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Home Artificial Nutrition in Switzerland: An Epidemiological Survey from 2005 to 2009

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Key Words
Home artificial nutrition · Oral nutritional supplements · Enteral and parenteral nutrition

Abstract
Background and Aims: Home artificial nutrition (HAN), including oral nutritional supplements (ONS) and enteral (HEN) and parenteral (HPN) nutrition, is an established, important treatment for malnourished patients. The aim of this study was to analyze the epidemiological data of patients on HAN in Switzerland. ***Methods:*** This retrospective study recorded all new cases of HAN in Switzerland from January 2005 to December 2009. ***Results:*** A total of 12,917 cases were recorded: 6,731 (52%) males and 6,186 (48%) females, with a mean age of 65.0 ± 17.6 years. The number of patients on ONS was 7,827 (57.4%), on HEN 3,966 (39.4%) and on HPN 433 (3.2%). The most common underlying disease category was neoplasms (6,519, 50.7%). The number of patients on ONS increased from 57.0% (n = 1,252) to 60.8% (n = 2,039), and on HPN from 2.1% (n = 45) to 4.0% (n = 134) between 2005 and 2009. ***Conclusions:*** This first analysis of the large-scale Swiss registry of HAN shows that approximately half of the patients received ONS, whereas HPN was rarely delivered. The frequency of ONS and HPN increased from the year 2005 to 2009. In accordance with previous European studies, malignant tumors were by far the most frequent indication for HAN.

Introduction

Over the last 2 decades, home artificial nutrition (HAN) has emerged as a relevant treatment method for patients suffering from malnutrition. Malnutrition is a broad description of very different conditions ranging from obesity to severe undernutrition [1]. In this study, malnutrition refers to protein-energy-malnutrition as described elsewhere [2]. After the initiation of artificial nutrition in hospital, HAN makes earlier discharge of a patient possible, which may be of great relevance when financial resources are limited. HAN facilitates the reduction or even elimination of malnutrition and thus contributes to an improvement in the quality of life of the patients and, ultimately, disease outcome [1–3]. Depending on the underlying disease process and the energy intake required, oral supplementation or enteral or parenteral nutrition is initialized, with oral supplementation being the preferred method. Previous surveys have ob-

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served ONS to be the preferred route of application when the most common underlying diseases were neurological disorders followed by cancer [4–6].

Epidemiological studies in Europe report a significant increase in the use of HAN [4, 5]. This necessitates a greater understanding of trends and the capacity to predict forthcoming issues on the part of nutritional registries [7].

Our study presents the first analysis of the HAN registry, covering over 90% of patients in Switzerland. Its aim was to collect and describe the epidemiological data of patients undergoing HAN during the period 2005–2009.

Methods

Ninety percent of the patients on HAN in Switzerland are registered by the SVK (Schweizerischer Verband für Gemeinschaftsaufgaben der Krankenversicherer), i.e. a Swiss consortium of health insurance companies for joint tasks in the field of transplantation, dialysis, HAN and home ventilation. As the application form for HAN was changed in 2005, we restricted the duration of the study to the time period from 01.01.2005 until 31.12.2009, thus enabling us to compare the data over this time. All patients started on HAN during this time period and handled by the SVK were included in this study. The doctor in charge completed a structured application form containing information about gender, age, nutritional status, underlying disease and type of HAN. For the first time, these data have been collected and were evaluated in this study.

Due to the fact that HAN was started in some patients (n = 705) more than once during the observation period, a few patients may be registered more than once. For these patients, the data of the first registration were used for the calculations. For the evaluation of the different types of HAN and access devices, a separate set of data for every type of HAN (total 13,642 cases) was recorded. This approach implicates that a patient can have more than one case.

The data collected refer to the state before initializing HAN and included sex, age, body mass index (BMI), weight loss, illness and type of nutritional access.

The costs include the artificial nutritional solutions, all material needed for the application as well as the support service.

