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ORIGINAL ARTICLE

Psychometric testing of the Chinese-version cancer needs questionnaire short form head and neck cancer-specific version in oral cavity cancer patients

Shu-Ching Chen · Yeur-Hur Lai · Sue-Yueh Cheng · Chun-Ta Liao · Joseph Tung-Chien Chang

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Abstract
Purpose The purposes of this two-phase study were to (1) develop and examine the content validity and feasibility of the Chinese-version cancer needs questionnaire, short form, head and neck cancer-specific version (CNQ-SF-hn) (phase I), and (2) examine its psychometric characteristics as supported by reliability and construct validity (phase II) in oral cavity cancer patients in Taiwan.
Methods Newly diagnosed oral cavity cancer patients (N= 206) were recruited from a medical center in northern Taiwan. Data were analyzed using descriptive statistics and psychometric analyses.
Results The results showed that the CNQ-SF-hn (1) had good internal consistency reliability for the overall scale and subscales; (2) had good 1-week test–retest reliability (correlation=0.80) for the overall scale; (3) had construct validity, supported by six clearly identified factors explaining 74.87% of the variance; and (4) had convergent validity, supported by correlations among its subscales and related scales, as well as by discriminating care needs according to undergoing versus not undergoing reconstructive surgery and cancer stage.
Conclusions The Chinese-version CNQ-SF-hn is a psychometrically satisfactory instrument. Further validation is suggested for its factor structure and different head and neck cancers.

Keywords Oral cavity cancer · Care needs · Care needs questionnaire · Psychometric testing · Reliability · Validity

S.-C. Chen
Department of Nursing, Chang Gung Institute of Technology, Kweishan, Taoyuan, Taiwan

Y.-H. Lai (✉)
Department of Nursing, College of Medicine, National Taiwan University, 1 Jen-Ai Rd., Sec. 1, Taipei 100, Taiwan
e-mail: laiyhwk@ntu.edu.tw

S.-Y. Cheng
College of Nursing, Taipei Medical University, Taipei, Taiwan

C.-T. Liao
Division of Head and Neck Surgery, Department of Otorhinolaryngology, Chang Gung Medical Foundation, Chang Gung Memorial Hospital at LinKou, and College of Medicine, Chang Gung University, Kweishan, Taoyuan, Taiwan

J. T.-C. Chang
Department of Radiation Oncology, Chang Gung Medical Foundation, Chang Gung Memorial Hospital at LinKou, and College of Medicine, Chang Gung University, Kweishan, Taoyuan, Taiwan

S.-C. Chen · C.-T. Liao · J. T.-C. Chang
Department of Head and Neck Oncology Group, Chang Gung Medical Foundation, Chang Gung Memorial Hospital at LinKou, Kweishan, Taoyuan, Taiwan

Introduction

Oral cavity cancer is a serious and growing problem globally [21] and is the fourth most prevalent cancer among males in Taiwan [43]. Because of the disease location and complications of surgical excision in the oral cavity, patients with oral cavity cancers usually experience severe physical and psychological distress [10, 17], dysfunction in the head and neck areas [10, 11], disfigurement [13], and increased

support needs [10]. Patients undergoing surgery for oral cancer have been shown to have greater care needs in all domains except sexual care needs [10] than patients with other cancers [3, 27, 39–41, 44]. These greater care demands highlight the importance of systematically assessing the needs of oral cavity cancer patients across treatments and cancer stages. Therefore, these patients as well as other head and neck cancer patients would benefit from an instrument that reflects their unique characteristics and the multidimensional nature of cancer care needs.

The most widely used instruments for assessing cancer patients' needs are the cancer needs questionnaire (CNQ) and supportive care needs survey (SCNS) series [2, 16, 26, 37]. The main part of the CNQ originated from the SCNS. The SCNS has several versions, including 65-item, 59-item, and 34-item versions [26]. We have used the 34-item SCNS (SCNS-34) to assess the care needs of oral cavity cancer patients [10]. As mentioned above, these patients were found to have high levels of care needs in four of five domains (the exception being sexual care needs). Furthermore, patients with head and neck cancers were most concerned about difficulties with communication and interference with interpersonal relationships [5, 8]. Therefore, we chose the CNQ, short form (CNQ-SF) [2], which is similar to the SCNS-34 (34-item version), except that the "sexual care needs" domain of the CNQ-SF (32 items) has been replaced with a new domain, "interpersonal/communication needs."

The 32-item CNQ-SF contains five domains: (1) psychological needs (need for help with psychological and emotional issues), (2) health information needs (informational needs pertaining to diagnosis, investigative tests, family issues, and financial issues), (3) physical and daily living needs (physical care needs and adjustment tasks), (4) patient care and support needs (support needs of cancer patients related to family, friends, and health care professionals), and (5) interpersonal/communication needs (needs related to interpersonal relationships, interaction skills, and communication styles of health care providers) [2]. The CNQ-SF has been validated [2, 3, 12] and widely used in patients with various cancers [3, 12, 18, 28, 33]. Given the unique care needs of head and neck cancer patients, we added four items to the CNQ-SF to create a sixth subscale, head and neck disease needs, resulting in an instrument that better reflects the general and unique care needs of patients with head and neck cancers. The new instrument was named the CNQ-SF-hn (CNQ-SF, head and neck cancer-specific version).

