

Original Article

Epidemiological characteristics of home enteral nutrition in patients from a Chinese tertiary hospital in 2021: A cross-sectional study

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Background and Objectives: Home enteral nutrition was reported to be a treatment reducing malnutrition rates and improving the rational allocation of medical resources. We aim to investigate the epidemiological characteristics and improved the management of home enteral nutrition. **Methods and Study Design:** 3953 patients with home enteral nutrition were enrolled in West China Hospital, located in Sichuan province, between January 1, 2021, and December 31, 2021. **Results:** 7238 visit records (3429 females and 3809 males) were included. The median age was 59.0, with the age from 1 to 115. The top two diseases were oncologic disorders (40.3%) and digestive disorders (15.9%). Oral nutritional supplements (86.2%) was the major treatment of home enteral nutrition. The median daily energy intake and daily protein intake were 575.1 kcal and 31.2 g. 25.8%, 39.3%, 34.9% patients choose online clinic (1867), offline clinic (2843) and hospital to home (2528) respectively. Interestingly, 63.6% patients were revisited, and the rate of online clinic, offline clinic and hospital to home was increasingly lower (91.9%, 71.5%, 33.8%) among them, revealing online clinic improving the revisit rate. Most patients lived in Chengdu (60.5%), and 67.4% patients from Chengdu were revisited. The median monthly cost of hospital to home patients (¥ 1863.8) was higher than the total median monthly cost (¥ 1714.5), illustrating the cost may reduce the revisit rate. **Conclusions:** Distance, cost and convenience may be the key factors to determine the method of visit and revisit in patients of home enteral nutrition. Online clinic may enhance the patients' follow-up.

Key Words: home enteral nutrition, hospital to home, online clinic, offline clinic, revisit

INTRODUCTION

Home enteral nutrition (HEN) has been recommended for patients who require enteral nutrition support to achieve nutritional goals at home.¹ The European Society for Parenteral and Enteral Nutrition (ESPEN) guidelines recommend that HEN be initiated during hospitalization, after discharge or from an outpatient HEN clinic where the patient is receiving long-term HEN therapy.² Malnutrition of patients can worsen their disease complications and reduce their quality of life.³ The implementation of HEN therapy has been reported to reduce the incidence of malnutrition⁴ and complications, including hospital-acquired infections,⁵ resulting in weight gain, improved nutritional status, no increase in adverse effects,⁶ improved clinical outcomes, fewer hospital admissions and length of stay, reduced hospital costs for patients,⁷ improved mental and physical health,⁸ and improved quality of life (QOL).^{4,9} In addition, the implementation of HEN has improved patient adherence to national prescribing guidelines while reducing health resource expenditures.¹⁰

The prevalence of HEN has increased dramatically. Data from the US population show an increase in prevalence from 463 per million inhabitants in 1995 to 1385 per million inhabitants in a recent study.¹¹ In addition, a study with 9 years of retrospective data showed a dramatic increase in the prevalence of HEN in Italy (205 per

million inhabitants).¹² Similarly, epidemiological studies in Spain have shown that the prevalence of HEN has been increasing in recent years.^{13,14} Unlike European countries and the United States, HEN in China is neither registered (mandatory or voluntary) nor publicly reimbursed. HEN practices around the world are highly heterogeneous and little is known about HEN patients in China. Since the introduction of family nutrition in China, there has been only one study on this patient population at the West China Hospital of Sichuan University in 2018, and the most recent Chinese epidemiological data are from this study.¹⁵ The revisit rate was 26.3% in this study, revisit rate and compliance are the important factors to determine HEN management effects. The Corona Virus Disease 2019 (COVID-19) pandemic has brought on difficulty to the offline clinic visit and revisit, so the HEN online clinic was established at the West China Hospital of Sichuan University in 2020. Therefore, the aim of this study was

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to retrospectively describe variety epidemiological data regarding Chinese patients with HEN after the addition of HEN online clinic.

