Quality of Life Research (2005) 14: 1181–1186
DOI 10.1007/s11136-004-4782-z

Brief communication

The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30): Validation of English version in Singapore

N. Luo[1], C.S.L. Fones[2], S.E. Lim[3], F. Xie[1], J. Thumboo[4,5] & S.C. Li[1]
[1]*Department of Pharmacy, National University of Singapore, Singapore (E-mail: phalisc@nus.edu.sg);* [2]*Department of Psychological Medicine, National University Hospital, Singapore;* [3]*Department of Hematology–Oncology, National University Hospital, Singapore;* [4]*Department of Rheumatology and Immunology, Singapore General Hospital, Singapore;* [5]*Department of Medicine, National University of Singapore, Singapore, Singapore*

Accepted in revised form 14 October 2004

Abstract

Objective: This study aimed to validate the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30, English version 3.0) in Singaporean cancer patients. *Methods*: In a cross-sectional study, a heterogeneous sample of cancer patients ($n = 57$) self-administered a questionnaire containing the QLQ-C30, the Short Form 36 Health Survey (SF-36) and assessing health and sociodemographic status. Construct validity was assessed by testing *a priori* hypotheses that QLQ-C30 scales would be moderately or strongly correlated with SF-36 scales measuring similar dimensions of health-related quality of life (HRQoL) and that subjects reporting mild symptoms would have better HRQoL scores than those reporting severe symptoms. Internal consistency reliability was assessed using Cronbach's α. *Results*: Strength of Spearman's correlations between the QLQ-C30 and SF-36 scales assessing similar dimensions of HRQoL ranged from 0.35 to 0.67. Subjects with mild symptoms had better scores than those with severe symptoms for all six QLQ-C30 HRQoL scales ($p < 0.05$ for five scales, Mann–Whitney U tests). Cronbach's α ranged from 0.19 for the cognitive functioning scale to 0.91 for the global QoL scale. *Conclusion*: This study provides preliminary evidence for the validity and reliability of the EORTC QLQ-C30 in English-speaking Singaporean cancer patients.

Key words: Cancer, EORTC QLQ-C30, Quality of life, Singapore

Abbreviation: EORTC QLQ-C30 – European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; HRQoL – Health-Related Quality of Life; SF-36 – Short Form 36 Health Survey

Introduction

The European Organization for Research and Treatment of Cancer Quality of Life Question-naire (EORTC QLQ-C30, referred to as QLQ-C30 hereafter) is an instrument for assessing health-related quality of life (HRQoL) in cancer patients [1]. The QLQ-C30 has been used worldwide [2]; however, it has not been validated in Singapore, a multi-ethnic South-East Asian country where English is the language of instruction in schools. The current study, therefore, aimed to examine the validity and reliability of the QLQ-C30 in English-speaking Singaporean cancer patients.

Methods

Study design

A convenience sample of cancer patients was recruited from a tertiary referral hospital in Singapore. After providing written consent, patients while waiting for their routine chemotherapy, completed a questionnaire containing the QLQ-C30, the Short Form 36 Health Survey (SF-36) [3] and assessing sociodemographic status and presence of chronic medical conditions. Patients not having a diagnosis of cancer, not fluent in English or too weak to self-administer the questionnaires independently were excluded. A sample size of 61 was targeted as it would allow identifying correlations of $\geqslant 0.35$ with a power of 80% at a p-value of 0.05 [4].

Instruments

The QLQ-C30 (version 3.0) measures HRQoL in the past week using a global QoL scale, five functional scales and eight symptom scales/items (Table 2). All QLQ-C30 items have four response options (i.e. 'not at all', 'a little', 'quite a bit' and 'very much') except that the two items assessing global QoL use a seven-point scale [5]. Scale scores (range: 0–100) are rescaled mean scores of their component items, with higher global QoL/functional scale scores indicating better HRQoL but higher symptom scale/item scores indicating higher level of symptomatology. The original English version of QLQ-C30 was used in this study after assessing appropriateness of phrasing.

