Asian Nursing Research 13 (2019) 277–285

Contents lists available at ScienceDirect

Asian Nursing Research

journal homepage: www.asian-nursingresearch.com

Research Article

Does Holding Back Cancer-Related Concern Affect Couples' Marital Relationship and Quality of Life of Patients with Lung Cancer? An Actor–Partner Interdependence Mediation Modeling Approach

Soonyoung Oh,[1] Eunjung Ryu[2,*]

[1] Department of Nursing, Kyungbok University, Pochun, Republic of Korea
[2] Department of Nursing, Chung-Ang University, Seoul, Republic of Korea

ARTICLE INFO

Article history:
Received 19 December 2018
Received in revised form
1 October 2019
Accepted 1 October 2019

Keywords:
communication
lung neoplasms
marriage
quality of life

ABSTRACT

Purpose: This study was designed to examine both actor and partner effects of perceived marital relationship on quality of life, as well as the mediating effect of holding back cancer-related concerns.
Methods: This was a cross-sectional study in an outpatient setting. Participants were 150 couples consisting of patients with lung cancer and their spouses. Perceived marital relationship, holding back cancer-related concerns, and quality of life were measured with self-report scales. Actor and partner effects on quality of life were analyzed using the actor–partner interdependence mediation model by using structural equation modeling.
Results: A couple's quality of life had a significant direct actor effect on the perceived marital relationship. However, the partner effect and the indirect effect of holding back cancer-related concerns on quality of life was not significant.
Conclusion: When patients with lung cancer and their spouses perceived their marital relationship positively, they assessed their quality of life positively. They were also found to be less hesitant when talking about cancer-related concerns. However, holding back on talking concerns did not have a significant impact on the quality of life (of either oneself or the spouse). Therefore, nurses should first check how they perceive their marital relationship before encouraging communication between patients with lung cancer and their spouses. Nurses can assess these risk factors and intervene if needed, along their cancer trajectory.

Introduction

Lung cancer is the leading cause of cancer death globally and in Korea [1,2]. In Korea, 24,267 new lung cancer cases were reported, and the crude lung cancer rate was 47.6 per 100,000 persons in 2016 [3]. Estimates suggest there will be 28,107 new lung cancer cases and a crude rate of 54.3 per 100,000 persons in 2019 [3]. In the USA, an estimated 228,150 new lung cancer cases will be diagnosed, and 142,670 people are projected to die from the disease in 2019, representing 23.5% of all cancer-related deaths [4]. The incidence and mortality rate of lung cancer is gradually declining, but still classified as a major cancer.

Immediately after diagnosis, patients with lung cancer generally undergo active treatment and experience physical symptoms such as fatigue, pain, sleep disturbance, and shortness of breath because of lung cancer treatment or complications. Because multiple symptoms appear simultaneously, patients bear heavier physical and psychological burdens. Meanwhile, patients with lung cancer and their spouses imagine negative scenarios including death and experience psychological symptoms such as depression and anger [5]. Moreover, while struggling with cancer, spouses become agonized about living with a patient with cancer as much as patients suffer from physical pain [6]; hence, spouses' quality of life (QOL) decreases as they experience burnout during ongoing cancer treatment [7].

While both patients with lung cancer and their spouses carry symptom burden, social constraints (e.g., cancer-related stigma and

Soonyoung Oh: https://orcid.org/0000-0003-3440-5164; Eunjung Ryu: https://orcid.org/0000-0002-2232-6082
* Correspondence to: Eunjung Ryu, RN, PhD, Department of Nursing, Chung-Ang University, 84 Heuksu-ro, Dongjak-gu, Seoul, 06974, Republic of Korea.
E-mail address: go2ryu@cau.ac.kr

https://doi.org/10.1016/j.anr.2019.10.001
p1976-1317 e2093-7482/

limited social activities) and conflicts (e.g., marital and familial conflicts) negatively affect marital relationships [8,9]. Thus, for patients with cancer and their spouses, effective communication is essential when they must cope with and overcome cancer [10]. Especially, spouses of patients with lung cancer experience more intense psychological distress than spouses of patients with other cancers; thus, it is challenging for intensely distressed spouses to support patients appropriately [11]. In this regard, communication incorporating self-disclosure helps establish marital roles and leads married couples to cope successfully with cancer [12].

