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A CAUSAL MODEL OF HEALTH-RELATED QUALITY OF LIFE AMONG LUNG CANCER PATIENTS UNDERGOING CHEMOTHERAPY IN VIETNAM

NGUYEN DUC DUONG

Burapha University

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A CAUSAL MODEL OF HEALTH-RELATED QUALITY OF LIFE AMONG LUNG CANCER PATIENTS UNDERGOING CHEMOTHERAPY IN VIETNAM

NGUYEN DUC DUONG

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The Dissertation of Nguyen Duc Duong has been approved by the examining committee to be partial fulfillment of the requirements for the Doctor Degree of Philosophy in Nursing Science of Burapha University

Advisory Committee

..... Principal advisor
(Associate Professor Dr. Nujjaree Chaimongkol)

..... Co-advisor
(Associate Professor Dr. Pornpat Hengudomsub)

Examining Committee

..... Principal examiner
(Emeritus Professor Dr. Somchit Hanuchareankul)

..... Member
(Associate Professor Dr. Nujjaree Chaimongkol)

..... Member
(Associate Professor Dr. Pornpat Hengudomsub)

..... Member
(Assistant Professor Dr. Khemaradee Masingboon)

..... Member
(Professor Dr. Ratsiri Thato)

This Dissertation has been approved by the Faculty of Nursing to be partial fulfillment of the requirements for the Doctor Degree of Philosophy in Nursing Science of Burapha University

..... Dean of the Faculty of Nursing
(Assistant Professor Dr. Pornchai Jullamate)

.....

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Health-related quality of life [HRQoL] is an important primary health outcome of chronic diseases, such as lung cancer. A model-testing, cross-sectional study was conducted to evaluate a causal model of [HRQoL] among lung cancer patients undergoing chemotherapy. Convenience sampling was used to recruit 232 persons with lung cancer receiving chemotherapy in three hospitals in the northern region of Vietnam. Data collection was carried out from April to September 2020. Research instruments included six self-report questionnaires: 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. Reliability ranged from 0.73-0.92. Data were analyzed by using descriptive statistics and structural equation modeling.

The results revealed that the modification of the hypothesized model fit the data well (χ^2 = 154.49, p =.691, df = 164, CMIN/df = .942, GFI = .942, AGFI = .918, CFI = 1.000, and RMSEA = .000). Self-care behavior, functional status, and general health perception had direct effects on [HRQoL] General health perception mediated the relationships between self-care behavior and [HRQoL], and between functional status and [HRQoL]. Symptom experience showed a negative indirect effect on [HRQoL], and social support had a positive indirect effect. In this causal relationship, social support, self-care behavior, symptom experience, functional status, and general health perception accounted for 68.0% of the variance in [HRQoL]. These findings suggest that this causal model of [HRQoL] is appropriate. The findings also suggest a new direction for the nursing profession to enhance [HRQoL] of persons with lung cancer receiving chemotherapy by improving self-care behavior, social support, general health perception, and functional status, and by reducing symptom distress.

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Nguyen duc Duong

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CHAPTER 1
INTRODUCTION

Statements and significance of the problems

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 (Bray et al., 2018). The 5-year relative survival rate of lung cancer for all stages is 18% in wealthy countries (American Cancer Society [ACS], 2018), and only nearly 9% in developing countries (Long, Thanasilp, & Thato, 2016). The lung cancer incidence in the United States, United Kingdoms, and France is 10.7%, 11.7%, and 10.3%, respectively. While lung cancer incidence in developed countries tends to decrease, the incidence in developing countries remains increasing. In southeast Asian countries, the incidence of lung cancer in Thailand, Singapore, Philippines is 14.1%, 12.4%, and 12.2%. Unfortunately, lung cancer in Vietnam 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 (International Agency for Research on Cancer [IARC], 2018). Most Vietnamese patients are diagnosed with lung cancer at the age of over 40 and they are often admitted to hospitals at advanced stages (65-80%) (Long et al., 2016).

There are 2 main types of lung cancer which are small cell lung cancer [SCLC] and non-small cell lung cancer [NSCLC]. SCLC is sometimes called oat cell cancer. It has about 10% to 15% of lung cancers. NSCLC makes up about 80% to 85% of lung cancers. The 3 main types of NSCLC are adenocarcinoma, squamous cell carcinoma, and large cell carcinoma. (Chan & Coward, 2013; Zappa & Mousa, 2016). Currently, treatment for lung cancer may vary depending on the disease stages, histology, molecular pathology, age, performance status, comorbidities, and the patient's preferences which include surgery, radiotherapy, chemotherapy, immunotherapy, and targeted therapy (National Institute for Health and Care Excellence [NICE], 2019; Wu et al., 2018; Zappa & Mousa, 2016). In Vietnam, patients were mostly diagnosed with advanced stages of lung cancer (stage III and

IV), hence, curative intent treatments are not eligible. Therefore, the treatment regimens of these stages target prolonging their life, managing their symptoms, and improving patients' quality of life. Chemotherapy was found as one of the most common treatments for these stages of lung cancer diseases (Tran, Pham, Dao, & Tran, 2016). While surgery or radiation aims to remove or to kill cancer cells locally, 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 (Dai, Yang, Chen, & Tang, 2017; Long et al., 2016; Zappa & Mousa, 2016). Hence, healthcare providers need to comprehend the health-related quality of life in lung cancer patients undergoing chemotherapy.

In health research, the terms quality of life [QoL], overall QoL, and health-related QoL [HRQoL] are often used interchangeably (Krethong, Jirapaet, Jitpanya, & Sloan, 2008). On the one hand, QoL is an umbrella term. It might consist of health-related and nonhealth-related domains. In general, QoL can be explained as 'individuals' perception of their position in life in the context of the culture and value systems in which they live and with their goals, expectations, standards and concerns' (Sosnowski et al., 2017). On the other hand, the term HRQoL is intended to narrow the focus to the effect of health, illness, and treatment on QoL (Ferrans, Zerwic, Wilbur, & Larson, 2005). This term excludes aspects of quality of life that are not related to health, such as cultural, political, or societal attributes. Unfortunately, the distinction between the health-related and nonhealth-related quality of life cannot always be obviously made. For example, air pollution contributes to chronic respiratory disease, and long dark winters contribute to seasonal affective disorder. In addition, in chronic illness, almost all areas of life are affected by health, and so become "health-related" (Guyatt, Feeny, & Patrick, 1993).

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 (van der Weijst, Surmont, Schrauwen, & Lievens, 2017; Wasalski & Mehta, 2021). HRQoL could be distinguished from the QoL from the general population since the latter depends, in part, on factors that are mainly unrelated to health. HRQoL refers to multidimensional assessments that include at

least the physical, emotional (or psychological) and social domains, and may also include other domains such as cognitive functioning, sexuality, and spirituality. While single domains, such as performance status or symptoms, may be components of HRQoL they are, by themselves, insufficient to constitute a complete HRQoL assessment (Osoba, 2011).

Despite HRQoL having been studied for several decades, there is still a lack of a consensus definition. In attempting to describe this concept, several conceptual frameworks and theories have been proposed to explain the core concept of HRQoL (Costa & King, 2013; Ferrans et al., 2005; Wilson & Cleary, 1995). In those frameworks, the works of Ferrans, Zerwic, Wilbur, and Larson (2005) are the most prominent to use for research in nursing and healthcare (Bakas et al., 2012). 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 (Ferrans et al., 2005).

Several studies have been found to measure and describe the HRQoL of lung cancer patients. Unfortunately, most of the findings reported that the level of HRQoL in this group is lower than other cancer sites, excepting pancreas cancer (Gu, Xu, & Zhong, 2018; Hung, Wu, & Chen, 2018; Johnson, Schreier, Swanson, Moye, & Ridner, 2019; Lee & Jeong, 2018; Pierzynski et al., 2018). Those studies revealed that HRQoL is a multi-facets concept and it serves as an important patients outcome besides progression-free survival and overall survival. Therefore, understanding the factors contributing to HRQoL in lung cancer undergoing chemotherapy is very important to healthcare providers. Based on the FCM and related literature, several factors have been indicated to influence HRQOL in lung cancer patients undergoing chemotherapy. The significant factors include symptom experience, functional status, social support, self-care behavior, and general health perception (Ferrans et al., 2005; John, 2010; Krethong et al., 2008; Lee, Lee, & Chang, 2018).

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 experienced by the patients including fatigue, loss of appetite, shortness of breath,

cough, pain, and blood in the sputum (Iyer, Roughley, Rider, & Taylor-Stokes, 2014). 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 (Iyer et al., 2014). 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 (β = -.31, p < .001) and mental (β = -.53, p = < .001) domain of HRQoL (Lee, Oh, Kim, & Kim, 2019). Furthermore, a study by Wong et al. (2017) in 145 lung cancer undergoing chemotherapy patients depicted that the higher symptom experience and comorbidity had lower functional status and general health perception.

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 (Skube et al., 2018). 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 (Granger et al., 2014; Petrick et al., 2014; Sarna, 1994). Functional status can be influenced by biological or physiological impairment, symptoms, mood, and other factors (Wilson & Cleary, 1995). It is also likely to be influenced by health perceptions (Leidy, 1994). For instance, a person whom most would judge to be well but who views himself as ill may have a low level of functional performance with his capacity (Leidy, 1994). Furthermore, in a longitudinal study of cancer survivors over 15 years, the functional status of the lung cancer group declined significantly after one year of diagnosis and had the largest average decline after five years (β = -19.86, p < 0.0001) (Petrick et al., 2014). Another study by Narsavage et al. (2012) in 24 hospitalized patients with 45.8% stage IV lung cancer reported a positively significant correlation between functional status and QoL (rho = 0.728, p < .01). Interestingly, some studies found that high social support and appropriate self-care behavior could increase functional status in cancer

patients (Luszczynska, Pawlowska, Cieslak, Knoll, & Scholz, 2013; Steele, Mills, Hardin, & Hussey, 2005).

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 (Fang-yu, Dodd, Abrams, & Padilla, 2007). In lung cancer undergoing chemotherapy, Lee et al. (2018) studied the factors that predicted HRQoL in 80 Korean patients. Their results showed that performance status, prior lines of treatment, health literacy, and self-care behavior are significant predictors of HRQoL. Among those factors, self-care behavior has the greatest impact ($\beta = .336$, $p < .001$) (Lee et al., 2018). Another study in Thailand found that most cancer patients showed abilities to care for themselves during chemotherapy. The most frequent activities include always eating cooked food, trying to obtain instruction from health personnel for self-care knowledge, and always tracking the change in the body during chemotherapy (Prutipinyo, Maikeow, & Sirichotiratana, 2012). In addition, Farahani, Pishe, Razie, and Varaei (2017) stated that a self-care behavior education program can help cancer patients reduce side effects of chemotherapy and better symptom experiences. Interestingly, several studies have proved that social support is a significant predictor of self-care behavior (Karimy, Koohestani, & Araban, 2018; Mohebi et al., 2018)

Social support can be regarded as an environmental characteristic that has been studied for decades in relation to health status and quality of life (Uchino, Bowen, Kent de Grey, Mikel, & Fisher, 2018). 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 (Applebaum et al., 2014; Luszczynska et al., 2013). 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 (Luszczynska et al., 2013). Corroborating evidence was found for the association between perceived and received support from family and friends with QoL (Luszczynska et al., 2013). 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 (Naughton et al., 2002; Steele et al., 2005; Wong & Fielding, 2008).

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 (Souto, Ramires, Leite, Santos, & Santo, 2018). During the last few years, researchers have found that individual perceptions affect healthy behaviors (Coleman, Hicks-Coolick, & Brown, 2015; Souto et al., 2018). Some studies indicate that GHP is an important predictor of health outcomes such as HRQoL (Krethong et al., 2008; Park & Larson, 2016). This health perception is decisive in decision-making in the context of health interventions because it predicts the use of appropriate care (Cloninger & Zohar, 2011). Although it plays an important in determining health outcomes, some people perceive themselves as healthy despite suffering from one or more chronic diseases, while others perceive themselves as ill when no objective evidence of disease can be found. In the cancer survivor population, the GHP was found to have a mediated effect on social support (Ochoa, Haardorfer, Escoffery, Stein, & Alcaraz, 2018). In the lung cancer population undergoing chemotherapy, GHP is a synthesis of all the various aspects of health in an overall evaluation. Supporting this idea is the finding that the strongest and most consistent predictors of GHP are physiological processes, symptoms, and functional ability (Ferrans et al., 2005; Wilson & Cleary, 1995).

Literature showed that advanced stages of lung cancer disease together with advanced treatment regimens, such as chemotherapy and radiotherapy, caused several symptom experience and distress. In addition, numerous factors have been found associated with HRQoL in persons with lung cancer undergoing chemotherapy such as symptom experience, functional status, social support, self-care behavior, and general health perceptions. Hence, the purpose of our nursing care during this trajectory period is to maintain and increase patients' HRQoL, so that they can tolerate those treatments. To understand the quality of life, the nursing profession needs to understand various factors that influence HRQoL and how those factors work

in persons with lung cancer receiving chemotherapy to decide an appropriate intervention to improve the HRQoL. However, this kind of study that measures and tests a causal relationship of these factors influence the HRQoL in the lung persons undergoing chemotherapy regimen is limited. Therefore, a study that tests the causal relationship of these factors in relation to health-related quality of life in persons with lung cancer undergoing chemotherapy needs to carry out. The findings from this study would be beneficial to develop an effective intervention that focuses on significant factors to help Vietnamese patients with lung cancer have better HRQoL.

Conceptual framework of the study

The conceptual framework of this study is based on Ferrans et al. (2005) causal model of HRQoL and evidence of factors affecting to quality of life in lung cancer patients undergoing chemotherapy from intensive literature reviews. According to Ferrans et al., HRQoL is characterized by five main components including biological function, symptoms, functional status, general health perceptions, and overall quality of life. Those components are in conjunction with the characteristics of the individual and the characteristics of the environment (Ferrans et al., 2005). Those main components of Ferrans' model and current literature reviews on the factors associated with HRQoL in lung cancer patients undergoing chemotherapy are described as the follows:

Biological function is viewed broadly and encompasses molecular, cellular, and whole organ level processes. It can be described as a continuum of ideal function on one end and serious life-threatening pathological function on the other end. In this study, the author does not include it as one component of the hypothesized model. Instead, it is controlled by identifying specific inclusion criteria to select the participants. Symptoms are described as a patient's perception of an abnormal physical, emotional, or cognitive state, which can be categorized as physical, psychological, or psychophysical. The persons with lung cancer who are undergoing chemotherapeutic regimen present several symptoms, those symptoms not only occur from cancer itself but also arise during receiving the treatment therapy. Therefore, the symptom experiences of the persons with lung cancer undergoing chemotherapy would have a great deal of accountability for HRQoL.

Functional status is another component in the Ferrans' model of HRQoL. In lung cancer patients undergoing chemotherapy, it reflects the ability to perform the task of daily activities in multiple domains such as physical, social, psychological, and role function to maintain their health. It was found to have a strong association with HRQoL in the lung cancer population. General health perception is the subjective perception of health status. This component is also associated with the HRQoL. Therefore, functional status and general health perception, defined by Ferrans and colleagues, will be included as predictors in the hypothesized model of this study. The HRQoL will serve as the outcome variable as in the Ferrans' model.

On the other hand, Ferrans and colleagues have noted that characteristics of individuals and environments are altogether associated with HRQoL. Literature showed that social support-an environmental characteristic, and self-care behavior-in individual characteristics are strongly associated with HRQoL perceived by the lung cancer population (Bennett et al., 2001; Krethong et al., 2008). Considering the unique characteristics of lung cancer persons undergoing chemotherapy and the theoretical concept of HRQoL described by Ferrans and colleagues, the hypothesized model of this research is proposed in Figure 1-1.

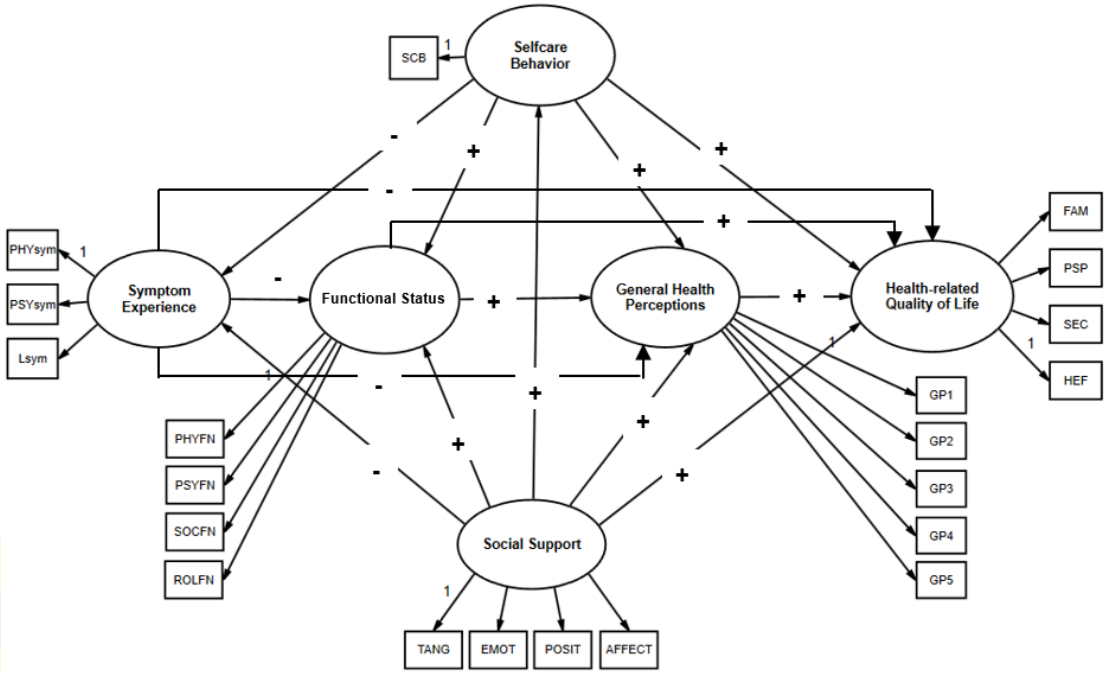

Figure 1-1 The hypothesized model of HRQoL in lung cancer patients receiving chemotherapy

Research objectives

1. To examine HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

2. To develop and test the causal relationship among symptom experience, functional status, self-care behavior, social support, general health perception, and HRQoL among people with lung cancer receiving chemotherapy in Vietnam.

Research hypotheses

1. 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.

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

3. Social support has 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.

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

5. 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.

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

Scope of the research

This model-testing design aims to examine predictors of HRQoL in the Vietnamese lung cancer population. The participants of this study included lung cancer patients undergoing treatment with a chemotherapy regimen. Data were collected at the tertiary hospitals in the Northern region of Vietnam in 2020-2021.

Definition of terms

Health-related quality of life [HRQoL] refers to the perception of Vietnamese lung cancer patients towards satisfaction and importance in life regarding health and functioning, socioeconomic, psychological/ spiritual, and family aspects during chemotherapy treatment. It was measured by using the Ferrans and Powers Quality of Life Index (Ferrans & Powers, 1992).

Symptom experience refers to the perception of Vietnamese lung cancer patients undergoing chemotherapy towards abnormal physical, psychological and cognitive state on common symptom dimensions of frequency, severity, and distress. It was measured by using the Memorial Symptom Assessment Scale [MSAS] (Portenoy et al., 1994).

Functional status is defined as the ability to perform normal daily activities of Vietnamese lung cancer patients undergoing chemotherapy to meet basic needs,

fulfill usual roles, and maintain health and well-being. It was measured by using the Functional Status Questionnaire (Jette et al., 1986).

Self-care behavior refers to decisions and actions that an individual can take to cope with a health problem or to improve his or her health. It was measured by using the Leuven questionnaire for Patient Self-care during Chemotherapy (L-PaSC) (Coolbrandt et al., 2013).

Social support is defined as tangible, emotional-informational, positive social interactions and affectionate support perceived by Vietnamese lung cancer patients. It was measured by using the Vietnamese version of the Medical Outcome Study: Social Support Survey [MOS-SSS] (Khuong, Vu, Huynh, & Thai, 2018).

General health perception is defined as an individual's perception of their well-being. It was measured by using the General health perception subscale of the MOS 36-item Short-Form Health Survey (SF-36) developed by (Ware & Sherbourne, 1992).

CHAPTER 2
LITERATURE REVIEWS

This study aimed to test a causal model of health-related quality of life in lung cancer persons undergoing chemotherapy. Related literature was reviewed and organized into the following four parts:

1. Overview of lung cancer disease
2. Ferrans' conceptual models of health-related quality of life
3. Factors related to HRQoL in lung cancer persons undergoing chemotherapy.

Overview of lung cancer disease

Lung cancer is a disease of symptoms. It usually occurs in adults for both sexes, with more frequently in males and tends to increase in females globally. It is the most common malignancy and remains the highest cause of cancer deaths in the past few decades. According to the Global Cancer Incidence, International Agency for Research on Cancer [IARC] (2018), there were 2,093,876 new cases for both sexes which accounted for 11.6 percent of total cancer cases worldwide, and there were 1,761,007 deaths from lung cancer representing 18.4 percent of total cancer deaths (Bray et al., 2018). For men, the incidence of lung cancer was about 1.4 million and its mortality was nearly 1.2 million people. For women, the incidence was 0.7 million and the number of mortalities was nearly 0.7 million people. Across the world regions, the highest number age-standardized incidence rate per 100,000 of lung cancer is Micronesia/ Polynesia with 52.2, followed by Eastern Europe with 49.3, Eastern Asia with 47.2. The age-standardized rate of South-Eastern Asia is 26.3 years (Bray et al., 2018; Didkowska, Wojciechowska, Mańczuk, & Łobaszewski, 2016). In well-developed countries, the incidence and mortality rates of lung cancer showed a decline in men but increasing in women. However, the less developed nations showed an increase in both sexes, and statistics depicted that approximately 58% of all lung cancers worldwide occurred in these nations (Wong, Lao, Ho, Goggins, & Tse, 2017).

The 5-year survival rate of lung cancer is much lower than other types of cancer. It is about 15% in developed countries, and only 9% in less developed nations (Dela Cruz, Tanoue, & Matthay, 2011). For instance, the 5-year survival rate of lung cancer for all stages in the United States is 18.6%, but it drops down to only 5% with lung cancer persons at advanced stages (Siegel, Miller, & Jemal, 2018). Although there has been some improvement in survival during the past few decades. The survival advances that have been realized in other common malignancies have not yet to be achieved in lung cancer (Dela Cruz et al., 2011). Data on the 5-year survival of lung cancer in developing countries is still lacking (How, Ng, Kuan, Jamalludin, & Fauzi, 2015). A recent study in Malaysia showed that the overall median survival was 18 weeks. Patients with SCLC had a shorter median survival of 6 weeks compared to NSCLC of 18 weeks. Among NSCLC patients on treatment, 1- and 2-year survival rates were 27% and 15%, and no report of a 5-year survival rate (How et al., 2015). The Socialist Republic of Vietnam is still a developing country. Statistics showed that lung cancer is the second leading of new cancer diagnoses nationwide (the second in men and the third in women). In 2018, the International Agency for Research on Cancer estimated that lung cancer contributes to 23,667 new cases which represent 14.4% of total cancer incidence, and 20,710 deaths which accounted for 18.0% of total cancer deaths nationwide (International Agency for Research on Cancer [IARC], 2018). Most Vietnamese patients are diagnosed with lung cancer at the age of over 40 and they have to admit to a hospital at advanced stages (65-80%) (Long et al., 2016). Compared to other nations in Sound-Eastern Asia, the incidence rate of lung cancer in Vietnam is higher than that in Thailand, Singapore, and the Philippines (14.1%, 12.4%, and 12.2%, respectively) (International Agency for Research on Cancer [IARC], 2018).

Etiology

The major types of lung cancer include adenocarcinoma, squamous cell carcinoma, small cell, and large cell carcinoma, and they were clustered into two groups so-called non-small cell lung cancer [NSCLC] and small cell lung cancer [SCLC]. The NSCLC makes up about 80-85% and the NSCL is about 10-15% of lung cancers. (Chan & Coward, 2013; Zappa & Mousa, 2016). Currently, the clinical researchers don’t know exactly what causes each case of lung cancer, but they show

that many of the risk factors for these cancers and how some of them cause cells to become cancerous. The etiology of lung cancer includes smoking, radon, secondhand smoke, diet, air pollution, exposures to asbestos, diesel exhaust, or certain other chemicals, and gene changes (inherited or acquired gene changes) (American Cancer Society [ACS], 2018). A small portion of lung cancers occurs in people with no known risk factors for the disease. Some of these might just be random events that don't have an outside cause, but others might be due to factors that research evidence does not know about yet (Dela Cruz et al., 2011). The current consensus epidemiologic studies showed that several risk factors can make one more likely to develop lung cancer including tobacco smoke (smoker and secondhand smoker), exposure to radon, exposure to other cancer-causing agents in the workplace (such as uranium, arsenic, beryllium, cadmium, silica, vinyl chloride, nickel compounds, chromium compounds, coal products, mustard gas, and chloromethyl ethers), arsenic in drinking water, certain dietary supplements. Exposure to radiation to the lungs, air pollution, personal or family history of lung cancer, and race and ethnicity are also accounted as risk factors for lung cancer (ACS, 2018; Dela Cruz et al., 2011).

