แบบจำลองเชิงสาเหตุของคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพของผู้ป่วยมะเร็งปอดที่ได้รับเคมีบำบัด
A Causal Model of Health-Related Quality of Life Among Lung Cancer Patients Undergoing Chemotherapy

นิพนธ์ต้นฉบับ

เหงียน ดึ๊ก ดึง[1,2], นุจรี ไชยมงคล[1]* และ ภรภัทร เฮงอุดมทรัพย์[1]

[1] คณะพยาบาลศาสตร์ มหาวิทยาลัยบูรพา อ.เมืองชลบุรี จ.ชลบุรี 20131
[2] คณะพยาบาลศาสตร์ Vinh Medical University, เวียดนาม 461150
* Corresponding author: nujjaree@buu.ac.th

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Original Article

Nguyen Duc Duong[1,2], Nujjaree Chaimongkol[1]* and Pornpat Hengudomsub[1]

[1] Faculty of Nursing, Burapha University, Muang Chonburi, Chonburi, 20131, Thailand
[2] Faculty of Nursing, Vinh Medical University, 461150, Vietnam
* Corresponding author: nujjaree@buu.ac.th

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บทคัดย่อ

วัตถุประสงค์: เพื่อทดสอบแบบจำลองเชิงสาเหตุของคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพในผู้ป่วยมะเร็งปอดที่ได้รับเคมีบำบัด **วิธีการศึกษา:** การวิจัยแบบทดสอบรูปแบบจำลองและภาคตัดขวาง ใช้วิธีการสุ่มตัวอย่างแบบสะดวกถูกเพื่อคัดเลือกผู้ป่วยมะเร็งปอดที่ได้รับเคมีบำบัดจำนวน 232 รายในโรงพยาบาลในภาคเหนือของประเทศเวียดนาม เครื่องมือที่ใช้ในการวิจัยประกอบด้วยแบบสอบถามแบบที่ให้ตอบเอง จำนวน 6 ฉบับ ได้แก่แบบสอบถามคุณภาพชีวิตของ Ferrans and Powers, แบบประเมินประสบการณ์อาการของ Memorial, แบบวัดพฤติกรรมการดูแลตนเองขณะได้รับเคมีบำบัดของ Leuven, แบบสอบถามสถานภาพการทำหน้าที่, แบบสำรวจการสนับสนุนทางสังคม, และ แบบวัดการรับรู้สุขภาพทั่วไป ใช้สถิติพรรณนาและแบบจำลองสมการโครงสร้างเพื่อวิเคราะห์ข้อมูล **ผลการศึกษา:** พบว่ารูปแบบความสัมพันธ์เชิงสาเหตุที่ปรับปรุงมีความสอดคล้องกับข้อมูลเชิงประจักษ์ (X^2 = 154.49, *P*-value = 0.691, df = 164, CMIN/df = 0.942, GFI = 0.942, AGFI = 0.918, CFI = 1.000 และ RMSEA = 0.000) พฤติกรรมการดูแลตนเอง สถานภาพการทำหน้าที่ และการรับรู้ด้านสุขภาพโดยทั่วไปมีอิทธิพลโดยตรงต่อคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ การรับรู้สุขภาพทั่วไปเป็นสื่อกลางของความสัมพันธ์ระหว่างพฤติกรรมการดูแลตนเองกับคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ และระหว่างสถานภาพการทำหน้าที่กับคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ ประสบการณ์อาการและการสนับสนุนทางสังคมไม่มีผลโดยตรงต่อคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพแต่มีผลทางอ้อม ในความสัมพันธ์เชิงสาเหตุนี้ประสบการณ์อาการ สถานภาพการทำหน้าที่ การรับรู้สุขภาพทั่วไป พฤติกรรมการดูแลตนเอง และการสนับสนุนทางสังคม สามารถทำนายความแปรปรวนของคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพได้ร้อยละ 68.0 **สรุป:** แบบจำลองเชิงสาเหตุของคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพนี้มีความเหมาะสม ข้อเสนอแนะแนวทางใหม่สำหรับวิชาชีพพยาบาลในการเพิ่มคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพของผู้ป่วยมะเร็งปอดที่ได้รับเคมีบำบัด โดยการปรับปรุงพฤติกรรมการดูแลตนเอง การรับรู้สุขภาพทั่วไป และสถานภาพการทำหน้าที่