Conversely, marital intimacy can decrease when patients with cancer and spouses show poor communication by hesitating to talk about cancer-related problems (that is, holding back cancer-related concerns) or avoiding conversation while the other is trying to communicate [13]. Therefore, marital satisfaction is determined by the couple's levels of openness of communication and of self-disclosure regarding cancer [10]. In addition, open communication correlates with each person's later QOL [14].

Recently, research studies on patients with cancer and caregivers have been carried out in various ways. Among them, studies on communication and QOL with patients with cancer and their spouses are increasing. Studies on communication patterns between them, intimacy, and marital relationships have mainly targeted patients with breast cancer and prostate cancer; however, research on patients with lung cancer and their spouses has also shown that relationship-enhancing communication about mental status and sexual issues related to cancer positively influences their QOL [15,16] and that people with higher levels of marital intimacy and marital satisfaction have a better QOL [17,18].

However, these results of the studies on the QOL of couples were not consistent. Therefore, this study aims to investigate the effect of perceived marital relationship and the disease-related communication level on the QOL of patients with lung cancer and their spouses. A married couple is a unit that cannot be completely divided, and one person's outcome not only is based on his or her own traits but also is influenced by the partner [19]. Therefore, the present study aims to test the mediating effect of holding back cancer-related concerns and to verify the actor–partner effect on the connection between perceived marital relationship and the QOL of couples with patients with lung cancer by applying the actor–partner interdependence model, which is useful for analyzing dyadic data.

Conceptual framework

The present study constructed a conceptual frame based on the actor–partner interdependence mediation model (APIMeM) developed by Ledermann et al [20] to consider the interdependence of targeted couples. Unlike identifying the elements of a person's QOL, each person's QOL will have a given effect through long-term interaction. In the APIMeM, X represents an independent variable, Y represents a dependent variable, M represents an intermediate variable, and X1 and X2 represent a member of a dyadic relationship. The model has six actor effects (i.e., the effect of a pair of independent variables on their own intermediate variables and their dependent variables) and six partner effects (the effect of a pair of independent variables on each other's independent variables, intermediate variables, and dependent variables) [20]. Studies based on the APIMeM were conducted mainly among friends, couples, parents, and children in interaction relationships, as well as on how independent variables affect outcomes through intermediate variables, and also saw the effects of marital intimacy, marital satisfaction, or self-efficiency in the context of distress [9,14,15].

Holding back cancer-related concerns

Studies on the communication and QOL relationship between patients with cancer and caregivers are not uncommon. In general, it has been reported that the QOL is low when communication is not smooth or when communication is negative [14,16]. In particular, cancer-related communication studies are linked to emotional anxiety about uncertain outcomes associated with treatment and the burden of care [7]. A study of patients with advanced lung cancer and their families found that 65% of the patients experienced communication difficulties [21], and patients with prostate cancer and spouses also had difficulty communicating about cancer-related problems [14].

Perceived marital relationship and QOL

If someone in the couple is diagnosed with cancer, the spouse would be accompanied by a treatment and recovery process with the patient. If the marital relationship is negative, the QOL of the married couple would be low [17]. Although the marital relationship at the initial stage of diagnosis is evaluated well, as the caregiving persists, the QOL is generally underestimated by emotional and negative influences [17,22]. The QOL depends on the difference in the marital relationship that the patient and the spouse perceive, but the study on the partner effect on QOL is rare.

The hypothetical model that embodies the APIMeM in this study, targeting patients with lung cancer and their spouses, saw the perceived marriage relationship as the independent variable and the QOL as the dependent variable. The total score of an independent variable is the sum of 10 questions about marital satisfaction, 10 questions about spousal communication, and 10 questions about resolving spousal conflict. Dependent variables are the sum of patients with lung cancer and their spouse's QOL: physical well-being, social well-being, emotional well-being, and functional well-being. The hypothetical model for examining the direct actor effect and the partner effect on married couple's QOL is shown in (Figure 1A). Hypotheses are as follows:

Hypothesis 1. *Perceived marital relationships of patients with cancer and their spouses will affect the QOL for each dyad member.*

Hypothesis 2. *Holding back concerns related to cancer will mediate the relationship between perceived marital relationships and the quality of life for each dyad member.*

Methods

Study design

This study was designed as a cross-sectional survey of couples living with lung cancer.