METHODS

Study design and patients

This trial was a single-center, retrospective, cross-sectional, epidemiological study. The study was conducted at West China Hospital of Sichuan University. The clinical registration number of this study is ChiCTR2100053762. The study protocol was approved by the ethics committee of West China Hospital, Sichuan University. The ethical approval number is 2019 (725). We obtained informed consent from the participants in this study. Patients were prescribed HEN treatment by our clinical nutrition department, and were enrolled between January 1, 2021 and December 31, 2021. Patients eligible for inclusion in the study were as follows:^{2,8} Malnutrition or risk of malnutrition, inability to meet nutritional requirements through food intake, patient acceptance, and family support. Patients were excluded if they had a short life expectancy,² or poor compliance,² or impersonal formula, or included only energy-free formula (probiotics or glutamine or calcium or dietary fiber). Visit records was defined as the time of the patients visiting the dietitians, and patients who were prescribed more than one visit record were defined as revisited patients.

Visit methods

The visit methods included the hospital to home nutrition care model (H2H model), HEN offline clinic and HEN online clinic. In 2013, the H2H model was established and implemented in the clinical department of West China Hospital, Sichuan University.¹⁵ The H2H model was designed to help patients who continued EN from hospital to home. In this model, patients were initiated on EN preparations during hospitalization, discharged into the H2H, and continued to adjust EN therapy in the clinical nutrition department. Patients who came from the H2H model were named H2H patients. The HEN clinic of West China Hospital includes offline clinics and online clinics. All patients were allowed to be prescribed by clinical dietitians in offline clinics. In this clinic, patients must go to the hospital clinic for face-to-face consultation and be prescribed for nutritional preparations. However, online clinics were recommended to revisited patients. In this clinic, patients via the internet to conduct online nutrition consultations, and nutritional preparations will be mailed to their homes. Patients who came from the offline clinics were named offline patients, and patients who came from the online clinics were named online patients.

HEN management

We created the HEN management team, which included clinical dietitians, nurses, and family members of the patients. The HEN team member discusses issues with the individualized HEN program according to the basic patient features, diseases and nutritional information. Patients, caregivers or family members were trained by the dietitian on HEN care information. The dietetic nurse creates a personal profile for the HEN patient, including demographic characteristics, illness, nutritional infor-

mation, and HEN program. The HEN program includes nutritional prescriptions such as formula type, frequency, dose and intervention intervals, revisited plans, management of adverse effects and tube-related care issues. All patients received EN preparation by means of oral nutritional supplements (ONS) or tube feeding (TF). TF was defined as placement of a nasogastric, nasoenteric feeding tube, gastrostomy or enterostomy.

Malnutrition

All participants were required to measure their weight and height at the visit. These data were used to calculate body mass index (BMI) or Z score to define malnutrition. BMI was calculated as weight (kg)/height (m²). As the adult patient had a BMI below 18.5 kg/m² and no other diseases, the dietitian defined the patient as malnourished. The screening standard for malnutrition of school-age children and adolescents (WS/T 456—2014) was used for patients aged 6-18 to define malnutrition, and patients aged 0-5 with a Z score less than -2 were defined as malnutrition.

Data statistics and analysis

Data were collected by Excel 2020 and analyzed by SPSS 28.0 software. Categorical variables are expressed as numbers (n) and percentages (%), and chi-square test was used for comparisons between groups. Parametric continuous variables are expressed as mean \pm SD, and nonparametric continuous variables are expressed as median (M) and interquartile range (IQR). The Shapiro-Wilk test was performed to test for normality, the t test was used to compare parametric variables between groups, and the Mann-Whitney U test was used to compare nonparametric variables. For all analyses, $p < 0.05$ was considered statistically significant. Correlation results are shown in the figures and tables.

RESULTS

In 2021, we prescribed 7865 visit records, 41.1% (n=3230) of which were from the offline clinic, 32.5% (n=2558) were from the H2H model, 26.4% (n=2077) were from the online clinic. A total of 627 visit records were excluded, 412 visit records were prescribed with impersonal formula, 215 visit records were prescribed with energy-free formula. Finally, 7238 visit records (3953 patients) were included in the analysis (Figure 1).