The psychometric properties of the CNQ-SF-hn will be supported by reliability and validity. The content validity is based on previous application in assessing cancer patients' care needs in general [3, 12, 18, 28, 33], as well as unique distress, reflecting potential care needs related to problems specific to head and neck cancer patients [14, 23, 30, 38].

Empirical evidence supports the construct validity of the CNQ-SF-hn. Hwang et al. [20] proposed that unmet needs can be used as an indicator of quality of life (QOL). Similarly, Carr [4] pointed out that overall physical health and distress related to disease and treatment are related to QOL. Hwang et al. [20] found that patients with lower functional performance and higher cancer stage had increased unmet physical needs. Our clinical observation indicates that these unmet needs may also be intercorrelated. Taken together, concurrent validity was assumed, based on a literature review, to be indicated by (1) positive intra-associations among the CNQ-SF-hn subscale and overall scale scores, (2) positive correlations between CNQ-SF-hn scores and patients' distress (depression, anxiety, and poor performance) [10, 12, 20], (3) higher CNQ-SF-hn scores among patients undergoing reconstructive surgery and at more advanced cancer stages [10], and (4) negative associations between CNQ-SF-hn scores and patients' QOL [12, 20]. Discriminant validity would be demonstrated by the ability of the CNQ-SF-hn to differentiate groups of patients receiving or not receiving reconstructive surgery. It would also be demonstrated by its ability to differentiate the needs of patients with early-stage versus advanced-stage cancers.

Therefore, the purposes of this two-phase study were to (1) develop and examine the content validity and feasibility of the CNQ-SF-hn (phase I) and (2) examine its psychometric characteristics as supported by reliability and construct validity (phase II) in oral cavity cancer patients in Taiwan.

Methods

We conducted our study in two phases as follows:

> Phase I: development and content and feasibility testing of the CNQ-SF-hn

The English-version CNQ-SF was initially checked for content validity by five oral cavity cancer experts (two physicians and three nurses with master's or doctoral degrees). In addition, we obtained permission to use and translate the CNQ-SF. The Chinese-version CNQ-SF was first developed according to principles of language translation and back-translation [25]. Further, four items related to head and neck-specific care needs based on literature review and clinical observation were developed by the authors and two head and neck cancer clinical experts to become the sixth subscale of the original CNQ-SF. The modified scale, the CNQ-SF-hn, is composed of 36 items that reflect both general and specific care needs in head and neck cancer patients. Items were scored from 1 (no need) to 5 (high level of need). Scores for the total scale and each subscale were summed and standardized [12, 26] to a range

of 0 to 100. Higher scores indicated higher care needs in each domain.

The content validity index of the CNQ-SF-hn [32] was checked by another five head and neck experts. It was further pilot-tested in 20 oral cavity cancer patients at a medical center in northern Taiwan. Participants reported no difficulties in understanding the CNQ-SF-hn items and could complete the scale in 5 to 15 min.

Phase II: reliability, factor analysis, and concurrent validity testing

Newly diagnosed oral cavity cancer patients undergoing surgery combined with other treatments were recruited from both inpatient and outpatient clinics of a 3,000-bed hospital in northern Taiwan. Patients were eligible for the study if they knew their cancer diagnosis. The institutional review board approved the study, and all patients provided written informed consent. Sample size was estimated based on the minimum requirement of five participants per item needed for psychometric testing [42]. Therefore, at most, 180 subjects were needed to meet the criteria.

The Cronbach's alpha value and the 1-week-interval test–retest reliability were calculated to reflect the internal consistency, reliability, and stability, respectively. Content validity was tested by expert evaluation (as described in phase I) and construct validity by factor analysis and concurrent validity. Underlying factor structure was analyzed by factor analysis and abstracting the subconcepts (subscale referring to "domains of needs") [29]. Concurrent validity was tested, and correlations were analyzed among the CNQ-SF-hn subscales and theoretically supported concepts using the following instruments.

Instruments to reflect variables

1. Hospital anxiety and depression scale (HADS)

Patients' levels of anxiety and depression were assessed using the HADS [45], with concurrent measuring for the CNQ-SF-C-hn. The HADS consists of 14 items: seven for anxiety and seven for depression. For each item, responses range from 0 (not at all) to 3 (always). The summated scores for depression or anxiety range from 0 to 21, with higher scores indicating higher levels of depression or anxiety. Satisfactory psychometric characteristics have been shown for the HADS in cancer-related studies in Taiwan [7, 10]. In the present study, the Cronbach's alphas for the depression and anxiety subscales were 0.75 and 0.76, respectively.

2. University of Washington quality of life scale (UW-QOL)

The UW-QOL (version 4) [34] is a specific head and neck cancer QOL questionnaire for patients. The 15-item UW-QOL has 12 disease-specific items and three general items that measure global health-related QOL [19]. The response to each item is standardized to a scale of 0 to 100, with higher scores indicating better life quality. Satisfactory psychometrics have been reported for the original UW-QOL [34] and its Chinese version [8]. In the present study, the Cronbach's alpha for the UW-QOL was 0.90.