Participants

Participants were patients and their spouses (1) who could communicate, (2) who were currently undergoing treatment for lung cancer (surgery, chemotherapy, or radiation therapy) or attending a follow-up appointment, (3) who had an Eastern Cooperative Oncology Group Evaluation (ECOG) performance score of 2 or less that checks the daily functional level of patients with cancer, i.e., those who are ambulatory and capable of self-care but unable to carry out any work activities, and (4) who

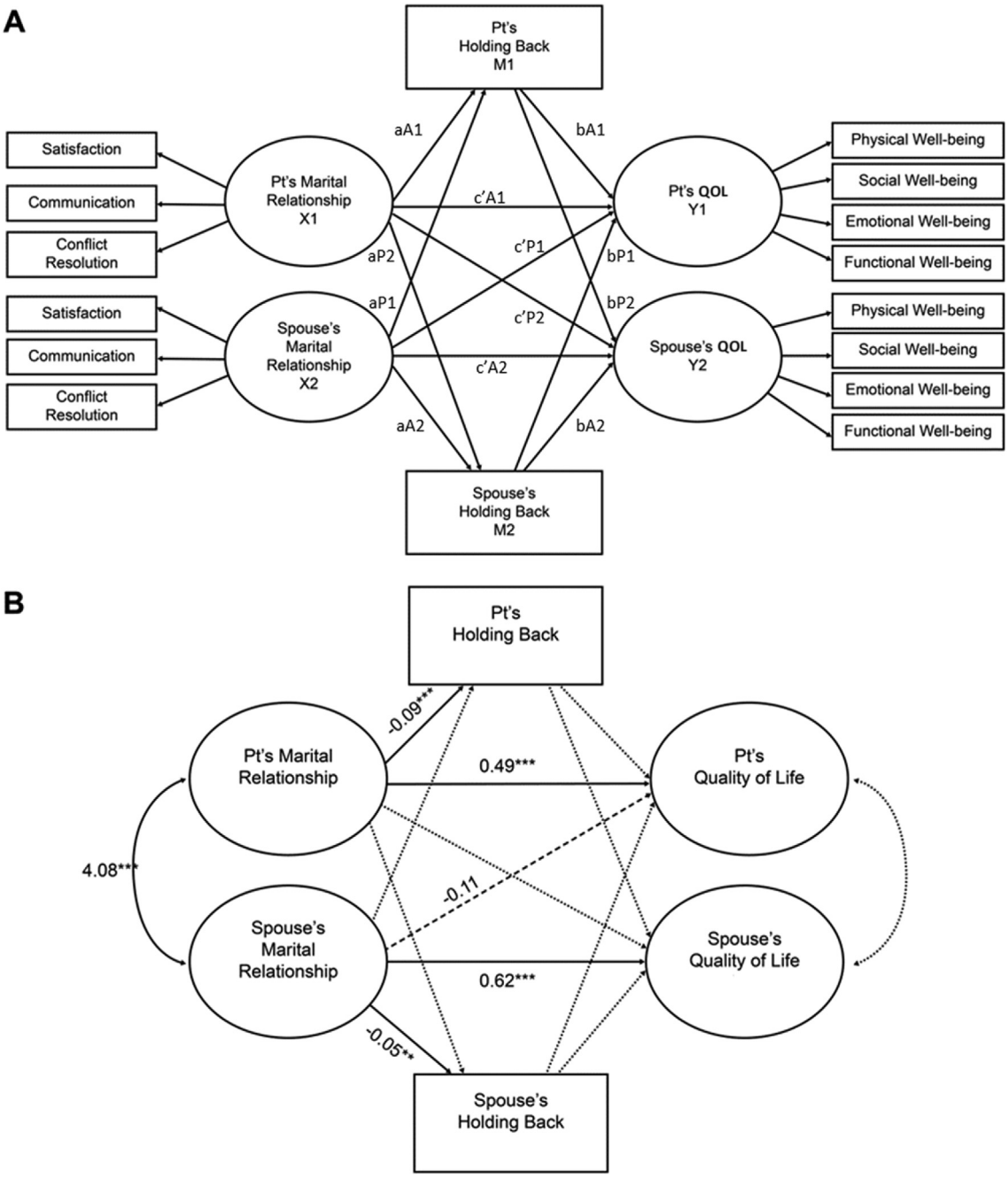

Figure 1. (A) A hypothetical model of quality of life and (B) APIMeM of predictors after testing.
Note. APIMeM = actor–partner interdependence mediation model; QOL = quality of life.

understood the study purpose and agreed to participate by giving written consent. When the participants had difficulty completing the questionnaire by themselves because of old age or poor eyesight, the researcher read the questions aloud and wrote down their responses. During the survey, participants were asked to sit away from their spouses and not to check or be influenced by each other's answers. The questionnaires were distributed to 153 couples (306 copies) of patients with lung cancer and their spouses; after excluding 3 couples (6 copies) who stopped the survey midway for treatment and refused to finish the remaining items, responses of 150 couples (300 copies) were used. The sample size was calculated with the effect size of .3, significance level of .05, and power of .8, which is appropriate in the explanation of the analysis of dyadic data [23].

Ethical considerations

