

# Predictors of Quality of Life Change in Head-and-Neck Cancer Survivors during Concurrent Chemoradiotherapy: A Prospective Study

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## ABSTRACT

**Objective:** Head-and-neck cancer (HNC) and its treatment impact patients' quality of life (QoL) and survival. The symptom burden of HNC survivors severely affects QoL, while hope serves as an impetus for adjustment that enables survivors to sustain basic QoL. This study investigated the change of QoL, symptom burden, and hope and the predictors of QoL change in HNC survivors from diagnosis to 3 months after concurrent chemoradiotherapy (CCRT) completing. **Methods:** This was a prospective, correlational study conducted between January 2016 and April 2017 at a medical center in northern Taiwan. Purposive sampling 54 adults newly diagnosed with HNC had completed the first CCRT. The questionnaires of Functional Assessment of Cancer Therapy-HNC Scale, M. D. Anderson Symptom Inventory, and Herth Hope Index were collected. The five measuring times were before CCRT (T<sub>1</sub>), the 3<sup>rd</sup>-4<sup>th</sup> week

of CCRT (T<sub>2</sub>), the last week of CCRT (T<sub>3</sub>), and 1 month (T<sub>4</sub>) and 3 months (T<sub>5</sub>) after the completion of CCRT. **Results:** The change of QoL first declined and then rose at T<sub>2</sub>-T<sub>5</sub>. The change of symptom burden increased initially and then declined at T<sub>2</sub>-T<sub>5</sub>. The change of hope remained steady between T<sub>1</sub> and T<sub>5</sub>. The change of symptom burden and hope significantly predicted the change of QoL over time. **Conclusions:** Clinicians are suggested to assess symptom burden and hope regularly in HNC during their CCRT and, if needed, promptly provide interprofessional care in time. Reducing symptom burden and maintaining a mindful hope could improve QoL in HNC survivors during CCRT.

**Key words:** Head-and-neck cancer, hope, quality of life, quality of life change, symptom burden

## Introduction

Head-and-neck cancer (HNC), occurring in the head-and-neck areas except brain, includes oral cancer, oropharyngeal cancer, nasopharyngeal cancer, hypopharyngeal cancer, laryngeal cancer, paranasal sinus

cancer, and salivary gland cancer. It is the sixth most common type of cancer worldwide.<sup>[1]</sup> In Taiwan, HNC occurs most commonly in middle-aged men and ranks fifth

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in incidence and mortality rate. Its median age of death is 58 years, or earlier than that of 68 years for all other types of cancers.<sup>[2]</sup> The psychosocial developmental tasks of middle adulthood are to produce and create, to love one's family, and to care about society.<sup>[3]</sup> Disrupting these phenomena illustrates the considerably negative impact of HNC survivors on their families and society as a whole.

Approximately two-thirds of HNC survivors are diagnosed at the advanced stage, for which treatment combinations, such as postoperative concurrent chemoradiotherapy or direct concurrent chemoradiotherapy (CCRT), are required.<sup>[4,5]</sup> In order to increase the overall survival rate of HNC, most current research focuses on developing new treatments, but the literature indicates that posttreatment quality of life (QoL) is an important factor for predicting 5-year survival.<sup>[6]</sup> The HNC survivors experience much symptom burden during treatment that severely affects QoL.<sup>[7]</sup> Symptom burden refers to symptom severity caused by disease or treatment for patients, and patients' perception of the total impact on daily activities, eventually affecting functional status and reducing QoL.<sup>[8,9]</sup> About 33% of cancer survivors experience high symptom burden; in severe cases, treatment might be delayed or interrupted, thus affecting disease prognosis.<sup>[10]</sup> However, during the treatment of HNC, hope is a positive power that enables patients to adopt to the limitations caused by disease and treatment, respond to the threat of death, and maintain basic QoL.<sup>[11-13]</sup> Hope is a feeling of expectation or desire for a specific thing to happen. It is the goal that urges people to survive and make progresses. It has a positive effect on health adjustment and can relieve pain. It is the energy required by psychological treatment and helps improve QoL.<sup>[14,15]</sup>