Baseline characteristics

The age of the patients ranged from 1 to 115 years, with a median age of 59.0 years (IQR 46.0-72.0) (Table 1). A total of 261 visit records were younger than 18 years old (3.6%), 155 of which were younger than 15 years old. A total of 3561 visit records (49.2%) were older than 60 years, and 3416 (47.2%) were between 18 and 59 years. The incidences were higher in the 55-64, 65-74 and 45-54 age groups, accounting for 20.8% (n=1506), 19.1% (n=1380) and 15.3% (n=1106), respectively. The visit records increased gradually with age under 65 years of age, while it decreased over 65 years of age (Figure 2). The total number of female patients was lower than that of male patients (47.4% vs. 52.6%). The male patients showed a significantly higher median age than the female

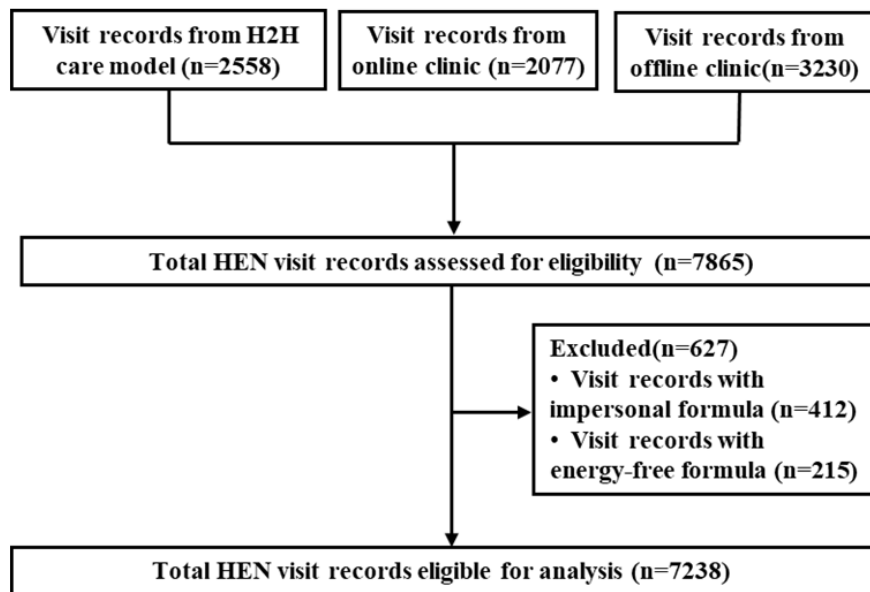


Figure 1. Selection and exclusion process.



Figure 2. Number of visit records in different age range and gender. Y-axis: age ranges (years); X-axis: number of visit records in different gender (n).

patients (60.0 vs. 57.0) (Table 1). A lower percentage of male patients was between 25 and 54 years of age than other age groups, and the lowest percentage of males was in the 35-44 age groups (Figure 2). In terms of residence, patients were from 31 provinces of China, most patients lived in Chengdu (n=4378, 60.5%), followed by patients living in other cities of Sichuan Province (n=2173, 30.0%) and other provinces (n=687, 9.5%) (Table 1). Among the patients from the other 30 provinces, most patients lived in Chongqing (n=123), followed by Tibet (n=113) and Yunnan (n=105). The median BMI was 18.9 kg/m² (IQR 16.7-21.6), and the male patients showed a significantly higher median BMI than female patients (19.3 vs. 18.3) (Table 1).

Oncological disorders were the most common diagnosis (n=2915, 40.3%), followed by digestive disorders (n=1150, 15.9%). In particular, the proportion of males was higher than females among patients with oral and maxillofacial surgery (66.7% vs. 33.3%), which was similar in respiratory disorders (77.1% vs. 22.9%), neurological disorders (59.0% vs. 41.0%), digestive disorders

(51.6% vs. 48.4%), and oncological disorders (59.6% vs. 40.4%). Moreover, the highest percentage of male patients was observed in respiratory disorders (n=246, 77.1%), and highest percent of female patients was observed in psychiatric disorders (n=176, 73.6%). A significant difference was observed in diagnosis between genders ($p < 0.001$) (Table 1).

