Original Article

Effect of the hospital-community-family (HCF) nutritional management on patients with esophageal and head and neck cancers undergoing radiotherapy: a randomized control trial

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Background: Malnutrition is particularly common in patients undergoing radiotherapy for head and neck cancers (HNC) and esophageal cancers (EC). Proper nutritional management plays an important role in improving the nutritional status and reducing complications in patients undergoing radiotherapy for malignancy. With most nutrition studies limited to the nutritional management of patients during hospitalization or after discharge, there is a lack of research evidence on the nutritional management of patients in combination with out-of-hospital. The aim of this study was to evaluate the effect of the hospital-community-family (HCF) nutritional management model on nutritional status and radiotherapy complications in EC and HNC radiotherapy patients.

Methods: Between October 2019 and October 2021, a total of 116 EC and HNC radiotherapy patients were randomized into control group (conventional nutritional support) and experimental group (HCF-model nutritional management), and assessed weekly for 3 months. The primary endpoint was the patient's Nutrition Risk Screening 2002 (NRS2002) score, Scored Patient-Generated Subjective Global Assessment (PG-SGA), weight change, and Eastern Cooperative Oncology Group (ECOG) score from baseline level to 3 months after the end of treatment. The secondary endpoints were the incidence of albumin, hemoglobin, hematological parameters, and radiotherapy complications.

Results: A total of 95 patients (47 in the control group and 48 in the experimental group) completed the study. At 3 months after treatment, NRS2002 (P=0.028) and PG-SGA (P=0.022) decreased, and albumin was higher (P=0.001) than at the beginning of treatment in HCF group. Weight decreased (P<0.001) and PG-SGA was higher after 3 months of treatment (P=0.012) in the control group. PG-SGA (P<0.001), NRS2002 (P<0.001), and ECOG (P=0.006) in the HCF group at the end of the 3-month treatment period were lower in the conventional group (P<0.05). The incidence of radiation mucositis (P=0.018)and radiation dermatitis (P=0.028) in the HCF nutrition management group was significantly reduced (P<0.05).

Conclusions: HCF-model nutritional management significantly improved the nutritional status and reduced the incidence and severity of radiation mucositis and dermatitis for EC and HNC radiotherapy patients. These findings suggest that HCF-model nutritional management is a promising nutritional management model.

Trial Registration: Chinese Clinical Trial Registry identifier: ChiCTR2300068399.

Keywords: Hospital-community-family model of nutritional management (HCF model of nutritional management); esophageal cancer; head and neck cancer (HNC); nutrition; Scored Patient-Generated Subjective Global Assessment (PG-SGA)

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Introduction

According to GLOBOCAN 2022 data (1), there were 544,000 esophageal cancer-related deaths worldwide in 2020, accounting for 5.5% of all malignant tumor deaths. Esophageal squamous cell carcinoma is a common histological type in Asia (2), and the 5-year survival rate in China is only 20.9% (3). Head and neck cancer is a general term for various types of tumors originating from the lining epithelium of the upper respiratory tract and upper gastrointestinal tract, and head and neck, of which squamous cell carcinoma is the main pathological type. Radiotherapy + chemotherapy is the main treatment method for esophageal cancer and head and neck cancer, and can significantly improve the prognosis of patients. However, it was reported that 94.7% of cases of head and neck cancer and 94.7% of newly treated patients with esophageal cancer require nutritional intervention (4,5). Radiotherapy causes local complications, such as inflammation, pain, and other adverse reactions, and reduced patient tolerance to radiotherapy, resulting in prolonged hospital stay (6). Malnutrition can affect the quality of life and treatment outcome of cancer patients with prolonged hospital stay, resulting in poor compliance with antitumor therapy, reduced tolerance to anticancer therapy, and the inability to complete treatment (7), which can be life-threatening. Active nutritional support, such as nutritional counseling, enteral nutrition (8), and exercise intervention (9), can promote the nutritional status and prognosis of patients.

Malnutrition rates are high, but it is often overlooked by patients, their families, and even doctors (10). Prevalence of malnutrition in family members and patient population is 22% and 23% respectively, while the actual incidence of malnutrition in patients was 39% (11).

The European Society for Clinical Nutrition and Metabolism (ESPEN) has suggested the following for the nutritional management of cancer patients: (I) nutritional risk screening should be performed early in the treatment process of cancer patients; (II) make individualized nutrition plan for patients in time; and (III) comprehensive nutritional interventions to improve the nutritional status of patients (12). At present, the nutrition research of patients with esophageal cancer and head and neck cancer is mainly based on in-hospital nutrition. For example, several studies have found that the addition of oral nutritional supplements or the use of a total nutritional management model during hospitalization for patients undergoing radiotherapy for esophageal cancer is effective in improving the nutritional status of them (13,14). Moreover, early nutritional interventions for patients undergoing radiotherapy for head and neck tumors during hospitalization could also improve the nutritional status of patients and reduce the adverse effects caused by radiotherapy (15,16). Notably, the nutritional needs of patients during and after radiotherapy are much greater than expected, which puts many patients at increased risk of malnutrition after discharge from the hospital (17). Therefore, it is necessary to find a nutritional management model that intervenes both inside and outside the hospital.