The researcher obtained approval from the Research Ethics Committee of the National Cancer Center in Korea (Approval no. NCC2016-0066). After explaining the purpose and intention of the survey to patients and their spouses awaiting treatment at the outpatient lung cancer center, the researcher proceeded with their consent.

Measurements

Holding back cancer-related concerns

Holding back cancer-related concerns was measured using the Disclosure Concerns Scale [24]. The researcher used a question on

Table 1 *Demographic and Clinical Characteristics of Participants (N = 150 couples).*

Demographic characteristics	Patient		Spouse	
	n (%)	Median (IQR)	n (%)	Median (IQR)
Gender				
Men	107 (71.3)		43 (28.7)	
Women	43 (28.7)		107 (71.3)	
Age (yrs)		61.00 (12.0)		60.00 (10.0)
≤50	13 (8.7)		17 (11.3)	
51–60	57 (38.0)		63 (42.0)	
61–70	53 (35.3)		53 (35.4)	
≥71	27 (18.0)		17 (11.3)	
Marriage duration (yrs)		35.50 (12.0)		
Occupation				
Yes	52 (34.7)		68 (45.3)	
No	98 (65.3)		82 (54.7)	
Smoking				
Yes	95 (63.3)		15 (10.0)	
No	55 (36.7)		135 (90.0)	

Clinical Characteristics	Total	Men	Women
	n (%)	n (%)	n (%)
Cancer type			
Non–small cell lung cancer			
Adenocarcinoma	104 (69.3)	63 (58.9)	41 (95.3)
Squamous cell	27 (18.0)	25 (23.4)	2 (4.7)
Large cell	1 (0.7)	1 (0.9)	
Pleomorphic carcinoma	1 (0.7)	1 (0.9)	
Small cell lung cancer	17 (11.3)	17 (15.9)	
Time since diagnosis (months)	11 (25.0)		
Treatment			
Surgery	49 (33.1)	33 (22.0)	16 (10.7)
Chemotherapy	122 (82.4)	89 (59.3)	33 (22.0)
Radiation therapy	25 (16.9)	20 (13.3)	5 (3.3)
Cancer stage			
Non–small cell lung caner			
Stage I	29 (19.3)	19 (12.7)	10 (6.7)
Stage II	14 (9.3)	11 (7.3)	3 (2.0)
Stage III	35 (23.3)	29 (19.3)	6 (4.0)
Stage IV	55 (36.7)	31 (20.7)	24 (16.0)
Small cell lung caner			
Limited	2 (1.3)	2 (1.3)	
Extensive	15 (10.0)	15 (10.0)	