Regarding the feeding route of EN preparations, 86.2% (n=6236) of patients were prescribed for oral nutritional supplements (ONS) and 13.8% (n=1002) were prescribed for tube feeding (TF), and significant difference was observed in feeding route between genders ($p < 0.001$). The median of daily energy intake and daily protein intake were 575.1 (IQR 384.2-725.8) kcal and 31.2 (IQR 20.8-39.9) g, and the male patients showed significantly higher daily energy intake and daily protein than the female patients ($p < 0.001$) (Table 1). Among the 7238 visit records, 43.0% (n=3110) had EN preparations under 500 kcal, 43.7% (n=3161) had it between 500 and 999.9 kcal, 9.2% (n=663) had it between 1000 and 1499.9 kcal, and 4.2% (n=304) had it more than 1500 kcal (Figure 3). The over-

Table 1. The baseline characteristics

variables	HEN (n=7238) M (IQR) or n (%)	Male (n=3809) M (IQR) or n (%)	Female (n=3429) M (IQR) or n (%)	χ^2/Z	<i>p</i>
Age (years)	59.0 (46.0-72.0)	60.0 (47.0-72.0)	57.0 (43.0-71.0)	-4.8	<0.001
Residence					
Chengdu of Sichuan Province	4378 (60.5%)	2191 (50.0%)	2187 (50.0%)	33.5	<0.001
Other city of Sichuan Province	2173 (30.0%)	1252 (57.6%)	921 (42.4%)		
Other provinces	687 (9.5%)	366 (53.3%)	321 (46.7%)		
BMI (kg/m ²)	18.9 (16.7-21.6)	19.3 (17.1-22.0)	18.3 (16.4-21.1)	-8.7	<0.001
Disease					
Musculoskeletal disorders	93 (1.3%)	36 (38.7%)	57 (61.3%)	387.9	<0.001
Oral and maxillofacial surgery	51 (0.7%)	34 (66.7%)	17 (33.3%)		
Respiratory disorders	319 (4.4%)	246 (77.1%)	73 (22.9%)		
Psychiatric disorders	239 (3.3%)	63 (26.4%)	176 (73.6%)		
Endocrine disorders	188 (2.6%)	69 (36.7%)	119 (63.3%)		
Neurological disorders	520 (7.2%)	307 (59.0%)	213 (41.0%)		
Urological disorders	510 (7%)	249 (48.8%)	261 (51.2%)		
Digestive disorders	1150 (15.9%)	593 (51.6%)	557 (48.4%)		
Cardiovascular disorders	282 (3.9%)	128 (45.4%)	154 (54.6%)		
Malnutrition	598 (8.3%)	173 (28.9%)	425 (71.1%)		
Oncological disorders	2915 (40.3%)	1737 (59.6%)	1178 (40.4%)		
Other disorders	373 (5.2%)	174 (46.6%)	199 (53.4%)		
EN routes					
ONS	6236 (86.2%)	3108 (49.8%)	3128 (50.2%)	140.2	<0.001
TF	1002 (13.8%)	701 (52.6%)	301 (47.4%)		
EN prescription					
Daily energy intake (kcal)	575 (384-726)	576 (401-827)	468 (380-625)	-16.4	<0.001
Daily Protein intake (g)	31.2 (20.8-39.9)	32.1 (22.5-44.1)	25.3 (19.2-34.1)	-16.0	<0.001
Monthly cost (RMB)	1715 (1184-2520)	1823 (1280-2799)	1626 (1115-2154)	-14.4	<0.001

HEN: home enteral nutrition; M: median; IQR: interquartile range; BMI: body mass index; EN: enteral nutrition; ONS: oral nutrition supplement; TF: tube feeding; RMB: renminbi.

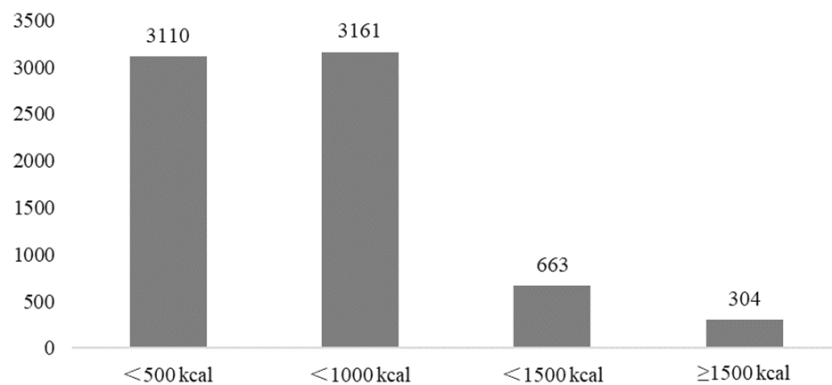


Figure 3. Visit records with energy range. Y-axis: number of visit records; X-axis: energy level range in kcal.

all HEN cost was ¥8420772.2, with a median of ¥922.4 (IQR 523.5-1532.4). The median monthly cost was ¥1714.5 (IQR 1183.5-2520.0), and the male patients showed a significantly higher monthly cost than the female patients (1822.5 vs.1626.0) (Table 1).