The SF-36 measures HRQoL in the past 4 weeks using eight dimension scales (Table 3), with higher scores (range: 0–100) indicating better HRQoL. The SF-36 has been intensively validated in many countries and in patients with various medical conditions [6] including laryngeal cancer [7]. In Singapore, the UK English version of SF-36 demonstrated good psychometric properties in both patient populations [8, 9] and the general population [10]. The SF-36 served as a 'gold standard' for HRQoL assessment in this study.

Statistical analyses

Spearman's correlations between QLQ-C30 and SF-36 scales were computed to assess convergent construct validity. Based on the literature [11–15], we hypothesized that scales of these two instruments measuring similar dimensions of HRQoL would be moderately or strongly correlated (see Table 3 for *a priori* hypothesized pairs of scales). A correlation coefficient of >0.5, 0.35–0.5 and <0.35 was considered a strong, moderate and poor correlation, respectively [16, 17].

The QLQ-C30 global QoL/functional scale scores were compared between subjects reporting mild and severe symptoms to assess known-groups construct validity. We hypothesized that subjects with mild symptoms would have better HRQoL than those with severe symptoms. We also assessed known-groups validity according to stage of disease and presence of comorbid conditions.

Cronbach's α was calculated for all QLQ-C30 scales to assess internal consistency reliability with an $\alpha \geqslant 0.7$ considered as acceptable [18].

Results

Completed questionnaires were collected from 78 subjects. Among these, 16 subjects completed the questionnaires using their caregivers' input and five subjects were not cancer patients. Analyses were conducted using data from the remaining 57 eligible subjects. The mean age of these subjects was 43 years, with 44% being male. The majority of these subjects was ethnic Chinese (60%), married (72%), employed (53%) and received 7–11 years of education (54%). Breast cancer ($n = 23$) and colorectal cancer ($n = 9$) were the most common diagnoses in these subjects; hypertension ($n = 8$) and diabetes ($n = 8$) were the most frequently reported chronic medical conditions (Table 1).

A total of seven missing answers, each for one different item, were identified, resulting in two missing scores (each for one QLQ-C30 scale). Median (interquartile) scores are displayed in Table 2. As to self-reported symptoms, severe conditions (i.e. indicated by the 'quite a bit' or 'very much' option) ranged from 9% for dyspnoea to 47% for fatigue (Table 2).

The strength of Spearman's correlations for eight pairs of QLQ-C30 and SF-36 scales measuring similar dimensions of HRQoL ranged from 0.35 between QLQ-C30 role functioning and

Table 1. Subjects' characteristics (n = 57)

	n	%
Mean age (range), year	43	15–79
Male	25	44
Ethnicity		
Chinese	34	60
Malay	21	37
Indian	2	3
Years of education		
⩽6 years	11	19
7–11 years	31	54
⩾12 years	15	26
Marital status		
Unmarried	14	25
Married	41	72
Separated/divorced/widowed	2	3
Employment status		
Employer/employee/student	30	53
Homemaker/housewife	8	14
Unemployed	11	19
Retiree	8	24
Presence of chronic medical conditions[a]	16	28
Diagnosis		
Breast cancer	23	40
Colorectal cancer	9	16
Leukemia	6	11
Lung cancer	5	9
Lymphoma	4	7
Germ cell tumor	3	5
Other cancers	6	11

[a] Conditions included hypertension (n = 8), diabetes (n = 8), stroke (n = 1), asthma (n = 1) and arthritis (n = 1).

SF-36 role-emotional scales to 0.67 between QLQ-C30 pain and SF-36 bodily pain scales (Table 3). Subjects reporting mild symptoms had statistically significant higher scores that those reporting severe symptoms (Table 4). Generally, subjects in early stages of cancer (or with no comorbid conditions) had better QLQ-C30 scores than those in advanced disease stages (or with comorbid conditions); however, none of these differences was statistically significant (Table 4).

Cronbach's α was higher than 0.70 for six of the nine QLQ-C30 scales (Table 2).