For the analysis, the SPSS 16 statistics package was used. Age, BMI, weight loss and costs are expressed as mean values ± standard deviations. Underlying diseases were classified according to ICD-10 codes [8]. On the occasion of the first application, the patients had to sign a form that they agree to the use of the data for research by the Swiss Association for Clinical Nutrition (GESKES).

Results

Population

During the 5-year analysis, 12,917 patients on HAN were registered; 6,734 (52%) males and 6,186 (48%) females. Mean age was 65.0 ± years (range 0–104), with the majority (n = 6,413, 49.7%) being 60–79 years old.

Nutrition Status

The mean BMI before initiation of HAN was 21.0 ± 4.6 (range 9.0–91.7). An extremely overweight child had the BMI of 91.7. Average weight loss compared to normal weight was 4.7% (0.0–42.9%) in the last month and 13.5 ± 6.8% (1.0–48.7%) in the last 6 months, respectively. However, documentation of weight loss in the last 6 months was missing for half of the patients.

Geographical Aspects

The federal state of Switzerland is divided into 26 member states (cantons). To compare the geographical distribution of patients on HAN by canton, the number of cases was compared in relation to the population of each canton [9].

The highest incidence of patients on HAN was registered in the cantons of Schaffhausen (2.63‰), Neuchâtel (2.60‰), Bern (2.30‰) and Schwyz (2.35‰), with the lowest incidence (by far) registered in the canton of Geneva (0.23‰) (fig. 1).

Distribution of Diseases in Patients on HAN

Table 1 shows the underlying diseases grouped by ICD-10 [8]. There are 5 major disease groups, of which neoplasms are clearly the most frequent with 6,519 patients (50.7%). The other 4 groups are diseases of the digestive tract with 1,341 patients (10.4%), of the nervous system with 1,231 patients (9.6%), of the circulatory system with 1,111 patients (8.6%) and 'not specifically classified' diseases with 740 cases (5.7%).

Due to the fact that the neoplasms group accounted for half of all patients with HAN and contained many different types of malignancy, the group was divided into subgroups [10] shown in table 2. The most common subgroups were neoplasms of the digestive organs (n = 2,065), ill-defined, secondary or unspecified sites (n = 1,186), lips, oral cavity and pharynx (n = 1,167) and of the respiratory and intrathoracic organs (n = 767).

Type of HAN and Access Devices

As mentioned above, some patients were registered more than once, therefore a separate set of data was recorded for every type of HAN (13,642 cases).

The distribution of route of nutrition was 7,827 ONS (57.4%), 5,372 HEN (39.4%) and 433 HPN (3.2%) (online suppl. fig. S1; for all online suppl. material, see www.karger.com/doi/10.1159/000346485).

In the HEN group, 3,996 cases (74.4%) were fed by means of a percutaneous endoscopic gastrostomy, 687 (12.8%) by nasoenteral feeding tube, 251 (4.7%) by means