Epidemiological characteristics and visit methods

Of the 7238 visit records, 2528 (34.9%) were from the H2H model, 1867 (25.8%) were from the online clinic and 2843 (39.3%) were from the offline clinic. More patients who lived in Chengdu used the offline clinic ($n=1961, 44.8\%$), while more patients who lived in other places used the H2H model. The BMI of patients was different in the three visit methods ($p<0.001$), and patients from the H2H model had a higher BMI (20.2) than others. Most patients from the offline clinic were prescribed ONS routes ($n=2560, 41.1\%$), while most patients from the H2H model were prescribed TF routes ($n=468, 48.5\%$). The diagnosis in the three visit methods were different ($p<0.001$), more patients with malnutrition were from the offline clinic, and more patients with oral and maxillofacial surgery were from the H2H model. Daily energy intake, daily protein intake and monthly cost were higher in patients from the H2H model than others (Table 2).

Epidemiological characteristics and compliance

The revisit rate of HEN patients was 63.6% ($n=4604$). The revisited patients were older than patients who did not return (60.0 vs. 57.0, $p<0.001$). In terms of visit method, most patients from the H2H model did not return ($n=1674, 66.2\%$), and a higher percentage of revisited patients were from the online clinic than the offline clinic (91.9% vs. 71.5%). Most revisited patients lived in Chengdu of Sichuan Province ($n=2949, 67.4\%$). The median BMI of the revisited patients was lower than that of patients who did not return (18.6 vs. 19.5). A higher percentage of revisited patients were prescribed ONS routes ($n=4024, 64.5\%$). The revisit rate was higher in malnutrition patients than in other groups, 69.1% revisited, and 30.9% did not return. The revisited patients have lower daily energy intake and daily protein intake than patients who did not return ($p<0.05$), and the monthly cost in revisited patients were lower than others, but there have no statistically difference (Table 3).

DISCUSSION

This is one of the largest prospective studies to investigate the demographic characteristics of HEN in China. The study found a higher proportion of patients between the ages of 55-64, a lower prevalence in women, majority patients lived in Chengdu, the most common diagnosis was prescribed for oncological disorders, most patients choose ONS as the EN feeding route, a higher proportion of H2H patients, and the lower revisit rate of H2H patients.

We found that the median age of patients in our study was 59.0 years (IQR 46.0-72.0), which is lower than some published studies with median ages of 61 years (IQR 46-75),¹⁵ 71.5 years (IQR 57-83),¹⁴ 71 years (IQR 57-82)¹⁶ and 79 years (IQR 87).¹⁷ The proportion of elderly patients (60 years and older) was 49.2%, apparently lower than the published study.¹⁷ Some HEN studies concluded a higher proportion of males.^{1,15,18} Our study confirms these findings and further establishes an association between age and sex, with a higher proportion of females between 25 and 54 years of age. However, our findings differ from those of the Swiss study and the San Diego study, which found a lower proportion of males (49.1% and 41.3%).^{17,19}

The previous studies concluded that the predominant disease in HEN patients was oncological disease,^{15,19} and our study supports this conclusion, with oncology being the most commonly diagnosis. However, different results were found in Poland,¹ Brazil,²⁰ Spain,^{13,14,17,18,21,22} where neurological disease was the predominant disease. In our sample, the prevalence of neurological disorders was 7.2%, a rate slightly lower than the recent study in China,¹⁵ but significantly lower than many studies in Europe, South America, and Spain, where the rates were 54.5%,¹ 46.4%,²⁰ and 71.6%.²² The main reason may be the high cost of nutritional preparations. Many Chinese families with neurological disorders complaints that the HEN preparations is important but being too expensive, they have to choose the cheap homemade stirred tube feeding. However, long time and single feeding of homemade stirred liquid will lead to malnutrition, because the nutrient density of it is much lower than EN preparations. An international survey in 22 European countries point out the reimbursement for EN seemed to be the key factor of effective campaign against malnutrition.²³ We also found that the median monthly