3. Karnofsky performance status index (KPS)

The 11-point KPS [22] is scored from normal function (100%) to dead (0%). In Taiwan, the KPS has been used in clinical cancer study to assess cancer patients' level of physical function [9]. We used the KPS to test the concurrent validity of the CNQ-SF-hn. The interobserver reliability of the KPS was 0.96.

4. Background information form

Background information was obtained on patients' age, gender, education (years of formal schooling), employment status, marital status, religion, tumor subsite, cancer stage (of four stages), type of surgery (tumor excision versus tumor excision with reconstruction), and treatment status.

Data analysis

Descriptive statistics (mean, frequency) were used to analyze demographic and clinical variables. The Cronbach's alpha was used to assess internal consistency reliability. One-week test–retest reliability was used to examine stability of the CNQ-SF-hn. The test–retest reliability was calculated using the intraclass correlation coefficient [32]. Construct validity for the substructure (subscales) of the CNQ-SF-hn was examined using factor analysis.

Bartlett's test of sphericity (BT) and Kaiser–Meyer–Olkin's measure of sampling adequacy (KMO) indicated that data were appropriate for factor analysis (KMO=0.927; BT=7,796.15; p value<0.001). Before conducting factor analysis, item-to-item correlation coefficients were calculated, and the data found satisfactory. Given the moderate-to-high correlation among items, we chose principal component analysis with oblique rotation [36]. A six-factor model was assumed (six subscales) for the CNQ-SF-hn. Criteria used to select factors included (1) eigenvalues >1.0, (2) factor loading >0.30, (3) scree plot test, and (4) percentage of total variance explained by each factor [36].

Convergent validity was analyzed by examining the theoretically assumed relationships between the CNQ-SF-hn and other instruments (anxiety, depression, physical performance, and QOL) [4, 10, 12, 20] using the Pearson correlation (first step) and multivariate multiple regression. The significant variables identified in the first step were selected as independent variable(s) in the multivariate

multiple regression, using the six care needs subscales (domains) and overall care needs as dependent variables [24]. Discriminant validity was examined by comparing differences in CNQ-SF-hn scores among groups with and without reconstructive surgery and among cancer stage groups (early-stage versus advanced-stage) by multivariate logistic regression [31]. The model diagnostics were first performed to check the validations of the basic assumptions for multivariate multiple linear and generalized linear regressions, respectively [24, 31].

Results

Patient characteristics

The study subjects were 206 oral cancer patients recruited from both inpatient (N=105) and outpatient (N=101) clinics at a medical center in northern Taiwan. Most were men (N=193, 93.7%), reflecting the national gender ratio in oral cavity cancers [6]. The patients' average age was 50.63 years (SD=11.30), and the majority (70.9%) were 40 to 64 years old. Most patients (89.8%) were married, and patients were generally educated at the junior-high (40.3%) or elementary (29.1%) level. Most patients (69.9%) held religious beliefs.

Regarding disease and treatment status, more than half of patients were at stage III (16.0%) or IV (35.4%). The most common cancer locations were the buccal mucosa (45.1%) and tongue (34.0%), which may reflect Taiwan's national habit of betel quid chewing [6]. About three quarters of patients (76.2%, N=157) underwent tumor resection combined with reconstructive surgery. A little more than half of the patients underwent only surgery (51.0%), and the other half had surgery combined with other treatments. A majority of subjects had a performance status with a score of 70 or higher (Table 1).

Reliability

The Cronbach's alpha for the total CNQ-SF-hn was 0.97. Subscale alpha values for subscales ranking in descending order related to health information needs, interpersonal/communication needs, patient care and support needs, physical and daily living needs, head and neck cancer-related needs, and psychological needs were 0.97, 0.94, 0.93, 0.92, 0.87, and 0.85, respectively. The overall 1-week-interval test–retest reliability was 0.80.

Construct validity

The exploratory factor analysis revealed a six-factor solution with an explained variance of 74.87% that had

Table 1 Demographic and clinical characteristics of patients (N=206)

Variable	Number (%)
Age (years)	
>65	23 (11.2)
64–40	146 (70.9)
<40	37 (18.0)
Gender	
Male	193 (93.7)
Female	13 (6.3)
Employment status	
Unemployed	92 (44.7)
Employed	114 (55.3)
Marital status	
Unmarried	21 (10.2)
Married	185 (89.8)
Educational level	
None	6 (2.9)
Elementary school	60 (29.1)
Junior high school	83 (40.3)
Senior high school	42 (20.4)
College and above	15 (7.3)
Religion	
None	62 (30.1)
Buddhism/Taoism	141 (68.4)
Christianity	3 (1.5)
Cancer pathological stage	
I	51 (24.8)
II	49 (23.8)
III	33 (16.0)
IV	73 (35.4)
Tumor subsite	
Buccal mucosa	93 (45.1)
Oral tongue	70 (34.0)
Other	23 (11.2)
Gingivae	14 (6.8)
Lip	6 (2.9)
Surgical procedure	
Tumor excision only	16 (7.8)
Tumor excision+lymphadenectomy	33 (16.0)
Tumor excision+lymphadenectomy+reconstruction	157 (76.2)
Treatment status	
Surgery only	105 (51.0)
Surgery+radiation	50 (24.3)
Surgery+chemotherapy	4 (1.9)
Surgery+radiation+chemotherapy	47 (22.8)
Performance status (measured by KPS)	
60	5 (2.4)
70	86 (41.8)
80	67 (32.5)
90	48 (23.3)