คำสำคัญ: แบบจำลองสาเหตุ, สถานภาพการทำหน้าที่, การรับรู้สุขภาพทั่วไป, คุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพ, พฤติกรรมการดูแลตนเอง, การสนับสนุนทางสังคม, ประสบการณ์อาการ

Abstract

Objective: To test a causal model of health-related quality of life (HRQoL) among lung cancer patients undergoing chemotherapy. **Methods:** A model-testing and cross-sectional study was conducted. A convenience sampling method was used to recruit 232 persons with lung cancer receiving chemotherapy in hospitals of the northern region of Vietnam. Research instruments included six self-report questionnaires of the Ferrans and Powers Quality of Life Index, the Memorial Symptom Assessment, the Leuven Patient Self-care during Chemotherapy, the Functional Status Questionnaire, the Social Support Survey, and the General Health Perception Scale. Descriptive statistics and Structural Equation Modeling were used to analyze the data. **Results:** The modification model fit the data well (X^2 = 154.49, *P*-value = 0.691, df = 164, CMIN/df = 0.942, GFI = 0.942, AGFI = 0.918, CFI = 1.000 และ RMSEA = 0.000). Self-care behavior, functional status, and general health perception had a direct effect on HRQoL. General health perception mediated the relationships between self-care behavior and HRQOL, and between functional status and HRQoL. Symptom experience and social support had no direct effect on HRQoL, but indirect effects. In this causal relationship, symptom experience, functional status, general health perception, self-care behavior, and social support accounted for 68.0% of variance in HRQOL. **Conclusion:** The causal model of HRQOL is appropriated. It would suggest a new direction for the nursing profession to enhance HRQOL of person with lung cancer receiving chemotherapy through improving self-care behavior, general health perception, and functional status.

Keywords: causal model, functional status, general health perception, health-related quality of life, self-care behavior, social support, symptom experience

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Introduction

Lung cancer is one of the leading causes of cancer incidence and mortality, with 2.1 million new lung cancer cases and 1.8 million deaths predicted in 2018, representing close to 1 in 5 (18.4%) of cancer deaths.[1] In Vietnam, lung

cancer is the second leading of new cancer diagnoses with 23,667 cases representing 14.4% of total new cases after liver cancer and 20,710 deaths were representing 18.0% of total cancer deaths in 2018.[2] Unfortunately, most Vietnamese patients are diagnosed with lung cancer at the age of over 40 and they often admit to hospitals at advanced stages (65 - 80%).[3] Most of the treatment regimens target prolonging their life, managing their symptoms, and improving patient's quality of life. Chemotherapy is the most common treatment for these stages of lung cancer in Vietnam.[4] Chemotherapy is a systemic treatment, which spreads the drug throughout the body. Consequently, not only symptoms of the disease but also it causes various side effects and complications that influence on health-related quality of life of the patients.[3,5,6] Therefore, healthcare providers need to comprehend the health-related quality of life in lung cancer patients undergoing chemotherapy.

Health-related quality of life (HRQoL) has been studied for several decades. Nowadays, HRQoL has become a popular health outcome and has been used as a primary endpoint in all types of clinical trials along with traditional endpoints of cancer cells' response and survival.[7,8] In attempting to describe this concept, several conceptual frameworks and theories have been proposed to explain the core concept of HRQoL.[9,10] In those frameworks, the works of Ferrans, Zerwic, Wilbur, and Larson[10] are the most prominent to use for research in nursing and healthcare.[11] Ferrans and colleagues' conceptual model (FCM) consists of five core components including biological function, symptoms, functional status, general health perception, and overall quality of life. In addition, they described individual and environmental characteristics associated with those five components.[10]

According to the FCM, symptom experience is the individual's awareness or experience reflecting the changed organ function. It refers to the perception, evaluation of the symptoms, and response to them. Lung cancer has demonstrated a variety of symptoms experiencing by the patients including fatigue, loss of appetite, shortness of breath, cough, pain, and blood in the sputum.[12] These symptoms have resulted from the disease as well as side effects from treatment of chemotherapy. Multivariate analysis showed four symptoms: loss of appetite, cough, pain and shortness of breath lung cancer patients were significant predictors of the patients' quality of life.[12] In addition, a recent study in Korean patients with lung cancer showed that the perceived high

symptom frequency, severity, and distress, and symptom experience negatively affecting both the physical and mental domain of HRQoL.[13] Furthermore, a study by Wong et al., stated that the higher symptom experience and comorbidity had lower functional status and general health perception.[14]