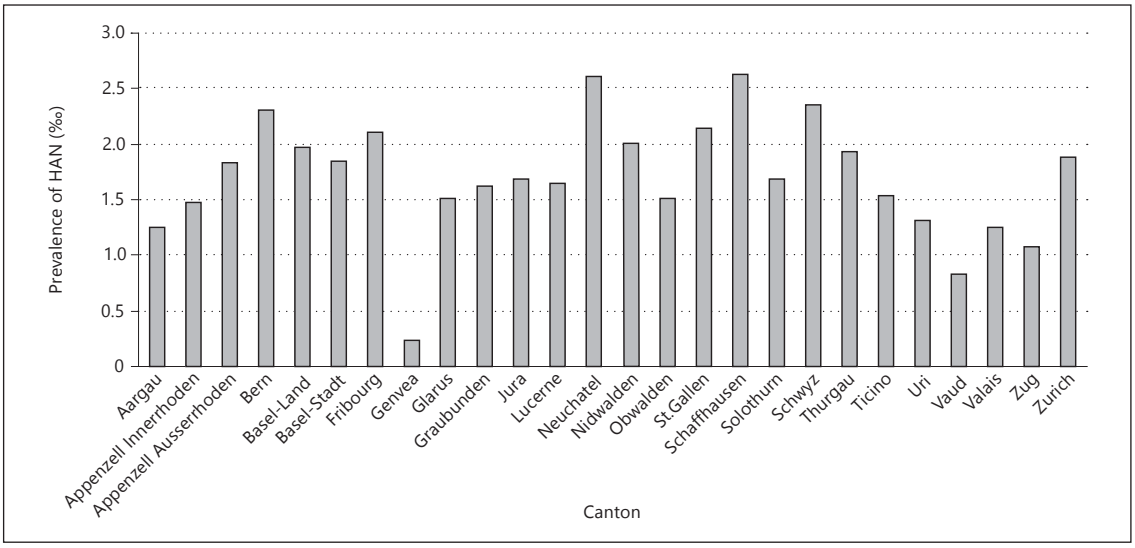

Fig. 1. Prevalence of HAN (‰) in the 26 Swiss cantons.

of a surgical jejunostomy and 66 (1.2%) by means of a percutaneous endoscopic jejunostomy (table 3).

HPN was mainly given by a central venous catheter (n = 315, 72.8%), and in 17 patients (3.9%) by a peripheral venous catheter (table 4). However, this data set is incomplete because in 372 HEN cases (6.9%) and 101 HPN cases (23%), information about the access device was not declared. This was mainly due to the fact that at the time of enrolment, the decision about the access device had not yet been made.

Costs

The mean monthly costs were 799.21 ± 989.96 CHF/patient. ONS was clearly the least expensive application with 224.96 CHF/month compared to HEN (1,447.43 CHF/month) and HPN (2,866.58 CHF/month).

Figure 2 shows the monthly costs in the context of the ICD code. Cardiovascular (1,137.50 CHF/month) and neurologic diseases (1,001.70 CHF/month) accounted for the highest costs. This was due to the higher incidence of HEN in these disease groups.

Neoplasms, being the main group of underlying disease, were slightly above the mean monthly costs with 813.20 CHF/month.

Duration of HAN

The mean duration of HAN was 7.2 months (range 1–60 months). The length of the different types of HAN was as follows: ONS 6.5 months (range 1–59 months), HEN 8.5 months (range 1–60 months) and HPN 4.7 months (range 1–58 months).

Table 1. Distribution of disease in patients on HAN according to ICD-10

ICD-10	Patients	%
Neoplasms	6,519	50.7
Diseases of the digestive system	1,341	10.4
Diseases of the nervous system	1,231	9.6
Diseases of the circulatory system	1,111	8.6
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	740	5.8
Mental and behavioral disorders	493	3.8
Endocrine, nutritional and metabolic diseases	323	2.5
Diseases of the respiratory system	307	2.4
Diseases of the genitourinary system	225	1.7
Diseases of the musculoskeletal system and connective tissue	161	1.3
Infectious and parasitic diseases	148	1.2
Injury, poisoning and certain other consequences of external causes	87	0.7
Congenital malformations, deformations and chromosomal abnormalities	47	0.4
Diseases of the skin and subcutaneous tissue	44	0.3
Codes for special purposes	40	0.3
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	27	0.2
Certain conditions originating in the perinatal period	8	0.1
Diseases of the eye and adnexa	6	0
Factors influencing health status and contact with health services	3	0
Pregnancy, childbirth and the puerperium	2	0
Diseases of the ear and mastoid process	1	0
External causes of morbidity and mortality	1	0
Total	12,917	100.0

Table 2. Distribution of neoplasms in patients receiving HAN

Type and/or location of neoplasm	Patients	%
Digestive organs	2,065	31.7
Ill-defined, secondary and unspecified sites	1,186	18.2
Lips, oral cavity and pharynx	1,167	17.9
Respiratory and intrathoracic organs	767	11.8
Lymphoid, hematopoietic and related tissue	288	4.4
Breast	234	3.6
Female genital organs	195	3
Male genital organs	137	2.1
Urinary tract	106	1.6
Neoplasms of uncertain or unknown behavior	87	1.3
Mesothelial and soft tissue	66	1
Skin	46	0.7
In situ neoplasms	44	0.7
Eye, brain and other parts of the central nervous system	40	0.6
Benign neoplasms	31	0.5
Thyroid and other endocrine glands	30	0.5
Bone and articular cartilage	27	0.4
Independent multiple sites	3	0
Total	6,519	100.0