Table 2 Results of principal component analysis (N=206)

Subscale	CNQ-SF-hn item	Factor loading					
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Health information needs	26. To be given a full explanation for every test and treatment procedure you go through	0.886	0.604	0.585	0.411	0.384	0.240
	27. To be fully informed about all of the benefits and side effects of treatment or surgery before you agree to have it	0.839	0.635	0.642	0.421	0.312	0.378
	28. To be fully informed about the odds of treatment success	0.875	0.601	0.635	0.472	0.385	0.403
	29. To be fully informed about your test results as soon as possible	0.913	0.442	0.545	0.397	0.419	0.306
	30. To be fully informed about the possible effects of the cancer on the length of your life	0.930	0.472	0.590	0.401	0.393	0.301
	31. To be fully informed about cancer remission	0.989	0.494	0.627	0.442	0.423	0.235
	32. To be fully informed about things you can do to help yourself get well	0.850	0.580	0.670	0.446	0.389	0.280
Patient care and support needs	20. To be allowed to have family or friends with you in hospital	−0.110	0.766	0.101	−0.051	0.004	0.175
	21. To have your rights for privacy more fully protected when you are at the clinic or hospital	0.091	0.821	−0.048	0.160	−0.136	−0.059
	22. To be reassured by medical staff that your physical and emotional responses are normal	0.203	0.665	−0.164	−0.003	0.176	0.076
	23. For nurses to attend promptly to your physical needs in hospital	0.301	0.656	0.087	0.076	−0.129	−0.069
	24. For nurses to acknowledge and show sensitivity to your feelings and emotional needs	−0.002	0.988	0.022	−0.010	−0.009	−0.132
	25. For your cancer specialist to acknowledge and show sensitivity to your feelings and emotional needs	−0.051	0.968	0.089	−0.052	0.029	−0.102
Head and neck cancer-specific needs	33. Coping with fears about the treatment-induced oral discomfort, including dry mouth, difficulty in swallowing, and difficulty chewing	0.071	0.059	0.811	−0.282	0.025	0.245
	34. Coping with learning about self-care knowledge and skill, including preparing food, wound care, skin care, and oral care	−0.056	0.121	0.870	−0.042	−0.175	0.142
	35. Coping with fear about surgery affecting further work	−0.096	0.123	0.672	−0.145	0.358	−0.142
	36. Coping with difficulty in talking with others	−0.197	0.007	0.937	−0.043	0.038	−0.021
Psychological needs	7. Dealing with anxiety or stress	0.206	−0.050	−0.101	0.957	0.233	0.020
	8. Dealing with feeling down or depressed	−0.084	−0.017	0.147	0.757	−0.109	0.087
	9. Dealing with fears about the cancer spreading or returning	0.339	−0.073	0.209	0.447	−0.031	−0.014
	10. Coping with fears about the pain and suffering you might experience	0.128	0.030	0.200	0.502	−0.003	0.138
	11. Coping with anxiety about having treatment or surgery	0.150	0.006	0.216	0.397	0.172	0.011
	12. Coping with fears about further physical disability or deterioration	0.060	0.073	0.162	0.546	0.049	−0.005
	13. Accepting the changes in your appearance and self-image	0.001	−0.096	0.173	0.815	−0.095	−0.177
	14. Coping with worry that the cancer is beyond your control	0.235	−0.134	0.383	0.433	0.072	−0.048
	15. Coping with an uncertain future	0.263	0.037	0.100	0.411	0.238	−0.091
	16. Working through your feelings about death and dying	0.308	−0.063	0.047	0.586	0.070	−0.025
	17. Learning to feel in control of your situation	0.368	0.102	0.167	0.388	0.010	0.069
Interpersonal/ communication needs	18. Coping with awkwardness in talking with others about the cancer	0.088	−0.077	0.000	−0.117	0.977	−0.063
	19. Coping with changes in other people's attitudes and behavior towards you	0.007	−0.078	0.103	−0.086	0.934	−0.049
Physical and daily living needs	1. Dealing with lack of energy and tiredness	0.067	−0.155	−0.006	0.073	0.033	0.913
	2. Coping with disturbed sleep	0.078	0.018	0.042	0.054	−0.080	0.872
	3. Coping with keeping up with work around the home	−0.275	0.264	−0.306	0.070	0.296	0.599
	4. Coping with frustration at not being able to do the things you used to	−0.136	−0.025	−0.067	0.108	0.402	0.604
	5. Coping with fears about losing your independence	−0.269	0.066	0.122	0.042	0.209	0.705
	6. Coping with feeling bored and/or useless	−0.057	0.106	−0.080	−0.048	0.006	0.921
Eigenvalue		7.58	4.87	4.62	3.99	3.79	2.11
Variance explained		48.87	8.82	5.91	4.79	3.83	2.66
Cumulative variance explained		48.87	57.68	63.59	68.38	72.21	74.87

eigenvalues greater than 1. The scree plot clearly showed a six-factor solution to be perfect for picking factors. All subscales except the psychological care needs subscale had clear factor loadings with items loaded in each factor (subscale) as expected. Several items on the psychological care needs subscale (factor) loaded equally or even higher in the physical and daily living needs, head and neck cancer-specific needs, or interpersonal/communication needs subscales. The "health information needs" factor explained most of the variance (48.87%) of the six subscales (Table 2).