Functional status is an individual's ability to perform normal daily activities required to meet basic needs, fulfill usual roles, and maintain health and well-being.[15] Functional status is important for determining overall general health and has been used as a factor to estimate the therapeutic risk of complications and adverse events. Literature depicted that most cancer patients, including lung cancer patients, undergoing chemotherapy have reported moderate to severe limitations in functional status such as reduced energy, difficulty with household chores, and interference with work.[16,17] Some studies found that functional status positively related to HRQoL in lung cancer.[16,18] Other studies also depicted that high social support and appropriate self-care behavior could increase functional status in cancer patients.[19]

Self-care behavior refers to decisions and actions that an individual can take to cope with a health problem or improve his or her health. Evidence indicated that patients with cancer and cancer survivors need to engage in self-care of their side effects, symptoms, and psychological burdens of the disease and its treatment.[20] In lung cancer undergoing chemotherapy, performance status, prior lines of treatment, health literacy, and self-care behavior are significant predictors of HRQoL in which self-care behavior has the greatest impact.[21] Furthermore, some studies have proved that social support has been found to be a significant predictor of self-care behavior.[22,23]
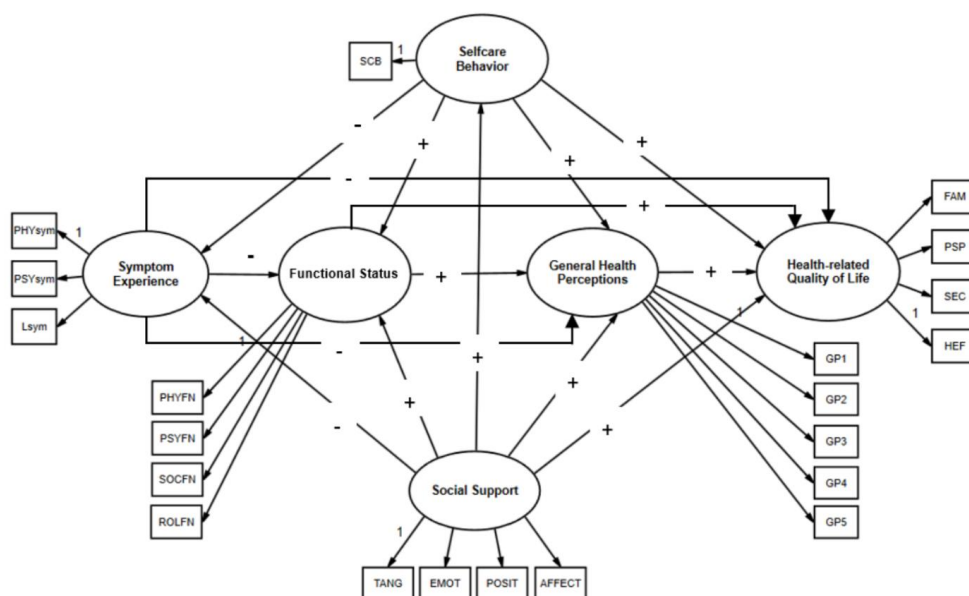
Social support can be regarded as an environmental characteristic that has been studied for decades in relation to health status and quality of life.[24] It is defined as individuals' perception of tangible, emotional-informational, positive social interactions and affectionate support from others. Several studies showed that social support plays an important role in promoting QoL in the lung cancer population.[19,25] Empirically, a systematic review on social support and quality of life in lung cancer showed that healthcare professionals as support sources which found positively associated with all aspects of HRQoL.[19] Corroborating evidence was found for the association between perceived and received support from family and friends with QoL.[19] Moreover, social support was also found to have negatively correlated with symptom

experience, and positively correlated with functional status and general health perception among cancer patients.[26]

There are personal beliefs and assessments of the general state of health that show how people consider themselves to be well or not, it is so-called "general health perception" (GHP). GHP is a subjective concept, and an individual's perceptions of his or her health status can reflect feelings and beliefs more than his or her current physical state.[27] During the last few years, researchers have found that individual perceptions affect healthy behaviors.[27,28] Some studies indicate that GHP is an important predictor of health outcomes such as HRQoL.[29,30] In the cancer survivor population, the GHP was found to have a mediated effect on social support.[31]