The hospital-community-family (HCF) model of nutritional management refers to the establishment of a nutrition team to provide nutritional management for patients outside the hospital, especially in the community, from the start to the end of treatment. The hospital will establish a nutrition team to maintain the stability of the

Highlight box

Key findings

- The HCF nutritional management model not only significantly improves the nutritional status of patients treated with radiotherapy for esophageal and head and neck cancers, but also reduces the complications associated with radiotherapy.

What is known and what is new?

- Effective nutritional interventions can improve the nutritional status of patients with esophageal cancer and head and neck tumors receiving radiotherapy;
- The role of the HCF nutritional management model for patients with esophageal cancer and head and neck tumors treated with radiotherapy remains unclear.

What is the implication, and what should change now?

- The HCF-model nutritional management is a promising and scalable nutritional management model for patients with esophageal and head and neck malignancies treated with radiotherapy. Next, the HCF nutritional management model needs to be further practiced for cancer patients with different cancer types and different treatment patterns.

body's internal environment, carry out individualized and refined nutrition management according to the patient's condition, and promote the development of scientific research. The community is the primary way for hospitals and families to connect, and is also a place to provide nutrition counseling and education, establish nutrition management plan, conduct regular nutrition assessments, provide individualized nutrition interventions, and maintain tube feeding when necessary. Family refers to the self-nutrition management of patients and their family members. The 3 roles are interconnected, and jointly manage the nutrition of cancer patients (18). Currently, the HCF nutritional management model has proven to be a promising management model in patients with chronic heart failure and hypertension (19,20). In addition, the HCF nutritional management model can improve the postoperative nutritional status of patients undergoing surgery for gastric cancer (18), but whether it can improve the nutritional status of cancer patients undergoing radiotherapy has not been studied.

The purpose of this study was to investigate the effect of a novel HCF nutritional management model on the nutritional status of esophageal and head and neck cancer patients receiving radiotherapy compared with the conventional nutritional management model. We hypothesized that the HCF model could improve the nutritional status of patients. We present the following article in accordance with the CONSORT reporting checklist (available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-2785/rc).

Methods

This is a randomized controlled trial. Patients with esophageal and head and neck cancers who received radiotherapy at the Oncology Radiotherapy Center of the Affiliated People's Hospital of Ningbo University, Zhejiang Province, China, between October 2019 and October 2021 were recruited for this trial. In this double-parallel study we numbered the patients according to their order of admission, and we randomly assigned them to the control group (conventional nutritional support) and experimental group (HCF-model nutritional management) in a 1:1 ratio by random selection of the numbers. As recommended by National Comprehensive Cancer Network (NCCN) guidelines, both groups of patients received intensity-modulated radiotherapy. Patients with head and neck malignant tumors were treated with radiotherapy to the primary tumor of the head and neck + positive lymph nodes + high-risk lymph node drainage area ± low-risk lymph node drainage area. The radiotherapy regimen was 2 Gy/day, 5 times/week, dose of target (DT) 50–70 Gy/5–7 weeks. Patients with esophageal cancer were treated with radiotherapy to the primary tumor and positive lymph nodes + high-risk lymph node drainage area. The radiotherapy regimen was 2 Gy/day, 5 times/week, DT 40–60 Gy/4–6 weeks. In this study, we used the patients' NRS2002 score, Scored Patient-Generated Subjective Global Assessment (PG-SGA) score, weight change and ECOG score as primary endpoints, and the incidence of albumin, hemoglobin, hematological parameters and radiotherapy complications as secondary endpoints. The patient's nutritional status will be evaluated by professional follow-up staff on a weekly basis for the next three months. The study was approved by the Ethics Review Committee of the Affiliated People's Hospital of Ningbo University (No. 2021-081), and was conducted in accordance with the Declaration of Helsinki (revised in 2013). Informed consent was obtained from all patients.

Standards

The inclusion criteria were as follows: (I) patients with esophageal and head and neck malignant tumors diagnosed by pathology or cytology; (II) physical condition [Eastern Cooperative Oncology Group (ECOG)] score 0–2; (III) 18–80 years of age; (IV) patients receiving radiotherapy; and (V) no obvious abnormalities in liver and kidney function. The exclusion criteria were as follows: (I) patients with mental illness and patients who were unconscious and unable to communicate verbally; (II) severe organic or functional lesions of the liver, kidney, heart, brain, and other organs; (III) patients with contraindications in enteral nutrition; (IV) patients who could not undergo radiotherapy; and (V) patients with impaired amino acid/fat metabolism.