Diagnoses and staging

Most of the patients with lung cancer are diagnosed at an advanced stage, therefore they often have a poor prognosis and short-time survival (Lehto, 2016). However, there is potential for lung cancer to be diagnosed at an earlier stage among high-risk individuals through the use of screening with low-dose computed tomography [LDCT], which has been shown to reduce lung cancer mortality by up to 20% among current and former smokers with a smoking history of 30 or more packyears. Despite its effective method, this technology seems to have few people approaching. For example, in the United State in 2015, only 4% of the 6.8 million eligible Americans reported being screened for lung cancer with LDCT (Siegel et al., 2018).

Currently, the classification and staging of lung cancer disease based on the American Joint Committee on Cancer [AJCC] and adopted by the Union for International Cancer Control [UICC] criteria (Wu et al., 2018) and the AJCC/ UICC Classification of Malignant of Tumor 8th edition (Table 2-1).

Table 2-1 Lung cancer stage grouping TNM 8th edition (Brierley, Gospodarowicz, & Wittekind, 2016)

NNSCLC stages	**T-classification**	**N-staging**	**M-staging**
Occult carcinoma	TX	N0	M0
Stage 0	Tis	N0	M0
Stage IA	T1	N0	M0
Stage IA1	T1a (mi)	N0	M0
	T1a	N0	M0
Stage IA2	T1b	N0	M0
Stage IA3	T1c	N0	M0
Stage IB	T1a	N0	M0
Stage IIA	T2b	N0	M0
Stage IIB	T1a-c	N1	M0
	T2a	N1	M0
	T2b	N1	M0
	T3	N0	M0
Stage IIIA	T1a-c	N2	M0
	T2a	N2	M0
	T2b	N2	M0
	T3	N1	M0
	T4	N0	M0
	T4	N1	M0
Stage IIIB	T1a-c	N3	M0
	T2a	N3	M0
	T2b	N3	M0
	T3	N2	M0
	T4	N2	M0
Stage IIIC	T3	N2	M0
	T4	N2	M0
Stage IV	Any T	Any N	M1
Stage IVA	Any T	Any N	M1a
	Any T	Any N	M1b
Stage IVB	Any T	Any N	M1c

In Vietnam, both the AJCC/ UICC Classification of Malignant of Tumor and the TNM 8th edition have been applied to classify and stage lung cancer disease. Classification and staging are clinically important to oncologists and healthcare providers to identify treatment strategy and prognosis.

Treatments

Treatment of lung cancer diseases depends on the stages of lung cancer, histology, molecular pathology, age, performance status, comorbidities, and the patient's preferences, patients are eligible for certain treatments (National Institute for Health and Care Excellence [NICE], 2019; Wu et al., 2018). The objectives of treatment therapeutics depend on the staging of the disease. Curing may apply for patients at early stages (I, II, IIIA), while palliative care and maintaining survival time will apply at advanced stages or cancer recurrence. The common treatment modalities include chemotherapy, surgery, radiotherapy, immunotherapy, targeted therapy (Zappa & Mousa, 2016).

Chemotherapy

Approximately 70% of newly diagnosed lung cancer patients are stages III-IV. The goal of treating these patients is to improve survival and reduce disease-related adverse events. Chemotherapy has shown some benefit when used alone in patients with stage IV of the disease, as well as in combination with radiotherapy in patients with locally advanced disease and the preoperative setting in those with early stages of NSCLC. For stage IV NSCLC, cytotoxic combination chemotherapy is the first-line therapy, which might be influenced by histology, age, comorbidity, and performance status (PS). Platinum drugs are still considered of crucial interest based on clinical studies and the results of meta-analyses, with their inconvenience being their observed toxicity and the inherent resistance. The poor efficacy and considerable toxicity of chemotherapy have caused great pessimism for many years regarding this approach, as only a small positive impact on survival rates was observed. Chemotherapy is now a broadly accepted form of therapy for stage IIIB/ IV NSCLC, and there is growing interest in its use in earlier stages of the disease when combined with other (local) therapy (C. Y. Huang, Ju, Chang, Muralidhar Reddy, & Velmurugan, 2017). Although chemotherapy is a common treatment for advanced lung cancer, this modality causes several adverse effects such as loss of appetite,

nausea, vomiting, hair loss, diarrhea, constipation, and anxiety. Those adverse effects result in reduced quality of life (Cooley, 2000).

Surgery

Whereas small cell lung cancer [SCLC] is rarely treated by surgery, early-stage patients with non-small cell lung cancer [NSCLC] are typically taken to surgery for resection for cure. Surgery serves an important role in the diagnosis, staging, and definitive management of NSCLC. Resection is the primary mode of treatment for stage I and II NSCLC and an important component of the multimodality approach to stage IIIA disease. For early-stage disease, the evolving surgical treatment goals are aimed at decreasing morbidity and mortality through less invasive approaches. For patients with locally advanced disease, ongoing research is focused on appropriately identifying patients who will most benefit from the addition of surgery to a multimodality regime and safely integrating resection with chemotherapy and radiotherapy (Baltayiannis et al., 2013; Lackey & Donington, 2013; Lang-Lazdunski, 2013).

Radiotherapy

Radiotherapy plays a key role in both curative and palliative treatments for lung cancer (Baker, Dahele, Lagerwaard, & Senan, 2016). It is used at every stage of clinical advancement, both in the non-small cell [NSCLC] and the small-cell form [SCLC] of cancer. According to epidemiological studies, in developed countries, 61-76% of all patients with NSCLC require one of the radiotherapy forms at a certain stage of their disease. At the early stages of the disease advancement, in cases when the patient is not planning to undergo surgery, stereotactic ablative radiotherapy [SABR] is applied. SABR is a newer radiotherapy technique as a treatment option for primary lung tumors ≤ 5 cm in diameter without evidence of metastatic spread (Maconachie, Mercer, Navani, & McVeigh, 2019). In locally advanced stages, radiochemotherapy or radical radiotherapy are used. In cases of disseminated disease or when the disease cannot be radically treated for various medical reasons, radiotherapy is also employed as a palliative treatment (Carlos Eduardo Cintra Vita Abreu et al., 2015; Baker et al., 2016; Maciejczyk, Skrzypczyńska, & Janiszewska, 2014).

Immunotherapy

The immunologic approach to managing cancer has been commonly used for decades (Bironzo & Di Maio, 2018; Zappa & Mousa, 2016). Recently, the discovery that cancer cells can exploit some immune inhibitory receptors such as cytotoxic T-lymphocyte associated protein 4 (CTLA-4) and programmed death-1 (PD-1) and its ligands (PD-L1 and PD-L2) to escape immune system surveillance, led the way to the development of specific monoclonal antibodies. The evidenced-based findings from recent clinical trials demonstrated that these molecules, known as immune checkpoints inhibitors, are being increasingly used for the treatment of many solid tumors, including lung cancer (Bironzo & Di Maio, 2018). Cancer immunotherapy, which utilizes the immune system as a treatment for cancer. Cancer immunosurveillance and immunoediting are based on protection against the development of tumors in animal systems and the identification of targets for immune recognition of human cancer. The common immunologic agents used for lung cancer comprise Atezolizumab, Bevacizumab, Cetuximab, Durvalumab, Nivolumab, Ipilimumab, Pembrolizumab (National Comprehensive Cancer Network [NCCN], 2018).

Targeted therapy

Personalized medicine by targeting appropriate molecular targets in tumors has helped improve survival in patients with NSCLC. There are targeted agents that have been successful against epidermal growth factor receptor [EGFR] mutations and anaplastic lymphoma kinase [ALK] rearrangements. Through genomic testing, other molecular changes have been found including gene rearrangements of ROS1 and RET, amplification of MET, and activating mutations in BRAF, HER2, and KRAS genes, which might be potential targets for future therapies.

EGFR is a cell-surface tyrosine kinase receptor that can activate pathways associated with cell growth and proliferation when activated. In cancers, mutations of EGFR produce uncontrolled cell division through constant activation. EGFR gene mutations are present in 10-15% of lung cancer adenocarcinomas patients who are of European and Asian descent, in those who have never smoked, and female. Approximately 3-7% of all lung tumors contain ALK mutations (56-58) where these mutations are commonly seen in younger patients. Rearrangement in EML-4-ALK is

the most common ALK rearrangement seen in NSCLC patients. These rearrangements arise on chromosome 2p23 due to the fusion between the 5' and of the EML-4 gene and the 3' end of the ALK gene, of which there are at least nine different fusion variants. *KRAS* is a commonly mutated oncogene associated with NSCLC due to missense mutations that substitute an amino acid at positions, 12, 13, or 61. *BRAF* is a proto-oncogene, which is a regulated signal transduction serine/ threonine-protein kinase that is able to promote cell proliferation and survival.

Above mentioned therapeutics showed current treatment options for lung cancer disease. In this study, the author focuses only on lung cancer persons at advanced stages (stages IIIB and IV) because of the high prevalence and common diagnoses in Vietnam. Regarding these stages, chemotherapy is the most commonly available treatment in Vietnam.

Nursing care for lung cancer patients with chemotherapy

Nurses play an important role in caring for and treatment of lung cancer disease. They either work independently or involve in a multidisciplinary team to optimize patient outcomes. According to Quinn (2003), the responsibilities of oncology nurses include, but are not limited to 1) Assess own level of knowledge relative to the pathophysiology of the disease process; 2) Make use of current research findings and practices in the care of the patient and his or her family; 3) Assess the learning needs, desires and capabilities of the patient with lung cancer; 4) Assess the social network available to the patient; 5) Assess nursing problems and plan appropriate interventions with the patient and his or her family; 6) Assist the patient to identify their strengths and limitations; 7) Assist the patient to design short and long term goals; 8) Implement an appropriate nursing care plan; 9) Foster continuity of care by collaboration within the multidisciplinary team; 10) Evaluate the outcome of care with the patient and his or her family, and members of the multidisciplinary team.

Ferrans' conceptual model of HRQoL

Quality of life has become an important health outcome for several decades. Although many authors have dedicated themselves to defining it, a widely accepted definition of QoL is still challenging for recent researchers. One of the most popular definitions came from the work of the World Health Organization Quality of Life [WHOQoL] projects. QoL was defined as "individuals' perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad-ranging concept affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships and their relation to salient features of their environments" (WHOQoL-Group, 1994), and later added with the sixth domain of spirituality/ personal beliefs/ religion (Saxena & Orley, 1997). This definition brought QoL to become one of the most complex concepts which challenge in driving operationalized measurement.

In attempting to focus on the health aspects driving the QoL, the term Health-related quality of life [HRQoL] was introduced. HRQoL can be defined as an index of a patient's perception of their position in life made over the course of a particular disease and its treatment (Sosnowski et al., 2017). Another definition by the European Organization for Research and Treatment of Cancer [EORTC], proposed that HRQoL are the functional effect of illness and its treatment which can lead to a subjective evaluation of life as a whole (The EORTC cited in Sosnowski et al., 2017)

Ferrans et al. developed the conceptual model of HRQoL based on Wilson and Cleary's works. This model consists of five domains including biological function, symptoms, functional status, general health perceptions, overall quality of life. These five domains are in conjunction with the characteristics of the individual and the characteristics of the environment where they live (Ferrans et al., 2005). Ferrans et al., have made three substantial additions to the Wilson and Cleary model in order to articulate the elements and the relationship among those elements of the model with greater depth and clarity. First, Ferrans et al. proposed that the characteristics of the individual and the environment may exert some causal influence over biological factors, that is, they included arrows from characteristics of the individual and environment to biological factors in Figure 2-1. Second, they removed

the explicit representation of non-medical factors from the model, arguing that it is adequately covered by characteristics of the individual and environment. Third, the examples labeling the arrows from characteristics of the individual and environment were removed, as they were considered a restrictive representation of the relations. The resultant model retains the substance of the Wilson and Cleary model but with both greater generality and parsimony.

The five domains of this model are described as follows: 1) Biological function is viewed broadly and encompasses molecular, cellular, and whole organ level processes. It can be described as a continuum of ideal function on one end and serious life-threatening pathological function on the other end. In this study, it would be the stage III-IV of the disease which are in the study inclusion criteria. Thus, it will not present as a predictor of HRQoL. 2) Symptoms are described as a patient's perception of an abnormal physical, emotional, or cognitive state, which can be categorized as physical, psychological, or psychophysical. Symptom experience is also accounted as a predictor. 3) Functional status includes four dimensions: functional capacity, functional performance, functional capacity utilization, and functional reserve. 4) General health perception includes two characteristics: (a) it integrates all the components that come earlier in the model, and (b) it is subjective in nature. 5) Overall quality of life:

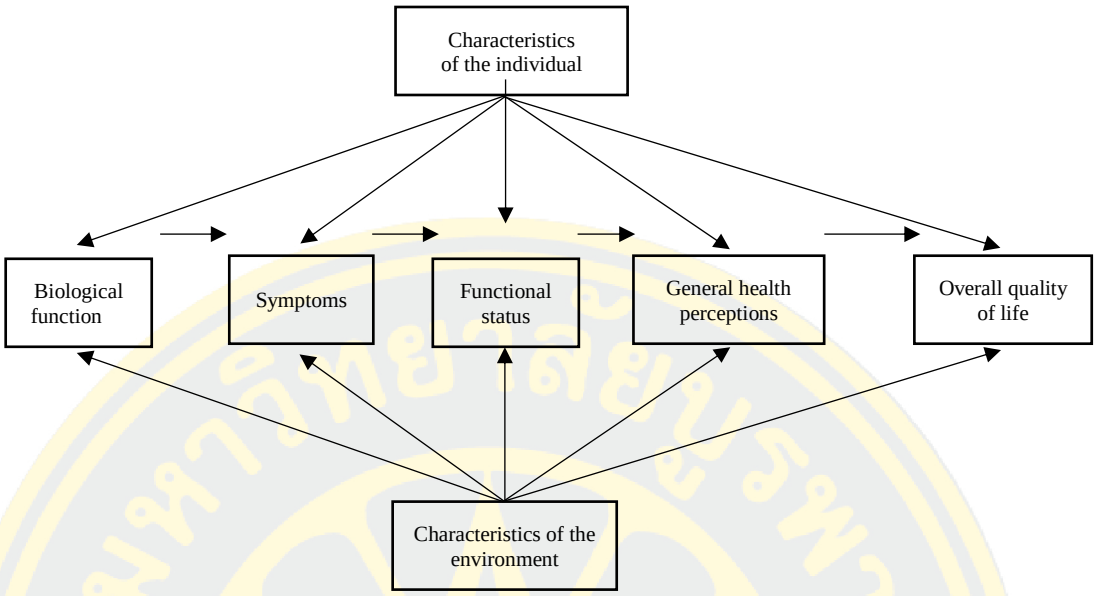

Figure 2-1 Ferrans' conceptual model for health-related quality of life (Ferrans et al., 2005)

Factors related to HRQoL in lung cancer persons undergoing chemotherapy

Literature depicted that several studies have been found to measure and describe the HRQoL of lung cancer patients. Those studies revealed that HRQoL is a multi-facets concept and it serves as an important patients outcome besides progression-free survival and overall survival. The significant factors associated with HRQoL in lung cancer include symptom experience, functional status, social support, self-care behavior, and general health perception.

Symptom experience

A systematic review depicted that patients with lung cancer experience more symptom distress than other samples of patients and most of the patients experience multiple symptoms (Cooley, 2000). The presence of symptoms depends on various points in the illness trajectory, and among various treatment modalities. The most common symptoms in newly diagnosed patients with lung cancer are fatigue, pain, dyspnea, loss of appetite, coughing, blood in sputum, and insomnia (Cooley, 2000; Iyer et al., 2014)

Most of the patients with lung cancer are diagnosed at an advanced stage and may already be negatively impacted by symptoms prior to the initiation of any anticancer treatment (Lehto, 2016). For example, symptoms such as fatigue, shortness of breath, cough, pain, loss of appetite at differing levels of severity are ubiquitous to those undergoing first- or second-line chemotherapy regimens (Iyer, Taylor-Stokes, & Roughley, 2013).

Symptom experience is defined as a person's awareness or experience reflecting changes in biopsychosocial function, sensation, or cognition as a result of illness. Persons evaluate their symptom experience by making decisions about the frequency, severity, and distress of symptoms affecting their lives (Armstrong, 2003). Current literature depicted that common symptoms resulting from disease progression and treatment complications frequently encountered in a person with lung cancer are fatigue, loss of appetite, shortness of breath, cough, pain, and blood in the sputum (Iyer et al., 2014; Iyer et al., 2013). Despite the advent of targeted therapies, symptom experience seems to be high in the advanced lung cancer patient population compared to other tumors (Iyer et al., 2013). The presence of those symptoms negatively affects QoL in persons with lung cancer (Lee & Jeong, 2018). Therefore, it is critical to assess the impact of these symptoms on patients' HRQoL to ensure proactive symptom management and minimize any negative impact on the quality of life of lung cancer patients. Several studies presented correlations between symptom experience and HRQoL in lung and other cancers (Iyer et al., 2013; Lee & Jeong, 2018).

For instance, Iyer et al. (2013) conducted a study on the factors related to HRQoL in 1213 advanced non-small cell lung cancer [NSCLC] in France and Germany, the results showed that more than 90% of patients frequently reported fatigue, loss of appetite, dyspnea, cough and pain as symptom burden. A multivariate regression analysis was performed, the symptom experience with fatigue ($\beta = -.122$; $p < .001$), loss of appetite ($\beta = -.17$; $p < .001$), pain ($\beta = -.145$; $p < .001$) and shortness of breath ($\beta = -.118$; $p < .001$) were significant predictors of lung cancer HRQoL as measured by the Functional Assessment of Cancer Therapy-Lung [FACT-L] total score (Iyer et al., 2013). Similarly, Iyer et al. (2014) in another study conducted in United State with 450 advanced NSCLC depicted that patients encountered fatigue

(100 %), loss of appetite (97 %), shortness of breath (95 %), cough (93 %), pain (92 %), and blood in the sputum (63 %). Multiple regression shown that loss of appetite (β = -.204; $p < .001$), cough (β = -.145; $p < .01$), pain (β = -.265; $p < 0.001$), and shortness of breath (β = -0.145; $p < 0.01$) were significant predictors of the quality of life (Iyer et al., 2014). The authors concluded that symptom experience in advance NSCLC is high and has a negative impact on the HRQOL (Iyer et al., 2014; Iyer et al., 2013).

Ma et al. (2014) investigated the relationship between symptom burden and quality of life in 376 lung cancer patients undergoing chemotherapy. The FACT-L questionnaire was used to measure HRQoL. The data depicted that the most frequent and severe symptoms were loss of appetite, breathing difficulty, cough, weight loss, and lack of energy. The HRQoL by FACT-L total score was highly correlated with symptom experience ($r = .708$, $p < .001$). A multiple regression analysis shown that loss appetite (β = .362), pain (β = .242), weight loss (β = .157), tightness of chest (β = .155), unclear thinking (β = .148), breathing difficulty (β = .140), lack of energy (β = .139), and cough (β = .070) were significant relationship with QoL.

Akin, Can, Aydiner, Ozdilli, and Durna (2010) conducted a study investigating the relationship between symptom experience and QoL of 154 lung cancer patients undergoing chemotherapy. The Memorial Symptom Assessment Scale and Quality of Life Index were used to measure symptom experience and quality of life. The results showed that the most common physical symptom experienced by lung cancer patients were lack of energy, coughing, pain, lack of appetite, and nausea, while the psychological symptoms were feeling nervous, difficulty sleeping, feeling sad, and worrying. There was a negative relationship between the symptom distress and quality of life scores ($r = -.45$, $p < .000$). In another long-term study of 447 lung cancer survivors by Yang et al. (2012), the results revealed that 155 patients declined QoL scores. Significantly worsened symptoms were fatigue (69%), pain (59%), dyspnea (58%), depressed appetite (49%), and coughing (42%).

Symptom burden not only negatively impact HRQoL in lung cancer person, but also influence patients' ability to self-care, functional status, and general health perceptions (Applebaum et al., 2014; Malangpoothong, Pongthavornkamol, Sriyuktasuth, & Soparattanapaisarn, 2009; Park & Larson, 2016). For instance,

Malangpoothong et al. (2009) study of 88 lung cancer patients showed that symptom experience with pain, lack of energy, sleeping difficulty, shortness of breath, worrying, and lack of appetite were significantly negatively correlated with functional status.

Functional status

Functional status is defined as an individual's ability to perform normal daily activities required to meet basic needs, fulfill usual roles, and maintain health and well-being (Leidy, 1994). Functional status is an important factor not only for determining overall health but also for measuring risks of adverse events. Unfortunately, the concepts and measurements of functional status are still not standardized (Skube et al., 2018). Leidy (1994) proposed that functional status has domains including functional capacity, functional performance, functional reserve, and functional capacity utilization. In health research, however, most of the current instruments that developed to measure functional status are likely to capture only an individual's functional performance such as measuring activities of daily living or intermediate activities (Lareau, Breslin, & Meek, 1996). In general, functional status can be influenced by biological or physiological impairment, symptoms, mood, and other factors (Wilson & Cleary, 1995). In the cancer population, cancer itself and related therapeutic treatments such as chemotherapy, radiotherapy, surgery cause several symptoms and adverse events affecting their functional status. Literature depicted that cancer patients have reported moderate to severe limitations in functional status such as reduced energy, difficulty with household chores, and interference with work (Garman & Cohen, 2002; Granger et al., 2014; Neo, Fettes, Gao, Higginson, & Maddocks, 2017; Petrick et al., 2014; Sarna, 1994). For example, a recent longitudinal study of cancer survivors over 15 years, functional status of the lung cancer group declined significantly after one-year diagnosis and had a largest average decline after five-years ($\beta = -19.86$, $p < 0.0001$) (Petrick et al., 2014). Similarly, Granger et al (2014) measured physical activity and functional status on 50 NSCLC patients in Australia at diagnosis and over six months treatment, the results revealed that patients with NSCLC were significant less physical activity than similar-age healthy individuals, and 60% did not meet physical activity guidelines. Over six

months, NSCLC experienced a decline in self-reported physical activity, 6 minutes walking distance and muscle strength, and worsening symptoms.

Furthermore, functional status has been reported to have a significant relationship to HRQoL. A study by Wedding et al. (2007) predicted the factors that contribute to HRQoL of 347 cancer patients, the results showed that functional status was significantly associated with HRQoL ($r = 0.483$, $p < 0.001$) in a univariate analysis. In a multivariate analysis, functional status explained 27% of variances at a group of patients over 60 years old and 23% of the variance of those below 60 years old. Similarly, Narsavage et al. (2012) studied 24 hospitalized patients with 45.8% stage IV lung cancer, the findings portrayed a positively significant correlation between functional status and QoL (rho = 0.728, $p < .01$). Another study by Wang et al. (2013) examined the relationship between functional status and HRQoL among 29 cancer patients, the results showed that the patients who experienced impairment of eating, speaking and body imaging functions reported lower global HRQoL. They also analyzed the relationship among functional status and functional well-being subscale of HRQoL, the results revealed that lower functional well-being scores were related to higher eating impairment ($r = -0.53$, $p < 0.01$), speaking impairment ($r = -0.56$, $p < 0.01$), and impaired body image ($r = -0.45$, $p < 0.01$) scores. Furthermore, some studies found that high social support and appropriate self-care behavior could increase functional status in cancer patients (Luszczynska et al., 2013; Steele et al., 2005).

Social Support

Social support refers to the assistance and support received by individuals from the family, friends, and significant other (Schwarzer, Knoll, & Rieckmann, 2004). Social support is a strong predictor of health outcomes such as quality of life and survival (Uchino et al., 2018). Several studies in persons with cancers including lung have shown that social support is a significant predictor of health-related quality of life (Applebaum et al., 2014; Arestedt, Saveman, Johansson, & Blomqvist, 2013; Steele et al., 2005).

In a recent study by Applebaum et al. (2014) in 168 advanced cancer patients (includes 28 lung cancer patients), the authors assessed psychological, spiritual, and physical well-being, including social support, optimism, depressive and

anxiety symptoms, and QoL. The result showed that higher levels of optimism were significantly associated with fewer anxious and depressive symptoms, less hopelessness, and better QoL. Higher levels of perceived social support were also significantly associated with better QoL (β = .204, p = .003) (Applebaum et al., 2014). Steele et al. (2005) studied 129 home-based hospice palliative care patients with different cancer sites, including NSCLC and SCLC patients. The Missoula-Vitas Quality of Life Index was used to measure the physical, emotional, and functional dimensions of QoL. The results indicated that social support from family and friends was related to better physical, functional, and emotional QoL (Steele et al., 2005). In addition, Wong and Fielding (2008) conducted a longitudinal study on 334 NSCLC and SCLC patients. The result showed that the global index of QoL was predicted by instrumental support (Wong & Fielding, 2008).

Nowadays, social support becomes an important source to optimize patients' health outcomes and quality of life. Literature also was depicted that social support had an association with self-care behavior (Dunbar, Clark, Quinn, Gary, & Kaslow, 2008; Sayers, Riegel, Pawlowski, Coyne, & Samaha, 2008). A study by Sayers et al., (2008) showed that patients perceived social support was moderately associated with relatively better self-reported medication and dietary adherence, and other aspects of self-care behavior such as daily weighing.

Self-care behavior

Self-care plays an important role in patients with chronic diseases. Self-care behavior refers to decisions and actions that an individual can take to cope with a health problem or to improve his or her health. Literature supported that patients with cancer and cancer survivors need to engage in self-care of side effects, symptoms, and psychological burdens of the disease and its treatment (Fang-yu et al., 2007). Therefore, self-care behavior is necessary for patients who suffer from chronic diseases such as cancer.

In lung cancer undergoing chemotherapy, Lee et al. (2018) studied the factors that predicted HRQoL in 80 Korean patients, the results showed that performance status, prior lines of treatment, health literacy, and self-care behavior are predictors of HRQoL. Among those factors, the self-care behavior has greatest impact (β = .336, p < .001).