Discussion

It has been well accepted that a comprehensive assessment of cancer and its treatment should include HRQoL [19]. The need of assessing HRQoL in cancer patients is especially pressing in Singapore where cancer is the leading cause of mortality (approximately one in four deaths caused by cancer [20]). The present study provides preliminary evidence demonstrating the validity and reliability of the QLQ-C30 (English version 3.0) in Singaporean cancer patients. With this study, we hope to elicit more outcomes research in cancer patients in Singapore.

Table 2. Distribution and internal consistency reliability of EORTC QLQ-C30 scores (n = 57)

QLQ-C30 scale/item	Number of items	Median score (interquartile)	Severe symptom[a], %	α[b]
Global QoL	2	67 (50, 75)		0.91
Functional scale				
Physical functioning	5	87 (73, 93)		0.62
Role functioning	2	83 (50, 100)		0.87
Emotional functioning	4	83 (67, 96)		0.86
Cognitive functioning	2	92 (67, 100)		0.19
Social functioning	2	67 (58, 100)		0.83
Symptom scale/item				
Fatigue	3	33 (22, 56)	47	0.82
Nausea and vomiting	2	17 (0, 33)	30	0.68
Pain	2	17 (0, 33)	26	0.84
Dyspnoea	1	0 (0, 33)	9	
Insomnia	1	33 (0, 33)	18	
Appetite	1	33 (0, 33)	23	
Constipation	1	0 (0, 33)	12	
Diarrhoea	1	0 (0, 33)	11	
Financial difficulties	1	67 (33, 100)	51	

[a] A symptom was considered severe if any response to the symptom item(s) was 'quite a bit' or 'very much'.
[b] Cronbach's α.

Table 3. Spearman's rank correlations between EORTC QLQ-C30 and SF-36 scales ($n = 57$)

QLQ-C30 scale	SF-36 scale							
	PF	RP	BP	GH	VT	SF	RE	MH
Global QoL	0.44**	0.41**	0.65***	*0.60***	0.74***	0.54***	0.45**	0.60***
Physical functioning	*0.62***	0.41**	0.40**	0.46***	0.41**	0.37**	0.13	0.25
Role functioning	0.44**	*0.38***	0.46***	0.27	0.29*	0.24	*0.35***	0.24
Emotional functioning	0.28*	0.23	0.49***	0.50***	0.45**	0.31*	0.53***	*0.62****
Social functioning	0.42**	0.48***	0.37**	0.44**	0.31*	*0.40***	0.45**	0.31*
Fatigue	−0.61***	−0.54***	−0.64***	−0.48***	−0.66***	−0.56***	−0.34*	−0.38**
Pain	−0.60***	−0.41**	−0.67***	−0.43**	−0.54***	−0.36**	−0.19	−0.43**

Notes: Italic numbers indicate correlations that were hypothesized to be moderate or strong. Higher scores indicate better HRQoL except the fatigue and pain scales.
PF – physical functioning; RP – role-physical; BP – bodily pain; GH – general health; VT – vitality; SF – social functioning; RE – role-emotional; MH – mental health.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

As hypothesized, the QLQ-C30 scales were moderately or strongly correlated with SF-36 scales that measure similar HRQoL dimensions; subjects reporting mild symptoms had better QLQ-C30 scores than those severe subjects. These results supported construct validity of the QLQ-C30 in Singapore. Cronbach's α was higher than or close to 0.7 for seven of the nine QLQ-C30 scales, suggesting that the internal consistency reliability of these scales are acceptable or almost acceptable for use in HRQoL studies requiring group comparisons [18].

In this study, not all QLQ-C30 scales were correlated more strongly with SF-36 scales measuring similar dimensions of HRQoL than with those SF-36 scales measuring different dimensions. For example, the QLQ-C30 global QoL scale demonstrated a stronger correlation with SF-36 vitality than with SF-36 general health scale (Table 3). Similar results were reported previously [11, 12]. A possible explanation is that these two instruments operationalize HRQoL construct in slightly different ways [12]. The QLQ-C30 scores did not discriminate subjects well in terms of their disease stage or presence of comorbid conditions. This may be due to the fact that a small sample of patients with various cancers was used. Future studies using larger samples of patients with specific cancers are therefore warranted.