Data collection

The following data were collected at the time of participant enrolment: sex, age, tumor type, clinical stage, smoking and alcohol history, American Joint Committee on Cancer (AJCC) stage, treatment, ECOG, PG-SGA, nutritional risk screening 2002 (NRS2002), weight loss, adverse reactions to radiotherapy, white blood cells, neutrophils, lymphocytes, hemoglobin, platelets, albumin, and prealbumin.

PG-SGA

PG-SGA is a nutritional status score for cancer patients, including patient self-reported sections (weight, dietary status, symptoms, activity, physical function) and medical staff evaluation sections (nutrition-related disease status, metabolic status, physical examination) (21). A score of 0–1 requires no nutritional intervention, and a score of 2–3 requires nutrition education and guidance, and drug intervention if necessary. Patients with a treatment score of 4–8 require nutritional intervention and clinical symptom management, and patients with a score of ≥9 should receive active nutritional intervention before antitumor treatment, and then receive antitumor treatment after nutritional improvement.

NRS2002

NRS2002 was performed within 24 hours of the patient's admission and mainly included the following 3 aspects: nutrition score (0–3 points), disease score (0–3 points), and age score (≥70 years, 1 point; <70 years, 0 point) (22). Patients with a score of ≥3 are at nutritional risk and should start nutritional therapy. Scores <3 can be considered of no nutritional risk, but weekly screening is still required.

Adverse reactions to radiotherapy

Side-effects of radiotherapy

According to the Radiation Therapy Oncology Group (RTOG) grading standard (23), the side-effects of radiotherapy were recorded, including radiation esophagitis, radiation pneumonitis, radiation mucositis, and radiation dermatitis.

Procedure

Implementation process of the HCF model nutrition group (experimental group)

The experimental group was followed up by a professional nutrition team, including professional nutritionists, doctors (including community doctors), and nurses. At the beginning of radiotherapy, the researcher recorded observation metrics for the enrolled patients every week. When the patient's NRS2002 score was ≥3, individualized nutritional interventions were performed according to the PG-SGA. After the patient was discharged from hospital (on completion of radiotherapy), the researcher contacted the patient's local community doctor who was managing and supervising the patient's nutrition. The community doctor recorded observation metric scores every week, and carried out nutritional management according to the PG-SGA results. Nutritional self-management was performed outside the hospital by patients and their families at home until 3 months after the end of treatment.

Nutrition implementation process of patients in the conventional mode nutrition management group (control group)

Patients in the control group received routine nutritional management. The researcher recorded observation metrics for the enrolled patients every week.

Nutritional interventions

A nutritional intervention plan was formulated based on ESPEN guidelines (12) and individual nutritional needs and clinical symptoms.

Nutritional intake

Based on daily target nutritional intake (including daily diet and parenteral nutrition support), calories were 25–30 kcal/kg standard body weight, and protein content was 1.2–1.5 g/kg/day. If the patient had serious treatment complications, the recommended energy was 30–35 kcal/kg/day and the energy ratio of protein and fat was adjusted according to the needs of patients.

Nutritional support methods

The nutritional intervention methods for patients vary, including oral nutritional preparations (Ruineng or Nengquanli), enteral nutrition, partial parenteral nutrition, total parenteral nutrition. The patients chose the most appropriate way to meet their needs. If there was intolerance to nutrient solution, the dose could be reduced or even discontinued.

Data analysis

We coordinator selected patients with a new pathological diagnosis and managed the collected data to limit selection bias. According to our historical data obtained from retrospective studies (unpublished), the data obtained for each subgroup sample should be at least 48 based on a

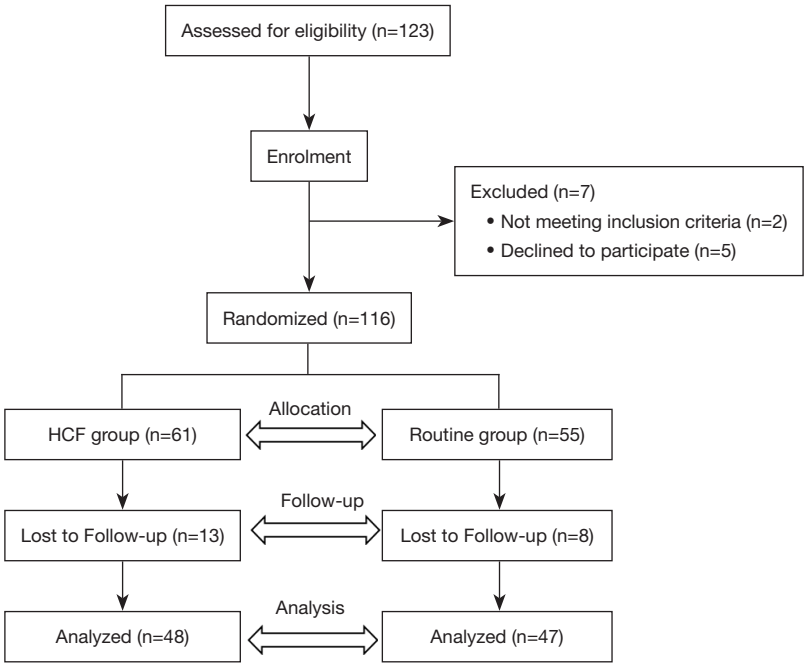

Figure 1 Study flow diagram. HCF, hospital-community-family.

statistical power of 80% and a bilateral type I error of 5%, and at least 116 patients should be enrolled in the study based on a 20% is the lost-to-review rate. A P value less than 0.05 was considered statistically significant.