From diagnosis to treatment completing, the change of QoL in HNC survivors significantly correlates with the postdiagnosis survival rate.<sup>[16,17]</sup> However, there is a lack of prospective studies investigating the association between symptom burden, hope, and QoL in Taiwan. Therefore, the purpose of this study is to investigate the change of QoL, symptom burden, and hope in HNC survivors from diagnosis to CCRT completing, and the predictors of QoL change. Hopefully, this study looks to predict the factors that may appear and affect QoL change during treatment and propose prevention and solutions to help patients complete the entire treatment process successfully.

## Methods

### Sampling and setting

This study adopted a prospective, correlational research design via purposive sampling. Data were collected between January 2016 and April 2017 from Taipei Veterans General Hospital (TVGH) in Taiwan. The inclusion criteria were as

follows: patients diagnosed with HNC including oral cancer, oropharyngeal cancer, hypopharyngeal cancer, or laryngeal cancer, undergoing CCRT for the first time, aged 20 years or older, conscious, and able to speak or write Mandarin Chinese. The exclusion criteria were those diagnosed with a recurrence disease or a second cancer and with a mental illness or cognitive impairment. This study used G Power 3.1.9 software (Heinrich-Heine-Universität, Düsseldorf, Germany) to estimate the sample size.<sup>[18]</sup> The statistical test was *F*-test-ANOVA: repeated measures, within factors. Finally, the sample size needed for this study was 55.

### Research procedure

A professionally trained research nurse recruited participants and conducted the questionnaire survey for five times. All data were collected five times over a period of 4.5–5 months for each case, described as follows: (1) before the patient had begun CCRT after initial diagnosis (T1), (2) during the 3<sup>rd</sup>–4<sup>th</sup> week of CCRT (T2), (3) the last week that CCRT was completed (T3), and (4) 1 and 3 months after CCRT completing (T4 and T5, respectively). After participants signed their written informed consent, the questionnaire package was filled in and the time for the next measurement was appointed. In addition, before each measurement, the research nurse made a phone call to participants to avoid lost follow-up.

### Ethical approval

This study began collecting data after obtaining the approval of the TVGH Institutional Review Board (Approval No. 2015-12-001BC). The research nurse thoroughly explained the study to eligible participants. All participants needed to sign an informed consent form to join this study.

### Instruments

This study used structured questionnaires to collect data, including patient demographics and clinical information, the Functional Assessment of Cancer Therapy-Head and Neck Traditional Chinese Version (FACT-H and N Traditional Chinese Version), the M. D. Anderson Symptom Inventory Taiwan Form (MDASI Taiwan Form), and the Herth Hope Index Traditional Chinese Version (HHI Traditional Chinese Version).

### Functional Assessment of Cancer Therapy-Head and Neck Traditional Chinese Version

The QoL was collected using the FACT-H and N Traditional Chinese Version.<sup>[19]</sup> According to the experiences in the past 7 days, the patients answered 27 items, including four primary areas of well-being (physical, social/family, emotional, and functional) and 12-item HNC-specific question. The (0–4) 5-point Likert scale was used for scoring where 0 denotes “no at all” and 4 denotes “very.” The

questionnaire contains 39 items, with a possible range of 0–148; the higher the score, the higher the QoL. Regarding its psychometrics, the internal consistency Cronbach's alpha was 0.72–0.89. FACT-H and N Traditional Chinese Version has good construct validity.<sup>[19]</sup> The Cronbach's alpha of this study was 0.80–0.87.