Table 3. Access devices for HEN

Access device	Patients	Percentage
Percutaneous endoscopic gastrostomy	3,996	74.4
Nasoenteral feeding tube	687	12.8
Surgical jejunostomy	251	4.7
Percutaneous endoscopic jejunostomy	66	1.2
Missing information	372	6.9

Table 4. Access devices for HPN

Access device	Patients	Percentage
Central venous catheter	315	72.8
Peripheral venous catheter	17	3.9
Missing information	101	23.3

The duration of HAN was calculated using the first and the latest date of delivery of HAN by the homecare service. Therefore, it was not possible to differentiate between patients no longer receiving HAN and those continuing on HAN beyond the end of the study period. So the data of duration of HAN are imprecise and the mean duration of HAN may be slightly longer in all patients.

Development of HAN

During the study period, there was a significant rise of newly initiated HAN from 150 cases per month in January 2005 to 202 cases per month in December 2009, i.e. the new registrations of cases increased from 2,132 per year in 2005 to 3,115 per year in 2009.

Online supplementary figures S2 and S3 show that there was an increase in ONS from 1,252 cases per year (57%) in 2005 to 2,039 cases per year (60.8%) in 2009; the percentage of cases receiving ONS in comparison to all patients with HAN did not change.

In contrast to cases on ONS, the percentage of cases on HPN increased from 2.1% in 2005 (45 patients) to 4.0% in 2009 (134 patients), whereas the percentage of cases on HEN decreased from 40.9% in 2005 (898 patients) to 35.2% in 2009 (1,180 patients).

Discussion

Our study provides a description of the epidemiological data of 12,917 patients undergoing HAN in Switzerland from January 2005 until December 2009. It is the first study to offer an analysis of HAN in Switzerland and possibly one of the most relevant registries of HAN overall.

Approximately 90% of all patients on HAN were included during the study period, and thus the study is representative for the whole of Switzerland. The remaining 10% either had an insurance that did not collaborate with the SVK, or they pay their nutritional therapy themselves. The results show clearly fewer patients registered in the French-speaking part of Switzerland, especially in the cantons of Geneva and Vaud; this could be explained by the fact that one of the leading insurance companies in that part of the country does not cooperate with the SVK.

The most important indication for HAN is undernutrition, defined as a BMI <18.5 and/or a loss of >5% of previous body weight in the last month and/or a loss of >10% of previous body weight in the last 6 months [1]. According to the literature, 18–60% of the patients in medical and surgical hospital wards are malnourished [2, 11]. At least one of the criteria for mal-/undernourishment applied to 7,716 patients in this study, and for the remaining 5,201 patients, the criteria did not apply or the