Statistical analysis

In this study, frequencies, percentages, means and standard deviations, and medians and interquartile ranges were used to describe the variables. Chi-square tests were used to compare categorical variables. Fisher's exact test was used if there was a low frequency of <5 for the cell count, Student's *t*-test was used to compare normally distributed continuous variables, and Wilcox rank-sum tests were used to compare non-normally distributed continuous variables. SPSS version 26.0 (IBM, Armonk, NY, USA) was used for the statistical analysis, and P<0.05 indicated statistical significance.

Results

Patient baseline conditions

According to the inclusion and exclusion criteria, a total of 116 patients were included in the study in November 2021 and we ended follow-up in February 2022. As shown in *Figure 1*, a total of 61 patients were included in the experimental group. Two patients discontinued their radiotherapy halfway through treatment, 1 patient did not complete the study due to respiratory failure, and 10 patients were lost to follow-up due to failure to follow-up in time. A total of 55 patients were included in the control group. One patient did not complete the entire study due to respiratory failure and cardiac arrest, and 7 were lost to follow-up due to failure to follow-up in time. As shown in *Table 1*, the baseline characteristics of the 48 patients in the experimental group were similar to those of the 47 patients in the control group, and there was no statistical difference in the baseline characteristics between the 2 groups.

Observations of change after treatment

At the end of the 3 months of treatment, the body weight of the control group was significantly lower than that before treatment (P<0.05), and the PG-SGA was higher than that before treatment (P=0.012) (*Table 2*).

After 3 months of treatment, albumin in HCF group increased (P=0.001), NRS2002 decreased (P=0.028), and PG-SGA decreased (P=0.022) (*Table 3*).

Table 1 Comparison of baseline between the HCF group and the routine group

Variables	Routine group (n=47)	HCF group (n=48)	P value
Sex[a]			0.770[d]
Male	33 (70.21)	35 (72.92)	
Female	14 (29.79)	13 (27.08)	
Age[a]			0.615[d]
<60 years	19 (40.43)	17 (35.42)	
≥60 years	28 (59.57)	31 (64.58)	
Smoker[a]			0.092[d]
No	28 (59.57)	28 (58.33)	
Yes	19 (40.43)	20 (41.67)	
Alcohol consumption[a]			0.888[d]
No	31 (65.96)	31 (64.58)	
Yes	16 (34.04)	17 (35.42)	
Cancer[a]			0.930[d]
Head and neck cancer	27 (56.25)	28 (58.33)	
Esophageal cancer	21 (43.75)	20 (41.67)	
Esophageal cancer tumor site[a]			0.405[d]
Upper section	4 (20.00)	2 (10.00)	
Middle section	9 (45.00)	7 (35.00)	
Lower paragraph	7 (35.00)	11 (55.00)	
AJCC stage[a]			0.887[d]
I	7 (14.89)	6 (12.50)	
II	7 (14.89)	5 (10.42)	
III	21 (44.68)	24 (50.00)	
IV	12 (25.54)	13 (27.08)	
Treatment[a]			
Induction chemotherapy	17 (36.17)	17 (35.42)	0.939[d]
Concurrent chemoradiotherapy	20 (42.55)	19 (39.58)	0.769[d]
Radical radiotherapy	28 (59.57)	29 (60.42)	0.933[d]
Postoperative radiotherapy	10 (21.28)	11 (22.92)	0.847[d]
Weight (kg)[b]	60.35±11.15	62.94±11.25	0.263[e]
Albumin (g/L)[b]	39.59±5.13	40.40±3.75	0.376[e]
Neutrophils ($\times10^9$/L)[b]	3.79±2.69	3.64±1.81	0.702[e]
Prealbumin (g/L)[b]	250.89±76.45	260.46±70.91	0.499[e]
Lymphocytes ($\times10^9$/L)[b]	1.21±0.51	1.25±0.54	0.708[e]
Leukocyte ($\times10^9$/L)[b]	5.69±2.84	5.54±2.09	0.770[e]

Table 1 (*continued*)

Table 1 (*continued*)

Variables	Routine group (n=47)	HCF group (n=48)	P value
Hemoglobin (g/L)[b]	119.17±18.47	125.77±15.97	0.065[e]
Platelets ($\times10^9$/L)[b]	224.11±84.99	228.79±73.76	0.775[e]
ECOG score[a]			0.709[d]
0 point	10 (21.28)	12 (25.00)	
1 point	32 (68.08)	33 (68.75)	
2 points	5 (10.64)	3 (6.25)	
NRS2002[c]	2 [2]	2 [2]	0.481[f]
PG-SGA[c]	4 [3]	4 [4]	0.880[f]

[a], categorical variables are presented as numbers (%); [b], data are presented as the mean ± standard deviation; [c], data are presented as the median [interquartile range]; [d], Pearson chi-square test for categorical data was used; [e], two independent sample t-tests for numeric variables data were used; [f], Wilcoxon signed-rank test for ordinal variables data was used. AJCC, American Joint Committee on Cancer; ECOG, Eastern Cooperative Oncology Group; HCF, hospital-community-family; NRS2002, nutritional risk screening 2002; PG-SGA, Scored Patient-Generated Subjective Global Assessment.