In summary, research on factors predicting HRQoL is important for enhancing better outcomes. To date, there are a few studies attempted to measure and describe the HRQoL in the lung persons undergoing chemotherapy regimen. Therefore, this study aims to test a causal relationship of symptom experience, functional status, general health perception, self-care behavior, and social support on health-related quality of life of lung cancer persons undergoing chemotherapy. Findings from this study would be beneficial to use for the suggestion to develop an effective intervention targeting significant factors to help lung cancer patients having better HRQoL. Consequently, drawing from the above theory and literature, we developed a hypothesized structural model

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to explain the causal linkage among these five factors and HRQoL (Figure 1). Therefore, we examined the following research hypotheses:

Symptom experience, functional status, self-care behavior, social support, and general health perception have influenced HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

2. Symptom experience has a negatively direct effect, and indirect effects on HRQoL through self-care behavior, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

3. Functional status has a positively direct effect and indirect effects on HRQoL through general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

4. Social support has a positively direct effect, and indirect effects on HRQoL through self-care behavior, symptom experience, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

5. General health perception has a positively direct effect on HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

6. Self-care behavior has direct effect, and indirect effects on HRQoL through symptom experience, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

Figure 1 The hypothesized model of the study.

Methods

In this cross-sectional model-testing, the participants were employed using a convenience sampling technique. Regarding sample size for structural equation modelling, a common rule of thumb so-called N:q rule is popular using to calculate sample size.[32] N is the number of needed subjects per one parameter (q). In general, the proportion is commonly set as 10:1. The ratio lower than 10:1 would lessen the credibility for the findings.[33] In this study, the hypothesized model consisted of 25 parameters (4 variances, 1 covariance, 15 paths, and 5 structure errors). Therefore, at least 250 subjects should be recruited. To compensate for a 10% attrition rate, a total of 275 lung cancer patients undergoing chemotherapy were recruited. However, according to Kline[33] a typical sample size as a rule of thumb in studies where SEM is used is about 200 cases.

To be eligible, participants who diagnosed with primary lung cancer at stages III and IV, hospitalized for first-line chemotherapy treatment, have completed at least one cycle of the chemotherapy course, age between 18-60 years, and able to read and verbally communicate in Vietnamese were included in this study. Data collection was carried out from April to September 2020.

Research instruments

Health-related Quality of Life (HRQoL) was measured by using the Ferrans and Powers Quality of Life Index (FPQLI).[34] The FPQLI contains 33 items asked patients to answer in two parts, the part one asking patients rating on satisfaction dimension and the part two asking patients rating how importance of those areas in their life. The participants were asked to rate their responses on a 6-point Likert-type scale ranging from 1 to 6. The response scores of each item in satisfaction part were re-coded by subtract to 3.5 to center the scale of zero. Then, the new recoded satisfaction score was multiplied with the raw important response for each pair of satisfaction and important items to constitute the weighted response scores. Next, the preliminary sum of overall score was obtained by sum up 33 weighted response scores. Later, the preliminary sum was divided by the number of items answered by that individual patient. (At this point the possible range for scores is –15 to +15.). To eliminate negative numbers of the FPQLI score, 15 was added to produce the final overall FPQLI score. Therefore, the possible range of overall FPQLI varies from 0 to 30. The higher scores represent the greater level of HRQoL. The FPQLI was originally in English and was later translated into Vietnamese by using a back-translation technique.[35] The internal consistency reliability of FPQLI-Vietnamese version was high with a Cronbach's alpha coefficient of 0.82.

Symptom experience was measured by the Memorial Symptom Assessment Scale (MSAS).[36] The MSAS consists of 32 items which clustered into two sections. The first section assesses three dimensions of 24 symptoms (which are frequency, severity and distress of the symptom) while the second one assesses only two dimensions of 8 symptoms (severity and distress). A patient may indicate that a symptom was not experienced by checking a column labelled 'did not have'. If a symptom was experienced, the patient describes its severity on a 4-point categorical scale; its frequency on a 4-point rating scale; and its associated distress on a 5-point rating scale. The initial step calculates a score for each symptom. If a symptom is not experienced, each dimension is scored as 0, and the score for that symptom is 0. If a symptom is experienced, the score for that symptom is determined as the average of the scores on the severity, frequency and distress scales, or if appropriate, on the severity and distress scales only. The higher score represents the more symptom experience. In the current study, the Cronbach's alpha coefficient of the MSAS was 0.83.