Convergent and discriminant validity

The Pearson correlation showed the significant correlations among six care needs domains and overall care needs (correlation=0.35 to 0.94). Furthermore, except for correlations between performance status and interpersonal/communication needs and between QOL and health information needs, all theoretically assumed relationships among the CNQ-SF-hn overall scale, subscales, and related factors were significant (correlation=−0.26 to 0.61; Table 3). In order to construct robust convergent validity, multivariate multiple regression was used for the next analysis. The results of convergent validity testing were as follows. Patients' physical and daily living needs were positively related to anxiety (coefficient=0.38, p value=0.000) and depression (coefficient=0.17, p value=0.028), with 37.6% of the variance explained. Patients' psychological needs were positively associated with anxiety (coefficient=0.50, p value=0.000), with 35.7% of the variance explained. The patients with higher anxiety (coefficient=0.42, p value=0.000) perceived greater interpersonal communication needs. Patients with higher anxiety (coefficient=0.35, p value=0.000) and lower physical performance (coefficient=−0.24, p value=0.000) perceived greater patient care support needs, with 29.2% of the variance explained. A significantly positive correlation was found between anxiety and health information needs (coefficient=0.28, p value=0.003) and head and neck disease needs (coefficient=0.36, p value=0.000). However, patients with higher anxiety (coefficient=0.48, p value=0.000) and lower physical performance (coefficient=−0.14, p value=0.025) were more likely to have greater overall care needs (Table 4).

The results of multivariate logistic regression showed that the six subscales and overall care needs were significantly positively associated with undergoing reconstructive surgery. The patients with an advanced cancer stage were significantly more likely to experience greater physical and daily living needs, psychological needs, and head and neck disease needs, indicating discriminant validity (Table 5).

Discussion

This is the first study to examine the psychometrics of the Chinese-version CNQ-SF-hn, consisting of the CNQ-SF

Table 3 Correlations among cancer needs questionnaire-short form-head and neck cancer-specific version overall need, needs in subscales, and selected instruments (N=206)

Scale	CNQ-SF-hn subscale score[a]										
	1	2	3	4	5	6	7	8	9	10	11
1. Physical/daily living needs	1.00										
2. Psychological needs	0.68**	1.00									
3. Interpersonal communication needs	0.49**	0.60**	1.00								
4. Patient care/support needs	0.48**	0.65**	0.35*	1.00							
5. Health information needs	0.41*	0.71***	0.38*	0.64**	1.00						
6. Head and neck disease needs	0.57**	0.76***	0.49**	0.62**	0.62**	1.00					
7. Overall care needs	0.73***	0.94***	0.60**	0.80***	0.84***	0.83***	1.00				
8. Anxiety	0.59**	0.59**	0.38*	0.50**	0.39*	0.49**	0.61**	1.00			
9. Depression	0.51**	0.49**	0.46**	0.39*	0.41*	0.38*	0.48**	0.70	1.00		
10. Physical performance	−0.35*	−0.30*	−0.01	−0.42**	−0.28*	−0.30*	−0.37*	−0.42**	−0.31*	1.00	
11. Quality of life[a]	−0.37*	−0.36*	−0.32*	−0.28*	−0.13	−0.33*	−0.33*	−0.42**	−0.41**	0.34*	1.00

[a] Measured by the University of Washington Quality of Life (UW-QOL) scale

*p value<0.05

**p value<0.01

***p value<0.001

Table 4 Multivariate multiple regression of convergent validity for the care needs for overall and each domain (N=206)

Model	Coefficient	95% CI for coefficient	Adjusted R^2
Physical/daily living needs			0.376
Anxiety	0.38	1.074 to 2.647	
Depression	0.17	0.085 to 1.431	
Physical performance	−0.11	−1.067 to 0.081	
Quality of life	−0.11	−0.254 to 0.022	
Psychological needs			0.357
Anxiety	0.50	1.691 to 3.335	
Depression	0.04	−0.524 to 0.884	
Physical performance	−0.42	−0.804 to 0.396	
Quality of life	−0.12	−0.282 to 0.007	
Interpersonal communication needs			0.140
Anxiety	0.42	1.347 to 3.441	
Depression	0.01	−0.909 to 0.949	
Quality of life	0.09	−0.076 to 0.297	
Patient care/support needs			0.292
Anxiety	0.35	0.963 to 2.852	
Depression	0.06	−0.517 to 1.101	
Physical performance	−0.24	−1.978 to −0.600	
Quality of life	−0.03	−0.204 to 0.127	
Health information needs			0.158
Anxiety	0.28	0.661 to 3.261	
Depression	0.08	−0.624 to 1.592	
Physical performance	−0.14	−1.874 to 0.007	
Head and neck disease needs			0.249
Anxiety	0.36	0.732 to 2.146	
Depression	0.05	−0.415 to 0.796	
Physical performance	−0.09	−0.843 to 0.188	
Quality of life	−0.13	−0.243 to 0.005	
Overall care needs			0.381
Anxiety	0.48	1.502 to 2.979	
Depression	0.10	−0.201 to 1.058	
Physical performance	−0.14	−1.144 to −0.076	

and a head and neck cancer-specific needs subscale. Our findings address several issues.