Another study described self-care behavior and variables associated with self-care behavior in 133 cancer patients undergoing chemotherapy in Thailand found that most of the patients showed abilities to care for themselves during chemotherapy. The most frequent activities include always eating cooked food, patients trying to obtain instruction from health personnel for self-care knowledge, and always tracking the change in the body during chemotherapy (Prutipinyo et al., 2012).

General health perceptions

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 an individual's perception of his or her health status, it can reflect feelings and beliefs more than his or her current physical state (Souto et al., 2018). During the last few years, researchers have found that individual perceptions affect healthy behaviors (Coleman et al., 2015; Souto et al., 2018). Some studies indicate that GHP is an important predictor of health outcomes such as HRQoL (Krethong et al., 2008; Lee & Kim, 2018). This health perception is decisive in decision-making in the context of health interventions because it predicts the use of appropriate care (Cloninger & Zohar, 2011). Although it plays an important in determining health outcomes, some people perceive themselves as healthy despite suffering from one or more chronic diseases, while others perceive themselves as ill when no objective evidence of disease can be found. In the cancer survivor population, social support was found to have a mediated effect on GHP (Ochoa et al., 2018). In the lung cancer population undergoing chemotherapy, GHP is a synthesis of all the various aspects of health in an overall evaluation. Supporting this idea is the finding that the strongest and most consistent predictors of GHP are physiological processes, symptoms, and functional ability (Ferrans et al., 2005; Wilson & Cleary, 1995).

In conclusion, literature reviews showed that symptom experience, functional status, social support, self-care behavior, and general health perceptions associated with HRQoL. However, the magnitude and cumulative effects of these predictors on HRQoL in lung cancer patients in Vietnam remain unclear. Moreover, most evidence is from Western cultures.

CHAPTER 3
RESEARCH METHODS

This study aimed to examine health-related quality of life [HRQoL] and test a causal model of the health-related quality of life among lung cancer patients undergoing chemotherapy in Vietnam. This chapter presents the research design, population and sample, research instruments, protection of human rights, data collection procedures, and data analyses.

Research design

This is a cross-sectional predictive study. The apparent advantage of this design is that it allows the investigation of a large number of interrelationships in a relatively short time (Polit & Beck, 2021). A model-testing design was used to investigate the influence of predictors, including symptom experience, functional status, self-care behavior, social support, and general health perception, on HRQoL among lung cancer patients undergoing chemotherapy.

Population and sample

Population

Participants of this study were lung cancer patients who are receiving chemotherapy in Vietnam.

Vietnam is a country located in Southeast Asia with a total population of about 98 million people (Worldometers.info, 2020). The country has governed by 63 provinces which are divided into three main regions (north, central, and south). Data were collected in the North and the Central. These two areas are selected because, evidence reported that they were a higher prevalence of lung cancer than in the South (Long et al., 2016).

In the north and the central, there are 5 national oncology centers and other 5 centers/hospitals at the provincial level offering treatments for cancer patients. All of these hospitals are eligible for chemotherapeutic procedures which have been approved by the Vietnamese Ministry of Health (Ministry of Health [MOH], 2018).

Lung cancer patients were diagnosed and classified based on the JCC/ UICC Classification of Malignant of Tumor and the TNM 8th edition. Patients at stage III B and stage IV were treated with chemotherapy. Permissions from three hospitals were granted and data were collected. Among three hospitals, two were in the central (Nghe An and Thanh Hoa Hospitals), and one was in the north (National Oncology Hospital).

Sample

Selection criteria*:* Participants were recruited by inclusion criteria, which are: 1) diagnosed with primary lung cancer at stages III and IV, 2) hospitalized for first-line chemotherapy treatment, 3) have completed at least one cycle of the chemotherapy course, 4) Age between 18-60 years, and 5) able to read and verbally communicate in Vietnamese. Exclusion criteria were 1) present life-threatening or co-morbidity diseases (e.g., tumor metastasized to the brain or central nervous system, end-stage renal disease, cirrhosis, etc.), and 2) having prior lung resection surgery.

Sampling technique*:* Participants were selected using a convenience sampling method. All patients who met the selection criteria and were available at the time data collection took place were recruited in the study.

To recruit participants, under the permission of the hospital authorities, researchers requested the Information Office of each hospital to provide the name list, contact number, and basic information (against the selection criteria) of all lung cancer patients who were receiving chemotherapy in that hospital. At the inpatients' units of each hospital, the researcher approach eligible participants and invited them to participate in the study. During communication, patients, who belonged to minor Vietnamese groups and could not communicate in Vietnamese, were excluded.

Sample size*:* Regarding the complex analysis of structural equation modeling [SEM], the sample size is an important consideration for the estimation and interpretation of SEM results (Hair, Anderson, Tatham, & Black, 2006). A common rule of thumb to calculate sample size for a study with Structural Equation Modeling is the so-called N:q rule (Wolf, Harrington, Clark, & Miller, 2013). N is the number of needed subjects per one parameter (q). In general, the proportion is commonly set as 10:1. A ratio lower than 10:1 would lessen the credibility of the findings (Kline & Little, 2016). Therefore, this study used a ratio of 10:1.

The sample size for the pilot study: Before the main data collection took place, a pilot study was conducted with 30 participants who have aged between 18-59 years, reside in Nghe An province, and meet the inclusion criteria to examine the psychometric properties of instruments. According to Hertzog (2008), 30-40 participants in a pilot study are adequate in providing estimates enough precise and psychometric of evaluating instrumentation. The Cronbach's alpha above .80 was set for the reliability of all research instruments used in this study (Grove, Gray, & Burns, 2014).

The sample size for the main study: The hypothesized model of this study consisted of 25 parameters. Therefore, at least 250 subjects should be recruited. To compensate for the potential missing data, 10% were added to the sample size. Finally, 275 patients were obtained in the study.

Measurements

1. Health-related Quality of Life [HRQoL] was measured by using the Ferrans and Powers Quality of Life Index [FPQLI] (Ferrans & Powers, 1992). The FPQLI contains 66 items which are divided equally into two parts with 33 items each, the first part covers the satisfaction dimension, and the second covers the important aspects of each item in their life. These two parts were integrated by each pair of satisfaction and important item to constitute 33 weighted items. Then, it was clustered into four domains which comprise health and functioning (12 items), socioeconomic (10 items), psychological-spiritual (7 items), and family domain (4 items). In the satisfaction part, participants were asked to rate on a 6-Likert scale how much their satisfaction with the areas in life from "very dissatisfied" (1) to "very satisfied" (6). The second part with the same 33-item contents asked the participants how they perceived the importance of those areas to their life by rating on a 6-Likert scale from "very unimportant" (1) to "very important" (6). This questionnaire has been translated into Portuguese and Spanish, and the translations also demonstrate good psychometric properties in the target languages.

In order to calculate the quality of life index, the following steps were carried out. First, the response scores of each item in the satisfaction part were

re-coded by subtracting to 3.5 to center the scale on zero. Next, 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. Then, the preliminary sum was obtained by summing up 33 weighted response scores. Later, the preliminary sum was divided by the number of answered items of the individual participant to generate the quality of life index (at this point the possible range of index scores ranging from -15 to +15.). Finally, 15 was added to each score to eliminate the negative digits of the final FPQLI. Consequently, the possible range of FPQLI varies from 0 to 30. The higher scores represent the greater level of HRQoL.

According to Ferrans and Powers, Cronbach's alpha of the entire FPQLI was 0.93. Cronbach's alpha of the four domains was 0.87 for the health and functioning, 0.82 for the socioeconomic, 0.90 for the psychological/ spiritual, and 0.77 for the family subscale. It also demonstrated a good test-retest reliability with the coefficient of 0.87 (2 weeks interval) and 0.81 (1-month interval) (Ferrans & Powers, 1992). In this current study, the content validity index [CVI] of the whole scale was 0.94 with item-CVI ranging from 0.8 to 1.0. Cronbach's alpha coefficient of FPQLI was 0.92 in the pilot, and 0.82 in the main studies.

2. Symptom experience was measured by the memorial symptom assessment scale [MSAS] developed by Portenoy et al. (1994). The MSAS consists of 32 items which are clustered into two sections. The first section assesses three dimensions of 24 symptoms which are frequency, severity, and distress while the second one assesses only two attributes of 8 symptoms (severity and distress). The MSAS has been widely tested in various populations and languages (Llamas Ramos et al., 2016; Nho, Kim, Chang, & Nam, 2018; Yildirim et al., 2011).

The MSAS asked patients how they encountered and suffered the symptoms based on a list of 32 common symptoms during the past week. A patient may indicate that a symptom was not experienced by checking a column labeled "did not have". In case a symptom was experienced, the patient described its severity attribute on a 4-point categorical scale; its frequency aspect, if appropriate, on a 4-point categorical scale; and its associated distress attribute on a 5-point categorical scale. The values for the severity and frequency measurements are scales 1 to 4, where 1 is "slight" on the severity and "rarely" on the frequency aspect, and 4 is "very severe" on the severity

and “almost constantly” on the frequency aspect. For ease of calculation, the values on the distress attribute are set to a range that is roughly similar to the other dimensions: “not at all” is scored as 0.8, “a little bit” is 1.6, “somewhat” is 2.4, “quite a bit” is 3.2, and “very much” is 4.

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. In case a symptom is experienced, the score for that symptom is determined as the average of the scores on the severity, frequency, and distress attributes, or if appropriate, on the severity and distress aspects only. In this study, the symptom experience was classified into three domains which are physical, psychological, and general subscales. 1) The psychological subscale score is the average of the symptom scores for six symptoms: feeling sad, worrying, feeling irritable, feeling nervous, difficulty sleeping, and difficulty concentrating. 2) The physical subscale score is the average of the symptom scores for the following 12 symptoms: lack of appetite, lack of energy, pain, feeling drowsy, constipation, dry mouth, nausea, vomiting, change in taste, weight loss, feeling bloated and dizziness. And 3) general subscale score is the average of the remaining fourteen of the 32 listed items. According to Portenoy et al., (1994), the higher the mean score of symptoms the more severe and distress that the patient experienced.

The internal consistency of MSAS subscales ranged from 0.75 to 0.88 (Portenoy et al., 1994). A recent study by Llamas Ramos et al. (2016) on 246 cancer patients receiving chemotherapy showed that the internal consistency coefficient of total MSAS was 0.89. In another study, the internal consistency coefficient calculated from 120 cancer patients was 0.84. Pearson correlations for test-retest reliability was 0.78 (Yildirim et al., 2011). In the current study, the CVI of MSAS was 0.96. The Cronbach’s alpha coefficient of MSAS was 0.82 in the pilot, and 0.83 in the main study.

3. Functional status was measured by using the functional status questionnaire [FSQ] developed by Jette et al. (1986). The FSQ originally comprises 34 items, in which the core section consists of 28 items, and the additional section comprises six single-item questions. Several previous studies have excluded these six single-item questions in calculating the final FSQ score, therefore, the researcher eliminated them for ease of

interpreting. Consequently, the core section of 28 items was used to calculate the value of functional status of lung cancer patients undergoing chemotherapy.

The FSQ was clustered into 6 categories which include 1) Basic activity of daily living (ADL) (3 items), 2) Intermediate ADL (IADL) (6 items), 3) Mental health (5 items), 4) Work performance (6 items), 5) Social activity (3 items), and 6) Quality of interaction (5 items) that constitute four domains of functional status which are physical function (consists of ADL and IADL), psychological function (mental health category), role function (work performance category), and social function (consists of social activity and quality of interaction).

With respect to the scoring system of the questionnaire, first, basic ADL and IADL are assessed on a five-point Likert scale, ranging from 4 (usually did with no difficulty) to 0 (usually did not do for other reasons). Second, mental health is assessed on a six-point Likert scale, ranging from 1 (all of the time) to 6 (none of the time). Third, work performance is rated on a four-point Likert scale, ranging from 1 (all of the time) to 4 (none of the time). Forth, social activity is assessed on a five-point scale, ranging from 4 (usually did with no difficulty) to 0 (usually did not do for other reasons). Last, the quality of interaction is assessed on a five-point scale, ranging from 1 (all of the time) to 5 (none of the time). The scoring on those Likert scales was transformed into scale values ranging from 0 to 100, with a score of 100 indicating maximum functional ability.

Cronbach's alpha for internal consistency reliabilities for FSQ subscale ranging from .64 to .82 (Jette et al., 1986). In the current study, the CVI of FSQ was 0.92. Cronbach's alpha coefficient for internal reliability was 0.95 in the pilot, and 0.97 in the main studies.

4. Social support was measured by the Vietnamese version of the MOS social support survey [MOS-SSS]. It is originally developed by Sherbourne and Stewart (1991) and translated into Vietnamese by Khuong et al. (2018). This measure contains 20 items, however, the first item did not use in calculating, the remaining 19 items constitute four dimensions. The first is the emotional/informational dimension which comprises 8 items. The second is the tangible dimension which encompasses 4 items. The third is the positive social interaction which consists of 4 items. The last is the affection support which contains 3 items. The participants were asked to rate how often they received support from family members,

relatives, friends, and others on a five-point Likert scale ranging from 1 (none of the time) to 5 (all of the time).

Participants rated the MOS-SSS items using a five-point Likert rating scale ranging from (1) none of the time to (5) most 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 (RAND Corporation, 2019).
A higher score indicates a higher level of social support that patients perceive (Sherbourne & Stewart, 1991).

Internal consistency reliability of the 4 dimensions ranges from 0.91 to 0.96 and the overall scale was 0.97 (Sherbourne & Stewart, 1991). Cronbach's alpha coefficients of the Vietnamese version of MOS-SSS ranged from 0.95 to 0.97 for the four subscales, and it was 0.97 for the overall scale. The construct validity of the MOS-SSS was established since a final four-factor model fitted the data well with Comparative Fit Index (0.97), Tucker-Lewis Index (0.97), Standardized Root Mean Square Residual (0.03), and Root Mean Square Error of Approximation (0.068; 90% CI = 0.059-0.077) (Khuong et al., 2018).

In the current study, the total CVI of the MOS-SSS was 0.97 and item-CVI ranged from 0.80 to 1.00. Cronbach's alpha coefficient for internal reliability was 0.94 in the pilot, and 0.92 in the main studies. Additionally, in the main study, the internal reliability of four dimensions: tangible support, emotional-informational support, affectionate, and positive social interaction were 0.83, 0.88, 0.86, and 0.82, respectively. Furthermore, the CFA analysis found that 19 items formed a four-factor model that fitted the data well, and most of the items had loadings of more than 0.70.

5. Self-care behavior was measured by using the Leuven questionnaire for Patient Self-care during Chemotherapy (L-PaSC) (Coolbrandt et al., 2013). The L-PaSC is a self-administered questionnaire that covers a wide range 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 (Coolbrandt et al., 2013). The steps to convert the items are as follows:

The first item contains 7 sub-items asking participants to respond in a 5-rating from never (1), mostly not (2), sometimes (3), mostly (4), and always (5). Regarding sub-items # 1-4, respondents rated “mostly” or “always” (4 or 5), which was converted to a score of ‘1’, and rated of “never”, “mostly not”, or “sometimes” (1, 2, or 3) which was converted to a score of ‘0’. Sub-item # 5-7 were given scores ‘1’ when respondents answer always (5), and score ‘0’ when respondents answer from “never (1)” to “mostly (4)”. Item 2 consists of 5 sub-items of multiple choices with one correct answer. It asked patients about how to react or behave with symptoms occurring during received treatment, for example, sudden shortness of breath, fever, diarrhea, and vomiting, by checking only one answer that was most likely for them. The correct answer scores ‘1’, and incorrect scores ‘0’. Items 3-5 are a single sub-item each. The respondents were asked to select a point on a visual analog scale from 0 to 100 for each item. Scores of 80 or above were converted to be ‘1’, and others were converted to be ‘0’. Items 6-10 are multiple choices that asked patients whether they experienced the particular side effect, how serious this side-effect was at its worst, and asked them what actions they took to relieve the side effects. Lastly, items 11-12 asked about how serious of fatigue and pain at their worst on a 1 to 10 visual analog scale. Details of the manual converting of patients’ responses to the L-PaSC can be found at Coolbrandt et al. (2013). The score ranges from 0 to 100. The higher the score, the better the self-care behavior that patients had.

According to Coolbrandt et al. (2013), the content validity was good (0.78-1.00) and the internal consistency was acceptable. In the current study, the total CVI of L-PaSC was 0.94, the item-CVI range was from 0.80 to 1.00. Regarding the internal consistency reliability, the item response was treated as relative scores with dichotomous values of 0 and 1, so the polychoric correlation matrix was appropriate to calculate standardized alpha of internal consistency (Gadermann, Guhn, & Zumbo, 2012). Therefore, the R-statistics was used to calculate standardized alpha of internal consistency, the reliability was acceptable with alpha = 0.83 in the pilot and 0.73 in the main studies.

6. 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) (Ware & Sherbourne, 1992). It measures the perceptions of the 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). To get the same direction, the score of questions # 2 and # 4 were reversed. Then the scores were recorded as 1 equals 100, 2 equals 75, 3 equals 50, 4 equals 25, and 5 equals 0. Its total score ranged from 0 to 100. A higher score indicates better general health than patients perceived.

The psychometric and clinical test of the validity of the SF-36 has been well documented (McHorney, Ware, & Raczek, 1993). The internal consistency reliability of the eight SF-36 subscales was above .70. In this study, the total CVI of the GHP was 0.95 and item-CVI ranged from 0.8 to 1.0. The Cronbach’s alpha coefficient for internal reliability was 0.94 in the pilot study and 0.83 in the main study.

Table 3-1 Summary of the study’s research instruments

Variable	**Measures**	**Likert type**	**No. of items**	**Cronbach’s alpha**
Health-related quality of life	FPQLI (Ferrans & Powers, 1992)	1-6	66	0.82
Symptom experience	MSAS (Portenoy et al., 1994)	1-4	32	0.83
Functional status	FSQ (Jette et al., 1986)	1-6	28	0.97
Social support	MOS-SSS (Sherbourne & Stewart, 1991; translated into Vietnamese by Khuonng et al., 2018)	1-5	20	0.92
Self-care behaviour	L-PaSC (Coolbrandt et al., 2013)	1-5	22	0.73

Table 3-1 (Continued)

Variable	Measures	Likert type	No. of items	Cronbach's alpha
General health perceptions	Subscale of the SF-36 (Ware & Sherbourne, 1992)	1-5	5	0.83

A back-translation technique

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 (Brislin, 1970; Eun-Seok, Kim, & Erlen, 2007) 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.

First, the original English version of the FPQLI, MSAS, FSQ, L-PaSC, and GHP-SF36 was translated independently into Vietnamese by two bilingual translators who were fluent in both languages. The translators had received doctoral degrees in nursing from abroad universities and were familiar with the content involved in the quality of life for the oncology field. They translated the contents by conveying the precise meanings and statements from the original measurement. These translated contents relayed the main ideas from the original English version. Furthermore, if any discrepancy in the meaning of each item in the two Vietnamese versions, an open discussion would be carried out between the researcher and two translators to reach a consensus of meanings, then two Vietnamese forms were integrated into one version for back-translation to English.

Second, the translated Vietnamese version was then translated independently back into English by two other bilingual translators who had not seen the English original versions of all instruments. These translators have received doctoral degrees in linguistics from overseas universities.

Finally, the back-translated versions of the QLI, MSAS, FSQ, L-PaSC, and GHP-SF36 were compared and reviewed for accurate interpretation between the

original version and back-translated versions by the researcher and the major advisor who are both bilingual and familiar with the issues of health-related quality of life. They compared the contents in terms of cultural acceptability as well as the consistency of grammar and structure of each item. If the items have any discrepancies, the researcher and the major advisor discussed the matter and revised for agreement with appropriate equivalence with real situations (Figure 3-1).

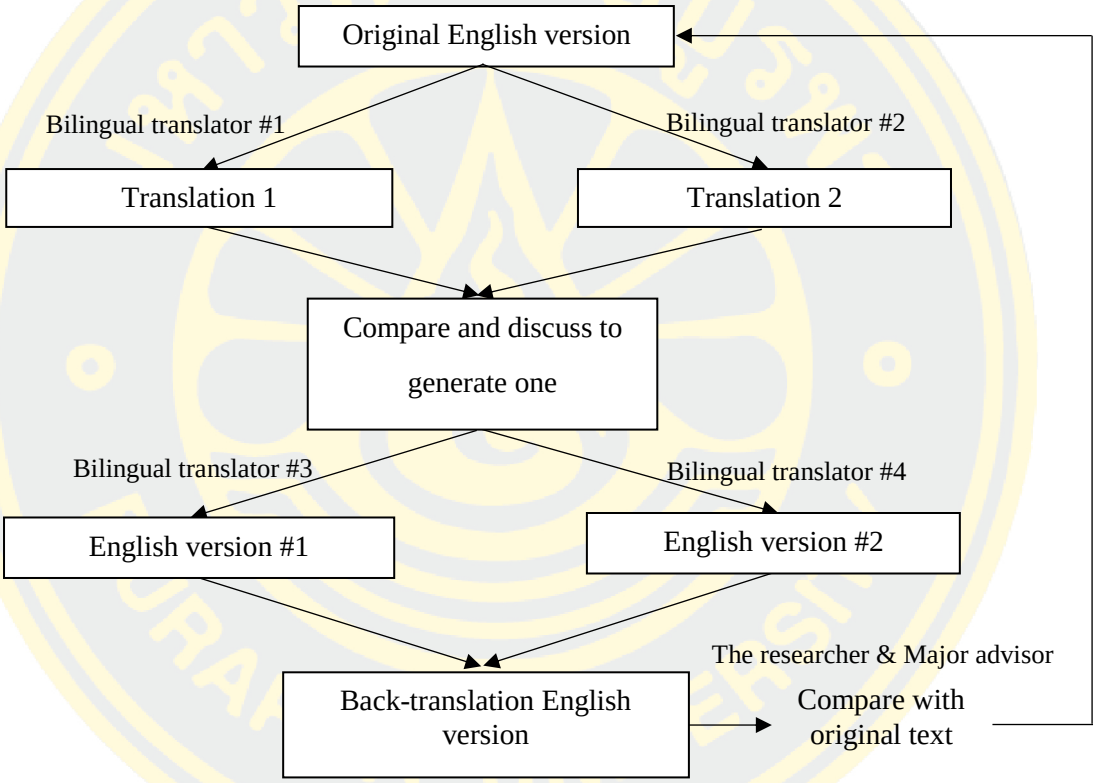

Figure 3-1 The process of the back-translation technique

Protection of human rights

This study was approved by the Institutional Review Board [IRB] from the Faculty of Nursing, Burapha University (# 02-11-2562), and the IRB from three hospitals (# 1493-2020/TB-BVK, # 927-2020/QĐ-BVUBNA, and # 625-2020/QĐ-BVUBTH). The participants were asked to voluntarily participate and were informed about the research objectives, benefits, potential risks, withdrawal, and confidentiality. The researcher recruited the participants based on their willingness to

sign informed consent forms. All participants had the right to refuse to participate in the study and be able to withdraw at any time during the process of the study with no requirement to provide reasoning and no impact on health services at the health-promoting hospitals. The questionnaires of this study were assigned by using code numbers for strict confidence. All the findings were reported as group data. After collecting and analyzing the data, the researcher sealed and placed them in a locked container until this study is published. The data will be destroyed after publication.

Data collection procedures

The data collection procedures are explained as follows:

1. After receiving IRB approval from the ethical committee of the Faculty of Nursing, Burapha University. The researcher has submitted the research proposal to the Institutional Review Board [IRB] of the hospitals.

2. A letter of introduction and request for permission to conduct the study from the Faculty of Nursing, Burapha University was submitted to the directors of the hospitals.

3. All data were collected by the researcher. The researcher selected the sample population undergoing treatment for lung cancer with chemotherapy studied the patients' medical records and invited patients who meet the inclusion criteria and are interested in participating. Then the researcher introduced himself, build rapport with the subjects and explain the objectives, data collection methods, and duration of the study, also informing the subjects of their rights to agree or refuse to participate in the study.

4. The data were collected by self-report questionnaires in the ward and outpatient departments of the hospitals by using an adequate period of 30-45 minutes after the patients have met with the physicians and received routine care. The informed consent form was signed by participants who agree to participate.

5. The researcher clearly explained the questionnaire to assist participants in completing the data and monitor the completeness of questionnaire administration.

6. The data obtained were analyzed by proper statistical methods.

Data analysis

Statistical software programs were used to analyze the data. The significance level was set at $p < .05$. The details of the analyses are as follows:

1. Descriptive statistics were used to describe the demographic characteristics of the participants and all study variables.

2. The magnitude of both direct and indirect causal effects on HRQoL in lung cancer patients undergoing chemotherapy were analyzed with Structural Equation Modelling [SEM] by using the AMOS program.

CHAPTER 4
RESULTS

This chapter presents the findings of the study which are outlined into five parts: 1) Characteristics of the participants, 2) Descriptive statistics of the study variables, 3) Structural Equation Modeling assumption testing, 4) Measurement model assessment of latent variables, and 5) Assessing the structural model fit**.**

Characteristics of the participants

A total sample was 232 participants with a mean age of 46.65 years (*SD* = 10.95). The majority was male (61.2%). Approximately half of the sample 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 (82.8%). The duration of being diagnosed with lung cancer among the sample varied from 2 to 26 months. The mean of such duration was 10.74 ± 5.38 months. The number of chemotherapy cycles completed varied 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 and 42-74, respectively. The mean of current weight (55.30 ± 6.38) was mildly lower than the usual weight (55.99 ± 6.19). Details were presented in Table 4-1.

