed as median and range. Survival curves were calculated with the Kaplan-Meier method and the significance between curves with the log-rank and the Wilcoxon tests. Factors influencing the outcome in relation to survival time (time to event) were analyzed with Cox's regression. The cutoff point for the predictive factors for survival was studied with a receiver operating characteristic (ROC) curve. P values less than 0.05 were considered significant.

### **RESULTS**

The team in charge performed 862 evaluations to assess whether HPN was indicated. In 82% of the cases the patient was considered eligible; in the remaining cases, alternative ways of nutritional support were chosen (oral feeding with dietitian counseling or enteral nutrition) or a program of simple hydration was started.

Table I shows the characteristics of the patients enrolled from 1 October 2000 to 31 December 2005. The cancer site was mostly in the intestinal tract (73%); among extraintestinal sites, ovary was the most frequent. Nutritional status as described by PG-SGA at the first evaluation was moderately (42%) or severely (56%) altered; median weight loss values, serum albumin, and performance status were severely altered.

At the start of HPN, 64% of patients were still able to take in a small quantity of soft foods by mouth (<500 kcal/day), whereas in the remaining 36% feeding by mouth was completely hampered or impossible.

The central venous catheter employed was totally implanted (Port) in 44% of cases, tunneled (Groshong) in 37%, and of the Hohn type in 19%.

The initial nutritional program is reported in Table II: it is consistent with the nutritional aim in these subjects and generally represents the basal requirements. Fluid intake was deliberately limited, given the risk of expansion of the extracellular compartment. At the beginning, bags with a standard formulation were prescribed in all patients; only in 2 diabetic subjects was a personalized formula subsequently employed because of the difficulty in maintaining glycemia within normal limits with the simple insulin therapy that can be used at home. In the same patients an infusion volumetric pump

**TABLE I - PATIENT DETAILS**

Patients	730	BMI (kg/m <sup>2</sup> )	20 (13-35)
Sex (M/F)	383/347	Body weight (kg) Weight loss (% UBW)	54 (29-90) 17 (2-32)
Age (years)	62 (30-87)	Performance status (KI)	60 (50-90)
Tumor site	Gastric: 33% Pancreatic/biliary tract 22% Colon-rectum 18% Ovary: 12% Other: 15%	PG-SGA	A=0% B=42% C=56%
Indication for HPN	Intestinal subocclusion: 50% Malnutrition: 44% Other: 6%	Serum albumin (mg/dL)	3.1 (1.2-4.8)

BMI, body mass index; UBW, usual body weight; PG-SGA: Patient-Generated Subjective Global Assessment of Nutritional Status; A, normally nourished; B, moderately undernourished; C, severely undernourished; KI, Karnofsky index

**TABLE II - NUTRITIONAL PROGRAM AT THE BEGINNING OF TREATMENT**

	kcal (nonprotein)		Energy (%BEE)	Amino acids (AA)		Liquids	
	kcal/d	kcal/kg/d		AA/d (g)	AA/kg/d (g)	mL/d	mL/kg/d
Median (range)	1400 (600-1900)	24 (9-40)	100 (35-167)	60 (30-85)	1.1 (0.8-1.3)	1500 (750-2500)	28 (13-53)

Energy (%BEE): nonprotein energy intake expressed as percentage of basal needs (BEE, basal energy expenditure according to Harris-Benedict) Body weight is real.

**TABLE III - NUTRITIONAL AND PERFORMANCE STATUS TRENDS IN 160 PATIENTS AFTER 2 MONTHS OF TREATMENT**

	T <sub>0</sub>	T <sub>2</sub>
Weight (kg)	54 (29-90)	53 (32-91)
BMI (kg/m <sup>2</sup> )	20 (13-30)	20 (14-31)
PG-SGA	A=0% B=42% C=56%	A=0% B=60% C=40%
Karnofsky index	60 (50-90)	60 (40-90)

T<sub>0</sub>, baseline; T<sub>2</sub>, after 2 months of HPN; BMI, body mass index; PG-SGA: Patient Generated-Subjective Global Assessment of Nutritional Status; A, normally nourished; B, mildly undernourished; C, severely undernourished

**TABLE IV - QUALITY OF LIFE TREND (THERAPY IMPACT QUESTIONNAIRE) FOR 160 PATIENTS AFTER 2 MONTHS OF TREATMENT**

	Worsening (%)	Stationary (%)	Improvement (%)
Pain	27	47	26
Nausea	7	71	22
Vomiting	8	66	26
Asthenia	43	33	24
Depression	29	55	16
Anxiety	15	80	5
Free time	46	31	23
Distraction	19	69	12
Mean	25	57	18

was needed, whereas in all other subjects a simple flux regulator was found satisfactory. Patient monitoring was done in hospital (clinic or day hospital) in 70% of cases and at home in 30%.