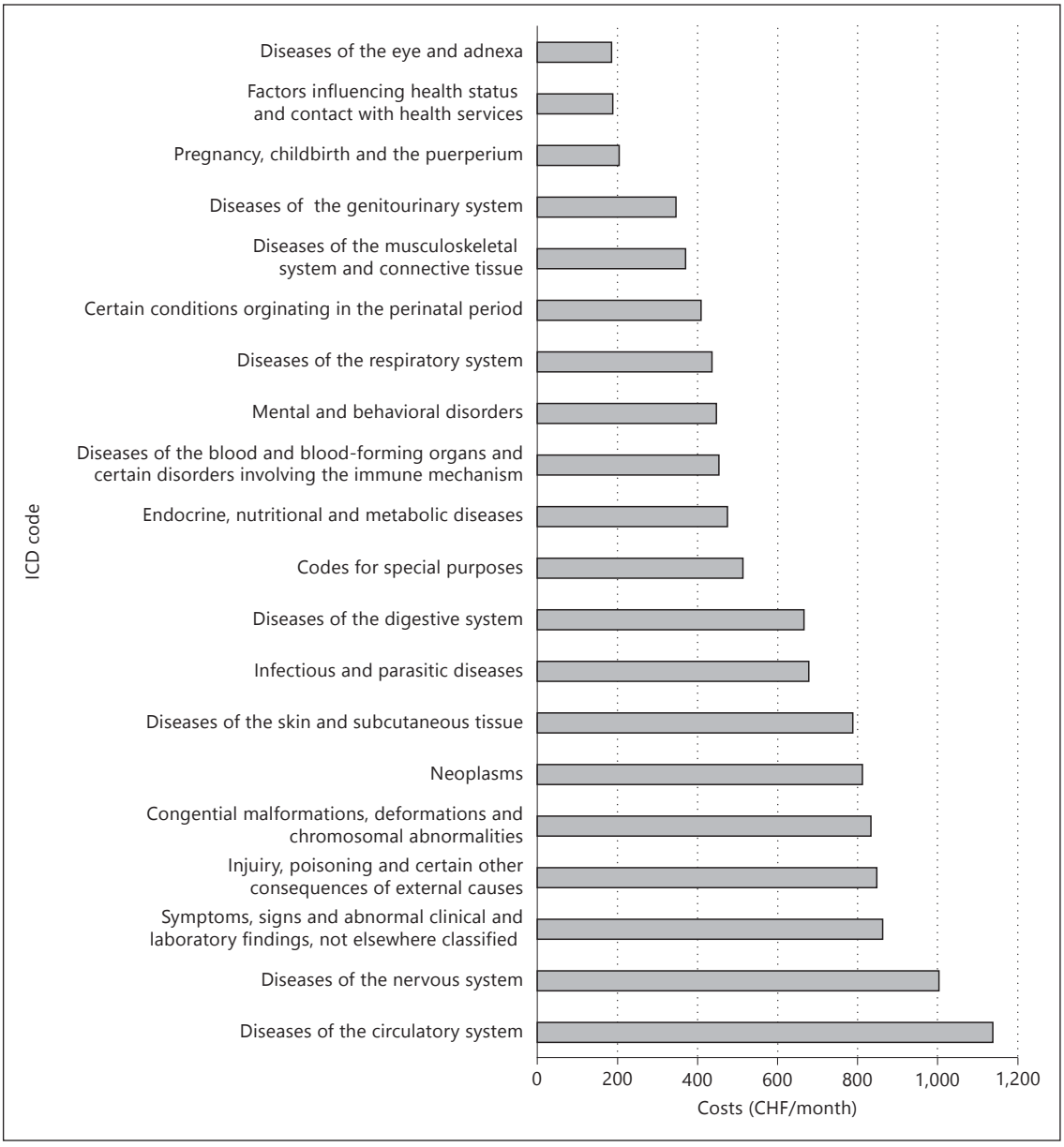

Fig. 2. Mean monthly costs in relation to ICD code.

information was not declared on the registration form. Surprisingly, the quantified loss of weight was missing in many cases although this information is an important part of the questionnaire of the SVK. On the one hand, the former registration form, where BMI and weight loss were not registered electronically, was mistakenly used for some cases, so we did not have access to these data. On the other hand, some patients did not measure their weight regularly and thus could not answer the questions about weight loss. In these situations, where a nutrition assessment was not available, the SVK made the decision on the basis of the ICD code and selected indications for artificial nutrition. For example, for HEN and HPN the insurers are obliged to take over the costs for all patients according to the medical indications following the guidelines of GESKES (Gesellschaft für klinische Ernährung der Schweiz) regardless of the patient's nutritional state. Furthermore, in some cases, an additional form evaluating the Nutrition Risk Score (NRS 2002 by Kondrup [12]), including the nutritional status and the severity of

the underlying disease are required by the SVK. An NRS ≥3 indicates already-existing malnutrition or a high risk for developing malnutrition, and obliges the health insurance company to pay for HAN.

Unfortunately, many insurance companies do not take over the costs of ONS even if the patient is malnourished and has an indication, e.g. an underlying disease.