Internal consistency reliability of the physical functioning scale ($\alpha = 0.62$) is suboptimal in this study. An examination of physical functioning items showed that the item assessing activities of daily living (ADL, i.e. 'eating', 'dressing', 'washing yourself' and 'using the toilet') was poorly correlated with other items, suggesting this item was the main cause of observed suboptimal reliability. One possible explanation is that, the ADL item was inefficient in this study because the subjects' ADL was rarely impaired; 52 subjects (91%) reported 'not at all' with this item (data not shown). Measurement inefficiency of this ADL item [21] and suboptimal reliability of the physical functioning scale [11, 22] have been reported previously. The discriminant and convergent validity of this item, however, is supported by its poor correlations with other QLQ-C30 scales and a strong correlation with the SF-36 ADL item (i.e. 'bathing or dressing yourself') (data not shown).

It is not surprising that the Cronbach's α for the cognitive functioning scale in this study is low, as suboptimal α values were widely reported for this scale [13–15, 22–30]. Intuitively, the two aspects of cognitive functioning assessed by the QLQ-C30, i.e., concentration and memory, are not necessarily strongly associated with each other. For example, a patient who cannot concentrate well due to severe pain or fatigue may actually have good memory. The poor internal consistency reliability therefore does not necessarily mean that this scale is poorly constructed; after all, these two items definitely assess important aspects of cognitive function. The construction of this scale may be justifiable from the perspective of clinimetrics. In

Table 4. Median (interquartile) EORTC QLQ-C30 scores in subjects known to differ in clinical or health status

	n	EORTC QLQ-C30 scale					
		Global QoL	Physical functioning	Role functioning	Emotional functioning	Cognitive functioning	Social functioning
Severity of symptoms[a]							
Mild	25	66.7 (58.3, 83.3)	91.7 (76.7, 93.3)	100 (66.7, 100)	83.3 (66.7, 100)	100 (83.3, 100)	83.3 (66.7, 100)
Severe	32	50.0 (41.7, 66.7)	80.0 (61.7, 86.7)	66.7 (33.3, 100)	75.0 (51.4, 91.7)	83.3 (66.7, 100)	66.7 (37.5, 83.3)
p-Value		0.017	0.023	0.008	0.147	0.025	0.015
Stage of disease[b]							
I/II	24	58.3 (50.0, 72.9)	86.7 (80.0, 90.4)	83.3 (50.0, 100)	83.3 (66.7, 100)	100 (66.7, 100)	66.7 (50.0, 66.7)
III/IV	27	66.7 (41.7, 83.3)	86.7 (73.3, 93.3)	66.7 (50.0, 100)	70.8 (60.4, 91.7)	83.3 (70.8, 100)	75.0 (66.7, 100)
p-Value		0.587	0.969	0.851	0.302	0.586	0.691
Comorbid conditions							
Not presence	40	66.7 (50.0, 79.2)	86.7 (73.3, 93.3)	83.3 (50.0, 100)	83.3 (66.7, 100)	100 (70.8, 100)	83.3 (66.7, 100)
Presence	16	62.5 (43.8, 72.9)	86.7 (60.0, 86.7)	83.3 (50.0, 100)	79.2 (54.2, 91.7)	83.3 (54.2, 100)	66.7 (37.5, 100)
p-Value		0.706	0.172	0.970	0.659	0.066	0.701

Notes: Higher scores indicate better HRQoL. All comparisons were performed using Mann–Whitney *U* tests.

[a] Severity was defined using subjects' responses to QLQ-C30 symptom items. A subject was considered mild if his or her responses to all QLQ-C30 symptom items were 'not at all' or 'a little'; a subject was considered severe if his or her responses to any QLQ-C30 symptom item was 'quite a bit' or 'very much'.