#### M. D. Anderson Symptom Inventory Taiwan Form

Symptom burden includes symptom severity and symptom interference.<sup>[8]</sup> Symptom burden was collected using MDASI Taiwan Form,<sup>[20]</sup> which measured symptom severity and level of interference caused by symptoms in the past 24 h. The 13-item symptom severity, a (0–10) 11-point Likert scale for scoring where 0 denotes “asymptomatic” and 10 denotes “the worst severity you can imagine,” included fatigue, sleep disturbance, pain, drowsiness, poor appetite, nausea, vomiting, shortness of breath, numbness, difficulty remembering, dry mouth, distress, and sadness. A 6-item symptom interference adopted a (0–10) 11-point Likert scale for scoring where 0 denotes “no disturbance” and 10 denotes “fully disturbed,” including general activities, mood, normal work, relations with other people, walking, and enjoyment of life. Regarding psychometrics, the internal consistency Cronbach's alpha was 0.89–0.94, and test–retest reliability was 0.96–0.97. MDASI Taiwan Form has good construct validity, concurrent validity, and sensitivity.<sup>[20]</sup> In this study, the Cronbach's alphas of symptom severity and symptom interference were 0.68–0.83 and 0.56–0.75, respectively.

#### Herth Hope Index Traditional Chinese Version

Hope was collected using HHI Traditional Chinese Version.<sup>[21]</sup> The items adopted a (1–4) 4-point Likert scale for scoring where 1 denotes “strongly disagree” and 4 denotes “strongly agree.” The questionnaire contains 12 items with a possible range of 12–48; the higher the score, the higher the degree of hope. Regarding its psychometrics, the internal consistency of Cronbach's alpha was 0.80–0.89, and test–retest reliability was 0.86. HHI Traditional Chinese Version has good content validity, appropriate convergence, and discriminant validity.<sup>[21]</sup> The Cronbach's alpha of this study was 0.91–0.95.

#### Statistical analysis

The IBM SPSS Statistics for Windows (IBM Corporation, Armonk, NY, USA) was used to create files and to conduct statistical analysis. In descriptive statistics, frequency, percentage, mean, and standard deviation were used to describe the distribution of demographic and clinically relevant variables, as well as that of symptom burden, hope, and QoL. In inferential statistics, the generalized estimating equation (GEE) was used to analyze the change in trend for symptom burden, hope, QoL, and predictors for QoL change trajectory.

## Results

This study enrolled 75 participants at the first time. Ultimately, only 54 of them completed all five rounds for a dropout rate of 28% [Figure 1]. Changes in symptom severity in oral cancer patients undergoing first-time radiotherapy or CCRT revealed a 3-month case dropout rate of 28.9%, which was similar to the rate in the present study.<sup>[22]</sup>

#### Demographic and clinical characteristics

The analysis of demographic variables revealed that the patients were mostly male and the mean age was  $53.44 \pm 8.10$  years. In addition, most patients were married, were from nuclear families, completed secondary school, had religious beliefs, and were employed. The analysis of clinical characteristics revealed that most of the patients had oral cancer, were at Stage IV, had smoking and drinking history, had no comorbidities, had undergone surgery, had weekly cisplatin administered, and had gastric tubes. Their mean total dose of radiotherapy was  $6569.26 \pm 397.93$  cGy [Table 1].

#### Changes in quality of life, symptom burden, and hope

The changes of research variables over time are demonstrated in Figure 2. The change of QoL first exhibited