Table 2 Comparison of routine management before treatment and 3 months after treatment

Variables	Before therapy	Three months after treatment	P value
Hemoglobin (g/L)[a]	119.17±18.47	120.66±16.48	0.562
Prealbumin (g/L)[a]	250.89±76.45	232.87±72.60	0.057
Weight (kg)[d]	58.70 (15.70)	55.00 (14.00)	<0.001*
Albumin (g/L)[d]	40.60 (6.10)	40.20 (7.90)	0.882
NRS2002 score[d]	2 [2]	2 [2]	0.192[b]
PG-SGA[d]	4 [3]	5 [4]	0.012*[b]
ECOG score, n (%)			0.144[c]
0 point	10 (21.28)	7 (14.89)	
1 point	32 (68.09)	27 (57.45)	
2 points	5 (10.64)	12 (25.53)	
3 points	0 (0.00)	1 (2.13)	

Two independent sample *t*-tests for numeric variables data were used unless otherwise stated. *, P<0.05; [a], continuous variables are presented as mean ± standard deviation; [b], Wilcoxon signed-rank test for ordinal variables data was used; [c], Pearson chi-square test for categorical data was used; [d], data are presented as the median [interquartile range]. ECOG, Eastern Cooperative Oncology Group; NRS2002, nutritional risk screening 2002; PG-SGA, Scored Patient-Generated Subjective Global Assessment.

Observation after 3 months of radiotherapy

After 3 months of treatment, hemoglobin (P=0.013), prealbumin (P=0.046), and albumin (P=0.001) of the HCF group were higher than those in the control group, and weight loss (P=0.024), PG-SGA, NRS2002 score, and ECOG score were lower than those in the control group (P<0.05) (*Table 4*).

Observation of adverse reactions of radiotherapy

Analysis of the side-effects of radiotherapy in the HCF group and the control group during treatment showed that the degree of radiation mucositis and radiation dermatitis in

Table 3 Comparison of hospital-community-family model before treatment and 3 months after treatment

Variables	Before therapy	Three months after treatment	P value
Albumin (g/L)[a]	40.40±3.75	42.37±3.68	0.001*
Hemoglobin (g/L)[a]	125.77±15.97	129.08±15.95	0.167
Weight (kg)[a]	62.94±11.25	62.17±10.25	0.418
Prealbumin (g/L)[d]	267.30 (93.8)	262.15 (80.05)	0.943
NRS2002 score[d]	2 [2]	1 [1]	0.028*[b]
PG-SGA[d]	4 [4]	3 [2]	0.022*[b]
ECOG, n (%)			0.216[c]
0 point	12 (25.00)	20 (41.67)	
1 point	33 (68.75)	24 (50.00)	
2 points	3 (6.25)	4 (8.33)	

Two independent sample *t*-tests for numeric variables data were used unless otherwise stated. *, P<0.05; [a], continuous variables are presented as mean ± standard deviation; [b], Wilcoxon signed-rank test for ordinal variables data was used; [c], Pearson chi-square test for categorical data was used; [d], data are presented as the median [interquartile range]. ECOG, Eastern Cooperative Oncology Group; NRS2002, nutritional risk screening 2002; PG-SGA, Scored Patient-Generated Subjective Global Assessment.

Table 4 Comparison of routine group and HCF group at the end of 3 months of treatment

Variables	Routine group (n=47)	HCF group (n=48)	P value
Weight loss (kg)[a]	2.77±4.73	0.78±3.65	0.024*
Albumin (g/L)[a]	39.27±5.37	42.37±3.68	0.001*
Neutrophils ($\times10^9$/L)[a]	4.04±2.62	3.49±1.70	0.228
Prealbumin (g/L)[a]	232.87±72.60	263.03±72.66	0.046*
Lymphocytes ($\times10^9$/L)[a]	0.84±0.37	0.93±0.51	0.359
Leukocyte ($\times10^9$/L)[a]	5.49±2.76	4.98±1.83	0.295
Hemoglobin (g/L)[a]	120.67±16.48	129.08±15.95	0.013*
Platelets ($\times10^9$/L)[a]	203.28±83.16	207.00±59.46	0.802
NRS2002 score[d]	2 [2]	1 [1]	<0.001*[b]
PG-SGA[d]	5 [4]	3 [2]	<0.001*[b]
ECOG score, n (%)			0.006*[c]
0 point	7 (14.89)	20 (41.97)	
1 point	27 (57.45)	24 (50.00)	
2 points	12 (25.53)	4 (8.33)	
3 points	1 (2.13)	0 (0.00)	