Functional status was measured by using the Functional Status Questionnaire (FSQ).[37] The FSQ comprises of 34 items, in which the core-section consist of 28 items, and additional section comprise of six-single item questions. In this study, the researchers eliminated 6 single items, only using 28 items to calculate the value of functional status of lung cancer patients undergoing chemotherapy. The rating on a Likert scale was transformed into scale values ranging from 0 to 100, with a score of 100 indicating maximum functional ability. In current study, the Cronbach's alpha reliability was 0.97.

Social support was measured by the Vietnamese version of the MOS Social Support Survey (MOS-SSS).[38] This measure contains 19 items of four dimensions. They are emotional/informational (8 items), tangible (4 items), positive social interaction (4 items), and affection support (3 items). The participants were asked to rate how often they received support from family members, relatives, friends, and other on a five-point Likert scale ranging from 1 (none of the time) to 5

(all of the time). The mean scores of the overall scale and four subscales were then transformed to a 100-point scale using the formula: Transformed score = [(observed score – minimum possible score)/ (maximum possible score – minimum possible score)] × 100.[39] A higher score indicates higher level of social support that patients perceive.[40] In the current study, the Cronbach's alpha reliability was 0.92.

Self-care behavior was measured by using the Leuven questionnaire for Patient Self-care during Chemotherapy (L-PaSC).[41] The L-PaSC is a self-administered questionnaire covers a wide ranges of essential self-care behaviors designed particularly for oncology patients undergoing chemotherapy treatment. The L-PaSC consists of 12 items with 22 sub-items. Scoring of the L-PaSC was done by converting the correct answers/adequate self-care into the binary relative scores, where 1 = correct/adequate self-care and 0 = incorrect/ inadequate self-care.[41] Details of the manual converting of patients' response to the L-PaSC can be found at Coolbrandt et al.[41] The score ranges from 0 to 100. The higher the score, the better the self-care behavior that patients had. In this study, its internal consistency was 0.73.

General health perception was measured by using a subscale with five items of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36).[42] It measures the perceptions of patient in terms of general health. The participants were asked to rate each item on a 5-point Liker scale ranging from '1' (excellent or definitely true) to '5' (poor or definitely false). Its total score ranged from 0 to 100. A higher score indicates a better general health that patients perceived. In this study, the Cronbach's alpha reliability 0.83.

Translation of measures

The original English version of FPQLI, MSAS, FSQ, L-PaSC, and the subscale GHP of the SF36 were translated into the Vietnamese language by using a back-translation technique after receiving permissions from the tools' owners. The back-translation technique[35] is an essential method for the cross-cultural application of existing measures and is used as a guideline to translate original English versions of instruments into Vietnamese versions.

Ethical consideration and data collection procedure

The IRB approval was obtained from the Faculty of Nursing, Burapha University, and three oncology hospitals in the Northern region of Vietnam (IRB No. 02-11-2562) prior to data collection which was carried out from April to September 2020. The researchers invited and informed lung cancer patients who met the inclusion criteria and were interested in participating in the study about the research objectives, data collection process, benefits, potential risks, withdrawal and confidentiality. The informed consent form was signed by participant who agreed to take part in the study. The participants were asked to fill the questionnaire in a private room. The questionnaires took about 35-40 minutes to complete. There were a few participants requested a time-break between each questionnaire, and that took 50-60 minutes to complete all.