First, the results show that the CNQ-SF-hn is a very reliable instrument with strong internal consistency reliability and measuring concepts similar to known care needs. The overall test–retest reliability was 0.80, suggesting that the CNQ-SF-hn is generally stable. However, the test–retest reliability for the psychological needs subscale was only 0.56. Similarly, relatively low test–retest reliabilities were found for the interpersonal/communication and head and neck cancer-specific needs subscales (correlation=0.67 and 0.65, respectively). These relatively low test–retest reliabilities may be due to the variable condition of our subjects' oral cavity area over 1 week. Because the oral cavity was the surgical site, patients' needs specific to this area, such as head and neck care needs and communication ability, probably varied over 1 week. These variable needs may be reflected as unstable psychological needs. Therefore, this inference should be examined in patients under more stable conditions, such as the survival phase, to verify the test–retest reliability of these three CNQ-SF-hn subscales.

Second, the results of exploratory factor analysis generally showed clear subscale structures across the six subscales. These results strongly support the idea that the CNQ-SF-hn can be divided and used as five subscales (CNQ-SF) or as six subscales (CNQ-SF-hn, specifically for the head and neck cancer population). Most of the variance was explained by health information needs (48.87%). Although this factor had a very clear factor structure with high factor loadings in each item, some items were

Table 5 Multivariate logistic regression of discriminant validity for the care needs for overall and each domain in different reconstruction and cancer stage group (N=206)

Model	Wald test	Exp for (beta)	95% CI for exp (beta)
Physical/daily living needs			
Reconstruction[a]	16.323	1.047	1.034–1.059
Cancer stage[b]	15.161	1.010	1.002–1.019
Psychological needs			
Reconstruction[a]	9.199	1.035	1.025–1.044
Cancer stage[b]	13.556	1.007	1.000–1.014
Interpersonal communication needs			
Reconstruction[a]	2.854	1.036	1.025–1.047
Cancer stage[b]	4.249	1.006	0.998–1.014
Patient care/support needs			
Reconstruction[a]	1.620	1.034	1.023–1.045
Cancer stage[b]	2.738	1.005	0.997–1.012
Health information needs			
Reconstruction[a]	0.084	1.022	1.015–1.029
Cancer stage[b]	0.061	1.001	0.996–1.007
Head and neck disease needs			
Reconstruction[a]	12.850	1.051	1.037–1.065
Cancer stage[b]	19.628	1.012	1.003–1.022
Overall care needs			
Reconstruction[a]	6.393	1.035	1.025–1.045
Cancer stage[b]	9.576	1.006	0.999–1.013

[a] Reconstruction is related to without or with reconstruction

[b] Cancer stage is related to early stage (stage I+II) and advanced stage (stage III+IV)

moderately loaded across the patient care and support needs and head and neck cancer-specific needs subscales. These results suggest that information needs may partly reflect needs across patient-related support and cancer-specific factors. Similarly, item 17 in psychological care needs (learning to feel in control of your situation) had a similar factor loading as health information needs, suggesting the intercorrelated nature of information needs for related psychological and physical care. Although some needs were intercorrelated across domains, our results show a clear factor structure; therefore, we kept the original CNQ domain categorization [12].

Third, in general, most of the correlations among the overall CNQ-SF-hn and its subscales, as well as the theoretically supported correlations, were significant and confirm the concurrent validity of the CNQ-SF-hn. The moderately negative correlations among all care needs and QOL indicate that patients with high levels of care needs perceived lower QOL, consistent with our assumptions [20]. Clinically, these findings again strongly suggest that higher care needs may imply lower patient-perceived QOL. This confirms that unmet care needs could be important indicators of patients' QOL and further supports the importance of tailoring use of the CNQ-SF-hn to clinical head and neck care settings. Convergent validity testing revealed anxiety across all need domains, demonstrating that anxiety may have a huge psychological impact on patients during the treatment process. Thus, reducing patients' anxiety may increase their ability to cope with their care needs.

In addition, one of the most powerful findings was that the CNQ-SF-hn can differentiate the care needs of oral cavity cancer patients undergoing versus not undergoing reconstructive surgery. This is an important factor in the care needs of patients with oral cavity cancer. Both radical excision and reconstruction have a significant impact on overall care needs and each individual care need domain. It is important to identify patients with clinically relevant unmet care needs.

The CNQ-SF-hn can also detect differences in needs between patients with stage IV and less advanced cancers. These results support clinical use of the CNQ-SF-hn to detect the needs of patients with different disease and treatment conditions. Therefore, future study to develop appropriate interventions that reflect patients' needs as measured by the CNQ-SF-hn is strongly recommended to maximize the usefulness of the CNQ-SF-hn.