Two independent sample *t*-tests for numeric variables data were used unless otherwise stated. *, P<0.05; [a], continuous variables are presented as mean ± standard deviation; [b], Wilcoxon signed-rank test for ordinal variables data was used; [c], Pearson chi-square test for categorical data was used; [d], data are presented as the median [interquartile range]. HCF, hospital-community-family; ECOG, Eastern Cooperative Oncology Group; NRS2002, nutritional risk screening 2002; PG-SGA, Scored Patient-Generated Subjective Global Assessment.

Table 5 Observation of adverse reactions of radiotherapy

Adverse reactions	Routine group (n=47)	HCF group (n=48)	P value
Radiation mucositis			0.018*
Level 0–I	17	29	
Level II–III	30	19	
Radiation dermatitis			
Level 0–I	24	35	0.028*
Radiation pneumonitis			0.975
Level 0	43	44	
Level 1	4	4	
Radiation esophagitis			0.340
Level 0–I	39	36	
Level II–III	8	12	

*, P<0.05. Pearson chi-square test for categorical data was used. HCF, hospital-community-family.

the HCF group were less severe compared with those in the control group (P<0.05) (*Table 5*).

Discussion

The prevalence of malnutrition is high among older adults living in the community, especially cancer patients. Benchmarking and routine screening of older patients could help raise awareness of malnutrition risk (24). At present, attention is focused on the nutritional management of cancer patients in the hospital, and there is little mention of community nutrition management. Recent literature has found that exercise rehabilitation and nutritional management of cancer patients in the community can improve the patient's mood (25,26). In one study, after jejunostomy and 6 weeks of home enteral feeding in patients with postoperative gastrointestinal tumors, patients' physical function and grip strength were significantly improved (27). However, analysis of the HCF model of nutritional management for tumor patients undergoing radiotherapy is currently limited. To the best of our knowledge, this is the first study to explore the effect of the HCF model of nutritional management for esophageal and head and neck cancer patients undergoing radiotherapy from the start of treatment to 3 months after the end of treatment. The findings indicated that HCF can improve the nutritional status of the patients and reduce the occurrence of radiotherapy side-effects. This finding has important clinical implications for HCF-style nutritional management to improve nutritional status and treatment tolerance in esophageal and head and neck cancer patients.

Nutritional management in the HCF model refers to the management of patients in community hospitals from the start of treatment after admission to the end of treatment and self-nutritional management at home. HCF aims to mobilize the large group of rural doctors to participate in the nutritional management, establish a county-township-village integrated nutrition management system for cancer patients. HCF can achieve standardized management and treatment of tumor nutrition, improve the efficiency and level of nutrition monitoring and management, and promote the equalization and standardization of family nutrition prevention and treatment services for cancer patients (18).

The ESPEN guidelines recommend NRS2002 as the diagnostic criteria for nutritional risk, which incorporate the severity of the patient's disease and impaired nutritional status, and is assessed according to the patient's condition (28). And the table is short content, low price, high sensitivity and high specificity (29). Therefore, this study applied the NRS2002 Nutritional Risk Screening Form for nutritional risk screening. In this study, at 3 months after the end of the treatment, the NRS2002 in the HCF group was lower than the beginning of treatment. Also, in the HCF group it was significantly reduced compared with the control group, and the nutritional risk of the patients who underwent the HCF model of nutrition management was significantly reduced.

PG-SGA is lightweight and convenience to evaluate the nutritional status of patients from multiple perspectives. It is currently widely used in the clinical setting to assess the nutritional status of cancer patients (21). In this study, PG-SGA was used as the main observation index. In the control group, PG-SGA increased in 3 months after radiotherapy compared with before radiotherapy. After applying of the HCF model of nutrition management, the PG-SGA of the HCF group decreased at 3 months after treatment than before treatment, and the HCF model of nutritional status was significantly improved compared with the control group.

Weight loss is a common manifestation of malnutrition. An analysis of nutritional status after chemotherapy in 3,047 patients found that 54% of cancer patients had weight loss before treatment, and those who lost weight were significantly more likely to have reduced median survival time than those who had not lost weight (30). In this study, the weight of patients in the control group decreased significantly compared with before treatment in HCF group, while the body weight did not change compared with that before treatment in HCF group. At 3 months after the end of treatment, patients in the HCF group lost less weight than those in the control group, demonstrating that the HCF model of nutritional management can alleviate weight loss and improve malnutrition in patients undergoing radiotherapy.