Data analysis

Descriptive statistics including frequency with percentage and mean with standard deviation were used to dsscribe demographic characteristics of the participants and all the study variables. The magitudes of both direct and indirect effects on the HRQoL were analyzed with Structural Equation Modeling (SEM) to the the hypothesized model. The Maximum Likelihood (ML) was a method to estimate parameters. The acceptance values of goodness-of-fit (GOF) indices suggest that a minimum chi-square value [CMIN] should be non-significant (P-value > 0.05) and CMIN/ degrees of freedom (*df*) of less than 2.0. The criteria of a goodness of fit model followed by the GFI (goodness of fit index) should be between 0.90 to 1.00, and the AGFI (Adjusted GFI) between 0.90 to 1.00.[43] For the CFI (comparative fit index), two values indicate the fit, specifically a value of 0.90 to less than 0.95 indicating acceptable fit while a value of 0.95 or higher indicating a good fit model. Finally, the RMSEA (root-mean square error of approximation) should be less than 0.05 to indicate that the model is close to the fit; Data analyses were conducted by using the IBM®SPSS® version 26.0 bundled with the Amos structural equation modeling (SEM) program. Statistical significance was set at P-value < 0.05.

Results

There were 254 participants voluntarily took part in this study where 15 cases were excluded from the final dataset due to missing items more than 10 percent. In addition, the dataset was scanned for multivariate outliers, normality, linearity, and multicollinearity. Seven cases were excluded

due to the multivariate outliers, finally 232 cases were used to test the hypotheses. Of 232 lung cancer patients undergoing chemotherapy, their mean age was 46.65 years (SD = 10.95), about 61% of them were male, approximately half of them finished their vocational (24.1%) and college or higher studies (25.4%). Patients with high school degrees accounted for the biggest prevalence (33.2%). Nearly, two-thirds of them (62.1%) were retired or not working at the time the data collection take place. Notably, the most prevalent group of the sample was at stage IV lung cancer (82.8%). The duration of being diagnosed with lung cancer varied from 2 to 26 months. The mean of such duration was 10.74 ± 5.38 months. The number of chemotherapy cycles completed ranged from 1 – 21 and the mean of them was 6.92 ± 4.66. The range of current weight and usual weight among the participants were quite similar, which were 41-72 kgs and 42 – 74 kgs, respectively. The mean of current weight (55.30 ± 6.38 kgs) was mildly lower than the usual weight (55.99 ± 6.19 kgs). Descriptive statistics of study variable and correlations among the exogenous and endogenous variables are presented in Table 1 and 2.

Table 1 Descriptive statistics of the study variable (N = 232).

Variables	Min-max	Mean	SD
Health-related Quality of life	16.27 - 25.50	20.82	1.62
Symptom experience	0.17 – 2.00	0.92	0.42
Social support	32.89 - 90.79	63.02	11.92
Self-care behavior	36.19 - 100.00	75.11	14.51
Functional status	40.70 - 86.85	64.84	9.13
General health perceptions	25.00 - 95.00	50.39	16.88

**Table 2** Correlation matrix among the exogenous and endogenous variables (N = 232).

Variables	(1)	(2)	(3)	(4)	(5)	(6)
HRQoL (1)	1.000					
SE (2)	-.472**	1.000				
FS (3)	.582**	-.682**	1.000			
SCB (4)	.418**	-.472**	.509**	1.000		
SS (5)	.408**	-.384**	.526**	.381**	1.000	
GHP (6)	.630**	-.322**	.493**	.183**	.374**	1.000

Note: HRQoL = Health-related quality of life, SE = symptom experience, FS = functional status, SCB = self-care behavior, SS = social support, GHP = general health perception.

** Correlation is significant at the 0.01 level (2-tailed).

The results of the initial structural equation modeling (SEM) analysis on the hypothesized model presented in Table 3. To improve the model fit, the hypothesized model was then modified by modification indices until achieving the criteria for model good of fit.[33] Finally, the results indicated that the final modified model fitted the data well (X^2 = 154.49, df = 164, P-value = 0.691, CMIN/df = 0.942, GFI = 0.942, AGFI = 0.918, CFI = 1.000, and RMSEA = 0.000), and had a validation index of model adequacy at good fit level with p-value > 0.05, GFI between 0.90 to 1.00, CFI > 0.95 and RMSEA < 0.05. Therefore, all hypotheses of this study were supported. The standardized parameter estimates of the final modified model were shown in Figure 2 and Table 4.

Table 3 Model fitness index for the hypothesized and the final modification models (N = 232).