Table 4-1 Demographic characteristic of the participants (*N* = 232)

Characteristic	**Min-max**	**Mean**	***SD***	**n (%)**
Age	18 - 60	46.65	10.95	
18-30				25 (10.8)
31-40				39 (16.8)
41-50				55 (23.7)
51-60				113 (48.7)
Gender				
Female				90 (38.8)
Male				142 (61.2)
Education level				
Secondary				40 (17.2)
High school				77 (33.2)
Vocational				56 (24.1)
College or higher				59 (25.4)
Working condition				
Working				144 (62.1)
Not working				88 (37.9)
Stage of disease				
Stage III				40 (17.2)
Stage IV				192 (82.8)
Time from diagnosis with lung cancer (month)	2 - 26	10.74	5.38	
Number of chemotherapy cycles completed	1-21	6.92	4.66	
Height (cm)	145-178	159.44	7.72	
Current weight (kg)	41-72	53.99	6.19	
Usual weight (kg)	42-74	55.30	6.38	

Descriptive statistics of the study variables

As can be seen in Table 4-2, the total score of health-related quality of life ranged from 16.27 to 25.50 with its total mean score of 20.81 ± 1.62. A subscale of health and functioning had the lowest mean score (19.54 ± 2.44), and a family subscale had the highest mean score (22.23 ± 2.56). The symptom experience score had a wide range (0.17-2.00). The total mean score of symptom experience was 0.92 ± .42. Regarding social support, it ranged from 32.89 to 90.79 with its total mean score of 62.89 ± 11.98. Tangible support had the highest score, and positive social interaction had the lowest score. The functional status score ranged from 35.15 to 86.85 and the total mean score was 64.78 ± 9.54. Self-care behavior ranged from 36.19 to 100.00, and its total mean score was 75.11± 14.51. Lastly, the general health perceptions ranged from 25.00 to 95.00 and its total mean score was 50.50 ± 16.78.

Table 4-2 Description of studied variables (*N* = 232)

Variables	Possible range	Min-max	Mean	*SD*
Health-related quality of life	**0-30**	**16.27 - 25.50**	**20.82**	**1.62**
Health & functioning	0-30	13.08 - 26.08	19.54	2.44
Social economical	0-30	16.07 - 26.50	21.71	1.85
Psycho-spiritual	0-30	15.93 - 26.79	21.30	1.79
Family	0-30	10.20 - 28.50	22.23	2.56
Symptom experience	**1-4**	**.17-2.00**	**.92**	**.42**
Physical symptoms	1-4	.08-2.41	1.10	.53
Psychological symptoms	1-4	.16-3.28	1.20	.68
Other symptoms	1-4	.00-1.68	1.68	.40
Social support	**0-100**	**32.89 - 90.79**	**63.02**	**11.92**
Tangible	0-100	6.25 - 100.00	67.79	15.95
Emotional	0-100	18.75 - 96.88	61.26	15.69
Social interaction	0-100	12.50 - 93.75	60.34	16.32
Affectionate	0-100	16.67 - 100.00	63.36	16.32

Table 4-2 (Continued)

Variables	Possible range	Min-max	Mean	*SD*
Self-care behavior	**0-100**	**36.19 - 100.00**	**75.11**	**14.51**
Functional status	**0-100**	**40.70 - 86.85**	**64.84**	**9.13**
Physical function	0-100	33.33 - 94.44	67.68	12.18
Psychological function	0-100	28.00 - 80.00	56.34	8.46
Social function	0-100	41.11 - 88.44	69.08	9.11
Role function	0-100	33.33 - 88.89	59.22	11.62
General health perceptions	**0-100**	**25.00 - 95.00**	**50.39**	**16.88**

Structural equation modeling assumption testing

The assumptions underlying structural equation modeling analysis were tested including missing data, outliers, normality, linearity, multicollinearity, and homoscedasticity (Hair, Black, Babin, & Anderson, 2019; Tabachnick & Fidell, 2018). Details were described as follows:

For this study, the researcher approached 275 eligible persons with lung cancer undergoing chemotherapy who met with the inclusion criteria. 254 participants voluntarily participated. Missing data must be addressed if the missing data are in a nonrandom pattern or more than 10 percent of the data items are missing (Hair et al., 2019). After thoroughly scanning the data, 15 cases were excluded from the final dataset due to missing items more than 10 percent. Consequently, a sample size of 239 cases was further tested for the outliers and other multivariate assumptions of SEM analysis.

Outliers

Univariate outliers

According to Tabachnick and Fidell (2018), a univariate outlier is a case with an extreme value or large standardized scores on one or more variables. If it is in excess tested of 3.29 standardized deviations or less than -3.29 standardized deviations are potential outliers. Then each measured variable was examined. There was no univariate outlier (Table F-1, Appendix F).

Multivariate outliers

For multivariate outliers, the Mahalanobis distance statistic, which indicates the distance of a case from the centroid of the means of all variables. It can be evaluated by using the Chi-square distribution. From the chi-square table alpha =.001, df = 17, the case more than 32.629 is a multivariate outlier. The test results showed that there were 7 cases of multivariate outliers, cases #10, #20, #48, #78, #106, #156, and case #172 (Table F-2, Appendix F). Consequently, these cases of multivariate outliers were deleted from raw data. Therefore, the final 232 cases were later tested for normality, linearity, and multicollinearity.

Normality

Univariate normality

Skewness and kurtosis values are important indicators of normal distribution. According to West, Finch, and Curran (1995), the skewness and kurtosis values of 3 and 21, respectively, represent a highly non-normality. The skewness value of 2 and kurtosis value of 7 indicate a moderate departure from the normal distribution.

In the current study, the skewness values of variables range from -0.676 to 0.668. The kurtosis values are varied from -0.806 to 1.949 (Table F-3, Appendix F). The values demonstrate that data does not remarkably depart from a non-normal distribution. Importantly, it is evidence that the Maximum Likelihood still works well as long as measured variables were not severely non-normal (the skewness exceeds 2 and the kurtosis exceeds 7) (Stenven, 2009). It could be concluded that there is efficient evidence about reasonable satisfaction of the univariate normality assumption.

Multivariate normality

Multivariate normality assumption requires that observations among all combinations of variables are normally distributed (Meyers, Gamst, & Guarino, 2006). The multivariate normality can be detected by Mardia's test (Kline & Little, 2016). The test estimates multivariate kurtosis and its critical ratio [C.R]-the most important factor to evaluate multinormality. The value of Kurtosis critical value is higher than 5 represents a non-normal distribution of variables (Byrne, 2010). In the current study, Mardia's test was run in AMOS to examine multivariate kurtosis and its

critical ratio. As shown in Table F-3 (Appendix F), Kurtosis was 11.481, and Kurtosis's critical value was 2.813. Thus, it could be concluded that the assumption of multivariate normality was not violated.

Multicollinearity

Multicollinearity refers to the interrelatedness of the independent variables. It is believed that the high correlations among variables would evaluate statistical results problematic (Munro, 2005). According to Kline (2016), three common ways can be used to examine multicollinearity among variables. First, calculate squared multiple correlations between each variable and all the rest. The observation that R-square > .90 for a particular variable analyzed as the criterion suggests extreme multivariate collinearity. Second, tolerance statistic (indicates the proportion of total standardized variance that is not explained by all the other variables) can be calculated by the formula $1-R^2$. Tolerance values < .10 may indicate extreme multivariate collinearity. Lastly, the variance inflation factor [VIF] (formula: $1/ (1-R^2)$). The VIF exceeding 10 indicates multivariate collinearity (Meyers et al., 2006). Munro (2005) also suggested that the high correlations ($|r| > .85$) among variables imply multicollinearity. In the current study, correlation coefficients, tolerance, and VIF were used to examine multivariate collinearity.

In this study, it was shown that the correlation coefficients among variables ranged from -.682 to .630 (Table F-4, Appendix F). None of them exceed the value of .85. The tolerance of variables ranged from .257 to .863, which were very close to 1.0. Additionally, the VIF varied from 1.159 to 3.894, which is very much less than 10 (Table F-5, Appendix F). Therefore, it could be concluded that there was no evidence of multivariate collinearity found.

Linearity

The assumption of linearity requires that the associations among variables must be in a linear pattern. Because correlations represent only the linear association between variables, nonlinear effects will not be represented in the correlation values. This absence results in an underestimation of the actual strength of the relationship. According to Hair et al. (2019), linearity can be examined by simple regression analysis to assess residuals. The residuals reflect the unexplained portion of the dependent variable. Thus, any nonlinear portion of the relationship will show up in the residuals. In this study, normal P-P plots of

regression standardized residuals showed linear association among variables (Appendix F). Thus, it could be concluded that the assumption of linearity was met.

Homoscedasticity

Homoscedasticity refers to the assumption that the dependent variables exhibit an equal level of variance across the range of predictor variables. Homoscedasticity is desirable because the variance of the dependent variable being explained in the dependence relationship should not be concentrated in only a limited range of the value. This assumption could be tested by the graphical test of equal variance dispersion. According to Hair et al. (2019), the test of homoscedasticity for two metric variables is best examined graphically. The homoscedastic data will show an equal distribution of residual across the central line. In the current study, the residual scatter plots show no violations of the homoscedasticity assumption (Appendix F).

Measurement model assessment of latent variables

The measurement model describes the connections between the latent variables and their manifest indicators (Blunch, 2008). The multiple-indicators approach to the measurement of CFA represents literally half the basic rationale of analyzing covariance structures in structural equation modeling (Kline, 2016).

There were six latent constructs in the hypothesized model, but the self-care behavior was treated as a latent variable with a single measured indicator. Therefore, it was not necessary to test with CFA. Consequently, the remaining five latent constructs of health-related quality of life, symptoms experience, social support, functional status, and general health perceptions were tested with confirmatory factor analysis as follows:

Health-related quality of life measurement model

The measurement model of health-related quality of life was accepted. All observed variables were statistically significant to health-related quality of life factors. The standardized regression weights range from 0.40-0.84 and are significantly associated with the health-related quality of life at $p < .001$. The highest value of the regression coefficient was health and functioning, and the lowest value was psychological/ spiritual. Details were in Table 4-3 and Figure 4-1.

Table 4-3 Results of CFA on the health-related quality of life

Observed variable	Standardized factor loadings	SE	*t*	R^2
Health and functioning	.84	-	-	.71
Social and economical	.52	.095	4.902***	.27
Psychological/Spiritual	.40	.073	4.830***	.16
Family	.49	.127	4.821***	.24

** $p < .01$, ***$p < .001$

Chi-square (χ^2) = 3.284, df = 2, p = .194, Normed χ^2 = 1.642, RMSEA = .053 (.00 ÷ .151), SRMR = .0282, CFI = .993, GFI = .989

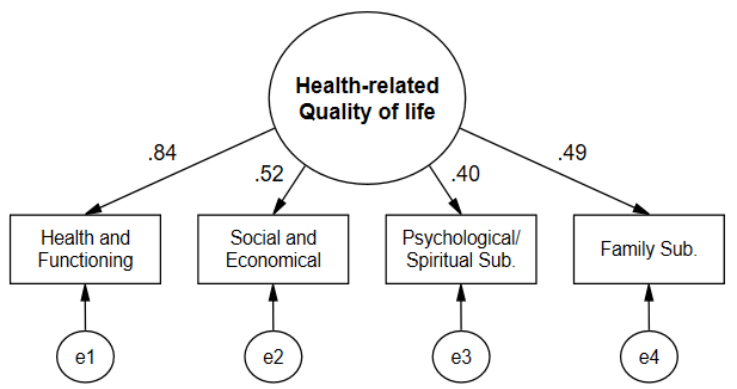

Figure 4-1 Standardized factor loadings of the measurement model of health-related quality of life

Symptom experience measurement model

Symptom experience was constituted by three indicators including physical, psychological, and other symptoms sub-scales. According to this measurement model, the empirical data presented as $p < .001$, df = 0, GFI = 1.000, RMR = 1.000, CFI = 1.000. As a result, the measurement model could not be identified. Therefore, the measurement model was constrained by adding a fixed parameter at the error variance of the physical symptoms indicator (value 0). The results of the modified model were p = .700, df = 1, CMIN/df = .149, GFI = 1.000, SRMR = .0066, RMSEA = .000, CFI = 1.000. Consequently, the modified model had a validation index of adequacy of the model at an acceptable level. Three measured variables were statistically significant at $p < .001$. The values of standard factor

loadings of physical, psychological, and other symptoms were 1.00, .54, and .66, respectively. Therefore, physical, psychological, and other symptoms sub-scale were indicators of the symptom experience. Table 4-4 and Figure 4-2 illustrated the measurement model of symptom experience.

Table 4-4 Results of CFA on symptom experience

Observed variable	Standardized factor loadings	SE	*t*	R^2
Physical symptoms	1.00	-	-	1.00
Psychological symptoms	.54	.688	9.703***	.29
Other symptoms	.66	.501	13.394***	.44

** $p < .01$, ***$p < .001$

$\chi^2 = 0.149$, $df = 1$, $p = .70$, Normed $\chi^2 = 0.149$, RMSEA = .000, SRMR = .0066, CFI = 1.000, GFI = 1.000.

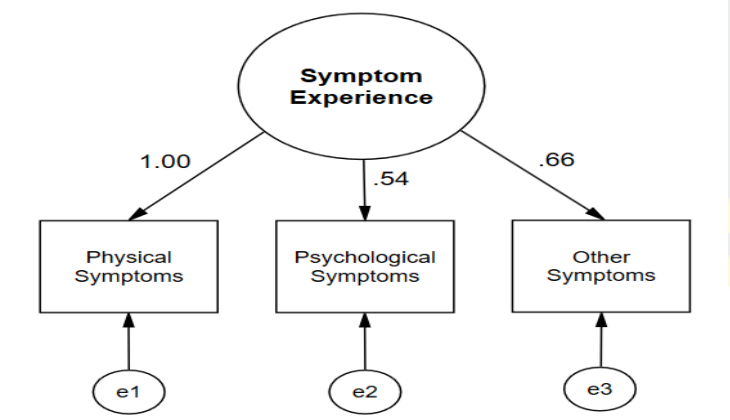

Figure 4-2 Standardized factor loadings of the measurement model of symptom experience

The functional status measurement model

According to the results showed in Table 4-5 and Figure 4-3, the measurement model of functional status was well fit with observed data, $p = .601$, CMIN/ $df = .509$, RMSEA = .000, CFI = 1.000, GFI = .998. All observed variables were statistically significant to the functional status construct. The standardized regression weights range from 0.69 - 0.93

and are significantly associated with the functional status at $p < .001$. The highest value of the regression coefficient was the social function, and the lowest value was the role function.

Table 4-5 Results of CFA on the Functional status

Observed variable	Standardized factor loadings	SE	*t*	R^2
Physical function	.80	-	-	.63
Psychological function	.85	.051	14.493***	.72
Social function	.93	.056	15.687***	.87
Role function	.69	.075	11.014***	.47

**$p < .01$, ***$p < .001$

$\chi^2 = 1.018$, $df = 2$, $p = .601$, Normed $\chi^2 = .509$, RMSEA = .000 (RMSEA is between .000 and .107 with 90 percent of confidence), CFI = 1.000, GFI = .998.

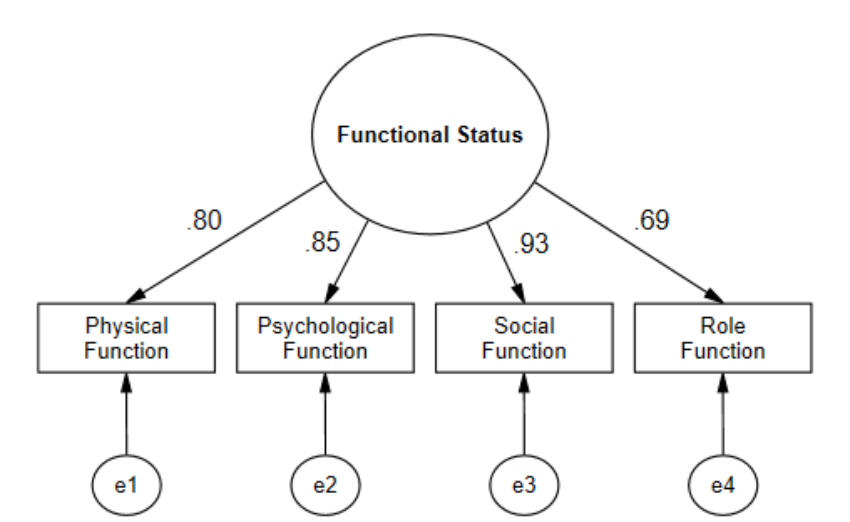

Figure 4-3 Standardized factor loadings of the measurement model of functional status

The social support measurement model

Social support includes four measured indicators which are tangible, emotional/ informational support, positive interaction, and affectionate support. According to this measurement model, the empirical data presented as $p < .051$, $df = 2$, GFI = .988, RMSEA = .092, CFI = .975. These results depicted that the measurement model was not well-

fit with the observed data. Therefore, the measurement model was modified based on the modification index by adding a covariance between the error variance term of tangible and positive interaction indicators. The results of the modified model were p = .858, df = 1, CMIN/ df = .032, GFI = 1.000, SRMR = .0024, RMSEA = .000, CFI = 1.000. Consequently, the modified model had a validation index of adequacy of the model fit at an acceptable level. Four measured variables were statistically significant at $p < .001$. The values of standard factor loadings of tangible, emotional/ informational, positive interaction, and affectionate support were .56, .73, .33, and .76, respectively. Therefore, tangible, emotional/ informational, positive interaction, and affectionate support were necessarily indicators of social support. Details were in Table 4-6 and Figure 4-4.

Table 4-6 Results of CFA on social support

Observed variable	**Standardized factor loadings**	**SE**	***t***	**R^2**
Tangible support	.56	-	-	.31
Emotional	.73	.190	6.798***	.54
Affectionate	.76	.208	6.711***	.58
Positive social interaction	.33	.162	3.710***	.11

**$p < .01$, ***$p < .001$

χ^2 = .032, df = 1, p = .858, Normed χ^2 = .032, RMSEA = .000, CFI = 1.000, GFI = 1.000.

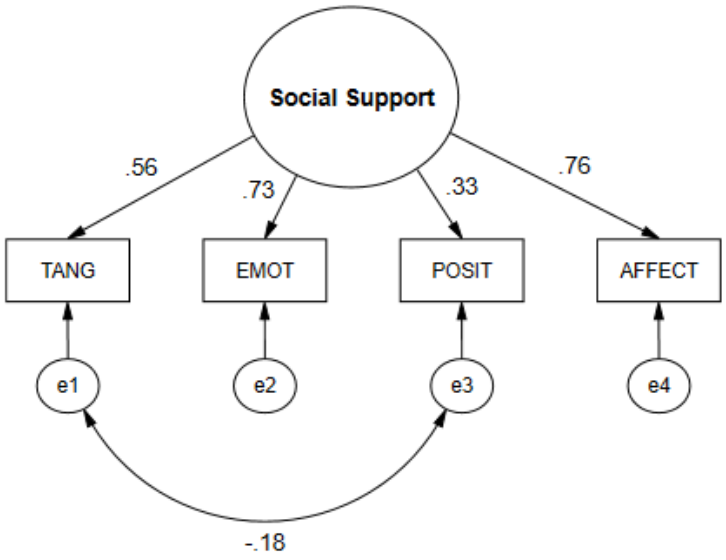

Figure 4-4 Standardized factor loadings of the measurement model of social support

The general health perception measurement model

General health perceptions were constituted from five measured indicators. According to this measurement model, the empirical data presented as $p < .025$, $df = 5$, CMIN/ $df = 2.566$, GFI = .978, RMSEA = .082, CFI = .981. These results represented that the measurement model was not well-fit with the observed data. Therefore, the measurement model was modified based on the modification index by adding a covariance between the error variance term of e2 and e5. The results of the modified model were $p = .495$, $df = 4$, CMIN/df = .846, RMSEA = .000 (.000 ÷ .092), CFI = 1.000, GFI = .994. Consequently, the modified model had a validation index of adequacy of the model fit at an acceptable level. The standardized regression weights range from 0.57-0.84 and are significantly associated with the general health perceptions at $p < .001$. Table 4-7 and Figure 4-5 showed results of the general health perception measurement model.

Table 4-7 Results of CFA on General health perception

Observed variable	Standardized factor loadings	SE	*t*	R^2
Total health	.84	-	-	.71
Easy to get sick	.68	.072	10.007***	.46
I am strong	.78	.073	11.701***	.61
I hope my health worse	.59	.075	8.878***	.35
My health was wonderful	.57	.087	8.130***	.32

**$p < .01$, ***$p < .001$

$\chi^2 = 3.386$, $df = 4$, $p = .495$, Normed $\chi^2 = .846$, RMSEA = .000 (.000 ÷ .092), CFI = 1.000, GFI = .994

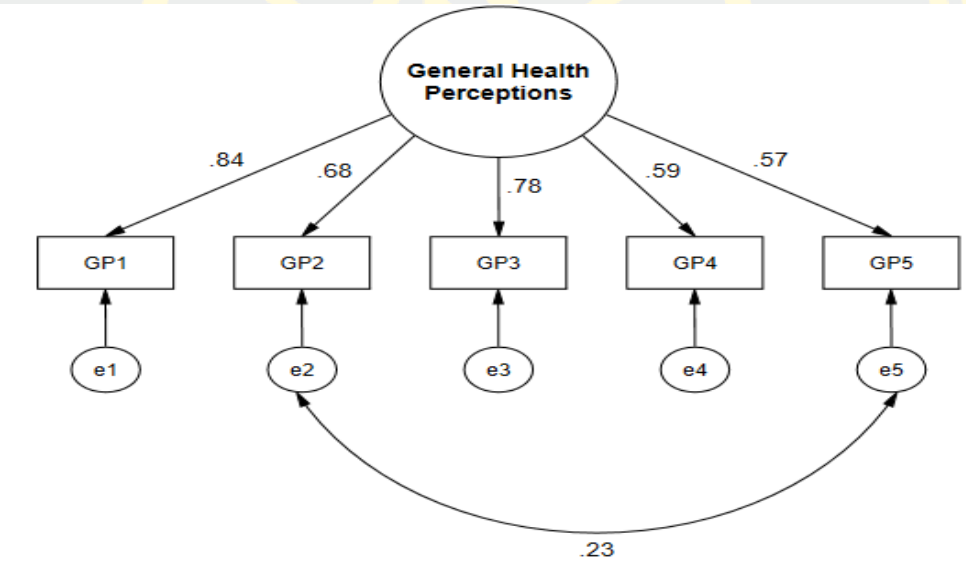

Figure 4-5 Standardized factor loadings of the measurement model of GHP

Assessing the structural model fit

After testing measurement models, the next step was done by using the structural equation modeling [SEM] technique. Two steps including assessing the structural model fit and modifying the hypothesized model were presented as follows.

1. Model identification

In this study, the analysis of moment structure [AMOS] program was used to test how the hypothesized model fit with the empirical data and then, to test a modified model. The Goodness of Fit [GOF] indices were used to estimate the model fit. The underlying principle to assess model fit which compares the theory to reality by assessing the similarity of the estimated covariance matrix (theory) to reality (the observed covariance matrix). The values of any GOF measure result from a mathematical comparison of these two matrices. The closer the values of these two matrices are to each other, the better the model is fit (Hair et al., 2019).

Determining model fit is complicated because several models fit criteria have been developed to assist in interpreting structural equation models under different model-building assumptions (Marcoulides & Yuan, 2017; Marsh, Hau, & Wen, 2004). In the present study, fit indices such as chi-square (χ^2), normed chi-square, the Goodness of Fit Index [GFI] the Comparative Fit Index [CFI], the Adjusted Goodness of Fit Index [AGFI], and the Root Square Error of Approximation [RMSEA] were used to analyze how well the empirical data fit the hypothesized model. Several studies have proposed the cut-off values of GOF indices (Hu & Bentler, 1999; Lance, Butts, & Michels, 2006; Marcoulides & Yuan, 2017; Marsh et al., 2004), the acceptance values of GOF include CMIN near-zero or p-value non-significant ($p > .05$), the CMIN/ degrees of freedom (normed chi-square) < 2.0, the GFI between .90-1.00, the AGFI between .90-1.00, and the RMSEA at < .05 (Hair et al., 2019; Kline & Little, 2016; Tabachnick & Fidell, 2018).

According to the hypothesized model testing, the results of the hypothesized model showed that CMIN was equal to 263.90 (p =.000, df = 174), CMIN/ df was 1.517, GFI was .904, AGFI was .872, CFI was .956, and RMSEA was .047. These findings indicated the hypothesized model was not fit with the sample data. Subsequently, the hypothesized model was modified by modification indices until achieving the criteria (Kline & Little, 2016). Then the results for the modified model found that CMIN was 154.49 (p =.691, df = 164), CMIN/ df was .942, GFI was .942, AGFI was .918, CFI was 1.000, and RMSEA was .000. Therefore, the modified model had a validation index of adequacy of the model at an acceptable level as shown in Table 4-8.