Table 2. The epidemiological characteristics and visit methods

variables	H2H (n=2528) M (IQR) or n (%)	Online clinic (n=1867) M (IQR) or n (%)	Offline clinic (n=2843) M (IQR) or n (%)	χ^2/H	<i>P</i>
Age (years)	58.0 (47.0-70.0)	58.0 (38.0-71.0)	60.0 (46.0-73.0)	10.9	0.004
Gender					
Male	1432 (37.6%)	967 (25.4%)	1410 (37%)	27.4	<0.001
Female	1096 (32.0%)	900 (26.2%)	1433 (41.8%)		
Residence					
Chengdu of Sichuan Province	1369 (31.3%)	1048 (23.9%)	1961 (44.8%)	143.9	<0.001
Other city of Sichuan Province	872 (40.1%)	621 (28.6%)	680 (31.3%)		
Other provinces	287 (41.8%)	198 (28.8%)	202 (29.4%)		
BMI (kg/m ²)	20.2 (17.3-22.9)	18.4 (16.4-20.9)	18.4 (16.5-20.8)	204.6	<0.001
EN routes					
ONS	2042 (32.7%)	1634 (26.2%)	2560 (41.1%)	100.3	<0.001
TF	486 (48.5%)	233 (23.3%)	283 (28.2%)		
Disease					
Musculoskeletal disorders	53 (57.0%)	18 (19.4%)	22 (23.7%)	514.4	<0.001
Oral and maxillofacial surgery	42 (82.4%)	5 (9.8%)	4 (7.8%)		
Respiratory disorders	141 (44.2%)	84 (26.3%)	94 (29.5%)		
Psychiatric disorders	110 (46%)	48 (20.1%)	81 (33.9%)		
Endocrine disorders	57 (30.3%)	45 (23.9%)	86 (45.7%)		
Neurological disorders	241 (46.3%)	138 (26.5%)	141 (27.1%)		
Urological disorders	206 (40.4%)	124 (24.3%)	180 (35.3%)		
Digestive disorders	354 (30.8%)	361 (31.4%)	435 (37.8%)		
Cardiovascular disorders	113 (40.1%)	62 (22.0%)	107 (37.9%)		
Malnutrition	1 (0.2%)	220 (36.8%)	377 (63%)		
Oncological disorders	1092 (37.5%)	656 (22.5%)	1167 (40%)		
Other disorders	118 (31.6%)	106 (28.4%)	149 (39.9%)		
EN prescription					
Daily energy intake (kcal)	602 (488-812)	575 (384-800)	406.2 (271-602)	650.8	<0.001
Daily protein intake (g)	33.8 (25.6-43.5)	31.2 (21.1-43.2)	22.9 (14.6-34.4)	574.9	<0.001
Monthly cost (RMB)	1864 (1545-2758)	1761 (1251-2760)	1482 (1047-2021)	517.6	<0.001

H2H: hospital to home; M: median; IQR: interquartile range; BMI: body mass index; EN: enteral nutrition; ONS: oral nutrition supplement; TF: tube feeding; RMB: renminbi.