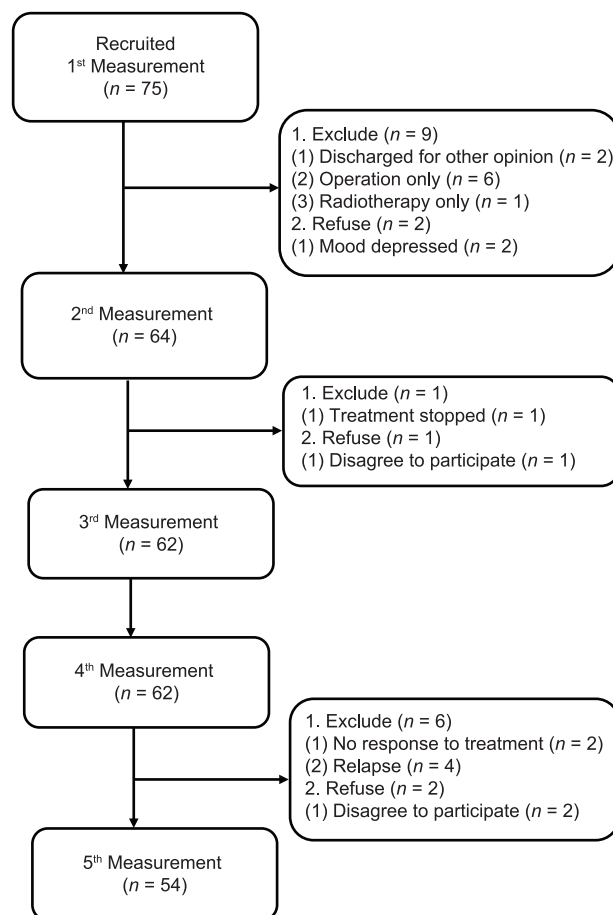


Figure 1: Patient recruitment and tracking process

Table 1: Demographic profile (n=54)

Demographic and clinical characteristics	n (%)
Gender	
Male	48 (88.9)
Female	6 (11.1)
Age (years), mean (SD)	53.44 (8.10)
Marital status	
Single	10 (18.5)
Married	44 (81.5)
Living status	
Live alone	3 (5.6)
Nuclear family	47 (87.0)
Extended family	4 (7.4)
Education	
Secondary school	26 (48.2)
High school	18 (33.3)
College	10 (18.5)
Religion	
No	8 (14.8)
Yes	46 (85.2)
Occupation	
Unemployed	14 (25.9)
Employed	20 (37.0)
Freelance	16 (29.6)
Others	4 (7.5)
Diagnosis	
Hypopharyngeal cancer	7 (13.0)
Oropharyngeal cancer	9 (16.7)
Oral cancer	38 (70.4)
Stage	
II	4 (7.4)
III	13 (24.1)
IV	37 (68.5)
Smoking history	
No	10 (18.5)
Yes	44 (81.5)
Drinking history	
No	13 (24.1)
Yes	41 (75.9)
Comorbidity	
No	33 (61.1)
Yes	21 (38.9)
Surgery	
No	5 (9.3)
Yes	49 (90.7)
Type of surgery (n=49)	
WE	8 (14.8)
WE + RND	10 (18.5)
WE + RND + mandibulectomy + free flap	25 (46.3)
Others	6 (11.1)
Radiotherapy	
Total dose (cGy), mean (SD)	6569.26 (397.93)
Type of chemotherapy	
PMU + weekly 5-Fu	10 (18.5)
TPF + CFHx	11 (20.4)
Weekly cisplatin	25 (46.3)
Others	8 (14.8)

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Table 1: Contd...

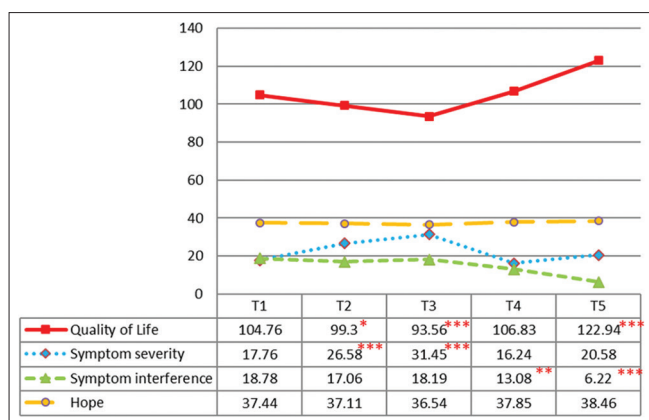
Demographic and clinical characteristics	n (%)
Gastric tube	
No	23 (42.6)
Yes	31 (57.4)
Type of gastric tube (n=31)	
Nasogastric tube	8 (25.8)
Gastrostomy tube	20 (64.5)
Others	3 (9.7)
PD	
No	49 (90.7)
Yes	5 (9.3)
Type of surgery: WE: Wide excision; WE + RND: Wide excision and radical neck dissection; WE + RND + mandibulectomy + free flap: Wide excision and radical neck dissection and mandibulectomy and free flap reconstruction. Type of chemotherapy: PMU + weekly 5-Fu: Cisplatin, mitomycin-C, and UFUR and 5-fluorouracil; TPF + CFHx: Taxotere, cisplatin, and 5-fluorouracil and cisplatin, 5-fluorouracil, and hydroxyurea; Weekly cisplatin: Cisplatin. PD: Progressive disease; SD: Standard deviation	