Albumin plays an important role in plasma protein, and does not only maintain important physiological functions, such as plasma colloid osmotic pressure and transport, it can also improve the tolerance of enteral nutrition (31). It is believed that albumin and prealbumin can be used as biomarkers for malnutrition in patients in the absence of infection (32). The findings of the present study indicated that albumin in the HCF group was higher than in 3 months after radiotherapy, while in the control group it was not discovered. Albumin and prealbumin levels in the HCF group was significantly higher than those in the routine group.

The ECOG score is an independent factor affecting the quality of life of patients (33). The performance status is significantly correlated with the patient's performance status, fatigue, and anorexia. The findings of the present study indicated that the level of ECOG score in control group increased in 3 months after treatment, while the ECOG in HCF group decreased. At 3 months after radiotherapy, the ECOG score in the HCF group was significantly lower than that of the control group. The ECOG of esophageal and head and neck cancer patients undergoing radiotherapy significantly improved with the HCF model of nutritional management.

Anemia decreases a patient's oxygen-carrying capacity, weakens muscle strength, and decreases body activity and physical state (34). The findings of the present study indicated that at the end of 3 months of treatment, hemoglobin in HCF group was significantly higher than that of the control group. Oral mucositis is a common side-effect affecting 80% and 40% of patients undergoing radiotherapy and chemotherapy, respectively (35). The findings of the present study indicated that radiation mucositis and radiation dermatitis in the HCF group were significantly reduced compared with those in the control group.

The present study has some limitations. First, radiation therapy affects the patient's immune system, and we did not include indicators of immune function in this study. Second, there was few exploration and analysis about the analysis of nutritional components. Third, community nutrition management needs to be further explored and standardized.

Conclusions

The HCF model of nutrition management group reduced the loss of weight of patients with esophageal and head and neck malignant tumors in the hospital, and outside the hospital, improves albumin and hemoglobin indicators, enhances performance status, reduces nutritional risk, improves nutritional status, and reduces the occurrence of toxic side effects of radiation mucositis and radiation dermatitis.

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Footnote

Reporting Checklist: The authors have completed the CONSORT reporting checklist. Available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-2785/rc

Trial Protocol: Available at https://tcr.amegroups.com/article/

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-2785/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was approved by the Ethics Review Committee of the Affiliated People's Hospital of Ningbo University (No. 2021-081), and was conducted in accordance with the Declaration of Helsinki (revised in 2013). Informed consent was obtained from all patients.

References

1. Siegel RL, Miller KD, Fuchs HE, et al. Cancer statistics, 2022. CA Cancer J Clin 2022;72:7-33.
2. Malhotra GK, Yanala U, Ravipati A, et al. Global trends in esophageal cancer. J Surg Oncol 2017;115:564-79.
3. Zeng H, Zheng R, Guo Y, et al. Cancer survival in China, 2003-2005: a population-based study. Int J Cancer 2015;136:1921-30.
4. Przekop Z, Milewska M, Szostak-Węgierek D, et al. GLIM-Defined Malnutrition in Patients with Head and Neck Cancer during the Qualification Visit for Home Enteral Nutrition. Nutrients 2022;14:502.
5. Movahed S, Varshoee Tabrizi F, Pahlavani N, et al. Comprehensive assessment of nutritional status and nutritional-related complications in newly diagnosed esophageal cancer patients: A cross-sectional study. Clin Nutr 2021;40:4449-55.
6. Dormand EL, Banwell PE, Goodacre TE. Radiotherapy and wound healing. Int Wound J 2005;2:112-27.
7. Muscaritoli M, Arends J, Aapro M. From guidelines to clinical practice: a roadmap for oncologists for nutrition therapy for cancer patients. Ther Adv Med Oncol 2019;11:1758835919880084.
8. Langius JA, Zandbergen MC, Eerenstein SE, et al. Effect of nutritional interventions on nutritional status, quality of life and mortality in patients with head and neck cancer receiving (chemo)radiotherapy: a systematic review. Clin Nutr 2013;32:671-8.
9. Samuel SR, Maiya AG, Fernandes DJ, et al. Effectiveness of exercise-based rehabilitation on functional capacity and quality of life in head and neck cancer patients receiving chemo-radiotherapy. Support Care Cancer 2019;27:3913-20.
10. Attar A, Malka D, Sabaté JM, et al. Malnutrition is high and underestimated during chemotherapy in gastrointestinal cancer: an AGEO prospective cross-sectional multicenter study. Nutr Cancer 2012;64:535-42.
11. Gyan E, Raynard B, Durand JP, et al. Malnutrition in Patients With Cancer: Comparison of Perceptions by Patients, Relatives, and Physicians-Results of the NutriCancer2012 Study. JPEN J Parenter Enteral Nutr 2018;42:255-60.
12. Arends J, Baracos V, Bertz H, et al. ESPEN expert group recommendations for action against cancer-related malnutrition. Clin Nutr 2017;36:1187-96.
13. Qiu Y, You J, Wang K, et al. Effect of whole-course nutrition management on patients with esophageal cancer undergoing concurrent chemoradiotherapy: A randomized control trial. Nutrition 2020;69:110558.
14. Chen Y, Wu X, Wei X, et al. The effect of oral nutritional supplement therapy on nutritional status and quality of life in patients with esophageal cancer undergoing radiotherapy and chemotherapy: A protocol for randomized controlled trial. Medicine (Baltimore) 2021;100:e25342.
15. Wei J, Wu J, Meng L, et al. Effects of early nutritional intervention on oral mucositis in patients with radiotherapy for head and neck cancer. QJM 2020;113:37-42.
16. Alhambra Expósito MR, Herrera-Martínez AD, Manzano García G, et al. Early nutrition support therapy in patients with head-neck cancer. Nutr Hosp 2018;35:505-10.
17. Della Valle S, Colatruglio S, La Vela V, et al. Nutritional intervention in head and neck cancer patients during chemo-radiotherapy. Nutrition 2018;51-52:95-7.
18. Pang Z, Li Y, Huang A, et al. Effect of HCH Nutrition