Table 4-8 Statistics of model fit indices of the hypothesized and the modified models (N = 232)

Model fit criterion	**Acceptable score**	**Hypothesized model**	**Modified model**
CMIN	$p > .05$	$\chi^2 = 263.90$	$\chi^2 = 154.49$
		$p = .000$ ($df = 174$)	$p = .691$ ($df = 164$)
CMIN/*df*	< 2	1.517	.942
GFI	.90-1.00	.904	.942
AGFI	.90-1.00	.872	.918
CFI	> .95	.956	1.000
RMSEA	< .05 to .08	.047	.000

Note

CMIN = minimum Chi-square, GFI = goodness of fit index, AGFI, = Adjusted GFI, CFI = Comparative fit index, RMSEA = Root-mean-square error of approximation

A path diagram of the hypothesized causal model of health-related quality of life among cancer patients undergoing chemotherapy was tested using parameter estimates and presented in Figure 4-6 and Table 4-9. The hypothesized model proposed relationships among exogenous, mediator, and endogenous variables. The exogenous was social support. The mediators contained symptom experience, functional status, general health perception, and self-care behavior. Simultaneously, the endogenous variables were symptom experience, functional status, general health perception, self-care behavior, and health-related quality of life. The tested path of the hypothesized model showed the parameter estimate and their directions were significant at a significant level of less than .05.

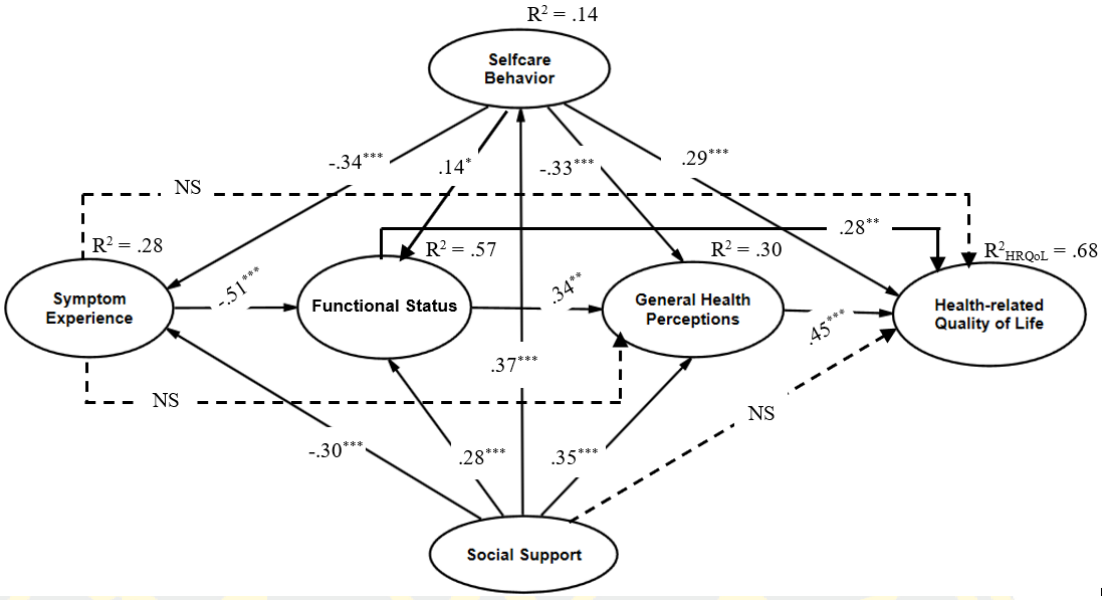

Figure 4-6 The hypothesized model of factors affecting health-related quality of life among lung cancer patients receiving chemotherapy

Note

ns = non-significant, * = $p < .05$, ** = $p < .01$, *** = $p < .001$

→ significant

⇢ non-significant

Table 4-9 Standardized regression weight (Estimate), standard errors (SE), critical ratio (C.R.), and *p*-value of the hypothesized model (*N* = 232)

Path	Estimate	*SE*	*C.R.*	*p*-value
Social support				
→ Symptom experience	-.30	.005	-3.90	***
→ Functional status	.28	.065	3.62	***
→ General health perception	.35	.220	3.35	***
→ HRQoL	.02	.015	.261	.794
→ Self-care behavior	.37	.115	5.28	***
Self-care behavior				
→ Symptom experience	-.34	.002	-5.47	***
→ Functional status	.14	.031	2.34	*
→ Gereral health perception	-.33	.099	-4.33	***
→ HRQoL	.29	.008	4.36	***
Symptom Experience				
→ Functional status	-.51	1.122	-6.64	***
→ General health perception	-.03	3.370	-.32	.750
→ HRQoL	-.12	.236	-1.70	.089
Functional status				
→ Genreal health perception	.34	.290	2.91	**
→ HRQoL	.28	.022	2.92	**
General health perception → HRQoL	.45	.007	5.45	***

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: *SE* = standard error, *C.R.* = critical ratio

The relationship between exogenous and endogenous variables: there were a significant parameter estimate with a path from social support to selfcare behavior in a possitive direction ($\beta = .37$, $p < .001$), which accounted for 14% of variance ($R^2 = .14$). The significant parameter estimate with a path from social support to general health perception in a possitive direction ($\beta = .35$, $p < .001$), which accounted for 12% of variance ($R^2 = .12$). A significant parameter estimates with a path from social support to

functional status in a possitive direction (β = .28, $p < .001$), which accounted for 8% of variance ($R^2 = .08$). The significant parameter estimate with a path from social support to symptom experience in a negative direction (β = -.30, $p < .001$), which accounted for 9% of variance ($R^2 = .09$). However, the parameter estimate from social support to HRQoL was not significant (β = .028, $p > .05$).

The relationships between mediators and endogenous variables: There was a significant parameter estimate from general health perception to HRQoL in a possitive direction (β = .45, $p < .001$), which accounted for 20% of variance ($R^2 = .20$). A significant parameter estimate from self-care behavior to HRQoL in a possitive direction (β = .29, $p < .001$). There were a significant parameter estimate from functional status to general health perception in a possitive direction (β = .34, $p < .01$), which accounted for 12% of variance ($R^2 = .12$) and a significant parameter estimate from functional status to HRQoL in a possitive direction (β = .28, $p < .01$). Also, there was a significant parameter estimate from self-care behavior to functional status (β = .14, $p < .05$).

Futhermore, there were a negative significant parameter estimate from symptom experience to functional status (β = -.51, $p < .001$), which accounted for 26% of variance ($R^2 = .26$), a negative significant estimate from self-care behavior to symptom experience (β = -.34, $p < .001$), and a negative significant estimate from self-care behavior to general health perception (β = -.33, $p < .001$). However, the parameter estimate from symptom experience to general health perception (β = -.03, $p > .05$) and the parameter estimate from symptom experience to HRQoL (β = -.12, $p > .05$) were not significant.

A summary of the direct, indirect, and total effects of the hypothesized model of health-related quality of life among lung cancer patients undergoing chemotherapy based on parameter estimates was presented in Table 4-10.

Table 4-10 Parameter estimates of direct, indirect, and total effects of the hypothesized 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	.37***	-	-.30***	-.13	.28***	.27***	.35***	.08	.02	.50	.53***
Selfcare behavior	-	-	-.34***	-	.14	.18	-.32***	.12	.29	.04	.33***
Symptom experience	-	-	-	-	-.51***	-	-.03	-.17	-.12	-.24	-.36***
Functional status	-	-	-	-	-	-	.34***	-	.28**	.15	.43**
GHP	-	-	-	-	-	-	-	-	.45***	-	.45***
	R^2 = .14		R^2 = .28		R^2 = .57		R^2 = .30		R^2 = .68		

Note

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

2. The model modification

Consideration of the variety of fit indices showed that the hypothesized model did not fit with the empirical data. The Model Modification (MI) was used to improve the model fit by examining the MI indices based on the results of the analysis by considering recommendations for adjusting the parameters in the model and by considering the index model based on the data analysis (Shumaker & Lomax, 2010). According to the hypothesized model, there were three non-significant parameter estimates including the parameter estimate from social support to HRQoL (p = .794), the parameter estimate from symptom experience to HRQoL (p = .089), and the parameter estimate from symptom experience to general health perceptions (p = .75). In addition, there was a weak parameter estimate from self-care behavior to functional status (β = .14, p = .02) (Table 4-9). Therefore, the hypothesized model was modified by modification indices until the criteria for the goodness of fit were met.

The parameter estimates and path diagrams for the modified model are presented in Table 4-11, Figure 4-7, and Table 4-12. In this model, social support was an exogenous variable. Symptom experience, functional status, general health perception, and self-care behavior were mediators between the exogenous variable and Health-related quality of life,

while symptom experience, functional status, general health perception, self-care behavior, and health-related quality of life were endogenous variables. The relationships among the variables were as follows:

The exogenous latent variable of social support had three significant estimate parametes with possitive direction to selfcare behavior (β = .38, $p < .001$), to general health perceptions (β = .38, $p < .001$), to functional status (β = .29, $p < .001$), and significant estimate parameter in negative direction to symptom experience with "β = -.34 ($p < .001$).

There were three direct significant estimate parameters affecting HRQoL which were selfcare behavior (β = .30, $p < .001$), functional status (β = .41, $p < .001$), and general health perception (β = .44, $p < .001$). Functional status also has a significant positive parameter estimate to general health perceptions (β = .30, $p < .001$). In addition, there were three significant negative parameter estimates that were a negative parameter estimate from selfcare behavior to symptom experience (β = -.33, $p < .001$), a negative parameter estimate from selfcare behavior to general health perceptions (β = -.31, $p < .001$), and a negative paramter estimate from symptom experience to functional status (β = -.56, $p < .001$).

Furthermore, social support had indirect effects on HRQoL through symptom experience, functional status, GHP, and self-care behavior with a total effect of β = .53, $p < .001$. Symptom experience also had indirect effects to HRQoL through functional status and GHP with a total effect of β = -.31, $p < .001$ (Table 4-12).

In this relationship, symptom experience, functional status, GHP, self-care behavior, and social support accounted for 68% ($R^2 = .68$) of the variance in HRQoL. Social support and symptom experience accounted for 55 percent of functional status. Social support, functional status, and self-care behavior accounted for 30 percent of general health perception. Social support and self-care behavior accounted for 31 percent of symptom experience (Table 4-11, Figure 4-7, and Table 4-12).

Table 4-11 Standardized regression weight (Estimate), standard errors (SE), critical ratio (C.R.), and *p*-value of the modified model (*N* = 232)

Path	Estimate	*SE*	*C.R.*	*p*-value
Social support				
→ Symptom experience	-.34	.005	-4.26	***
→ Functional status	.29	.063	3.80	***
→ GHP	.38	.220	3.59	***
→ Self-care behavior	.38	.114	5.28	***
Self-care behavior				
→ Symptom experience	-.33	.002	-5.16	***
→ GHP	-.31	.094	-4.27	***
→ HRQoL	.30	.007	4.87	***
Functional status				
→ GHP	.30	.237	3.27	***
→ HRQoL	.41	.019	5.04	***
Symptom Experience	-.56	1.17	-6.85	***
→ Functional status				
GHP → HRQoL	.44	.007	5.72	***

*** $p < .001$

Note: *SE* = standard error, *C.R.* = critical ratio, GHP = general health perceptions, HRQoL = Health-related quality of life

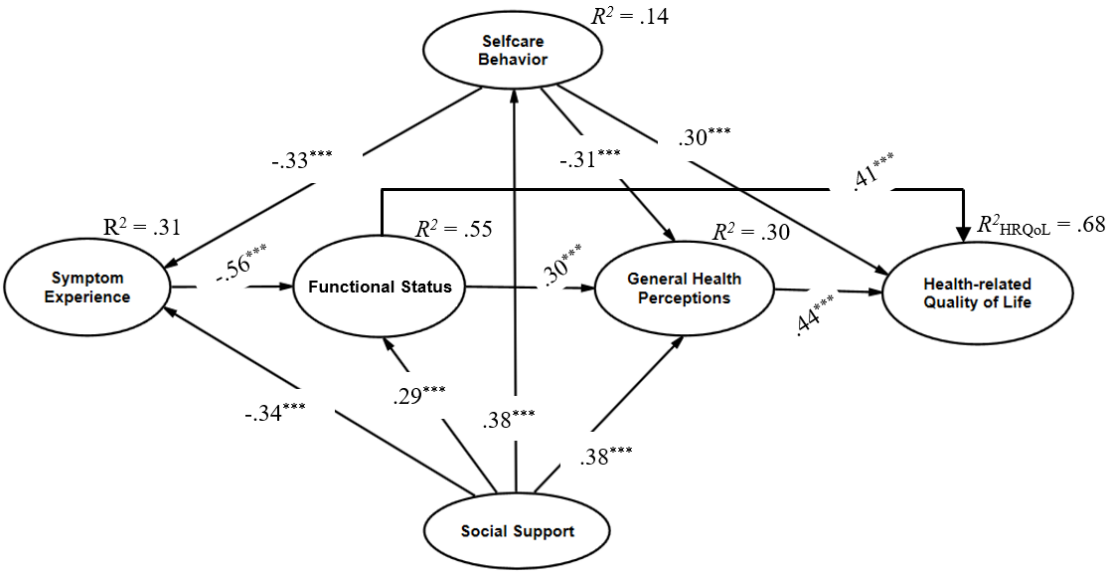

Figure 4-7 The modified model of factors affecting health-related quality of life among lung cancer patients receiving chemotherapy

Note

** = p < .01, *** = p < .001

⟶ significant

Table 4-12 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	.38***	-	-.34***	-.12	.29***	.26***	.38***	.05	-	.53***	.53***
Selfcare behavior	-	-	-.33***	-	-	.18	-.31***	.06	.30***	-.04	.27***
Symptom experience	-	-	-	-	-.56***	-	-	-.17	-	-.31***	-.31***
Functional status	-	-	-	-	-	-	.30***	-	.41***	.13	.55***
GHP	-	-	-	-	-	-	-	-	.44***	-	.44***
	R^2 = .14		R^2 = .31		R^2 = .55		R^2 = .30		R^2 = .68		

Note

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

Summary of the study findings in relation to research hypotheses

In this study, six hypotheses were tested as follows:

Hypothesis 1: Symptom experience had negatively direct and indirect effects on HRQoL through functional status and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

The path coefficient from symptom experience to HRQoL in the hypothesized model showed nonsignificantly, therefore the direct relationship between two variables were removed at the modified model. Remarkably, the results from the modified model showed that there was an indirect effect of symptom experience on HRQoL through functional status and GHP with β = -.31 ($p < .001$). Therefore, this hypothesis was partially supported.

Hypothesis 2: Functional status had a positively direct and indirect effect on HRQoL through general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

The path coefficient of functional status had a positive direct effect on HRQoL in lung cancer persons receiving chemotherapy in the hypothesized model (β = .28, $p < .01$) and the modified model (β = .41, $p < .001$). In addition, it had an indirect effect on HRQoL through general health perceptions with β = .13. Consequently, the functional status had a total effect on HRQoL with β = .55 ($p < .001$). Thus, it could be concluded that this hypothesis was fully supported.

Hypothesis 3: Social support had a positively direct and indirect effect on HRQoL through self-care behavior, symptom experience, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

The parameter estimate from social support to HRQoL in the hypothesized model showed a nonsignificant result, hence the direct path between those variables was removed in the modified model. In modified model, however, the social support showed indirect effects on HRQoL through symptom experience (β = -.12), functional status (β = .26), and functional status (β = .05). Cumulatively, the social support had a total indirect effect on HRQoL beyond self-care behavior, symptom experience, functional status, and GHP with beta =.53 ($p < .001$). Therefore, it could be stated that this hypothesis was partially supported.

Hypothesis 4: General health perception had a positively direct on HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

The path coefficient general health perceptions had a positive direct effect on HRQoL in lung cancer person undergoing chemotherapy in both hypothesized model (β = .45,

$p < .001$) and modified model (β = .44, $p < .001$). Thus, it could be stated that the hypothesis was fully supported.

Hypothesis 5: Self-care behavior had direct and indirect effects on HRQoL through symptom experience, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

The path coefficient of self-care behavior had a positive direct effect on HRQoL in persons with lung cancer undergoing chemotherapy in the hypothesized model (β = .29, $p < .001$) and the modified model (β = .30, $p < .001$). However, in the modified model the self-care behavior showed negative effect on symptom experience (β = -.33, $p < .001$), negative effect on general health perceptions (β = -.31, $p < .001$), and showed nonsignificant effect to functional status. Cumulatively, the self-care behavior had an indirect effect on HRQoL through symptom experience, functional status, and general health perception with beta = .04 resulted in a total effect on HRQoL with β = .27 ($p < .001$). Thus, this hypothesis was partially supported.

Hypothesis 6: Symptom experience, functional status, self-care behavior, social support, and general health perception influenced HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

The path coefficient of self-care behavior, functional status, and general health perception had significant positive direct effects on HRQoL of lung cancer patients undergoing chemotherapy with β = .30, .41, and .44 ($p < .001$), respectively. The results from modified model depicted that both symptom experience and social support had nonsignificant direct effects on HRQoL, but they showed indirect effects on HRQoL with β = -.31 ($p < .001$) and β = .53 ($p < .001$). Consequently, five variables of symptom experience, functional status, GHP, self-care behavior, and social support explained for 68% of the total variance on HRQoL. Therefore, this hypothesis was partially supported.

CHAPTER 5
CONCLUSION AND DISCUSSION

This chapter comprises three sections. The first section presented a summary of the study. The second section discussed the findings in response to the study objectives and research hypotheses. Lastly, the limitations, implications, and recommendations were addressed.

Summary of the study

This study aimed to examine HRQoL and test a causal model of HRQoL in persons with lung cancer undergoing chemotherapy. The predictors included symptom experience, functional status, general health perception, self-care behavior, and social support. A convenience sampling was used to recruit participants of 232 persons with lung cancer receiving chemotherapy in three hospitals in the northern region of Vietnam. The mean age of the participants was 46.65 years (*SD* = 10.95). Most of them were male (61.2%), and at stage IV of lung cancer (82.8%). The mean diagnosis duration was 10.74 months (*SD* = 5.38). The research instruments consisted of the FPQLI, the MSAS, the MOS-SS, the FSQ, the L-PaSC, and the GHPQ. Their reliability was from 0.73 to 0.92.

The total mean score of HRQoL was 20.81 (*SD* = 1.62, range = 16.27-25.50). Symptom experience score had a mean score of 0.92 (*SD* = 0.42, range = 0.17 -2.00). Social support had a mean score of 62.89 (*SD* = 11.98, range = 32.89-90.79). Functional status had a mean score of 64.78 (*SD* = 9.54, range = 35.15-86.85). Self-care behavior had a mean score of 75.11 (*SD* = 14.51, range = 36.19-100.00). Lastly, the general health perceptions had a mean score of 50.50 (*SD* = 16.78, range = 25.00 - 95.00).

At the beginning, the hypothesized model did not fit the empirical data. The model was modified until the final reached the goodness-of-fit criteria (CMIN = 154.49, p =.691, df = 164, CMIN/df = .942, GFI = .942, AGFI = .918, CFI = 1.000, and RMSEA = .000). Then, the modified model was tested further and found that 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 functional status and HRQoL. Symptom experience and social support had no direct effect on HRQoL. In this relationship, symptom experience, functional status, general health perception, self-care behavior, and social support accounted for 68 percent of health-related quality of life.

Discussion of the research findings

Health-related quality of life

The finding showed that the mean of overall HRQoL in lung cancer undergoing chemotherapy was 20.82 (*SD* = 1.62) from a possible total score ranging from 0-30. The mean of four subscales of HRQoL including health and functioning, social and economical, psycho-spiritual, and family were 19.54 (*SD* = 2.44), 21.71 (*SD* = 1.85), 21.30 (*SD* = 1.79), and 22.23 (*SD* = 2.56), respectively. Among four subscales, the family domain was the highest, and the health and functioning subscale was the lowest score.

Quality of life in lung cancer patients undergoing chemotherapy often reports low or moderate levels. The values of overall and subscales of HRQoL from this study were lower than those of other studies that used the same measurement scale. In particular, Schreier and Williams (2004), using FQLI to measure the HRQoL of 48 breast cancer patients undergoing chemotherapy, results showed that overall HRQoL was 23.1 and subscales of health and functioning, social and economical, psycho-spiritual, and family were 21.5, 22.9, 24.3, and 25.8, respectively. The quality of life in the current study was lower than in other studies maybe because most of the patients from this study were at advanced stages of the disease (82.8 % at stage IV, Table 4-1). Another study by Lis, Gupta, and Grutsch (2008) measured the HRQoL of 230 persons with prostate cancer treated at Center Treatment Centers of America. The results showed that the overall HRQoL was 22.8 and four subscales of health and functioning, social and economical, psycho-spiritual, and family were 21.3, 22.4, 23.9, and 25.5, respectively. The median of 23.6 was used as the cutoff value to classify the HRQoL into two dichotomized groups which yielded “good” (above-median) and “poor” (below-median) HRQoL scores. Therefore, the HRQoL of these prostate cancer patients was classified at a poor level. Although it was concluded at a poor level, the mean score of HRQoL and its subscales in these prostate cancer patients were significantly higher than those of our lung cancer population. This may be because two-third of the participants were newly diagnosed with prostate cancer, and prostate cancer seems not to have as severe symptoms as advanced lung cancer. In addition, several other studies also confirmed that that the HRQoL in lung cancer patients was lower than that of other cancer sites, excepting pancreas cancer (Gu et al., 2018; Hung et al., 2018; Johnson et al., 2019; Lee & Jeong, 2018; Pierzynski et al., 2018).

Hypothesis testing

Hypothesis 1: Symptom experience had negatively direct and indirect effects on HRQoL through functional status and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

According to the findings, the path coefficient from symptom experience to HRQoL in the hypothesized model showed nonsignificantly, therefore, the direct path between two variables was removed at the modified model. Interestingly, the results from the modified model revealed that symptom experience had a negative indirect effect on HRQoL through functional status and GHP with $\beta = -.31$ ($p < .001$), implying that a patient with moderate or severe symptom distress would perceive poorer HRQoL. Therefore, it could be concluded that this hypothesis was partially supported.

The conceptual model of health-related quality of life (Ferrans et al., 2005) explained that when patients perceived symptoms of having unwell, uncomfortable, or abnormal in physical and emotional states, those symptom experiences would affect one's HRQoL. However, in this study, the model showed that 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 not to effect enough to see a significant relationship. Moreover, the MSAS used to measure symptom experience is difficult to use and interpret and includes 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 (Applebaum et al., 2014; Malangpoothong et al., 2009; Park & Larson, 2016).

Hypothesis 2: Functional status has a positively direct and indirect effect on HRQoL through general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

The research finding revealed that the path coefficient of functional status had a positive direct effect on HRQoL in lung cancer persons receiving chemotherapy ($\beta = .41$, $p < .001$). In addition, it had an indirect effect on HRQoL through general health perceptions with $\beta = .13$. Consequently, the functional status had a total effect on HRQoL with $\beta = .55$ ($p < .001$). Therefore, it could be concluded that this hypothesis was entirely supported.

The results of this study can be explained based on the conceptual model of health-related quality of life (Ferrans et al., 2005). 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 (Z. P. Huang, Cheng, Loh, & Cheng, 2020). As a result, they will independently perform their daily activities, fulfill their roles and actively maintain their health. Consequently, they may 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 is significantly positively associated with HRQoL (Narsavage et al., 2012; Wang et al., 2013; Wedding et al., 2007). Moreover, functional ability predicted GHP (Ferrans et al., 2005; Wilson & Cleary, 1995). For example, a recent study by Huang et al. (2020) on 103 advanced lung cancer (87.4% at stage IV) in Singapore showed that a higher functional status score was significantly associated with better HRQoL. Another study by Wedding et al. (2007) predicted the factors that contribute to HRQoL of 347 cancer patients, the results showed that functional status was significantly associated with HRQoL ($r = 0.483$, $p < 0.001$) and it explained 27% of variances of HRQoL at a group of patients over 60 years old and 23% of the variance of those below 60 years old. Similarly, Narsavage et al. (2012) studied 24 hospitalized patients with 45.8% stage IV lung cancer, the findings portrayed a positively significant correlation between functional status and QoL (rho = 0.728, $p < .01$). Furthermore, Wang et al. (2013) examined the relationship between functional status and HRQoL among 29 cancer patients, the results showed that patients with low functional status reported lower global HRQoL.

Hypothesis 3: Social support had a positive direct and indirect effect on HRQoL through self-care behavior, symptom experience, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

In the modified models, the path coefficient of social support had a positive direct effect on functional status ($\beta = .29$, $p < .001$), self-care behavior ($\beta = .38$, $p < .001$), and general health perception ($\beta = .38$, $p < .001$). In addition, the social support had a negative direct effect on symptom experience ($\beta = -.34$, $p < .001$). Cumulatively, the social support had a total indirect effect on HRQoL through self-care behavior, symptom experience, functional status, and GHP with beta =.53 ($p < .001$). However, there was no significant direct effect of social support on HRQoL. This hypothesis was partially supported. The above 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.

The results of this study can be described based on the health-related quality of life theory by Ferrans and Powers (2005). 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.

Hypothesis 4: General health perception had a positively direct on HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

According to the findings, a path coefficient between general health perceptions and HRQoL in lung cancer patients undergoing chemotherapy had a positive direct effect on the hypothesized model ($\beta = .45$, $p < .001$) and the modified model ($\beta = .44$, $p < .001$), meaning 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. This finding further validated the Ferrans et al., (2005) conceptual model of health-related quality of life.

The findings of this study were congruent with previous studies. For instance, Oh and Yi (2014) examined the factors that influence HRQoL of 180 older adults with osteoarthritis in Korea, the results showed general health perception was a significant predictor of HRQoL with beta = .28 ($p < .01$). In cancer populations, Lee and Kim (2018) examined the causal model of HRQoL on 210 thyroid cancer persons receiving radioactive iodine treatment, the results revealed that general health perception had a direct positive effect on HRQoL ($\beta = .35$, $p < .05$).