We report the nutritional data of a group of 160 patients in whom it was possible to test TIQ at the beginning and after 2 months of HPN. The nutritional status and life quality trend was studied 2 months from the beginning of HPN in 160 patients with survival ≥2 months. In Tables III and IV the data concerning nutrition, performance status and quality of life are reported.

They indicate that among these patients nutritional status (PG-SGA) was improved in 16%, whereas body weight, body mass index (BMI) and performance status remained stable; in 18% of the patients the perception of quality of life improved.

Complications were evaluated in the sample of patients followed by the S. Giovanni Hospital of Turin. Among these 302 subjects, there were 25 complications of the catheter in 22 patients (7%): there were 18 instances of sepsis, 2 of venous thrombosis and 4 of catheter dislocation. In the cumulative treatment time

TABLE V - TREATMENT DURATION RELATED TO INITIAL PERFORMANCE STATUS (KI)

Days of HPN	% of HPN patients, according to initial KI				
	KI 50 (n=111)	KI ≥60 (n=294)	KI 60 (n=102)	KI 70 (n=153)	KI 80 (n=39)
30 days	83	88	84	88	89
60 days	57	61	60	63	56
90 days	41	44	41	45	46
120 days	30	32	25	32	42
180 days	11	22	11	22	36
≥360 days	2	6	0	3	22

KI, Karnofsky index

(88.4 years), the incidence of sepsis, thrombosis and dislocations was 0.2, 0.02, and 0.06 per year of HPN, respectively. During the first year of the project, a sepsis incidence (1.04 per year) significantly higher than that observed in the intestinal failure patients HPN program of the Turin Center (0.08 per year) was noticed. Representatives of the territorial nursing services were therefore informed and nursing procedures reviewed; this review and regular auditing produced a stable decrease to acceptable levels of this complication.

Metabolic complications were quite rare: there were no cases of fluid overload or electrolyte imbalance, and there were 4 cases of hyperglycemia (1%), which were successfully treated – in 3 patients with insulin therapy and modification of the PN formulation, and in 1 patient with insulin therapy only.

Catheter complications required hospitalization in 11 patients (3.6%), while in 2 patients (0.7%) only day hospital admission was needed; days of admission were 12±3. Analysis of the cumulative data (cumulative time of HPN and cumulative days of admission) shows that 1.3 days of admission per year of HPN may be expected.

By December 2005, 76% of patients had died, 9% were able to resume oral food intake, and 15% were still on HPN. Patients who adequately resumed oral food intake were those who, thanks to an improved general health status induced by i.v. nutrition and/or palliative chemotherapy, did not longer need artificial nutritional support. The duration of HPN in the deceased patients had been 80 days (range, 20-766 days). Survival at 1, 2, 3 and ≥6 months from the beginning of HPN was 82%, 54%, 34% and 10%, respectively. It should be noted that 11 patients survived ≥1 year including 4 patients with colon cancer, 2 with gastric cancer, 2 with pancreatic cancer, 2 with ovarian cancer and 1 with other tumor sites); 3 patients survived ≥2 years (1 colon cancer, 1 pancreatic cancer and 1 intestinal leiomyosarcoma). The survival curve is depicted in Figure 1.