Model	X^2	df	CMIN/df	P-value	GFI	CFI	RMSEA
Hypothesized model	263.90	174	1.517	< 0.001	0.904	0.956	0.047
Final modified model	154.49	164	0.942	0.691	0.942	1.000	0.000
Recommended value	-	-	< 2.0	> 0.05	0.90 - 1.00	> 0.95	< 0.05
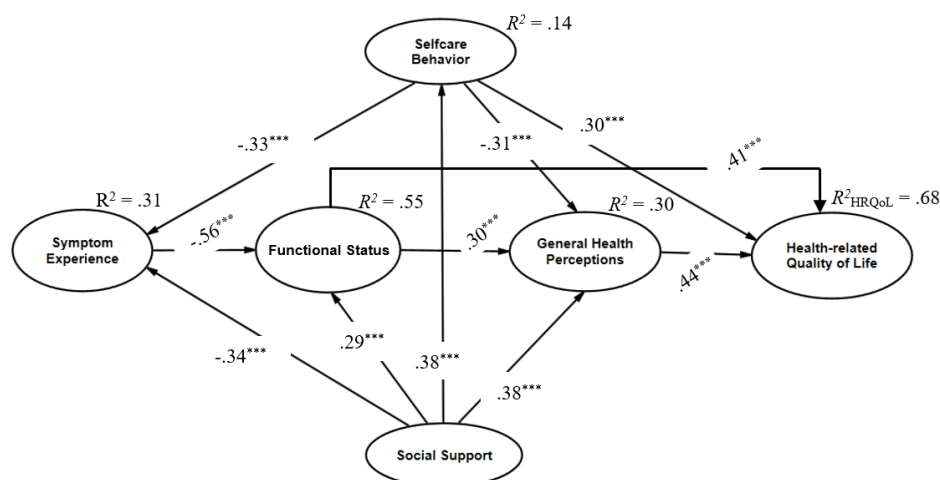
Figure 2 The final modified model.

Table 4 Parameter estimates of direct, indirect, and total effects of the modified model (N = 232).

Variables	Selfcare behavior		Symptom experience		Functional status		GHP		HRQoL		
	DE	IE	DE	IE	DE	IE	DE	IE	DE	IE	TE
Social support	0.38***	-	-0.34***	-0.12	0.29***	0.26***	0.38***	0.05	-	0.53***	0.53***
Selfcare behavior	-	-	-0.33***	-	-	0.18	-0.31***	0.06	0.30***	-0.04	0.27***
Symptom experience	-	-	-	-	-0.56***	-	-	-.017	-	-0.31***	-0.31***
Functional status	-	-	-	-	-	-	0.30***	-	0.41***	0.13	0.55***
GHP	-	-	-	-	-	-	-	-	0.44***	-	0.44***
	$R^2 = 0.14$		$R^2 = 0.31$		$R^2 = 0.55$		$R^2 = 0.30$		$R^2 = 0.68$		

Note: DE = Direct Effect, IE = Indirect Effect, TE = Total Effect, GHP = general health perceptions, HRQoL = Health-related quality of life

*** P-value < 0.01.

All specified paths in the final model were statistically significant and indicated that functional status, general health perception, and self-care behavior had a direct effect on HRQoL (β = 0.41, P-value < 0.001; β = 0.44, P-value < 0.001; β = 0.30, P-value < 0.001, respectively). In addition, functional status had a direct effect on general health perception (β = 0.30, P-value < 0.001), symptom experience had a high negative direct effect on functional status (β = -0.56, P-value < 0.001), and self-care behavior had a negative direct effect on symptom experience (β = -0.33, P-value < 0.001) and general health perception (β = -0.31, P-value < 0.001). Moreover, the exogenous latent variable of social support had positive direct effects on self-care behavior, functional status, and general health perception, and had a negative effect on symptom experience. This could imply that social support had an indirect effect on HRQoL through symptom experience, functional status, self-care behavior and general health perception (β = 0.53, P-value < 0.001). The estimate of the direct, indirect, and total effect of all variables are depicted in Table 4. Finally, the final modified model indicated that symptom experience, functional status, general health perception, social support, and self-care behavior explained 68.0% of variance in HRQoL (R^2 = 0.68).

Discussions and Conclusion

The present study examined causal relationships of symptom experience, functional status, general health perception, self-care behavior, and social support on HRQoL among lung cancer persons undergoing chemotherapy. The Ferrans and Powers model[10] guided the conceptual framework of this study. The pathway of the final model indicated that general health perception was found to be strongly and positive associated with HRQoL, followed by functional status and self-care behavior. In addition, the indirect effect of social support and symptom experience on HRQoL through functional status and general health perception were significant.