Hypothesis 5: Self-care behavior had direct and indirect effects on HRQoL through symptom experience, functional status, and general health perceptions among lung cancer patients undergoing chemotherapy in Vietnam.

The modified model of HRQoL in persons with lung cancer undergoing chemotherapy indicated that there was a significant positive direct effect between the path coefficient of self-care behavior and HRQoL ($\beta = .30$, $p < .001$). The self-care behavior also showed negative effects on symptom experience ($\beta = -.33$, $p < .001$) and general health perceptions ($\beta = -.31$, $p < .001$), but there was no significant effect on functional status. In addition to that, the self-care behavior revealed indirect effects on HRQoL through symptom experience, functional status, and general health perception with beta = .04. Cumulatively, the self-care behavior had a total effect on HRQoL with $\beta = .27$ ($p < .001$). Thus, this hypothesis

was partially supported. The above 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 (Ferrans et al., 2005). Literature depicted that patients with cancer and cancer survivors need to engage in self-care of side effects, symptoms, and psychological burdens of the disease and its treatment. It can be explained based on the theory of self-determination, which distinguishes between different types of motivation arising from different reasons for performing a given activity (Ryan & Deci, 2000). Therefore, patients with high self-care behavior are those who have the strong intrinsic motivation to start and maintain healthy behaviors.

This theory and research findings correspond with previous findings. Akin and Kas Guner (2018) examined the correlation between self-care behavior and HRQoL on 236 cancer patients receiving chemotherapy including lung (30.9%), gastrointestinal (25.8%), and breast cancers (25.4%). The results of the study showed that patients had little confidence in performing self-care self-efficacy during chemotherapy for the management of illness and chemotherapy-related side effects, and all the domains of HRQoL were considerably impaired. There were a positive correlations between self-care behavior and and QoL scores (r = .746, $p < 0.001$). It can be 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.

Hypothesis 6: Symptom experience, functional status, self-care behavior, social support, and general health perception influenced HRQoL among lung cancer patients undergoing chemotherapy in Vietnam.

In the modified model, the path coefficient of self-care behavior, functional status, and general health perception had significant positive direct effects on HRQoL of lung cancer patients undergoing chemotherapy with β = .30, .41, and .44 ($p < .001$), respectively. Despite showing nonsignificant direct effects on HRQoL, symptom experience and social support both showed substantial indirect effects on HRQoL with β = -.31 ($p < .001$) and β = .53 ($p < .001$). Symptom experience, functional status, GHP, self-care behavior, and social support influenced the HRQoL of the lung cancer patients undergoing chemotherapy treatment and explained 68 percent of the total variance on HRQoL. Therefore, this hypothesis was supported. These findings can be explained in that persons with lung cancer undergoing chemotherapy who had high functional status, general health perception, self-care behavior,

and social support tended to have better HRQoL. Conversely, those who had high symptom experience tended to have poorer HRQoL.

The findings of this study supported the health-related quality of life theory by Ferrans and Powers (2005). Social support is an environmental domain that positively influences the individual domain, like self-care behavior, symptom experience, functional status, general health perception, and these environmental and individual domains cumulatively affect HRQoL. Consequently, the persons with lung cancer receiving chemotherapy would have better HRQoL while receiving more social support, increasing functional status, self-care behavior, and general health perception. These findings were congruent with previous studies. For instance, Lee et al. (2018) conducted a study to examine the factors predicting the HRQoL in 80 older persons undergoing chemotherapy for lung cancer in Korea, the results showed that among four predicted factors the self-care behavior had the highest positive impact on HRQoL with beta equal .314 ($p < .001$). In other populations, Tangkawanich, Yunibhand, Thanasilp, and Magilvy (2008) examined a causal model of HRQoL in 422 persons living with HIV/AIDS in Thailand, the results portrayed that self-care strategy had a positive direct effect on HRQoL with a high coefficient estimate ($\beta = .62$, $p < .001$).

Besides, several studies have stated that GHP was an important predictor of HRQoL (Krethong et al., 2008; Lee & Kim, 2018; Oh & Yi, 2014). For example, Oh and Yi (2014) measured factor predicted HRQoL on 180 older adults with osteoarthritis in Korea, the results showed general health perception was a significant predictor of HRQoL with beta = .28 ($p < .01$). In addition, a study by Lee and Kim (2018) examined the causal model of HRQoL on 210 thyroid cancer person receiving radioactive iodine treatment, the results revealed that general health perception had a direct positive effect on HRQoL ($\beta = .35$, $p < .05$). Furthermore, some studies found that high social support and appropriate self-care behavior could increase functional status in cancer patients (Luszczynska et al., 2013; Steele et al., 2005).

Conclusion

The results of this study depicted that functional status, general health perception, self-care behavior had positively direct effects on HRQoL, while social support showed a positive indirect and symptom experience showed a negative indirect effect on HRQoL. Furthermore, functional status was the most influential factor of HRQoL, followed by social

support, general health perception, and self-care behavior. These findings partially supported Ferrans' conceptual model of HRQoL.

Implications for Nursing

This study provided nursing knowledge that clarifies the influence of significant factors of HRQoL in lung cancer persons undergoing chemotherapy. The implications for the nursing profession could be described as follow.

Nursing practice: 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 predictors of symptom experience. Consequently, the HRQoL on lung cancer patients would be enhanced.

Nursing research: Nurse professions and healthcare teams could use thefindings of this study to develop nursing research that targets the influence of significant factors of HRQoL in other chronic illness persons. Furthermore, this knowledge may also guide future intervention research design by focusing on promoting social support, self-care behavior, and managing symptom distress in lung cancer persons undergoing chemotherapy to enhance the quality of life.

Nursing education: Nurse instructors should utilize the knowledge in teaching nursing students self-care behavior, social support, symptom experience, HRQoL, and factors influencing HRQoL in lung cancer persons undergoing chemotherapy. Especially in the practicing period, nurse instructors should encourage nursing students to apply this knowledge to provide holistic care for patients.

Health/hospital policy: Healthcare providers may use the findings of this study to promote significant positive factors such as social support, self-care behavior, and functional status, as well as manage unfavorable symptoms, and promote a holistic care environment for lung cancer patients.

Limitations and recommendations for future research

First, all research instruments are based on self-report reflecting the individual perceptions of participants only. Thus, an objective instrument shouldbe paralleled in future studies for increasing a better understanding of HRQoL in these patients.

Second, in the future, a longitudinal study to examine several influential factors on HRQoL in lung cancer persons undergoing chemotherapy would increase the understanding.

Third, future research should replicate the present study by recruiting a larger

sample size and conducting it at a nationwide level.

Finally, limit generalizability to other studies with different settings because this study conducts with participants in oncology hospitals in the north and central of Vietnam.

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APPENDICES

APPENDIX A

Inviting documents of experts

Phòng Hợp tác Quốc tế
Khoa Điều dưỡng, Trường Đại học Burapha
Địa chỉ: 169 Longhard Bangsaen, Chon Buri, Thailand 20131
Điện thoại: +66 38 102 808 Fax: +66 38 393 476

Số MHESI 8106/ 0980
Ngày 25 tháng 12 năm 2019
Về việc: Xin phép đánh giá thử nghiệm bộ công cụ nghiên cứu cho Đề tài nghiên cứu sinh

Kính gửi: Giám đốc Bệnh viện Ung bướu Nghệ An

Khoa Điều dưỡng Trường Đại học Burapha, Thái Lan xin giới thiệu ông Nguyễn Đức Dương, là nghiên cứu sinh chương trình tiến sỹ điều dưỡng, chuyên ngành điều dưỡng người lớn. Hiện tại, ông Nguyễn Đức Dương đang thực hiện đề tài nghiên cứu khoa học cho luận án tiến sĩ với tiêu đề "Mô hình tiên đoán chất lượng cuộc sống của bệnh nhân ung thư phổi trong thời gian điều trị bằng hóa trị liệu" dưới sự hướng dẫn của Phó giáo sư, tiến sĩ Nujjaree Chaimongkol. Đề cương nghiên cứu của đề tài này đã được Hội đồng khoa học trường Burapha thông qua ngày 02/10/2019 và được Hội đồng Y đức chấp thuận triển khai ngày 11/12/2019.

Thay mặt nhà trường, tôi viết thư này kính đề nghị Bệnh viện Ung bướu Nghệ An cho phép ông Nguyễn Đức Dương được phép tiến hành đánh giá thử nghiệm bộ công cụ nghiên cứu về chất lượng cuộc sống của người bệnh ung thư phổi trong thời gian điều trị bằng hóa trị liệu tại quý viện, với số lượng 30 người. Người đồng ý tham gia nghiên cứu sẽ được mời trả lời vào Bộ câu hỏi tự điền đã được chuẩn bị sẵn. Chi tiết về nghiên cứu này được trình bày trong đề cương nghiên cứu đã được phê duyệt cùng với các phụ lục kèm theo.

Nếu quý viện cần cung cấp thêm các thông tin về nghiên cứu này, xin liên hệ với tác giả qua địa chỉ email: ducduong80@gmail.com

Kính mong quý Viện quan tâm giúp đỡ.

Xin trân trọng cảm ơn!

(Đã ký)

Tiến sỹ Pornchai Jullamate
Trưởng Khoa điều dưỡng, Đại học Burapha
Chon Buri, 20131, Thailand
Email: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

Phòng Hợp tác Quốc tế
Khoa Điều dưỡng, Trường Đại học Burapha
Địa chỉ: 169 Longhard Bangsaen, Chon Buri, Thailand 20131
Điện thoại: +66 38 102 808 Fax: +66 38 393 476

Số MHESI 8106/ 0980
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Kính gửi: Giám đốc Bệnh viện Ung bướu Thanh Hoa

Khoa Điều dưỡng Trường Đại học Burapha, Thái Lan xin giới thiệu ông Nguyễn Đức Dương, là nghiên cứu sinh chương trình tiến sỹ điều dưỡng, chuyên ngành điều dưỡng người lớn. Hiện tại, ông Nguyễn Đức Dương đang thực hiện đề tài nghiên cứu khoa học cho luận án tiến sĩ với tiêu đề "Mô hình tiên đoán chất lượng cuộc sống của bệnh nhân ung thư phổi trong thời gian điều trị bằng hóa trị liệu" dưới sự hướng dẫn của Phó giáo sư, tiến sĩ Nujjaree Chaimongkol. Đề cương nghiên cứu của đề tài này đã được Hội đồng khoa học trường Burapha thông qua ngày 02/10/2019 và được Hội đồng Y đức chấp thuận triển khai ngày 11/12/2019.

Thay mặt nhà trường, tôi viết thư này kính đề nghị Bệnh viện Ung bướu Nghệ An cho phép ông Nguyễn Đức Dương được phép tiến hành đánh giá thử nghiệm bộ công cụ nghiên cứu về chất lượng cuộc sống của người bệnh ung thư phổi trong thời gian điều trị bằng hóa trị liệu tại quý viện, với số lượng 30 người. Người đồng ý tham gia nghiên cứu sẽ được mời trả lời vào Bộ câu hỏi tự điền đã được chuẩn bị sẵn. Chi tiết về nghiên cứu này được trình bày trong đề cương nghiên cứu đã được phê duyệt cùng với các phụ lục kèm theo.

Nếu quý viện cần cung cấp thêm các thông tin về nghiên cứu này, xin liên hệ với tác giả qua địa chỉ email: ducduong80@gmail.com

Kính mong quý Viện quan tâm giúp đỡ.

Xin trân trọng cảm ơn!

(Đã ký)

Tiến sỹ Pornchai Jullamate
Trưởng Khoa điều dưỡng, Đại học Burapha
Chon Buri, 20131, Thailand
Emai l: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

Phòng Hợp tác Quốc tế
Khoa Điều dưỡng, Trường Đại học Burapha
Địa chỉ: 169 Longhard Bangsaen, Chon Buri, Thailand 20131
Điện thoại: +66 38 102 808 Fax: +66 38 393 476

Số MHESI 8106/ 0980
Ngày 25 tháng 12 năm 2019
Về việc: Xin phép đánh giá thử nghiệm bộ công cụ nghiên cứu cho Đề tài nghiên cứu sinh

Kính gửi: Giám đốc Bệnh viện K

Khoa Điều dưỡng Trường Đại học Burapha, Thái Lan xin giới thiệu ông Nguyễn Đức Dương, là nghiên cứu sinh chương trình tiến sỹ điều dưỡng, chuyên ngành điều dưỡng người lớn. Hiện tại, ông Nguyễn Đức Dương đang thực hiện đề tài nghiên cứu khoa học cho luận án tiến sĩ với tiêu đề "Mô hình tiên đoán chất lượng cuộc sống của bệnh nhân ung thư phổi trong thời gian điều trị bằng hóa trị liệu" dưới sự hướng dẫn của Phó giáo sư, tiến sĩ Nujjaree Chaimongkol. Đề cương nghiên cứu của đề tài này đã được Hội đồng khoa học trường Burapha thông qua ngày 02/10/2019 và được Hội đồng Y đức chấp thuận triển khai ngày 11/12/2019.

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Nếu quý viện cần cung cấp thêm các thông tin về nghiên cứu này, xin liên hệ với tác giả qua địa chỉ email: ducduong80@gmail.com

Kính mong quý Viện quan tâm giúp đỡ.

Xin trân trọng cảm ơn!

(Đã ký)

Tiến sỹ Pornchai Jullamate
Trưởng Khoa điều dưỡng, Đại học Burapha
Chon Buri, 20131, Thailand
Email: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

APPENDIX B

Permission instruments

The Permission for the use of
the Ferrans and Powers Quality of Life Index

From:	**Ferrans, Carol J** <cferrans@uic.edu>
to:	Nguyễn Đức Dương <ducduong80@gmail.com>
date:	30 Sep 2019, 21:44

Dear Mr. Duong,

Thank you for your interest in the Quality of Life Index. I am happy to grant you permission to use the QLI for your work and to translate it into Vietnamese. There is no charge for this permission.

I would think that the Cancer Version or the Pulmonary Version would be appropriate for your project; you are free to choose whichever version you wish.

I recommend that more than one person translate the QLI, so that the translations can be compared and discussed, to produce the most accurate translation. In return for my permission to translate the QLI, I ask that you send me a copy of the instrument in its translated form. I will then add the translation to the website for the QLI, so it is available for others to use. On the translated version, a statement should be added that provides the name of the people who translate the QLI. This statement should be added below the copyright statement and should include the year. You may include your address and contacting information, if you would like.

Even with translated instruments, I continue to hold the copyright of the instrument, and the copyright statement must remain on the translated instrument also.

Copies of the instrument, scoring instructions, and supporting information are found on our website at www.uic.edu/orgs/qli .

I wish you all success with your work.

Sincerely,
Carol Estwing Ferrans, PhD, RN, FAAN
Harriet H. Werley Endowed Chair in Nursing Research,
Professor, Biobehavioral Health Science,
University of Illinois at Chicago
College of Nursing,
845 S. Damen Avenue (Rm 824)
Chicago, IL 60612. Phone 312.996.8445; Email: cferrans@uic.edu

The Permission for the use of Functional Status Questionnaire

From: Alan Jette <alanmjette@gmail.com>
to: Nguyễn Đức Dương <ducduong80@gmail.com>
date: 30 Sep 2019, 04:21
subject: Re: I would like to ask permission for using the Functional Status Questionnaire
mailed-by: gmail.com

Dear Andy,

Permission granted. You can use FSQ for your research.

Alan Jette

The Permission for the use of Memorial Symptom Assessment Scale

From: Russell Portenoy <RPORTENO@mjhs.org>
to: Nguyễn Đức Dương <ducduong80@gmail.com>
date: 30 Sep 2019, 20:16
subject: RE: {External Sender} - I would like to ask for your permission to use the Memorial Symptom Assessment Scale
mailed-by: mjhs.org

Dear Mr. Duong,

From my perspective, you are free to use the MSAS in your research. I wish you the best.

R. Portenoy MD

The Permission for the use of
the MOS 36-items Short-Form Health Survey

From: John Ware <john.ware@jwrginc.com>
date: 30 Sep 2019, 16:41
subject: RE: I would like to ask for your permission to use the MOS 36-items Short-Form Health Survey

Dear Andy,

The original SF-36 survey form, information about its use and scoring, and early references are available at: http://www.jwrginc.com/public/MOT-How-to-Score-SF-36-January-1994.pdf.

For scholarly (academic) applications, use of the above has been granted royalty free.

I recall that the survey has already been translated into Vietnamese and I encourage you to Google and contact the translator(s) and use it and collaborate.

I hope this information is helpful and wish you good luck with your study.

Regards,
John

John E. Ware, Jr., PhD
Chief Science Officer and Chairman, JWRG, Incorporated, Watertown, MA
Adjunct Research Professor, Tufts University School of Medicine, Boston, MA
Visiting Professor, College of Health Solutions, Arizona State University, Phoenix, AZ

The Permission for the use of The Leuven questionnaire for Patient Self-care during Chemotherapy

From: Annemarie Coolbrandt <annemarie.coolbrandt@uzleuven.be>
to: Nguyễn Đức Dương <ducduong80@gmail.com>
date: 30 Sep 2019, 03:04
subject: RE: I would like to ask for your permission to use The Leuven questionnaire for Patient Self-care during Chemotherapy (L-PaSC)
mailed-by: uzleuven.be

Hi Andy

The instrument is freely available. You can definitely make use of it.

Good luck with your research

Annemarie

The Permission for the use of the Vietnamese version of the MOS-Social Support Survey

From: Thái Thanh Trúc <thaithanhtruc@ump.edu.vn>
to: Nguyễn Đức Dương <ducduong80@gmail.com>
date: 21 Aug 2019, 14:39
subject: RE: I would like to request for using the Vietnamese version of The MOS-SSS
mailed-by: ump.edu.vn

Dear Duong,

You are more than welcome to use the Vietnamese version of the MOS-SSS. The attached files are the paper and the questionnaire for your reference.

Good luck,

Best,

Truc

APPENDIX C

Research instruments

APPENDIX C1

A DEMOGRAPHIC QUESTIONNAIRE

Date: ……

GENERAL INFORMATION

Code Number: _____ **Hospital:**_____

Age:_____ **Duration from diagnosis** _____ months

Gender: Male ☐ Female ☐

Stage: Stage I ☐ Stage II ☐ Stage III ☐ Stage IV ☐

Metastasis sites:_____

Treatment

Number of cycle completed:_____

Tumor removal surgery before: Yes ☐ No ☐

Additional notes on treatments:_____

Education

Primary school ☐

Secondary school ☐

High school ☐

Vocational school ☐

University and higher ☐

Religion

Non-religion ☐

Buddhism ☐

Christian ☐

Others ☐

Employment status: Current worker ☐ Non-current worker ☐

Height: _____cm **Usual weight: _____** kg **Current weight:** _____ kg

APPENDIX C2

FERRANS AND POWERS QUALITY OF LIFE INDEX©

CANCER VERSION-III

PART 1. For each of the following, please choose the answer that best describes how satisfied you are with that area of your life. Please mark your answer by circling the number. There are no right or wrong answers.

HOW *SATISFIED* ARE YOU WITH:	Very Dissatisfied	Moderately Dissatisfied	Slightly Dissatisfied	Slightly Satisfied	Moderately Satisfied	Very Satisfied
1. Your health?	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
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……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
33. Yourself in general?	1	2	3	4	5	6

(Please Go To Next Page)

PART 2. For each of the following, please choose the answer that best describes how important that area of your life is to you. Please mark your answer by circling the number. There are no right or wrong answers.

HOW *IMPORTANT* TO YOU IS:	**Very Unimportant**	**Moderately Unimportant**	**Slightly Unimportant**	**Slightly Important**	**Moderately Important**	**Very Important**
1. Your health?	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
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……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
……	1	2	3	4	5	6
33. Yourself in general?	1	2	3	4	5	6

APPENDIX C3

THE MEMORIAL SYMPTOM ASSESSMENT SCALE

Section 1

Introductions: We have listed 24 symptoms below. Read each one carefully. If you have had the symptom during this past week, let us know how **often** you had it. How **severe** it was usually and how much it **distressed or bothered** you by make an X the appropriate number. If you did not have the symptom, make an X in the box marked "**did not have"**

DURING THE PAS WEEK Did you have any of the following symptoms	DID NOT HAVE	**IF YES** How often did you have it?				**IF YES** How severe was it usually?				**IF YES** How much did it distress or bother you?				
		Rarely	Occasionally	Frequently	Almost constantly	Slight	Moderate	Severe	Very severe	Not at all	A little bit	Somewhat	Quite a bit	Very much
		1	2	3	4	1	2	3	4	1	2	3	4	5
Difficulty concentrating														
…………………………..														
…………………………..														
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…………………………..														
…………………………..														
…………………………..														
Feeling irritable														

Memorial Symptom Assessment Scale										
Section 2										
Introductions: We have listed 8 symptoms below. Read each one carefully. If you have had the symptom during this past week, let us know how **often** you had it. How **severe** it was usually and how much it **distressed or bothered** you by make an X the appropriate number. If you did not have the symptom, make an X in the box marked **"did not have**"										
		IF YES How severe was it usually?				**IF YES** How much did it distress or bother you?				
DURING THE PAS WEEK Did you have any of the following symptoms	DID NOT HAVE	Slight	Moderate	Severe	Very severe	Not at all	A little bit	Somewhat	Quite a bit	Very much
		1	2	3	4	1	2	3	4	5
Mouth sores										
……..										
……..										
……..										
……..										
……..										
……..										
Changes in skin										
If you have any other symptoms during the past week, please list below and indicate how much the symptom has distress or bother you										
Other:										
Other:										
Other:										

APPENDIX C4

THE FUNCTIONAL STATUS QUESTIONNAIRE

For each of the following, please mark your answer by circling the number. There are no right or wrong answers.

During the past month have you had difficulty of:	*Usually did with no difficulty*	*Some difficulty*	*Much difficulty*	*Usually did not do because of health*	*Usually did not do for other reasons*
1. Taking care of yourself, that is, eating, dressing or bathing?	4	3	2	1	0
……..	4	3	2	1	0
……..	4	3	2	1	0
……..	4	3	2	1	0
9. Doing vigorous activities such as running, lifting heavy objects or participating in strenuous sports?	4	3	2	1	0

During the past month:	*All of the time*	*Most of the time*	*A good bit of the time*	*Some of the time*	*A little of the time*	*None of the time*
10. Have you been a very nervous person?	1	2	3	4	5	6
……..	1	2	3	4	5	6
……..	1	2	3	4	5	6
……..	1	2	3	4	5	6
14. Did you feel so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6

*Scores are reversed.

During the past month you have:	*All of the time*	*Most of the time*	*Some of the time*	*None of the time*
15. Done as much work as others in similar jobs?*	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4
……..	1	2	3	4
	1	2	3	4
28. Gotten along well with other people?*	1	2	3	4

*Scores are reversed.

APPENDIX C5

THE MEDICAL OUTCOME STUDY SOCIAL SUPPORT SURVEY

1. About how many close friends and close relatives do you have? *(people you feel at ease with and can talk to about what is on your mind)?*

No	Item	None of the time	A little of the time	Some of the time	Most of the time	All of the time
2	Someone to help you if you were confined to bed	1	2	3	4	5
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
	……..					
20	Someone to love and make you feel wanted	1	2	3	4	5

APPENDIX C6

THE LEUVEN QUESTIONNAIRE FOR PATIENT SELF-CARE DURING CHEMOTHERAPY

Instructions:
This questionnaire assesses your self-care during your treatment. Please do not rely on help from sources or other people to complete it. It is important that the questionnaire provides a true picture of your self-care during your treatment

QUESTION 1. Do you take the following self-care measures?	**Never**	**Mostly not**	**Sometimes**	**Mostly**	**Always**	**Not applicable**
a) Drinking at least 1,5 liter a day	☐	☐	☐	☐	☐	
……..	☐	☐	☐	☐	☐	
……..	☐	☐	☐	☐	☐	☐
……..	☐	☐	☐	☐	☐	
……..	☐	☐	☐	☐	☐	
……..	☐	☐	☐	☐	☐	
g) Taking measures to prevent you or your partner becoming pregnant	☐	☐	☐	☐	☐	☐

QUESTION 2. Please indicate what you do in the following situations.
Tick one box only.

a) You suddenly feel short of breath after only a little physical activity. What do you do?

b) ……..

c) ……..

d) ……..

e) ……..

QUESTION 3. Does your treatment (also) include chemotherapy in the form of tablets to be taken by mouth?

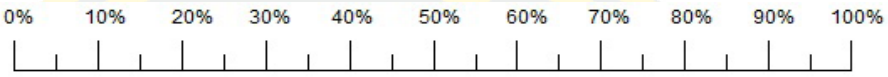
☐ No → *Please go to question 4.*

☐ I don't know → *Please go to question 4.*

☐ Yes → *Please answer the question below:*

<u>If it does, what percentage of these doses have you taken correctly and at the right moment of the day?</u>

Please indicate with an x below.



QUESTION 4. ……..

QUESTION 5. ……..

QUESTION 6. ……..

QUESTION 7. ……..

QUESTION 8. ……..

QUESTION 9……..

QUESTION 10. ……..

QUESTION 11. ……..

QUESTION 12: ……..

APPENDIX C7

THE GENERAL HEALTH PERCEPTION SUBSCALE OF THE SHORT-FORM HEALTH SURVEY

Choose on option for each questionnaire item.

1. In general, would you say your health is:
   - ☐ 1-Excellent
   - ☐ 2-Very good
   - ☐ 3-Good
   - ☐ 4-Fair
   - ☐ 5-Poor

How TRUE or FALSE is each of the following statements for you

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
2. I seem to get sick a little easier than other people	○	○	○	○	○
……..	○	○	○	○	○
……..	○	○	○	○	○
5. My health is excellent	○	○	○	○	○

Thank you very much for take part in this study!