Note. M = median; IQR = interquartile range; yrs = years.

holding back that the developer had chosen for this study's topic [24]; in other words, the question “How much do you hold back cancer-related concerns when communicating with your spouse?” was used to measure the level of holding back. “Not at all” was given 0 point; “I am very hesitant” was given 3 points. The higher scores indicate higher hesitation (or holding back) during cancer-related conversations. Although this instrument was developed to measure cancer-related concern in patients with cancer, the instrument has been extensively validated and compared with instruments used to measure cognitive function in the normal population [25,26]. The holding back cancer-related concerns showed a Cronbach α of .77 in this study.

Perceived marital relationship

This study used the 30-item ENRICH marital inventory to measure perceived marital relationship [27]. The scale consists of three dimensions, including marital satisfaction, communication, and conflict resolution. Each item was recorded on a five-point Likert scale ranging from 1 (not at all) to 5 (very much so), and the summed overall score was ranged from 30 to 150, with a higher score indicating more positive perceptions of the marital relationship. A previous study reported satisfactory psychometric characteristics for this scale [28]. The internal consistency reliability of the ENRICH marital inventory for each domain (marital satisfaction, communication, and conflict resolution) showed a Cronbach α of .84 for the patient and .87 for the spouse in this study.

Quality of life

QOL for patients with lung cancer was assessed using the Functional Assessment of Cancer Therapy – General (FACT-G), and spouse's QOL was assessed using the Functional Assessment of Cancer Therapy – General Population (FACT-GP) in the following four domains: physical, social/familial, emotional, and functional domains [29]. The FACT-G (version 4) consists of 27 questions, with five domains assessing physical well-being (7 items), social/family well-being (7 items), emotional well-being (6 items), and functional well-being (7 items). The FACT-GP for spouses does not include questions about illness and comprises 21 questions. Spouses were asked to rate their QOL during the most recent week on a five-point scale, from 0 points (“not at all”) to 4 points (“very much so”). The total FACT-G score ranges from 0 to 108, whereas the total FACT-GP score ranges from 0 to 84. Higher scores indicate better QOL. While this instrument was developed to measure QOL in patients with cancer, the instrument has been extensively validated and compared with the normal population. In the present study, the FACT-G showed a Cronbach α of .87 and the FACT-GP for spouses showed a Cronbach α of. 86, demonstrating good internal consistency reliability.

Data collection

This study was conducted in the National Cancer Center in Korea between February and March 2017. This study was approved by the hospital's institutional review board. The purpose of the study was explained to couples, and they were assured that all questionnaires were anonymous and participation in this study was voluntary. All participants were clearly informed that returning the completed questionnaire was considered informed consent for participation in this study.

Data analyses

Statistical analyses were performed using SPSS 23.0 (IBM Corp., Armonk, NY, USA) and R version 3.31 (R Project for Statistical Computing, Vienna, Austria). Descriptive statistics [frequency distributions, percentages, means, medians, interquartile ranges (IQRs), and standard deviations] were used to characterize demographic and clinical characteristics, levels of holding back cancer-related concern, perceived marital relationship, and QOL for each patient and spouse. To test normality, skewness and kurtosis were examined. Paired *t* tests were used to compare holding back cancer-related concerns, perceived martial relationship, and QOL between couples. To test the hypothetical model that applied the APIMeM, each variable's model was tested first, and the actor and partner effects of each patient and spouse were examined while applying equality constraints on significant effects to verify discrepancies between patients and their spouses.

In using R, diagonally weighted least squares was used as the parameter estimation method, which considers the characteristics of nonnormally distributed data. Bootstrapping methods, which are generally used for testing the significance of indirect effects, can be underestimated in complicated models [30]; therefore, significance levels of estimated parameters were tested by confidence intervals estimated based on the diagonally weighted least squares method. The following indices were used to assess the adequacy of the model fit: the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the normed fit index (NFI), and the Tucker–Lewis index (TLI).