Our hypothesis that functional status has a positively direct and indirect effect on HRQoL through general health perceptions was significant and confirmed. The results of this study can be explained based on the conceptual model of health-related quality of life.[10] Functional status is considered as the ability to perform normal daily activities to meet basic needs, fulfill usual roles, and maintain health and well-being. When patients perceive high functional status, they would have a stronger physical function, positive psychological function, interactive social function, and better role function. As a result, they will independently perform their daily activities, fulfill their roles and actively maintain their health. Consequently, they would have a positive perception of health, and satisfaction with their life. These findings were similar to the findings from many studies showing that among cancer patients, functional status was significantly positively associated with HRQoL.[18,44,45]

General health perception had a positively direct effect on HRQoL. This could imply that patients perceived positive about their health would have a better quality of life. Thus, it could be stated that the hypothesis was fully supported. The findings of this study were congruent with previous studies.[46,47]

Our hypothesis that self-care behavior had direct and indirect effects on HRQoL through symptom experience, functional status, and general health perceptions were significant and proved. These findings can be explained that the patients with lung cancer receiving chemotherapy treatment who had high self-care behavior tend to have a better quality of life. The results of this study can be explained based on the conceptual model of health-related quality of life [10]. Literature depicted that patient with cancer and cancer survivors need to engage in self-care of side effects,

symptoms, and psychological burdens of the disease and its treatment. Therefore, patients with high self-care behavior are those who have the strong intrinsic motivation to starting and maintaining healthy behaviors. This findings correspond with previous study of Akin and Kas Guner[48] explained that improving the cancer patients' self-confidence in performing self-care behaviors may have a positive impact on performing cognitive and behavioral management strategies and can influence positively the patients' HRQoL during chemotherapy.

Unfortunately, social support had no direct on HRQoL, it showed an indirect effect via self-care behavior, symptom experience, functional status, and general health perceptions on HRQoL. These findings can be explained in that persons with lung cancer who received high social support from family, friends, and significant others tended to have high functional status, self-care behavior, and general health perception. In addition, when receiving high social support together with lower symptom experience would lead to having greater HRQoL than when receiving social support alone. Social support is an environmental domain that positively influences symptom experience, functional status, general health perception, and HRQoL. Therefore, the persons with lung cancer receiving chemotherapy in this study had higher HRQoL after receiving more social support. Social support influences HRQoL by increasing functional status, self-care behavior, and general health perception, but a direct effect was not found.

Although the model of health-related quality of life [10] explained that when patients perceived symptoms of having unwell, uncomfortable, or abnormal in physical and emotional status. These symptom experiences would affect one's HRQoL. However, we found symptom experience had no direct effect on HRQoL. This could be that our participants had pretty low symptom experiences with a mean of 0.92 (SD = 0.42) from a maximum possible score of 4.00, and it may have no effect enough to see a significant relationship. Moreover, the MSAS is difficult to use and interpret, as well as contained general symptoms for all illnesses. In the future study, a specific, user-friendly, and ease of interpretation measure of the symptom experience for lung cancer should be administered. The findings of indirect effects of symptom experiences on HRQoL through functional status and GHP were congruent with previous studies. Symptom experience was found to influence patients' ability to self-care, functional status, and general health perceptions.[25,30,49]

This present study provides beneficial information for developing an intervention to promote HRQoL among lung cancer persons undergoing chemotherapy by focusing on increasing self-care behavior, functional status, general health perception, social support, and reducing symptom distress. Moreover, findings of this study were derived from the HRQoL in Vietnamese context. Specifically, this study focused only on lung cancer persons undergoing chemotherapy. Therefore, generalizability may be limited to other settings and cultures. In addition, most tools used in this study were developed form western samples. For future research, replication of this study in other populations and context could broaden generalizability.

In conclusion, HRQoL among lung cancer patients undergoing chemotherapy was directly and indirectly influenced by symptom experience, functional status, general health perception, self-care behavior, and social support. Functional status was the most influential factor, followed by general health perception and self-care behavior. The findings of this study should be utilized in developing a nursing intervention aiming at promoting positive predictors of social support, self-care behavior, functional status, general health perception, and decreasing negative predictor of symptom experience. Consequently, the HRQoL on lung cancer patients would be enhanced.

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