Table 3. The epidemiological characteristics and compliance

variables	One visit (n=2634) M (IQR) or n (%)	Revisit (n=4604) M (IQR) or n (%)	χ^2/Z	<i>p</i>
Age (years)	57.0 (43.0-69.0)	60.0 (46.0-73.0)	-6.5	<0.001
Gender				
Male	1427 (37.5%)	2382 (62.5%)	4.0	0.046
Female	2634 (36.4%)	4604 (63.6%)		
Visit method				
H2H model	1674 (66.2%)	854 (33.8%)	1685.0	<0.001
online clinic	151 (8.1%)	1716 (91.9%)		
offline clinic	809 (28.5%)	2034 (71.5%)		
Residence				
Chengdu of Sichuan Province	1429 (32.6%)	2949 (67.4%)	67.6	<0.001
Other city of Sichuan Province	910 (41.9%)	1263 (58.1%)		
Other provinces	295 (42.9%)	392 (57.1%)		
BMI (kg/m ²)	19.5 (17.0-22.4)	18.6 (16.6-21.1)	-8.1	<0.001
EN routes				
ONS	2212 (35.5%)	4024 (64.5%)	16.5	<0.001
TF	422 (42.1%)	580 (57.9%)		
Disease				
Musculoskeletal disorders	59 (63.4%)	34 (36.6%)	122.3	<0.001
Oral and maxillofacial surgery	44 (86.3%)	7 (13.7%)		
Respiratory disorders	106 (33.2%)	213 (66.8%)		
Psychiatric disorders	93 (38.9%)	146 (61.1%)		
Endocrine disorders	61 (32.4%)	127 (67.6%)		
Neurological disorders	212 (40.8%)	308 (59.2%)		
Urological disorders	195 (38.2%)	315 (61.8%)		
Digestive disorders	369 (32.1%)	781 (67.9%)		
Cardiovascular disorders	113 (40.1%)	169 (59.9%)		
Malnutrition	185 (30.9%)	413 (69.1%)		
Oncological disorders	1032 (35.4%)	1883 (64.6%)		
Other disorders	165 (44.2%)	208 (55.8%)		
EN prescription				
Daily energy intake (kcal)	575 (384-725)	552.7 (383-722)	-3.1	0.002
Daily protein intake (g)	31.2 (20.8-38.9)	30.0 (20.8-38.9)	-2.5	0.011
Monthly cost (RMB)	1715 (1227-2520)	1706 (1155-2493)	-1.8	0.067

M: median; IQR: interquartile range; H2H: hospital to home; BMI: body mass index; EN: enteral nutrition; ONS: oral nutrition supplement; TF: tube feeding; RMB: renminbi.

cost of H2H patients (¥ 1863.8) was higher than the total median monthly cost (¥ 1714.5), and the revisit rate of H2H patients (33.8%) is lower than online clinic patients (91.9%) and offline clinic patients (71.5%), illustrating the cost may reduce the revisit rate. Different from China, almost all states in the USA and many other countries in Europe have already provided reimbursement for HEN cost, and medical insurance has been the majority HEN insurance payer.^{11,24} Given the growing demand of HEN, we believe that the HEN's reimbursement in China is a meaningful policy, will be helpful to reduce the HEN economic burden and increase revisit rate of HEN patients.

The COVID-19 pandemic has brought on difficulty to the HEN practice, and patients need to be isolated at residence to reduce the risk of COVID-19 pandemic from 2020. Interestingly, the visit records of our department have increased obviously, from 3375 in 2018 to 7238 in 2021, and previous work has concluded that a high proportion of H2H patients are composed of sources (49.5%).¹⁵ Our study found that the percentage of H2H patients fall to 34.9% and further defines percentage of the online clinic patients reach to 25.8%. Furthermore, 63.6% patients were revisited, and the revisit rate of online clinic, offline clinic and H2H was increasingly lower (91.9%, 71.5%, 33.8%), revealing that the online

clinic improving the visit rate and revisit rate of HEN. We found that the HEN patients were from 31 provinces of China, most patients lived in Chengdu (60.5%), most Chengdu patients were from the offline clinic (44.8%), most patients lived in other provinces were from the H2H model (41.8%). We also found that most patients from Chengdu were revisited (67.4%), followed by patients from other city of Sichuan province (58.1%), and patients from other provinces (57.1%), illustrating that distance may be the key factor to determine the method of visit and revisit in HEN patients. While the difficulty of long-distance medical treatment can be solved through online clinics. Based on the above results, we speculate that the HEN online clinic of our department established at the end of 2020 have increased the convenience of HEN prescription.

Our study has several limitations. On the one hand, it is a single-center analysis with design limitations such as selection bias that is not representative of the entire Chengdu population or the Chinese population, and a multi-center HEN organization should be established to avoid selection bias. On the other hand, there is a lack of data related to intervention effects, such as laboratory values, quality of life, complications and mortality, which is due to time-consuming data collection and limited staffing of our team, and a more complete data collection

procedure will be implemented next year to facilitate data collection.

Conclusion

This large cross-sectional study shows that distance, cost and convenience may be the key factors to determine the method of visit and revisit in HEN patients. Online clinic can increase the HEN convenience of patients, may enhance the revisit rate of patients. A reimbursement mechanism for HEN agents should be established to reduce the financial pressure of patients, increase the revisit rate of HEN, and decrease the incidence of malnutrition.

AUTHOR DISCLOSURES

The authors declare no conflict of interest.

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