a decreasing trend followed by an increasing trend. One month after treatment completing, the QoL returned to the pretreatment statuses. Moreover, the change of symptom severity first exhibited an increasing trend followed by a decreasing trend. The change of symptom severity from T1 to T2 and T3 all achieved statistical significances. The change of symptom interference exhibited a general decreasing trend. The change of symptom interference from T1 to T4 and T5 all achieved statistical significances. While, the change of hope exhibited a mostly stable trend and did not achieve statistical significance over time. In addition, the symptom severity and symptom interference are significantly negatively correlated with QoL over time, suggesting that higher symptom burden leads to lower QoL. Hope is significantly positively correlated with QoL over time, suggesting that higher hope leads to higher QoL [Table 2].

### Predictors of change in quality of life

Table 3 shows the univariate GEE of the factors associated with QoL change over time. The results revealed that “extended family” in living status, “employed” in occupation, “wide excision and radical neck dissection (WE + RND) + mandibulectomy + free flap” in type of surgery, “Taxotere, cisplatin, and 5-fluorouracil and cisplatin, 5-fluorouracil, and hydroxyurea” in type of chemotherapy, “gastrostomy tube” in type of gastric tube, and changes in symptom severity, symptom interference, and hope achieved statistical significances.

The study next took the abovementioned variables in a multivariate GEE to examine the factors significantly associated to QoL change. The results showed that “extended family” in living status, “WE + RND + mandibulectomy + free flap” in type of surgery, and the change of hope achieved statistical significances. The study then took living status, type of surgery, and hope changes as independent variables and QoL changes as a dependent variable. The results



**Figure 2:** The trend of quality of life, symptom burden, and hope. \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ . T1: Before CCRT; T2: The 3<sup>rd</sup>–4<sup>th</sup> week of CCRT; T3: The last week of CCRT; T4: One month after the end of CCRT; T5: Three months after the end of CCRT. CCRT: Concurrent chemoradiotherapy

**Table 2: Correlation between symptom, hope, and quality of life over time**

T1-T5	QoL 1	QoL 2	QoL 3	QoL 4	QoL 5
Variable (n)	75	64	62	62	54
Symptom severity	-0.17*	-0.38***	-0.45***	-0.42***	-0.27***
Symptom interference	-0.37***	-0.30***	-0.38***	-0.46***	-0.35***
Hope	0.26***	0.21***	0.32***	0.30***	0.32***

\* $P < 0.05$ , \*\*\* $P < 0.001$ . QoL: Quality of life

showed that hope changes ( $B = 2.10$ ,  $P < 0.001$ ) achieved statistical significances.

Finally, a multivariate GEE was performed to detect the predictors of QoL change over time. The results showed that symptom severity changes, symptom interference changes, hope changes, T2, T3, and T5 achieved statistically significant differences. Symptom severity changes, symptom interference changes, T2, and T3 negatively predicted QoL changes, and hope changes and T5 positively predicted QoL changes [Table 4].

## Discussion

The study revealed that the change of QoL first declined and then rose; the change of symptom burden increased initially and then declined between the 3<sup>rd</sup> and 4<sup>th</sup> week of CCRT and 3 months after CCRT. While, the change of hope remained steady during the study period. Moreover, symptom severity changes, symptom interference changes, T2 (during the 3<sup>rd</sup>–4<sup>th</sup> week of CCRT), and T3 (CCRT completing) negatively predicted QoL changes, and hope changes and T5 (3 months after CCRT completing) positively predicted QoL changes.