[b] Disease stage was not available for subjects with leukemia ($n = 6$).

addition to psychometric properties, clinical relevance is also an important consideration in HRQoL instrument development [31].

In addition to its acceptable measurement properties, we also consider the QLQ-C30 to be suitable for use in Singapore because of its brevity (only 30 items) and carefully selected wording. The instrument contains no words that may arouse negative emotions (e.g. 'cancer' or 'tumor') or that might confuse Singaporeans with lower educational attainment (e.g. 'mile' or 'yard'). Given these features, the QLQ-C30 is a promising self-report HRQoL instrument for use in busy cancer clinics or clinical trials in Singapore.

This study used a small sample and did not allow assessment of test–retest reliability or responsiveness due to its cross-sectional design, thus offering minimal testing of construct validity and sensitivity. Our study, however, laid a basis for more comprehensive evaluation of this instrument in Singapore.

In conclusion, this study provides preliminary evidence for the validity and reliability of the EORTC QLQ-C30 in English-speaking Singaporean cancer patients.

Acknowledgements

The authors would like to thank the EORTC Group for providing the EORTC QLQ-C30 and the Cancer Registry of the National University Hospital for assistance in diagnosis retrieval and verification. The authors would also like to thank Ms Xiaolei Guo, Ms Sihui Tan and the nurses working in the Chemotherapy Treatment Center of the National University Hospital for their help with the study.

References

1. Aaronson NK, Cull A, Kaasa S, et al. The European Organization of Research and Treatment of Cancer (EORTC) modular approach to quality of life assessment in oncology: and update. In: Spilker B (ed.), Quality of Life and Pharmacoeconomics in Clinical Trials, 2nd ed. New York, NY: Raven Press, 1996: 179–189.
2. http://www.eortc.be/home/qol/ExplQLQ-C30.htm.Accessed April 12, 2004.
3. Ware JE, Snow KK, Kosinski M, et al. SF-36 Health Survey Manual and Interpretation Guide. Boston: The Health Institute, New England Medical Center, 1993.