APPENDIX D

The institutional review board and permission letter for data collection

THE INSTITUTIONAL REVIEW BOARD (IRB) FOR GRADUATE STUDIES
FACULTY OF NURSING, BURAPHA UNIVERSITY, THAILAND

Thesis Title A Causal model pf Health-related Quality of Life among Lung Cancer Patients undergoing Chemotherapy in Vietnam

Name Mr. Nguyen Duc Duong
ID: 59810023
Doctor of Philosophy in Nursing Science (International Program)

Number of the IRB approval 02 – 11 – 2562

The Institutional Review Board (IRB) for graduate studies of Faculty of Nursing, Burapha University reviewed your submitted proposal. The contingencies have been addressed and the IRB **approves** the protocol. Work on this project may begin. This approval is for a period of one year from the date of this letter and will require continuation approval if the research project extends beyond **December 11st, 2020.**

If you make any changes to the protocol during the period of this approval, you must submit a revised protocol to the IRB committee for approval before implementing the changes.

Date of Approval December 11st, 2019

Chintana Wacharasin, R.N., Ph.D.

Chairperson of the IRB
Faculty of Nursing, Burapha University, THAILAND

Tel.: 66-038-102823
Fax: 66-038-393476
E-Mail: naruemit@buu.ac.th

Phòng Hợp tác Quốc tế
Khoa Điều dưỡng, Trường Đại học Burapha
Địa chỉ: 169 Longhard Bangsaen, Chon Buri, Thailand 20131
Điện thoại: +66 38 102 808 Fax: +66 38 393 476

BẢN DỊCH

Số MHESI 8106/ 0980
Ngày 25 tháng 12 năm 2019
Về việc: Xin phép đánh giá thử nghiệm bộ công cụ nghiên cứu cho Đề tài nghiên cứu sinh

Kính gửi: Giám đốc Bệnh viện Ung bướu Nghệ An

Khoa Điều dưỡng Trường Đại học Burapha, Thái Lan xin giới thiệu ông Nguyễn Đức Dương, là nghiên cứu sinh chương trình tiến sỹ điều dưỡng, chuyên ngành điều dưỡng người lớn. Hiện tại, ông Nguyễn Đức Dương đang thực hiện đề tài nghiên cứu khoa học cho luận án tiến sĩ với tiêu đề "Mô hình tiên đoán chất lượng cuộc sống của bệnh nhân ung thư phổi trong thời gian điều trị bằng hóa trị liệu" dưới sự hướng dẫn của Phó giáo sư, tiến sĩ Nujjaree Chaimongkol. Đề cương nghiên cứu của đề tài này đã được Hội đồng khoa học trường Burapha thông qua ngày 02/10/2019 và được Hội đồng Y đức chấp thuận triển khai ngày 11/12/2019.

Thay mặt nhà trường, tôi viết thư này kính đề nghị Bệnh viện Ung bướu Nghệ An cho phép ông Nguyễn Đức Dương được phép tiến hành đánh giá thử nghiệm bộ công cụ nghiên cứu về chất lượng cuộc sống của người bệnh ung thư phổi trong thời gian điều trị bằng hóa trị liệu tại quý viện, với số lượng 30 người. Người đồng ý tham gia nghiên cứu sẽ được mời trả lời vào Bộ câu hỏi tự điền đã được chuẩn bị sẵn. Chi tiết về nghiên cứu này được trình bày trong đề cương nghiên cứu đã được phê duyệt cùng với các phụ lục kèm theo.

Nếu quý viện cần cung cấp thêm các thông tin về nghiên cứu này, xin liên hệ với tác giả qua địa chỉ email: ducduong80@gmail.com

Kính mong quý Viện quan tâm giúp đỡ.

Xin trân trọng cảm ơn!

(Đã ký)

Tiến sỹ Pornchai Jullamate
Trưởng Khoa điều dưỡng, Đại học Burapha
Chon Buri, 20131, Thailand
Email: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

Office of International Strategic Affairs
Faculty of Nursing, Burapha University
169 Longhad Bangsaen Rd., Chon Buri, THAILAND 20131
Tel : +66 38 102 808 Fax: +66 38 393 476

MHESI 8106/0982

December 25th, 2019

Director
Vietnam National Cancer Hospital
No. 30 Cau Buou Rd.,
Tan Trieu, Tranh Tri,
Hanoi, Vietnam

Subject: Asking permission for data collection

Dear Director of Vietnam National Cancer Hospital,

Mr. Nguyen Duc Duong is a Ph.D. candidate of Faculty of Nursing, Burapha University, Thailand. Presently, he is in the process of conducting his dissertation entitled "*A causal model of health-related quality of life among lung cancer patients undergoing chemotherapy in Vietnam*" under supervision of Associate Professor Dr. Nujjaree Chaimongkol.

In this regard, I am writing to ask your permission to allow Mr. Nguyen Duc Duong to collect data from 70 patients at in-patients department of Vietnam National Cancer Hospital, Vietnam during the period of February 10th – March 30th, 2020. Participants will be asked to complete questionnaires on their own.

Should you need further information of this research project, please contact Mr. Nguyen Duc Duong at ducduong80@gmail.com.

Your kind cooperation for this matter will be highly appreciated.

Yours sincerely,

Pornchai Jullamate

Pornchai Jullamate, RN, PhD,
Assistant Professor and Dean,
Faculty of Nursing, Burapha University
Chon Buri, 20131, THAILAND
E-mail: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

Office of International Strategic Affairs
Faculty of Nursing, Burapha University
169 Longhad Bangsaen Rd., Chon Buri, THAILAND 20131
Tel : +66 38 102 808 Fax: +66 38 393 476

MHESI 8106/ 0984

December 25th, 2019

Director
Thanh Hoa Oncology Hospital
No. 958 Quang Trung Rd.,
Dong Ve, Thanh Hoa city,
Vietnam

Subject: Asking permission for data collection

Dear Director of Thanh Hoa Oncology Hospital,

Mr. Nguyen Duc Duong is a Ph.D. candidate of Faculty of Nursing, Burapha University, Thailand. Presently, he is in the process of conducting his dissertation entitled "*A causal model of health-related quality of life among lung cancer patients undergoing chemotherapy in Vietnam*" under supervision of Associate Professor Dr. Nujjaree Chaimongkol.

In this regard, I am writing to ask your permission to allow Mr. Nguyen Duc Duong to collect data from 70 patients at in-patients department of Thanh Hoa Oncology Hospital, Vietnam during the period of February 10th – March 30th, 2020. Participants will be asked to complete questionnaires on their own.

Should you need further information of this research project, please contact Mr. Nguyen Duc Duong at ducduong80@gmail.com.

Your kind cooperation for this matter will be highly appreciated.

Yours sincerely,

Pornchai Jullamate

Pornchai Jullamate, RN, PhD,
Assistant Professor and Dean,
Faculty of Nursing, Burapha University
Chon Buri, 20131, THAILAND
E-mail: pornchai@buu.ac.th
Tel: 66 38 102 809
Fax: 66 38 393 476

APPENDIX E

Participant’s information sheet and consent form

THÔNG TIN TÓM TẮT VỀ NGHIÊN CỨU

Xin trân trọng cảm ơn ông (bà) đã tham gia nghiên cứu này!

Tôi là Nguyễn Đức Dương, hiện là Nghiên cứu sinh chương trình tiến sĩ điều dưỡng tại Trường Đại học Burapha, Thái Lan. Tôi đang tiến hành nghiên cứu với tiêu đề ***"Mô hình tiên đoán Chất lượng cuộc sống của Bệnh nhân ung thư phổi trong thời gian hóa trị tại Việt Nam"***. Với mục tiêu: 1) đánh giá chất lượng sống của bệnh nhân ung thư phổi trong thời gian điều trị hóa chất và 2) xây dựng mô hình tiên đoán chất lượng cuộc sống của bệnh nhân ung thư phổi trong thời gian điều trị hóa chất tại Việt Nam.

Đây là một nghiên cứu điều tra mô tả cắt ngang. Khi đồng ý tham gia nghiên cứu này, ông (bà) sẽ được yêu cầu trả lời Bộ câu hỏi nghiên cứu. Chúng tôi sẽ giải thích cụ thể về cách trả lời từng câu hỏi, thời gian để hoàn thành bộ câu hỏi này khoảng 30-45 phút. Chúng tôi hy vọng rằng kết quả của nghiên cứu này sẽ đóng góp vào nền tảng kiến thức về chăm sóc người bệnh và cải thiện chất lượng chăm sóc cho người bệnh ung thư đang trải qua thời gian hóa trị.

Sự tham gia vào nghiên cứu này là tự nguyện. Ông (bà) có thể từ chối trả lời bất kỳ câu hỏi cụ thể, giữ im lặng hoặc rút lui khỏi nghiên cứu này bất cứ lúc nào mà không nhất thiết phải thông báo cho nhà nghiên cứu, việc dừng hay rút lui không ảnh hưởng đến quá trình điều trị. Mọi thông tin nhận được từ sự tham gia của ông (bà) sẽ được giữ bí mật, bao gồm cả danh tính. Chúng tôi sẽ mã hóa cho bộ câu hỏi mà ông (bà) đã trả lời để đảm bảo bảo mật thông tin. Kết quả của nghiên cứu này sẽ được trình bày dưới dạng số liệu tổng hợp, không đề cập đến thông tin cụ thể bất kỳ cá nhân nào tham gia. Tất cả dữ liệu sẽ bị hủy hoàn toàn sau khi công bố kết quả. Chúng tôi sẵn sàng trao đổi chi tiết về kết quả của nghiên cứu này cho ông (bà) sau khi hoàn thành nghiên cứu, nếu ông bà yêu cầu.

Nghiên cứu này được thực hiện bởi ông Nguyễn Đức Dương dưới sự hướng dẫn và giám sát của Phó giáo sư Tiến sĩ Nujjaree Chaimongkol, khoa Điều dưỡng Trường ĐH Burapha, Thailand. Nếu ông (bà) có bất kỳ câu hỏi nào, xin vui lòng liên hệ với tôi theo số điện thoại: 094-822-1369 hoặc qpua e-mail: ducduong80@gmail, và/hoặc Giáo sư của tôi tại địa chỉ e-mail: nujjaree@buu.ac.th. Chúng tôi đánh giá rất cao sự hợp tác của quý vị!

Xin trân trọng cảm ơn!

Nguyễn Đức Dương

INFORMED CONSENT

Research title: “A causal model of health-related quality of life among lung cancer patients undergoing chemotherapy in Vietnam.”

IRB approval number : 02-11-2562……..

Date of collection data ……Month ……..Years……

Before I give signature in below, I already be informed and explained from Mr. Nguyen Duc Duong-the principal researcher, about purposes, method, procedures, and benefits of this study, and I understood all of that explanation. I agree to be as a participant of this study.

I am Nguyen Duc Duong as a researcher had explained all of explanation about purposes, method, procedures, and benefits of this study to the participant with honestly; then, all of data/information of the participants will only be used for purpose of this research study.

_____ _____

Name and Signature of the Participant Date

_____ _____

Name and Signature of witness Nguyen Duc Duong

APPENDIX F

Evaluation of assumptions

Table Appendix F-1 Standardized scores of continuous variables for testing univariate outlier (N = 232)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
1	0.089	0.912	-1.489	0.022	1.170	0.566
2	0.931	0.924	-1.116	1.120	1.671	0.864
3	0.203	-0.106	1.622	1.120	-1.114	1.162
4	-0.488	-0.300	-0.608	0.132	-1.641	0.566
5	-0.252	0.147	-0.709	0.791	-1.243	0.566
6	2.767	1.289	-1.227	0.571	1.696	2.651
7	1.575	1.343	-1.484	1.559	1.018	2.353
8	-2.220	-2.525	2.010	0.461	-2.632	-1.222
9	0.912	1.075	-1.219	1.230	1.179	1.162
10	-2.911	-3.108	1.586	-2.064	0.760	-0.030
11	-0.905	-0.273	-0.493	-2.174	-0.489	0.864
12	1.594	1.716	-1.531	2.108	-0.726	2.055
13	2.786	1.801	-1.541	0.791	0.174	2.055
14	2.777	1.343	-1.389	0.132	-1.492	2.651
15	0.155	1.355	-1.158	1.669	1.080	1.758
16	0.354	0.395	-0.829	1.010	1.131	1.460
17	1.963	1.910	-1.364	1.449	0.977	1.758
18	0.363	1.106	-1.423	0.791	1.602	1.460
19	0.685	-0.731	-1.276	1.010	1.432	1.758
20	-0.734	-0.036	0.967	-1.954	-0.271	-1.222
21	-2.750	0.104	-0.039	0.242	0.992	-1.222
22	-0.299	0.757	-1.396	0.791	0.543	1.460
23	-0.167	0.757	-1.119	0.351	1.696	1.460
24	0.184	0.757	-1.619	0.242	-0.135	1.460
25	-0.280	-0.090	-1.460	-0.198	-2.373	1.460
26	-0.062	1.021	-1.143	-0.088	-0.355	1.460
27	0.231	0.574	-1.482	0.681	0.956	-1.222

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
28	-0.110	0.228	-0.648	0.351	-1.792	1.162
29	0.666	0.174	-1.138	-1.734	-1.510	1.758
30	-0.848	0.493	-0.898	-0.637	-1.722	0.566
31	-0.034	0.757	-1.349	0.571	-0.503	1.460
32	0.610	-0.273	-0.071	-0.198	0.040	1.162
33	2.266	1.980	-1.757	1.120	0.472	2.353
34	-1.577	-1.313	1.735	0.791	-1.375	0.566
35	1.793	1.285	-0.944	0.461	0.057	2.055
36	-1.567	-0.424	1.794	0.132	0.481	0.864
37	1.537	1.801	-1.202	1.449	0.259	1.758
38	-1.236	-0.548	1.809	-1.405	-1.394	1.162
39	0.079	0.368	0.241	-0.198	0.385	1.162
40	2.256	1.075	-0.834	1.339	-0.259	1.758
41	-0.725	-0.451	1.281	-0.198	-1.792	1.162
42	-0.328	0.228	1.497	-0.088	-1.905	0.864
43	-0.924	-0.424	1.652	-0.527	-1.921	0.864
44	1.717	1.619	0.145	1.888	-2.298	1.758
45	1.584	-0.645	0.994	1.669	0.657	1.460
46	1.206	1.230	-0.338	1.559	0.607	0.864
47	-0.214	0.174	0.778	-1.186	-0.665	0.268
48	1.944	0.217	-1.011	0.571	-0.256	1.460
49	0.505	0.007	0.302	-1.625	-0.541	0.864
50	-1.397	-0.160	0.025	-1.844	-0.602	-0.030
51	0.468	-0.774	-0.174	-1.295	-0.665	0.864
52	-1.331	-0.855	2.000	1.559	-1.340	0.566
53	-1.785	-1.244	2.265	-1.076	-1.114	-0.328
54	-0.848	-0.548	0.214	-0.856	-0.832	0.268
55	0.212	-0.451	0.987	-1.186	-0.016	0.566

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
56	0.070	-0.548	0.302	-0.746	0.204	0.566
57	1.830	1.840	-0.596	1.669	0.769	1.460
58	-0.034	0.019	0.111	0.242	0.390	0.268
59	0.184	-0.645	0.550	0.242	0.528	0.268
60	-0.214	1.145	-0.878	0.461	0.375	0.268
61	-1.293	0.201	0.611	-0.637	-0.665	0.268
62	1.045	1.576	-1.440	1.559	1.485	0.864
63	0.184	-0.591	0.150	-0.966	-2.197	0.268
64	0.089	-0.548	0.206	-0.088	-0.436	0.268
65	-1.246	-0.995	1.485	-0.966	-1.873	0.268
66	0.922	1.479	-1.418	0.242	0.780	0.268
67	0.221	-0.451	-0.189	-2.064	-0.320	0.268
68	0.751	-0.758	0.229	0.461	0.833	0.566
69	0.165	1.145	-1.273	-1.295	0.097	0.268
70	-0.157	-0.774	1.237	-0.856	0.481	0.268
71	0.931	-0.548	1.029	-0.527	0.824	0.268
72	0.496	1.425	-0.728	0.351	0.453	0.268
73	1.338	1.910	-1.479	1.669	1.583	0.566
74	-0.034	0.244	-0.913	-0.527	0.011	-0.030
75	-1.747	-1.550	1.686	-0.088	-2.044	-0.030
76	-1.227	-1.313	0.700	-0.198	-1.792	-0.030
77	-0.564	0.924	0.162	-0.307	-0.193	-0.030
78	0.647	2.190	-0.613	0.242	1.502	0.566
79	0.051	-0.451	-0.024	0.900	-0.285	-0.030
80	1.121	0.131	-0.198	0.351	0.252	0.268
81	-0.214	0.213	-0.235	0.022	0.730	-0.030
82	0.600	1.343	0.528	0.900	0.692	0.268
83	-1.227	-1.313	0.960	-0.417	-2.600	-0.030

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
84	-0.583	0.007	-0.186	-1.295	0.170	-0.030
85	-1.643	-1.313	0.675	-0.088	-0.602	-0.030
86	-1.236	-0.812	0.741	-1.186	-0.436	-0.030
87	0.941	1.102	-1.305	0.791	-0.226	-0.030
88	0.524	-0.451	-0.805	1.339	0.252	-0.030
89	-0.148	0.465	-0.873	0.791	0.243	-0.030
90	0.449	-0.451	-0.086	0.681	1.397	-0.030
91	1.291	-0.548	-0.343	-0.527	0.627	0.268
92	0.486	-1.119	0.030	-1.186	-1.281	-0.030
93	-0.242	-0.063	-0.540	-1.186	-0.468	-0.030
94	-0.659	0.632	-0.368	0.132	-0.010	-0.328
95	-0.129	-0.078	-1.268	1.230	-0.096	-0.030
96	0.184	0.535	0.268	0.900	-0.274	0.566
97	-0.914	-0.451	0.351	-1.186	-0.788	-0.030
98	-0.138	-0.187	1.932	-1.295	-1.001	-0.030
99	-0.905	-0.424	-0.284	-0.856	-0.177	-0.626
100	0.240	-1.605	2.246	1.010	-1.501	-0.030
101	-0.858	0.353	0.074	-1.295	1.050	-0.626
102	-1.955	-2.094	0.457	-0.198	-1.873	-0.030
103	-0.110	-1.313	1.686	-0.198	-1.792	-0.030
104	0.666	-1.216	2.555	-0.746	-0.516	-0.030
105	0.553	-0.591	1.195	-0.856	0.856	-0.030
106	-1.700	-3.038	2.368	0.571	-3.116	-0.030
107	0.127	-0.451	0.525	-1.076	1.615	-0.924
108	-1.264	-1.523	0.884	-1.076	-0.549	-0.328
109	-0.678	-0.451	0.916	0.351	0.695	-0.328
110	0.553	1.079	-1.666	1.449	1.583	-0.328
111	-1.274	-0.467	0.047	-0.417	-1.986	-0.328

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
112	0.401	-0.273	-0.152	-1.405	0.509	-0.328
113	0.023	-0.424	-0.449	-0.856	0.001	-0.328
114	-0.261	-0.548	1.448	-0.746	-0.037	-0.328
115	0.354	-0.424	0.474	-0.527	0.743	-0.328
116	0.231	-0.451	0.125	-0.637	0.711	-0.328
117	-0.848	-1.244	0.987	-0.637	-0.549	-0.328
118	0.269	-0.451	0.008	-1.405	0.445	-0.328
119	-0.839	-0.451	-0.434	-1.295	-0.436	-0.328
120	0.098	-0.036	0.646	-1.515	0.252	-0.328
121	0.534	-1.313	1.161	-1.625	0.139	-0.328
122	-1.482	-1.341	0.781	0.242	-0.318	-0.328
123	-1.255	-1.174	1.041	-2.393	-0.828	-0.030
124	-0.498	-0.187	0.086	-0.307	-0.069	-0.328
125	-0.630	-0.451	0.344	0.242	-0.811	-0.030
126	0.098	-1.216	1.276	-0.198	-1.038	-0.328
127	-1.851	-0.952	0.219	0.132	-0.092	-0.626
128	0.534	2.007	-1.506	2.108	0.634	-0.328
129	-1.700	-1.216	0.788	-0.307	0.481	-0.626
130	-1.653	-1.313	0.150	-0.198	-1.099	-0.328
131	0.770	-1.119	1.649	0.242	-0.565	0.566
132	0.269	0.632	-0.540	0.571	0.833	-0.030
133	-0.195	-1.508	1.662	-0.198	-0.811	-0.626
134	0.988	1.242	-1.474	1.339	1.357	-0.626
135	-1.501	-0.731	0.602	-0.088	-1.551	-0.626
136	0.411	-0.634	-0.292	-0.198	1.037	-0.626
137	-0.100	-0.451	-0.591	-0.527	0.707	-0.626
138	0.449	-0.591	0.746	0.571	-0.048	-0.626
139	1.291	1.840	-1.028	1.339	0.824	0.268

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
140	-0.839	-0.424	-0.181	-0.198	0.365	-0.626
141	1.054	-0.548	-0.576	-0.746	0.164	0.268
142	-0.905	0.493	-0.522	-0.637	-0.030	-0.626
143	-1.539	-1.508	1.171	0.132	0.031	-0.626
144	0.449	-1.119	0.741	-1.186	-1.441	-0.626
145	0.430	-0.117	-0.034	-0.527	-0.203	-0.626
145	0.184	-1.216	-0.211	-0.637	0.040	-0.626
147	0.430	0.535	-0.591	-1.295	-0.087	-0.626
148	1.016	-0.451	-1.438	1.559	0.769	-0.626
148	-0.526	1.075	-0.645	-1.076	-0.468	0.864
150	0.231	-0.078	-0.917	1.559	0.170	-0.626
151	1.906	2.120	-1.357	2.218	1.018	2.055
152	0.638	-0.257	-0.321	-0.417	0.065	-0.924
153	-0.025	1.091	-0.967	0.461	1.376	-0.924
154	0.278	0.520	-0.672	-1.405	-0.942	-0.924
155	-0.801	0.493	-0.279	0.022	-0.949	-0.924
156	0.789	1.118	-1.219	0.681	-1.055	0.268
157	-0.346	-0.078	0.989	0.571	0.874	-0.328
158	-0.214	0.353	-0.108	-0.417	1.018	-0.924
159	-0.782	-0.645	1.865	-0.856	-0.576	-0.924
160	-0.100	-1.286	0.813	0.242	-0.177	-0.924
161	1.376	0.632	0.525	0.022	0.340	2.055
162	-0.223	-0.160	0.216	-1.515	-1.379	-0.924
163	0.799	1.366	-0.787	1.120	0.735	0.566
164	-0.309	0.632	0.197	0.351	0.745	-0.924
165	0.950	-0.273	1.703	0.022	0.114	-0.924
166	-1.047	-1.605	1.941	-0.307	0.134	-0.924
167	-0.744	-0.704	1.355	-0.856	0.830	-0.924

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
168	-0.640	0.438	-0.086	0.242	0.924	-0.626
169	-0.195	0.562	0.140	1.230	0.815	-0.924
170	1.499	0.465	1.078	0.132	0.641	1.758
171	-0.157	-1.508	0.643	-1.076	-0.709	-0.924
172	0.326	1.118	-0.454	-0.527	0.603	0.566
173	0.089	-0.160	0.030	0.022	-0.395	-0.924
174	-1.567	-0.855	0.072	-0.637	-2.170	-0.328
175	-0.668	-0.300	1.367	-0.307	0.107	-0.924
176	0.079	-0.078	0.398	-0.527	0.882	-0.924
177	-0.574	-0.424	-0.262	-0.527	-0.056	-1.222
178	-0.876	0.854	0.467	-0.856	0.093	-0.924
179	-1.293	-1.605	0.916	0.351	-0.715	-1.222
180	-0.659	-0.548	-0.375	-0.307	0.360	-1.222
181	-0.734	-0.257	0.965	-0.637	0.924	-1.222
182	-0.507	-0.160	0.344	-2.503	-1.469	-1.222
183	0.789	-0.451	-0.147	-2.283	0.093	-1.222
184	-0.460	-0.785	0.658	-0.307	0.178	-1.222
185	0.061	1.118	-0.881	0.132	1.485	-1.222
186	-0.507	-0.273	-0.795	0.571	0.735	-1.222
187	1.310	1.075	-0.380	1.339	-0.453	-0.328
188	0.969	0.978	-1.072	2.218	0.924	-0.626
189	0.079	-0.257	1.208	-0.417	-0.441	-1.222
190	1.149	1.230	-0.827	1.559	0.372	0.268
191	0.695	-1.508	0.364	-0.527	-0.629	-1.222
192	-0.867	-0.424	-0.574	-1.295	0.830	-0.626
193	-0.006	-0.952	0.425	-0.527	-0.474	-0.924
194	0.619	-0.634	1.171	-0.746	0.868	-1.222
195	0.146	-1.022	0.636	-1.734	-1.243	-1.222