### Changes in quality of life

In this study, the QoL in participants declines until 1 month post-CCRT and sharply increases 3 months

post-CCRT. The findings are similar to two systematic literature reviews in HNC survivors who received treatment that found their QoL scores back 12 months posttreatment.<sup>[16,17]</sup> One study found that the QoL gradually recovered 6<sup>th</sup> month postradiotherapy in HNC survivors receiving radiotherapy.<sup>[23]</sup> Nevertheless, one study in patients with advanced stage HNC who underwent IMRT alongside weekly cisplatin has exactly the same findings as our study that the QoL returned to the normal level 1 month after completing treatment.<sup>[24]</sup> The reason of the similarity with a shorter recovery time in this study probably contributes to the advance of current radiotherapy in reducing side effects<sup>[25]</sup> to effectively increase survivors' QoL.

### Changes in symptom burden

In this study, symptom severity significantly increased between the middle and completion of CCRT and then become flat posttreatment as expected. This is similar to a study<sup>[22]</sup> in oral cancer that the severity went back to pretreatment level 1 month after completing treatment. On the other hand, symptom interference remained flat across the measuring period. Symptom burden was most severe at the end of CCRT, which is the same as our findings.<sup>[26]</sup> In oropharyngeal cancer patients with or without surgery, their symptom burden was gradually relieved at the 6<sup>th</sup> month post-CCRT.<sup>[27]</sup> Other possible reasons for stable burden interference in this study may be the advancement in medical treatment, such as more medications to prevent or alleviate side effects of cancer treatment.<sup>[26,28]</sup> Moreover, 88.9% of this study participants were male, they might under-report symptom interference although they did experience severe symptom burden. This may be due to the gender stereotype of men in Asian culture that is taking charge and being in control. Hence, their symptom interference scores remain stable over time.

### Changes in hope

Hope remains stable during our study period. While the result is different from the research assumption, there is no literature examining change of hope over time in HNC population up to date. A study on patients with advanced stage cancer noted that the patients' hope changes had a wide variation across the disease trajectory.<sup>[29]</sup> Another study in patients with cervical cancer receiving radiotherapy indicated that the sense of hope was always maintained at a medium to high level,<sup>[30]</sup> which is similar to our findings that hope scores remain at a high level. Hope changes remained stable over time in this study, the possible reasons may be due to the study participants mainly were male (88.9%) with a mean age of 53.44 years. They are mostly the breadwinner for their family. With their tasks being considerably affected during the course of cancer

Table 3: The factor associated with quality of life change over time (*n*=54)