4. Gatsonis C, Sampson AR. Multiple correlation: Exact power and sample size calculations. Psychol Bull 1989; 106: 516–524.
5. http://www.eortc.be/home/qol/QLQ-C30.doc. Accessed April 12, 2004.
6. Ware JE Jr. SF-36 health survey update. Spine 2000; 25: 3130–3139.
7. Mosconi P, Cifani S, Crispino S, et al. The performance of SF-36 health survey in patients with laryngeal cancer. Head and Neck Cancer Italian Working Group. Head Neck 2000; 22: 175–182.
8. Thumboo J, Fong KY, Ng TP, et al. Validation of the MOS SF-36 for quality of life assessment of patients with systemic lupus erythematosus in Singapore. J Rheumatol 1999; 26: 97–102.
9. Luo N, Seng BK, Thumboo J, et al. Validation of English and Chinese versions of the SQLS, SF-36 and HU13 in patients with schizophrenia in Singapore. Value Health 2003; 6: 360.
10. Thumboo J, Fong KY, Machin D, et al. A community-based study of scaling assumptions and construct validity of the English (UK) and Chinese (HK) SF-36 in Singapore. Qual Life Res 2001; 10: 175–188.
11. Apolone G, Filiberti A, Cifani S, et al. Evaluation of the EORTC QLQ-C30 questionnaire: A comparison with SF-36 Health Survey in a cohort of Italian long-survival cancer patients. Ann Oncol 1998; 9: 549–557.
12. Kuenstner S, Langelotz C, Budach V, et al. The comparability of quality of life scores: A multitrait multimethod analysis of the EORTC QLQ-C30, SF-36 and FLIC questionnaires. Eur J Cancer 2002; 38: 339–348.
13. Chie WC, Hong RL, Lai CC, et al. Quality of life in patients of nasopharyngeal carcinoma: Validation of the Taiwan Chinese version of the EORTC QLQ-C30 and the EORTC QLQ-H&N35. Qual Life Res 2003; 12: 93–98.
14. Chie WC, Chang KJ, Huang CS, Kuo WH. Quality of life of breast cancer patients in Taiwan: Validation of the Taiwan Chinese version of the EORTC QLQ-C30 and EORTC QLQ-BR23. Psychooncology 2003; 12: 729–735.
15. Chie WC, Yang CH, Hsu C, Yang PC. Quality of life of lung cancer patients: Validation of the Taiwan Chinese version of the EORTC QLQ-C30 and QLQ-LC13. Qual Life Res 2004; 13: 257–262.
16. Guyatt GH, Berman LB, Townsend M, et al. A measure of quality of life in clinical trials in chronic lung disease. Thorax 1987; 42: 773–778.
17. Juniper EF, Guyatt GH, Jaeschke R. How to develop and validate a new health-related quality of life instrument. In: Spilker B (ed.), Quality of Life and Pharmacoeconomics in Clinical Trials, 2nd ed. Philadelphia: Lippincott-Raven Publishers, 1996: 49–56.
18. Nunnally JC, Bernstein IR. Psychometric Theory, 3rd ed. New York: McGraw-Hill, 1994.
19. Osoba D. Measuring the effect of cancer on health-related quality of life. Pharmacoeconomics 1995; 7: 308–319.
20. Hock LC. An overview of the cancer control programme in Singapore. Jpn J Clin Oncol 2002; 32(Suppl): 62–65.
21. Bjordal K, de Graeff A, Fayers PM, et al. 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 2000; 36: 1796–1807.
22. Zhao H, Kanda K. Translation and validation of the Standard Chinese version of the EORTC QLQ-C30. Qual Life Res 2000; 9: 129–137.
23. Aaronson NK, Ahmedzai S, Bergman B, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. J Natl Cancer Inst 1993; 85: 365–375.
24. Bjordal K, Kaasa S. Psychometric validity of EORTC core quality of life questionnaire. 30 item version, a diagnosis specific module for head and neck cancer patients. Acta Oncol 1992; 31: 311–321.
25. Kaasa S, Bjordal K, Aaronson N, et al. The EORTC Core Quality of Life Questionnaire (QLQ-C30): Validity and reliability when analyzed with patients treated with palliative radiotherapy. Eur J Cancer Inst 1993; 85: 365–376.
26. Ringdal GI, Ringdal K. Testing the EORTC Quality of Life Questionnaire on cancer patients with heterogeneous diagnoses. Qual Life Res 1993; 2: 129–140.
27. Osoba D, Zee B, Pater J, et al. Psychometric properties and responsiveness of the EORTC Quality of Life Questionnaire (QLQ-C30) in patients with breast, ovarian and lung cancer. Qual Life Res 1994; 3: 353–364.
28. Kobayashi K, Takeda F, Teramukai S, et al. A cross-validation of the European Organization for Research and Treatment of Cancer QLQ-C30 (EORTC QLQ-C30) for Japanese with lung cancer. Eur J Cancer 1998; 34: 810–815.
29. Montazeri A, Harirchi I, Vahdani M, et al. The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30): Translation and validation study of the Iranian version. Support Care Cancer 1999; 7: 400–406.
30. Arraras JI, Arias F, Tejedor M, et al. The EORTC QLQ-C30 (version 3.0) Quality of Life questionnaire: Validation study for Spain with head and neck cancer patients. Psychooncology 2002; 11: 249–256.
31. Fayers PM, Machin D. Quality of Life: Assessment, Analysis and Interpretation. Chichester: John Wiley & Sons, Ltd., 2000; 38–39.

Address for correspondence: Shu Chuen Li, Department of Pharmacy, Faculty of Science, National University of Singapore, 10 Kent Ridge Crescent, Singapore 119260, Singapore
Phone: +65-68746537; Fax: +65-67791554
E-mail: phalisc@nus.edu.sg