The following factors were analyzed as candidate

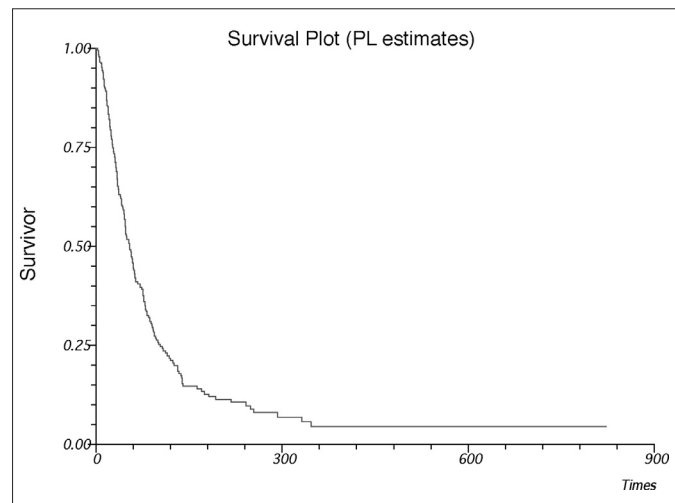


Fig. 1 - Survival curve (all cases).

predictive factors for survival time: cancer site, sex, age, and baseline values of body weight, percentage weight loss, BMI, performance status (KI), and serum albumin. The following turned out to be predictive for survival time: baseline serum albumin ≥3.5 g/dL and initial KI ≥60 (ROC curve Fig. 2). Survival curves according to KI (<60 and ≥60) are significantly different (Fig. 3); the difference between survival curves according to initial albumin level (<3.5 and ≥3.5 g/dL) is of borderline significance (p=0.059). Table V describes in detail all patients' survival times divided by initial KI. In the first 2 columns of the table, the whole sample is split with a cut-point at KI 60; the next columns provide details of the groups with KI ≥60 in order to highlight the correspondence between KI increase and percentage of patients with prolonged survival.

The incidence of HPN was calculated for the year 2005, when the number of requests had stabilized. In the Turin inner city area (900,000 population) the incidence

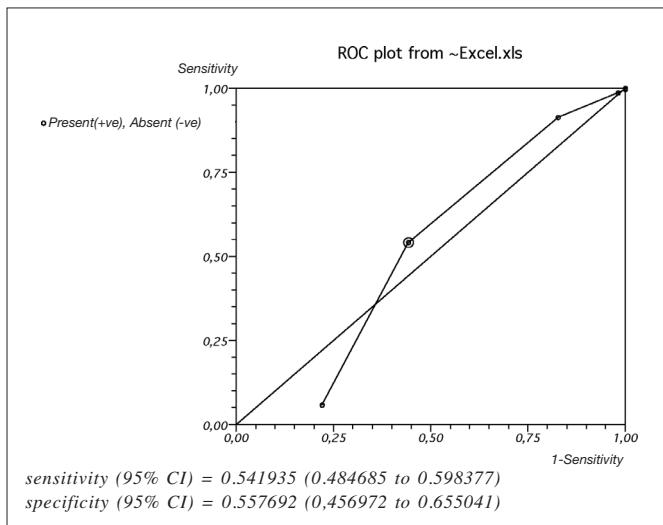


Fig. 2 - ROC curve analysis.

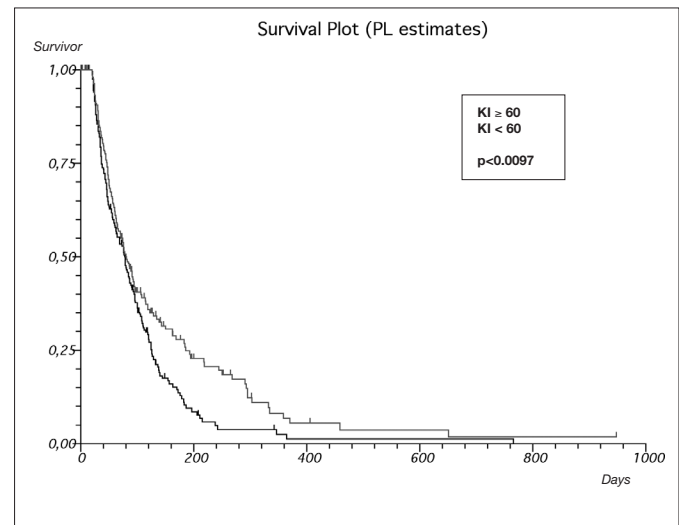


Fig. 3 - Survival curves branched according to the initial Karnofsky index.

was found to be 70 new cases per year per million inhabitants and in Asti ASL (200,000 population) 50 new cases per year per million inhabitants. In the same period the number of patients under treatment per day was 15 per million inhabitants.