Parameter	B	SE	95% CI	Wald $\chi^2$	P
Gender					
Male	0				
Female	-10.47	15.59	-41.03-20.10	0.45	0.502
Age (years)	-0.34	0.71	-1.73-1.04	0.23	0.629
Marital status					
Single	0				
Married	5.70	15.12	-23.93-35.34	0.14	0.706
Living status					
Live alone	0				
Nuclear family	25.86	21.48	-16.23-67.96	1.44	0.229
Extended family	54.83	27.64	0.65-109.00	3.93	0.047
Education					
Secondary school	0				
High school	-8.98	14.96	-38.31-20.34	0.36	0.548
College	4.85	12.77	-20.18-29.87	0.14	0.704
Religion					
No	0				
Yes	11.93	18.90	-25.11-48.98	0.40	0.528
Occupation					
Unemployed	0				
Employed	30.30	11.36	8.04-52.57	7.12	0.008
Freelance	22.79	16.03	-8.63-54.21	2.02	0.155
Others	8.30	28.70	-47.95-64.54	0.08	0.773
Diagnosis					
Hypopharyngeal cancer	0				
Oropharyngeal cancer	-13.84	23.86	-60.61-32.92	0.34	0.562
Oral cancer	-25.64	20.33	-65.48-14.20	1.59	0.207
Stage					
II	0				
III	-14.15	19.15	-51.69-23.38	0.55	0.460
IV	-24.33	17.15	-57.94-9.29	2.01	0.156
Smoking history					
No	0				
Yes	15.93	14.24	-11.97-43.83	1.25	0.26
Drinking history					
No	0				
Yes	-2.97	12.41	-27.28-21.35	0.06	0.81
Comorbidity					
No	0				
Yes	-0.34	12.69	-25.22-24.54	0.00	0.979
Surgery					
No	0				
Yes	12.33	24.80	-36.27-60.94	0.25	0.619
Type of surgery ( <i>n</i> =49)					
WE	0				
WE + RND	-15.41	20.13	-54.87-24.05	0.59	0.444
WE + RND + mandibulectomy + free flap	-50.59	17.40	-84.70-16.49	8.45	0.004
Others	9.44	23.91	-37.41-56.30	0.16	0.693
Radiotherapy					
Total dose	0.02	0.02	-0.01-0.05	1.47	0.225
Type of chemotherapy					
PMU + weekly 5-Fu	0				
TPF + CFHx	41.98	20.22	2.34-81.61	4.31	0.038
Weekly cisplatin	16.90	17.38	-17.15-50.96	0.95	0.331
Others	42.31	25.20	-7.08-91.70	2.82	0.093

Contd...

Table 3: Contd...

Parameter	B	SE	95% CI	Wald $\chi^2$	P
Tube					
No	0				
Yes	-5.57	12.58	-30.23-19.09	0.20	0.658
Type of tube (n=31)					
Nasogastric tube	0				
Gastrostomy tube	10.39	3.66	3.22-17.56	8.06	0.005
Others	10.11	5.81	-1.29-21.50	3.02	0.082
PD					
No	0				
Yes	4.31	18.30	-31.63-40.25	0.06	0.81
Symptom severity	-0.48	0.064	-0.59--0.36	70.55	<0.001
Symptom interference	-1.03	0.09	-1.20--0.87	144.37	<0.001
Hope	1.33	0.22	0.90-1.76	36.47	<0.001

SE: Standard error; CI: Confidence interval; PD: Progressive disease; WE: Wide excision; WE+ RND: Wide excision and radical neck dissection; WE + RND + mandibulectomy + free flap: Wide excision and radical neck dissection and mandibulectomy and free flap reconstruction. Type of chemotherapy: PMU + weekly 5-Fu: Cisplatin, mitomycin-C, and 5-fluorouracil; TPF + CFHx: Taxotere, cisplatin, and 5-fluorouracil and cisplatin, 5-fluorouracil, and hydroxyurea; Weekly cisplatin: Cisplatin

Table 4: The predictors of quality of life change (n=54)

Parameter	B	SE	95% CI	Wald $\chi^2$	P
Intercept	93.03	6.42	80.46-105.61	210.28	<0.001
Symptom severity	-0.25	0.05	-0.35--0.16	30.04	<0.001
Symptom interference	-0.67	0.07	-0.81--0.53	89.45	<0.001
Hope	0.77	0.15	0.48-1.07	26.13	<0.001
T5	9.68	2.13	5.50-13.87	20.58	<0.001
T4	-2.46	1.85	-6.07-1.16	1.77	0.183
T3	-7.43	1.74	-10.84--4.01	18.13	<0.001
T2	-4.12	1.72	-7.49--0.76	5.78	0.016
T1	0				

SE: Standard error; CI: Confidence interval via multiple regression generalized estimating equation, T1: Before CCRT, T2: The 3<sup>rd</sup>-4<sup>th</sup> week of CCRT, T3: The last week of CCRT, T4: One month after the end of CCRT, T5: Three month after the end of CCRT; CCRT: Concurrent chemoradiotherapy

treatment, those participants tend to maintain a stable sense of hope that they can and should return to their families and society as soon as possible. About 82% of Taiwanese have religious beliefs,<sup>[31]</sup> literature supported that those had religious beliefs better sustained their hope and resulted in positive health outcomes, such as better quality of life.<sup>[32]</sup> Health-care professionals should use this knowledge to help patients seek spiritual and family support as well as adapt a positive attitude toward cancer in order to complete treatment successfully.