Fourth, because the CNQ-SF-hn retains the original content of the CNQ-SF while adding head and neck cancer-specific care needs, the overall and individual Cronbach's alphas, as well as its content and construct validity, make the CNQ-SF-hn more clinically important and useful than the original CNQ-SF. It can be used both generally and specifically to determine overall cancer care needs as well as those specific to head and neck cancer. We therefore suggest that developing questionnaires similar to the European Organisation for Research and Treatment of Cancer QLQ general scale and cancer-specific QOL scales [1, 15] may be a step toward developing a series of cancer-specific care needs instruments that can reflect both general and specific needs in various types of cancer patients.

Although the CNQ-SF-hn has proven to be a valid instrument for assessing head and neck cancer patients' needs, we suggest that clinicians use the CNQ-SF-hn together with other clinical assessment tools for more comprehensive screening and assessment. For example, the patients concerns inventory (PCI) [35] may allow easier screening and classification of head and neck cancer patients' concerns. However, the CNQ-SF-hn can provide more detailed information about patients' specific care needs. Therefore, we suggest initial use of the PCI to screen patients' concerns, followed by in-depth needs assessment using the CNQ-SF-hn. It is crucial to build a good head and neck cancer consultation team to deal with patients' concerns and care needs as assessed by the PCI and CNQ-SF-hn.

Finally, despite the satisfactory psychometrics of the CNQ-SF-hn, our results are limited to an oral cavity cancer population. Further testing and expansion of the use of this instrument for patients with other head and neck cancers are recommended.

Conclusion

Our results strongly support satisfactory psychometrics for the Chinese-version CNQ-SF-hn in measuring the supportive care needs of oral cavity cancer patients in Taiwan. Patients reported that the CNQ-SF-hn reflected their care needs during the cancer treatment process. Future studies are recommended to validate the factor structure of the CNQ-SF-hn across other head and neck cancer populations and to expand its usefulness.

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Conflicts of interest None.

References

1. Bjordal K, de Graeff A, Fayers PM et al (2000) A 12 country field study of the EORTC QLQ-C30 (version 3.0) and the head and neck cancer specific module (EORTC QLQ-H&N35) in head and neck patients. EORTC quality of life group. Eur J Cancer 36:1796–1807
2. Bonevski B, Sanson-Fisher R, Girgis A et al (2000) Evaluation of an instrument to assess the needs of patients with cancer. Supportive Care Review Group. Cancer 88:217–225
3. Bonevski B, Sanson-Fisher R, Hersey P, Paul C et al (1999) Assessing the perceived needs of patients attending an outpatient melanoma clinic. J Psychosoc Oncol 17:101–108
4. Carr ER (2008) Quality of life for our patients: how media images and messages influence their perceptions. Clin J Oncol Nurs 12:43–51
5. Chen MH (2005) Communication and quality of life in head and neck cancer patients. Thesis. Taipei Medical University, Taipei, Taiwan
6. Chen YJ, Chang JTC, Liao CT, Wang HM, Yen TC, Chiu CC, Lu YC, Li HF, Cheng AJ (2008) Head and neck cancer in the betel quid chewing area: recent advances in molecular carcinogenesis. Cancer Sci 99:1507–1514
7. Chen ML, Chang HK, Yeh CH et al (2000) Anxiety and depression in Taiwanese cancer patients with without pain. J Adv Nurs 32:944–951
8. Chen MH, Lai YH (2007) Communication and quality of life in head and neck cancer patients. VGH Nursing (Chinese) 24:151–162
9. Chen SC, Lai YH, Liao CT, Chang JTC, Lin CC (2009) Unmet information needs and preferences in newly diagnosed and surgically treated oral cavity cancer patients. Oral Oncol 45:946–952
10. Chen SC, Liao CT, Lin CC, Chang JTC, Lai YH (2009) Distress and care needs in newly diagnosed oral cavity cancer patients receiving surgery. Oral Oncol 45:815–820
11. Connelly ST, Schmidt BL (2004) Evaluation of pain in patients with oral squamous cell carcinoma. J Pain 5:505–510
12. Cossich T, Schofield P, McLachlan SA et al (2004) Validation of the cancer needs questionnaire (CNQ) short-form version in an ambulatory cancer setting. Qual Life Res 13:1225–1233
13. Dropkin MJ (2001) Anxiety, coping strategies, and coping behaviors in patients undergoing head and neck cancer surgery. Cancer Nurs 24:143–148
14. Eades M, Chasen M, Bhargava R et al (2009) Rehabilitation: long-term physical and functional changes following treatment. Semin Oncol Nurs 25:222–230
15. Fayers P, Bottomley A, EORTC Quality of Life Group, Quality of Life Unit (2002) Quality of life research within the EORTC-the EORTC QLQ-C30. European Organisation for Research and Treatment of Cancer. Eur J Cancer 38:S125–S133
16. Foot G (1995) Measuring the unmet needs of people living with cancer. Cancer Forum 19:131–135
17. Gellrich NC, Schimming R, Schramm A, Schmalohr D, Bremerich A, Kugler J (2002) Pain, function, and psychologic outcome before, during, and after intraoral tumor resection. J Oral Maxillofac Surg 60:772–777
18. Girgis A, Boyes A, Sanson-Fisher RW, Burrows S et al (2000) Preferences for follow-up after treatment for lung cancer: assessing the nurse-led option. Aust N Z J Public Health 24:166–173