At the end of 2002, when methodological stabilization had been achieved, the time dedicated by the staff of the units of dietetics and clinical nutrition and the relative costs were calculated. It turned out that 1 full-time physician and 1 part-time (25% of the workshift) dietitian were needed for every 30 patients/day on treatment. The cost of dedicated staff was found to be 15 euros per patient per day. To calculate the total costs, expenses that may vary depending on local circumstances (hospital cost for clinic and admission days, traveling allowances for home visits by staff, territorial nursing service, materials and equipment) must be added.

## DISCUSSION

The aims of this multicenter study were to assess the clinical and quality-of-life results of HPN and to define the requirements and costs of HPN in cancer patients when no further curative but only palliative therapies are administered.

The issue is relevant both from an ethical and organizational point of view. The ethical criteria that define the indication for HPN are controversial, and, even following expert advice (4), many grey areas remain; subjective evaluation by the physician (survival time prediction) and by the patient and relatives (expectations and

intentions for the future, and assistance/support requirements) can be relevant. From an organizational point of view, it is clear that home management of PN must have a correct methodological basis, given the risks (sepsis, metabolic alterations, fluid-electrolyte imbalances) related to this therapy: the complication rate must be closely followed. Thus, proper management of HPN gives rise to relevant costs, which should be carefully evaluated by health services.

Accordingly, this project was based on 2 preliminary considerations: accurate inclusion criteria (deriving from an evaluation shared by clinical nutritionists, oncologists, and GPs) and the commitment of the management to specialized centers.

Regarding the inclusion criteria, the multidisciplinary approach avoided at least some common mistakes. As a matter of fact, it is quite frequently seen that PN is simply employed because a central venous catheter is already inserted and/or because supporting therapy was administered by this route during hospital stay. In this study it has been observed that a fair amount (18%) of patients with advanced cancer, when the digestive function is undamaged, may be properly fed by mouth with appropriate counseling by a dietitian. The inclusion criterion reported as "malnutrition" in 44% of the patients in this study (Tab. I) refers to undernourished subjects who did not have an intestinal subocclusion yet but in whom oral food intake was insufficient and could not be influenced by specific dietetic counseling. Moreover, enteral nutrition was impossible because of adverse effects or not indicated because of expected short-term digestive tract alterations due to cancer. The indication

“other” (6%) refers mainly to patients in whom enteral feeding was possible but was refused by the patient. An incorrect prediction of survival time and/or subjective factors caused the apparently wrong inclusion of 131 patients who died within 1 month of the start of HPN. We are unable to judge whether 18% of “inappropriate inclusions” is a worrying finding or the inevitable result of the unpredictable part of medicine and/or of what is roughly described as “compassion”. Interestingly, this study shows that baseline performance status (significant) and serum albumin (of borderline significance) are predictive factors for survival time. We would therefore suggest to include patients with a baseline KI  $\geq 60$ .

The incidence of HPN stabilized 3 years after the start of the project; during the first 2 years a steady increase was observed, possibly because some time was required before the existence, relevance and indications for HPN became known to all medical staff involved. The data of this study suggest that the demand for HPN in cancer patients under palliative care may vary between 50 (Asti area) and 70 (Turin inner city area) new patients per million inhabitants per year.

The cost defined here (15 euros per patient per day) applies only to the dedicated staff of the clinical nutrition unit and in our opinion appears to be moderate; it has to be considered that HPN is a risky procedure that has to be handled by expert and specialized centers whose duty it is not only to treat patients but also to carefully control the quality standards of the treatment. Any further costs (materials and supplies, home delivery, expenses for home transfer, general expenses for the hospital concerned, territorial nursing service) depends on the specific organization and must be calculated separately.

The basal nutritional status of the patients included in our study was, as expected, severely altered: a median weight loss of 17% with respect to the pre-illness body weight was observed, although there was a high degree of variability (2-32%); the PG-SGA index defined 56% of the patients as being severely undernourished.