Management Combined with Early Exercise Nursing on Nutrition Status and Postoperative Rehabilitation of Patients after Gastric Cancer Surgery. Evid Based Complement Alternat Med 2022;2022:2813050.
19. Guo X, Gu X, Jiang J, et al. A Hospital-Community-Family-Based Telehealth Program for Patients With Chronic Heart Failure: Single-Arm, Prospective Feasibility Study. JMIR Mhealth Uhealth 2019;7:e13229.
20. Shi W, Cheng L, Li Y. Influence of "Hospital-Community-Family" Integrated Management on Blood Pressure, Quality of Life, Anxiety and Depression in Hypertensive Patients. Comput Math Methods Med 2022;2022:1962475.
21. Ottery FD. Definition of standardized nutritional assessment and interventional pathways in oncology. Nutrition 1996;12:S15-9.
22. Poulia KA, Klek S, Doundoulakis I, et al. The two most popular malnutrition screening tools in the light of the new ESPEN consensus definition of the diagnostic criteria for malnutrition. Clin Nutr 2017;36:1130-5.
23. Cox JD, Stetz J, Pajak TF. Toxicity criteria of the Radiation Therapy Oncology Group (RTOG) and the European Organization for Research and Treatment of Cancer (EORTC). Int J Radiat Oncol Biol Phys 1995;31:1341-6.
24. Van Den Broeke C, De Burghgraeve T, Ummels M, et al. Occurrence of Malnutrition and Associated Factors in Community-Dwelling Older Adults: Those with a Recent Diagnosis of Cancer Are at Higher Risk. J Nutr Health Aging 2018;22:191-8.
25. Hall CC, Skipworth RJE, Blackwood H, et al. A randomized, feasibility trial of an exercise and nutrition-based rehabilitation programme (ENeRgy) in people with cancer. J Cachexia Sarcopenia Muscle 2021;12:2034-44.
26. Swartz MC, Lewis ZH, Lyons EJ, et al. Effect of Home- and Community-Based Physical Activity Interventions on Physical Function Among Cancer Survivors: A Systematic Review and Meta-Analysis. Arch Phys Med Rehabil 2017;98:1652-65.
27. Bowrey DJ, Baker M, Halliday V, et al. A randomised controlled trial of six weeks of home enteral nutrition versus standard care after oesophagectomy or total gastrectomy for cancer: report on a pilot and feasibility study. Trials 2015;16:531.
28. Bossi P, Delrio P, Mascheroni A, et al. The Spectrum of Malnutrition/Cachexia/Sarcopenia in Oncology According to Different Cancer Types and Settings: A Narrative Review. Nutrients 2021;13:1980.
29. Benoist S, Brouquet A. Nutritional assessment and screening for malnutrition. J Visc Surg 2015;152 Suppl 1:S3-7.
30. Dewys WD, Begg C, Lavin PT, et al. Prognostic effect of weight loss prior to chemotherapy in cancer patients. Eastern Cooperative Oncology Group. Am J Med 1980;69:491-7.
31. Dubois MJ, Orellana-Jimenez C, Melot C, et al. Albumin administration improves organ function in critically ill hypoalbuminemic patients: A prospective, randomized, controlled, pilot study. Crit Care Med 2006;34:2536-40.
32. Duguet A, Bachmann P, Lallemand Y, et al. Summary report of the Standards, Options and Recommendations for malnutrition and nutritional assessment in patients with cancer (1999). Br J Cancer 2003;89 Suppl 1:S92-7.
33. Daly LE, Dolan RD, Power DG, et al. Determinants of quality of life in patients with incurable cancer. Cancer 2020;126:2872-82.
34. Corona LP, Andrade FCD, da Silva Alexandre T, et al. Higher hemoglobin levels are associated with better physical performance among older adults without anemia: a longitudinal analysis. BMC Geriatr 2022;22:233.
35. Harris DJ. Cancer treatment-induced mucositis pain: strategies for assessment and management. Ther Clin Risk Manag 2006;2:251-8.

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