19. Hassan SJ, Weymuller EA (1993) Assessment of quality of life in head and neck cancer patients. Head Neck 15:485–496
20. Hwang SS, Chang VT, Cogswell C, Alejandro Y, Osenenko P, Morales E, Srinivas S, Kasimis B (2004) Study of unmet needs in symptomatic veterans with advanced cancer: incidence, independent predictors and unmet needs outcome model. J Pain Symptom Manage 28:421–432
21. Jemal A, Siegel R, Ward E, Hao Y, Xu J, Murray T, Thun MJ (2008) Cancer statistics, 2008. CA Cancer J Clin 58:71–96
22. Karnofsky DA, Abelmann WH, Craver LF, Burchenal JH et al (1948) The use of the nitrogen mustards in the palliative treatment of carcinoma with particular reference to bronchogenic. Cancer 1:634–656
23. Katre C, Johnson IA, Humphris GM, Lowe D, Rogers SN (2008) Assessment of problems with appearance, following surgery for oral and oro-pharyngeal cancer using the University of Washington appearance domain and the Derriford appearance scale. Oral Oncol 44:927–934
24. Lewis-Beck MS (1980) Applied regression. An introduction. Sage, London
25. Marin G, Marin BV (1991) Research with Hispanic populations. Applied social research methods series, vol 23. Sage, Newbury Park
26. McElduff P, Boyes A, Zucca A, Girgis A et al (2004) The supportive care needs survey: a guide to administration, scoring and analysis. Centre for Health Research & Psycho-Oncology, Newcastle
27. Newell S, Sanson-Fisher RW, Girgis A, Ackland S et al (1999) The physical and psycho-social experiences of patients attending an outpatients medical oncology department: a cross-sectional study. Eur J Cancer Care 8:73–82
28. Newell S, Sanson-Fisher RW, Girgis A, Bonevski B et al (1998) How well do medical oncologists' perceptions reflect their patients' reported physical and psychosocial problems? Cancer 83:1640–1651
29. Nunnally JC, Bernstain IH (1994) Psychometric theory, 3rd edn. McGraw-Hill, New York
30. Penner JL (2009) Psychosocial care of patients with head and neck cancer. Semin Oncol Nurs 25:231–241
31. Polit DF (2009) Statistics and data analysis for nursing research, 2nd edn. Prentice Hall, New Jersey
32. Polit DF, Beck CT (2004) Nursing research: principle and methods, 7th edn. Lippincott, Philadelphia
33. Richardson A, Medina J, Brown V, Sitzia J (2007) Patients' needs assessment in cancer care: a review of assessment tools. Support Care Cancer 15:1125–1144
34. Roger SN, Gwanne S, Lowe D, Humphris G, Yueh B, Weymuller EA (2002) The addition of mood and anxiety domains to the University of Washington quality of life scale. Head Neck 24:521–529
35. Rogers SN, El-Sheikha J, Lowe D et al (2009) The development of a patients concerns inventory (PCI) to help reveal patients concerns in the head and neck clinic. Oral Oncol 45:555–561
36. Rummel RJ (1970) Applied factor analysis. Northwestern University Press, Evanston
37. Sanson-Fisher R, Girgis A, Boyes A, Burton L, Cook P, the Supportive Care Needs of Patients with Cancer (2000) The unmet supportive care needs of patients with cancer. Cancer 88:226–237
38. Scott B, Butterworth C, Lowe D, Rogers SN (2008) Factors associated with restricted mouth opening and its relationship to health-related quality of life in patients attending a maxillofacial oncology clinic. Oral Oncol 44:430–438
39. Smith DP, Supramaniam R, King MT, Ward J, Berry M, Armstrong BK (2007) Age, health, and education determine supportive care needs of men younger than 70 years with prostate cancer. J Clin Oncol 25:2560–2566
40. Snyder CF, Garrett-Mayer E, Brahmer JR, Carducci MA, Pili R, Stearns V, Wolff AC, Dy SM, Wu AW (2008) Symptoms, supportive care needs, and function in cancer patients: how are they related? Qual Life Res 17:665–677
41. Steginga SK, Occhipinti JD, Gardiner RA et al (2001) The supportive care needs of men with prostate cancer. Psychooncology 10:66–75
42. Tabachnick BG, Fidell LS (2001) Using multivariate statistics. Allyn and Bacon, New York
43. Taiwan Cancer Registry (2009) 2008 annual report. Available via http://crs.cph.ntu.edu.tw. Accessed 24 May 2009
44. Zebrack BJ, Mills J, Weitzman TS et al (2007) Health and supportive care needs of young adult cancer patients and survivors. J Cancer Surviv 1:137–145
45. Zigmond AS, Snaith RP (1983) The hospital anxiety and depression scale. Acta Psychiatr Scand 67:361–370