### Predictors of the quality of life change

Results of this study indicated that symptom severity, symptom interference, and the middle and completion of CCRT were negatively related to QoL. Not surprisingly, when human beings experience burden and discomfort during treatment period, their QoL falls. Among lung cancer survivors over a 5-year period, symptom burden negatively affected QoL changes.<sup>[33]</sup> In contrast, hope and T5 were positively related to QoL. When they have hope and completed the painful treatment for a while, they regain

the quality life they want back. In a study on changes in hope and QoL in patients with acute myocardial infarction, hope and QoL increased over time.<sup>[34]</sup> Although other studies indicated that gender, age, comorbidities, diagnosis, disease stage, treatment, or tubing were significant variables in predicting QoL,<sup>[17,23,35-38]</sup> we did not find the same in this study. This may be due to different target population and sample chosen with various sample size.

### Strengths, limitations, and suggestions

In terms of strengths, this is the first study performing follow-up analyses on change in hope and its effect on QoL change in HNC survivors. It is a prospective, correlational study that can prospectively understand the true trend of changes in symptom burden, hope, and QoL from diagnosis to posttreatment, as well as inspect the effects of changes to symptom burden and hope on QoL change. During the enrollment, the same research nurse continued the follow-ups on patients for 4.5–5 months. Therefore, a strong sense of trust was developed between the nurse and patients, who were more willing to express their true feelings about QoL, symptom burden, and hope.

In terms of limitations, this study only enrolled 54 adults at a certain medical center in northern Taiwan. The extensiveness of research results is thus limited. Although the samples were HNC survivors, the cancers included oral cancer, oropharyngeal cancer, hypopharyngeal cancer, and laryngeal cancer. In addition, some patients needed to undergo surgery prior to CCRT, and the differences in complexity of surgeries were significant. The symptoms or side effects might not be the same and could affect the prediction for QoL change.

Future studies are advised to enroll patients diagnosed with a specific type of HNC to increase the homogeneity. Study sites are advised to be expanded to other hospitals to

increase sample size and able to extend the generalizability of research results. If there are sufficient research resources, it is advised to extend the enrollment period to 2 years to fully understand the cancer survivorship of patients with HNC, the overall QoL change, and the predictors of QoL change throughout the HNC trajectory in terms of diagnosis, treatment, and return to the society.

## Conclusions

This study observed that the QoL among HNC survivors first exhibited a decreasing followed by an increasing trend, and symptom burden first increased and subsequently decreased. While, hope remained stable during the period from diagnosis to 3 months after the end of CCRT. Moreover, symptom burden change, hope change, and time significantly predicted QoL changes in HNC survivors.

To enable HNC survivors who are suffering from symptom burden to successfully complete treatment courses, we recommend regular evaluation of survivors' physical, mental, and social domains of QoL. In doing so, the provision of individualized care and interprofessional teams for shared care will be possible. Before treatment, instructions regarding symptoms that may appear during the course of the illness or treatment must be provided and explained. During treatment, MDASI and HHI are suggested to be employed for continued patient evaluation, and comprehensive care measures should be provided in relation to symptoms to alleviate symptom burden and to express concern and support for patients. Survivors of HNC could be introduced to patients who had overcome the distress during their cancer trajectory to provide encouragement and to help survivors maintain hope. After treatment, continued follow-up with survivors through telephone interviews is recommended, and relevant counseling is suggested to be conducted to facilitate the continued improvement of QoL during follow-ups of the survivorship.

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### Conflicts of interest

There are no conflicts of interest.

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