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
196	-0.441	-0.257	0.084	0.132	0.408	-0.924
197	0.619	0.034	-0.390	-0.856	-0.387	-0.924
198	1.386	1.646	-0.910	2.327	1.489	1.758
199	0.316	-1.077	-0.014	-0.637	-1.133	-0.030
200	-0.290	-0.063	-1.278	-1.076	0.874	-1.222
201	0.240	-1.022	-0.078	-0.966	-0.037	-0.328
202	0.212	1.576	-1.119	1.230	1.018	-1.519
203	-1.141	-0.925	0.224	-1.515	-0.226	-1.222
204	-0.394	-0.370	-0.922	0.900	1.583	-1.519
205	-0.763	-0.424	-0.508	0.242	0.695	-1.519
206	-1.198	-0.451	-0.113	-0.307	0.426	-1.222
207	1.291	1.052	-1.062	1.888	1.470	0.864
208	-1.690	-1.077	2.354	-0.198	-1.908	-1.222
209	-0.716	0.438	-0.490	0.900	-0.022	-1.519
210	0.278	0.034	1.483	0.681	0.743	-0.924
211	-0.867	0.562	-0.549	1.120	1.330	-1.222
212	-0.328	0.632	0.844	0.900	0.010	-1.519
213	-0.678	0.314	0.211	-0.198	-0.355	-1.222
214	-0.062	-0.187	-0.576	-0.417	-1.441	-0.924
215	1.083	-0.117	1.149	-0.527	0.068	1.162
216	1.405	1.770	-1.352	1.779	1.080	2.055
217	-0.914	-0.354	0.837	-0.198	-0.013	-0.626
218	2.843	1.328	-1.254	1.339	1.131	2.651
219	-1.492	-1.896	1.608	0.571	-1.243	-1.222
220	-0.801	0.034	0.616	-0.527	0.075	-1.519
221	1.026	0.632	0.440	-0.417	1.037	0.566
222	-0.848	-0.397	0.383	-0.417	0.360	-0.924
223	0.023	-0.937	-0.454	0.132	0.199	-0.924

Table Appendix F-1 (Continued)

ID	ZQLI	ZFSQ	ZSYEX	ZSSP	ZSCB	ZGHP
224	0.628	2.314	-1.168	1.559	1.080	0.566
225	-0.290	-0.548	-0.537	0.461	0.146	-1.519
226	1.187	-0.564	-1.457	0.791	1.131	-0.030
227	0.098	1.646	0.543	1.669	0.689	-1.222
228	-0.346	-0.840	0.238	-0.198	0.291	-1.222
229	-0.110	0.827	-0.576	0.242	0.924	-0.924
230	-0.223	0.493	-0.807	0.571	0.475	-0.924
231	1.092	1.883	-0.964	1.010	0.663	1.162
232	-0.384	0.632	-0.034	0.132	0.905	-1.519
233	0.221	0.562	-0.510	-0.088	0.924	-0.030
234	-0.233	0.632	-0.358	-0.198	0.010	-0.924
235	1.793	0.896	-0.937	1.339	0.943	2.651
236	-0.356	0.547	0.013	0.022	1.450	-0.924
237	0.468	1.091	-1.040	0.461	1.508	0.268
238	-0.157	0.423	-0.216	-0.088	0.657	0.268
239	-0.309	0.228	-0.414	0.351	-0.452	-0.328

Table Appendix F-2 Test of multivariate outliers by using Mahalanobis distance (N = 232)

ID	MAH	p_MAH	ID	MAH	p_MAH
1	20.976	0.227	31	13.146	0.726
2	19.872	0.281	32	17.198	0.441
3	22.229	0.176	33	13.730	0.686
4	32.376	0.014	34	17.680	0.409
5	22.031	0.184	35	11.410	0.835
6	23.397	0.137	36	16.949	0.458
7	18.195	0.377	37	12.829	0.748
8	31.236	0.019	38	12.764	0.752
9	21.968	0.186	39	8.775	0.947
10	44.047	0.000	40	20.724	0.239
11	30.970	0.020	41	22.194	0.177
12	23.433	0.136	42	24.664	0.103
13	13.724	0.687	43	23.360	0.138
14	16.723	0.473	44	26.053	0.074
15	14.742	0.614	45	25.596	0.082
16	13.470	0.704	46	19.094	0.323
17	16.898	0.461	47	22.912	0.152
18	12.874	0.745	48	46.215	0.000
19	32.629	0.013	49	28.269	0.042
20	39.477	0.002	50	12.744	0.753
21	8.826	0.946	51	14.189	0.654
22	9.281	0.931	52	26.252	0.070
23	10.146	0.897	53	27.338	0.053
24	9.140	0.936	54	10.500	0.881
25	16.447	0.492	55	14.973	0.597
26	7.807	0.971	56	10.411	0.886
27	14.336	0.643	57	19.561	0.297

Table Appendix F-2 (Continued)

ID	MAH	p_MAH	ID	MAH	p_MAH
28	9.603	0.919	58	16.334	0.500
29	25.355	0.087	59	6.924	0.985
30	23.033	0.148	60	8.572	0.953
61	13.069	0.732	92	10.306	0.890
62	11.686	0.819	93	14.571	0.626
63	18.322	0.369	94	12.166	0.790
64	5.116	0.997	95	21.569	0.202
65	23.125	0.145	96	9.753	0.914
66	10.854	0.864	97	8.838	0.945
67	20.784	0.236	98	19.411	0.305
68	14.142	0.657	99	14.032	0.665
69	19.240	0.315	100	17.851	0.398
70	13.397	0.709	101	20.759	0.237
71	17.448	0.425	102	17.786	0.402
72	17.727	0.406	103	13.224	0.721
73	7.559	0.975	104	18.749	0.343
74	20.540	0.248	105	16.981	0.456
75	24.755	0.100	106	36.692	0.004
76	12.767	0.752	107	20.302	0.259
77	8.562	0.953	108	13.006	0.736
78	41.460	0.001	109	10.345	0.889
79	10.123	0.898	110	21.109	0.222
80	11.934	0.804	111	24.214	0.114
81	16.988	0.455	112	20.627	0.243
82	18.405	0.364	113	9.615	0.919
83	23.444	0.135	114	12.106	0.794
84	10.251	0.893	115	14.348	0.642
85	7.965	0.967	116	11.548	0.827

Table Appendix F-2 (Continued)

ID	MAH	p_MAH	ID	MAH	p_MAH
86	10.338	0.889	117	8.037	0.966
87	12.202	0.788	118	22.343	0.172
88	17.670	0.410	119	19.041	0.326
89	5.636	0.995	120	17.683	0.409
90	15.288	0.575	121	16.760	0.471
91	11.440	0.833	122	9.364	0.928
123	24.986	0.095	154	21.624	0.200
124	15.230	0.579	155	18.009	0.388
125	13.039	0.734	156	37.134	0.003
126	9.628	0.919	157	13.381	0.710
127	17.842	0.399	158	17.521	0.420
128	22.917	0.152	159	15.712	0.544
129	14.695	0.617	160	12.193	0.788
130	10.480	0.882	161	20.283	0.260
131	13.940	0.671	162	24.429	0.108
132	9.068	0.938	163	10.773	0.868
133	16.297	0.503	164	11.937	0.804
134	16.737	0.472	165	20.711	0.240
135	18.928	0.333	166	13.691	0.689
136	14.792	0.611	167	23.160	0.144
137	10.581	0.878	168	25.407	0.086
138	15.912	0.530	169	7.912	0.968
139	13.592	0.696	170	26.028	0.074
140	8.171	0.963	171	15.180	0.583
141	12.553	0.766	172	38.446	0.002
142	17.136	0.445	173	7.003	0.984
143	16.878	0.463	174	18.746	0.343
144	15.078	0.590	175	14.461	0.634

Table Appendix F-2 (Continued)

ID	MAH	p_MAH	ID	MAH	p_MAH
145	9.630	0.918	176	16.792	0.469
145	10.082	0.900	177	8.641	0.951
147	19.373	0.308	178	22.436	0.169
148	23.161	0.144	179	17.412	0.427
148	17.772	0.403	180	11.628	0.822
150	23.933	0.121	181	9.435	0.926
151	18.927	0.333	182	29.776	0.028
152	16.249	0.506	183	15.180	0.583
153	9.467	0.925	184	13.705	0.688
185	15.337	0.571	213	21.576	0.202
186	11.131	0.850	214	13.095	0.730
187	23.010	0.149	215	16.708	0.474
188	23.779	0.126	216	17.591	0.415
189	10.594	0.877	217	9.958	0.905
190	24.353	0.110	218	15.591	0.553
191	13.318	0.715	219	28.075	0.044
192	18.510	0.357	220	14.557	0.627
193	8.962	0.941	221	21.653	0.199
194	11.653	0.821	222	5.756	0.995
195	10.917	0.861	223	12.918	0.742
196	9.160	0.935	224	24.362	0.110
197	16.568	0.484	225	11.221	0.845
198	15.243	0.578	226	31.802	0.016
199	13.466	0.705	227	25.988	0.075
200	20.845	0.233	228	16.485	0.490
201	7.109	0.982	229	8.957	0.942
202	17.576	0.416	230	11.916	0.805
203	11.609	0.823	231	12.916	0.742

Table Appendix F-2 (Continued)

ID	MAH	p_MAH	ID	MAH	p_MAH
204	20.179	0.265	232	11.964	0.802
205	7.480	0.976	233	11.982	0.801
206	9.942	0.906	234	8.751	0.948
207	29.869	0.027	235	25.788	0.078
208	18.024	0.387	236	11.307	0.840
209	18.403	0.364	237	19.666	0.292
210	24.624	0.104	238	15.176	0.583
211	7.606	0.974	239	20.476	0.251
212	12.711	0.755			

Table Appendix F-3 Test of normality of the study variables (*N* = 232)

Variables	Skewness	Critical value	Kurtosis	Critical value
Health and functioning Sub	.067	.416	-.196	-.609
Scio/Economical Sub	-.201	-1.250	-.012	-.038
Psycho/spiritual Sub	-.089	-.555	.156	.484
Family Sub	-.635	-3.948	1.949	6.060
Physical symptoms	.106	.656	-.635	-1.975
Psychological symptoms	.668	4.155	.002	.007
Other symptoms	.663	4.123	-.378	-1.176
Physical function	.417	2.593	-.358	-1.114
Psychological function	.535	3.327	.786	2.445
Social function	-.110	-.684	-.336	-1.045
Role function	.533	3.316	-.053	-.164
Tangible support	-.676	-4.206	1.084	3.370
Emotional support	-.223	-1.389	-.145	-.451
Positive support	-.431	-2.677	.211	.655
Affectionate support	-.057	-.353	-.207	-.643
Self-care behavior	-.534	-3.323	-.336	-1.044
GP1	.658	4.091	-.497	-1.546
GP2	.472	2.935	-.289	-.898
GP3	.540	3.358	-.433	-1.345
GP4	.070	.436	-.806	-2.505
GP5	.663	4.124	-.584	-1.815
Multivariate			7.283	1.777

Table Appendix F-4 Correlation matrix of study variables (*N* = 232)

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

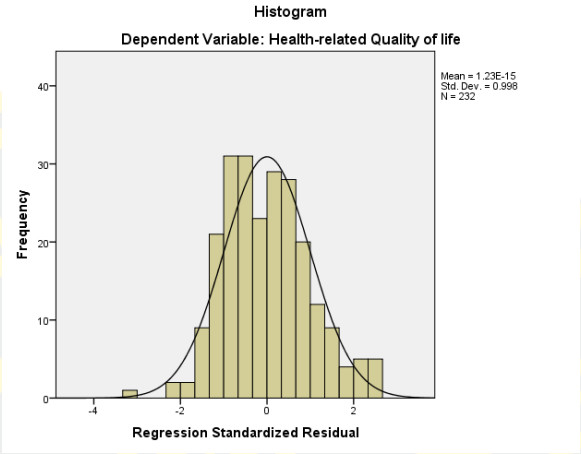
**. Correlation is significant at the 0.01 level (2-tailed)

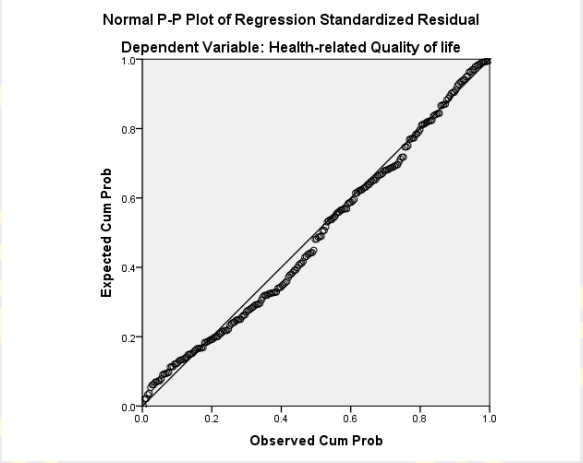
Table Appendix F-5 Test for multicollinearity of the predictor variables (*N* = 232)

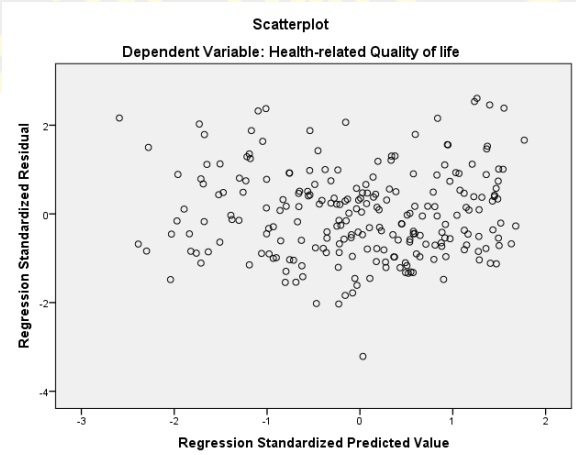
Variables	Collinearity Statistics	
	Tolerance	**VIF**
Physical symptoms	.652	1.533
Psychological symptoms	.334	2.994
Other symptoms	.541	1.850
Physical function	.326	3.066
Psychological function	.305	3.276
Social function	.257	3.894
Role function	.499	2.005
Tangible support	.620	1.612
Emotional support	.558	1.791
Positive support	.863	1.159
Affectionate support	.585	1.709
Selfcare behavior	.616	1.623
GHP indicator 1	.424	2.359
GHP indicator 2	.552	1.811
GHP indicator 3	.486	2.059
GHP indicator 4	.670	1.492
GHP indicator 5	.566	1.765

Appendix F-6: Linearity and Homoscedasticity

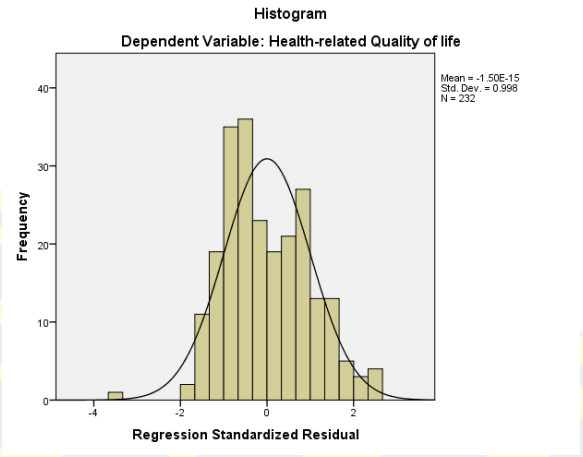
Health-related Quality of life vs Symptom experience

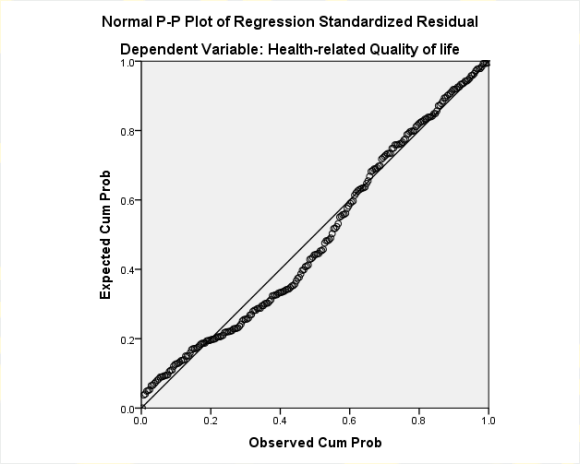


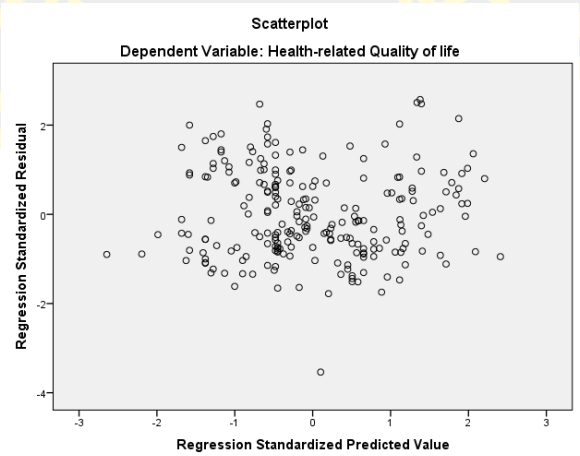




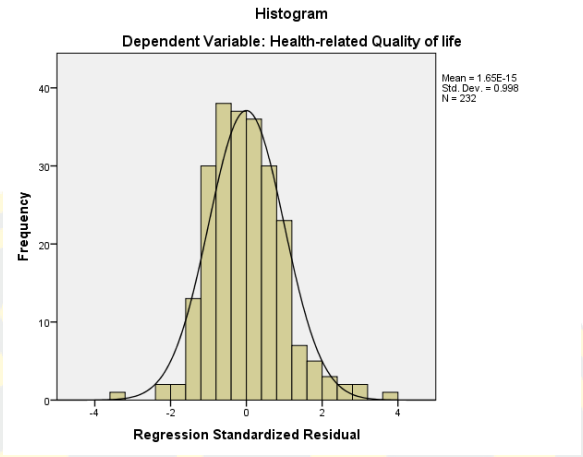
Health-related Quality of life vs Functional status

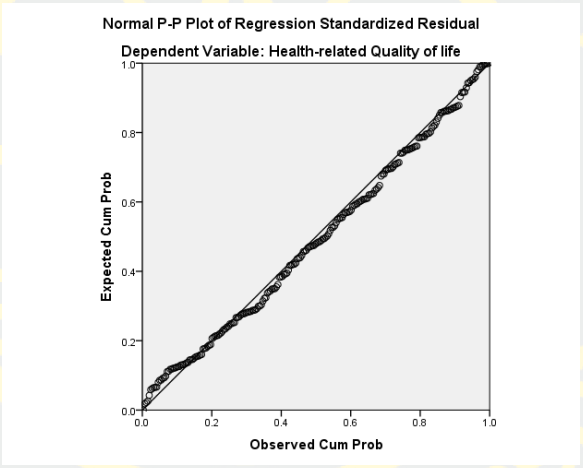


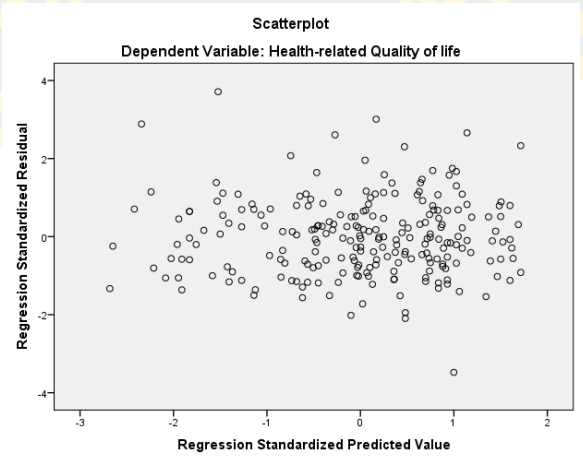




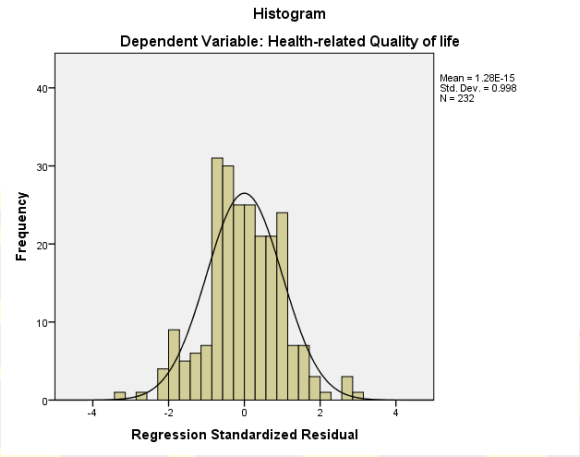
Health-related Quality of life vs Selfcare behavior

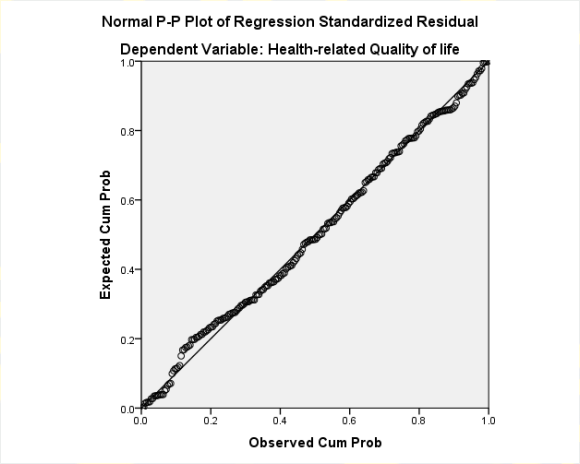


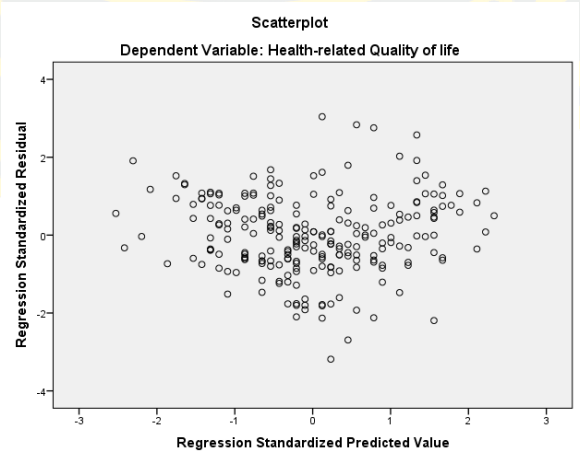




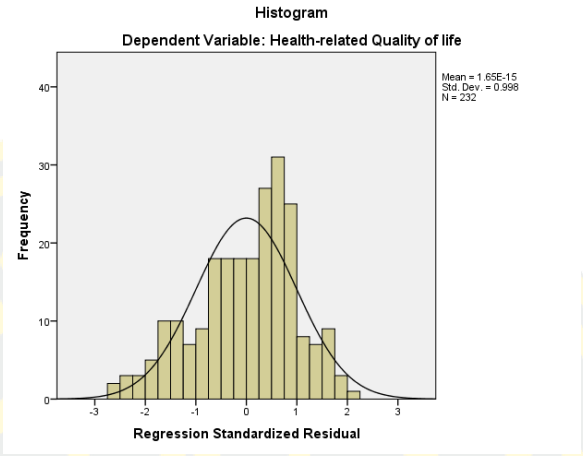
Health-related Quality of life vs Social support

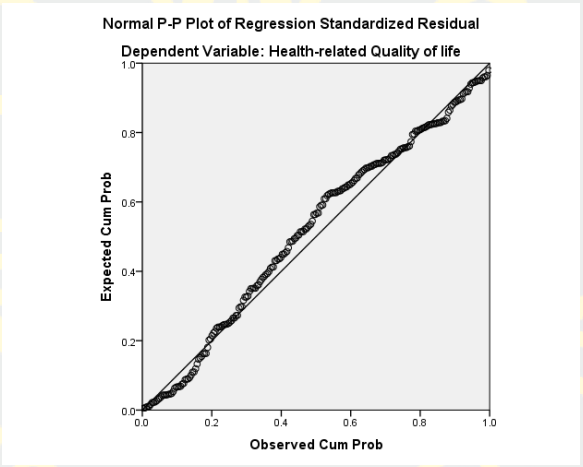


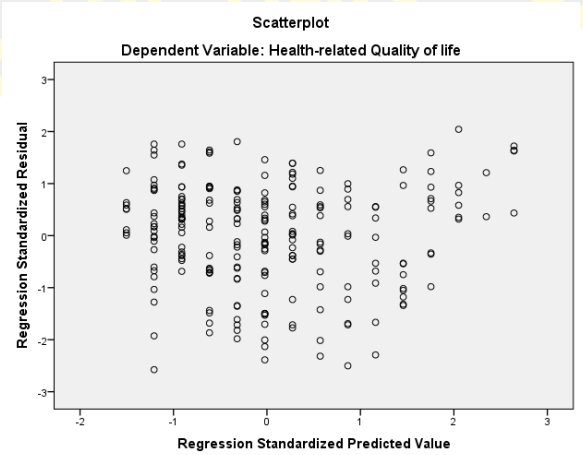




Health-related Quality of life vs General health perception







BIOGRAPHY

NAME	Nguyen Duc Duong
DATE OF BIRTH	November 15, 1980
PLACE OF BIRTH	Nghe An Province, Vietnam
PRESENT ADDRESS	36 Dang Nhu Mai Rd., Vinh city, Nghe An Province, Vietnam
POSITION HELD	2003-2005 Registered nurse Clinical instructor at Faculty of Nursing, Nghe An Medical College, Vietnam 2005-2011 Lecturer and Staff Training bureau of Nghe An Medical College, Vietnam 2012-Present Lecturer Head of International Relations Office of Vinh Medical University, Vietnam
EDUCATION	Education 1998-2002 Bachelor of Nursing Science, Hanoi Medical University, Vietnam 2009-2011Master of Nursing Science (Nursing Administration) Faculty of Nursing, Chiang Mai University, Thailand 2016-2021 Doctor of Philosophy in Nursing Science (International Program) Faculty of Nursing, Burapha University, Chon Buri, Thailand