The nutritional aim in cancer patients on palliative care cannot be rehabilitation, but, at best, to sustain vital functions and prevent the malnutrition from worsening and become the cause of death. In this study the nutritional program was established in accordance with this aim: on average an energy intake equivalent to the basal requirement was prescribed, to avoid an overload of energy substrates in subjects unable to use them for anabolism; the fluid intake was also limited to prevent expansion of the extracellular compartment. It is known that severely undernourished patients are at risk of the refeeding syndrome caused by a sudden metabolic increase produced by an energy intake, particularly if giv-

en as glucose, disproportionate to the previous metabolic level; this, in turn, induces a massive influx of potassium, phosphorus and magnesium into the cells (9). Extracellular fluid retention may be favored by the decrease in oncotic pressure and the increase in capillary permeability caused by the high level of proinflammatory cytokines that characterizes these patients. Parenteral administration represents an additional risk for both these conditions. With the highly cautious mode of proceeding adopted in this study, the clinical complications have been almost insignificant and no fluid-electrolyte imbalances or refeeding syndrome were observed.

With regard to the type of PN bags, the results of this study allow to confirm that in HPN for advanced cancer patients standard bags are appropriate; they are cheaper and easier to handle because no refrigerator is needed for transport and storage. In our experience, also the infusion regulation may be safely handled using the cheaper and simpler flux regulator instead of the volumetric pump; moreover, pumps are poorly appreciated by patients and relatives because of their higher complexity.

From a clinical point of view, the results in patients who responded to the TIQ at baseline and after 2 months seem consistent with the nutritional aims: overall stability of body weight, BMI and performance status. Evaluation of nutritional status (PG-SGA) and quality of life (TIQ) by the patients themselves indicated an improvement in a fair percentage of cases: severe malnutrition (PG-SGA point C) decreased from 56% to 40% and the sensation of asthenia improved in 25% of cases. The mean value of all TIQ items remained stable in 57% of cases and improved in 18%. Taking into account that the percentage of patients who survived  $\geq 3$  months was 44% and that the sample of patients tested was only almost half of them, these data imply that HPN contributes to maintaining a stable performance status and quality of life also in patients who will die after 1 month.

Septic complications of the catheter represent the most important risk of long-term HPN; however, they may be limited by careful and specialized nursing of all venous line-related procedures. Cancer patients might be particularly at risk because of altered immunocompetence, chronic inflammation and malnutrition, but the incidence should not be very much higher than that occurring in chronic intestinal failure patients on long-term HPN. In the latter, an incidence of  $\leq 0.36$  episodes/year of HPN was observed in recent European studies (10-13), while septic complications in cancer patients on HPN were reported to vary from 0.2 to 1.22/year of HPN (14-17). In the present study a low incidence of septic complications was observed (0.2/year

of HPN), confirming the satisfactory methodological level of the program. A consistently high standard of nursing in cancer patients on HPN may be difficult to obtain, because patients are usually managed by the territorial nursing service. This means that many different professionals, with their workshifts and turnover, are involved and the strict observation of a protocol may become problematic. In our experience, establishing the nursing protocol together with the nurses in charge of the territorial services at the beginning of the program, and sharing results, criticisms and revision during the study have proven to be useful: the catheter infection rate fell from 1.04/year of HPN in the first year to a subsequent steady level of 0.2/year of HPN. Metabolic and fluid-electrolyte complications were negligible.

## CONCLUSIONS

This study indicates that the incidence of advanced cancer patients needing HPN is 50-70 patients per million inhabitants per year; these data may be considered reliable because they were calculated on a cumulative population of 1,100,000 when a steady state in HPN had been reached for a period of 1 year.

The clinical results allow us to suggest that HPN, if based on adequate inclusion criteria and expert specialized management, may improve nutritional and quality

of life conditions in 16-25% of advanced cancer patients, and stabilize these conditions in 57%. Moreover, in 9% of patients, HPN may represent a temporary means of artificial nutrition, allowing the patient to receive palliative care and subsequently be rehabilitated to oral feeding.

Performance status and serum albumin were identified as predictive factors for survival. Even if this result is derived from a large sample of patients (730), it is advisable, considering the marked variability in clinical conditions among advanced cancer patients, that the cut-points proposed by this study (KI  $\geq$ 60; serum albumin  $\geq$ 3.5 g/dL) be confirmed by further studies. The rate of septic complications may be kept at a low level (0.2/year of HPN) with accurate monitoring and strict collaboration with territorial nurses.

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