The frequency of the use of HAN in the various categories of underlying diseases grouped by ICD-10 shows the group of neoplasms, with 50.7%, to clearly dominate. This result correlates with the results of a multicenter European study on HAN [11, 13]. However, other authors have stated that the main underlying diseases were afflictions of the nervous system [4–6, 14]. Neoplasms often make nutrition by the normal route impossible [15]. Malignant tumors of the digestive organs and of the lips, oral cavity and pharynx were the main subgroups of malignant disease in our study. This fact is not surprising because these organs are responsible for the intake of food and thus feeding may be compromised by the tumor. Many severe neurologic diseases lead to an inability to chew and/or swallow which also impairs normal nutrition. We hypothesize that malignancies are the leading group of underlying diseases in our analysis because, as seen above, medical insurance is obliged to take over the costs for HEN and HPN in these patients in Switzerland. The legislation regarding insurance coverage varies greatly in European countries, thereby influencing incidence statistics [16].

Most cases of HAN were on ONS (57.4%), followed by HEN (39.4%), whereas HPN (3.2%) accounted for only a small number of cases. Literature with incidence figures for the different types of HAN is rather limited. The results of a recent study in Spain coincide with ours [6]. The reasons for the low incidence of HPN are varied. On the one hand, the natural way of feeding should be maintained as long as ONS and HEN are considered the preferred methods of feeding [3]. On the other hand, HPN is the final route of supplying nutrients, and is avoided if possible because of a high rate of complications, e.g. catheter infections and possible reduction in quality of life [17, 18]. Moreover, in earlier studies, HPN has been shown to be much more expensive; this might also have influenced the method of feeding chosen [19, 20]. The 6-fold costs of HEN and nearly 13-fold costs of HPN in comparison to ONS shown in our analysis confirm this hypothesis and underline the importance of ONS.

We observed an increasing incidence of HAN during the study period which we cannot explain but which follows a trend seen elsewhere [21]. We hypothesize that the growing awareness by the medical staff of undernutrition and nutritional medical aspects in general may have increased the rate of HAN [22]. Another important factor may be the economic aspect [23]. Inducing early home nutrition has been shown to be cost-effective mainly because patients can be discharged from hospital much earlier [24]. Moreover, the industry manufacturing artificial nutrition products has been much more active over the last years in contributing to the awareness of undernutrition [25]. Furthermore, improvements concerning safety and handling have made HAN more convenient [26].

It is noteworthy that HPN increased substantially during the study period, a finding supported by a study from Denmark [27], even though it is much more expensive and beset by complications as we have discussed above. The reason for the increase in HPN cases may be the increasing incidence of neoplasms and more complex gastrointestinal surgery [28]. In patients with cancer, and in particular cancer of the gastrointestinal tract, feeding by the oral or enteral route may not be possible due to malignancy-associated complications, e.g. stenosis of the intestine and ileus by mechanical obstruction.

Our study and analysis were limited by not all the registration forms being completed. In some cases, only a bit of information was missing; however, on some forms, this was up to 50%. So, aware that the available data on HAN were limited, but due to the lack of registries, it was not possible to compare whether missing data are also a problem in other registries. Wanden-Berghe et al. [7] emphasize the importance of registries, but, unfortunately, the keeping of records is not compulsory in most countries. Considering the rising incidence of HAN, we consider national registries to be very important in order to be able to detect trends and predict upcoming issues and we propose that there should be more such national registries. Moreover, we recommend that the forms used in our study should be checked more exactly and be returned to the doctor in charge if there are data missing.

In conclusion, this epidemiological study demonstrates that HAN is an important and well-established therapy for malnourished patients in Switzerland. The use of HAN increased during the study period. We believe that there will be a further rise in patients on HAN because of an increase in cancer patients, complex therapies and operations as well due to economic reasons as discussed above. The considerable difference in costs between ONS, HEN and HPN demands that the use of ONS should be promoted. We propose that HAN registries should be analyzed on a regular basis to be able to identify future trends and to react early if necessary.

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