Results

Participant characteristics in the sample and clinical characteristics of the patients

The median age of the patients with lung cancer and spouses in this sample was 61.00 (IQR = 12.0) and 60.00 (IQR = 10.0) years, respectively. The median marriage duration was 35.50 years (IQR = 12.0). In terms of clinical characteristics, 69.3% of patients had adenocarcinoma; 36.7% had cancer stage IV; the median time since diagnosis was 11.00 months (IQR = 25.0) (Table 1).

Descriptive statistics of study variables between couples

Comparison of the results between means of patients and spouses (shown in Table 2) revealed significant differences between couples in marital relations or QOL indicators, with one exception. The exception, which was not expected, was that holding back cancer-related concerns showed no significant difference between couples.

Verification of the measurement model

Because no prior studies showed the causal relationship of potential variables, in this study, we verified the validity of the measurement models of four potential variables (perceived marital relationship of the patient and spouse and the QOL of the patient and spouse). As a result of checking the fit indexes, all the measurement models were suitable. The perceived marital relationship between patients and spouses was found to have the greatest effect on communication (patient: B = 1.84, spouse: B = 1.45), and the QOL was found to have the greatest effect on the quality of a functional life (patient: B = 2.20; spouse: B = 2.79).

Verification of the hypothetical model

Confirmatory factor analysis was performed to assess the validity of the elements. By considering the fit indexes, the first hypothesis model was tested, and goodness of fit based on the confirmatory factor analysis was as follows: $\chi^2 = 65.75$, $p = .589$, RMSEA = .00, CFI = 1.00, NFI = .93, and TLI = 1.00. The second hypothetical model's fit indexes were valid as follows: $\chi 2 = 87.27$, $p = .532$, RMSEA = .01, CFI = 1.00, NFI = .92, and TLI = 1.00. As a result, the model of perceived marital relationship and QOL of patients with lung cancer and spouses (H1) was appropriate, and the mediating model with holding back cancer-related concerns (H2) was also validated as an appropriate model.

Looking at the structural coefficients that show how directly the independent variables of the hypothetical model are affecting the dependent variables, actor effects of both patients with lung cancer and their spouses' were significant and the patient's partner effects were significant within 10% of the significant level. We conducted an equality constraint to compare the difference between the patient with lung cancer and spouse in the significant actor effect and partner effect paths. Three paths that demonstrated significant coefficients are as follows: (1) comparison of the actor effects of perceived marital relationship on withholding cancer-related concerns (aA1 = aA2), (2) comparison of the actor effects of perceived marital relationship on QOL (c'A1 = c'A2), and (3) comparison of the partner effects of perceived marital relationship on QOL (c'P1 = c'P2). Table 3 shows the result of testing χ^2 differences between the basic model and by applying the equality constraint model. After comparing the actor effects of perceived marital relationship of the patient with lung cancer and spouse on withholding cancer-related concerns and the actor effects of perceived marital relationship of the patient with lung cancer patient and spouse on QOL, there were no significant differences between patients and spouses.

Analysis of the hypothetical model's effects

Table 4 and Figure 1B show the direct, indirect, and total effects and squared multiple correlation in the APIMeM. Patients' perceived marital relationship had a significant direct actor effect on QOL (B = .49, $p = .001$), and QOL of 38.1% of the patients is explained as the patient's and spouse's holding back cancer-related concerns and perceived marital relationship. Analyzing the variables influencing the patient's QOL showed that the patient's total actor effect (aA1bA1 + aP2bP1 + c'A1) had a significant positive (+) effect (B = .52, $p = .001$), and the patient's direct partner effect (c'P1) was significant at the 10% significance level in a negative (−) direction (B = −.11, $p = .061$). The patient's total partner effect (aA2bP1 + aP1bA1 + c'P1) was also significant at the 10% significance level (B = −.11, $p = .053$).

The perceived marital relationship of spouses had a significant direct actor effect on QOL (B = .63, $p = .001$), and QOL of 74.8% of the spouses is explained as the patient's and spouse's holding back cancer-related concerns and perceived marital relationship.

Table 2 *Comparison of the Results of the Study Variables Between Couples (N = 150 couples).*

Variables	Patient		Spouse		Paired t test	
	M (SD)	Minimum–maximum	M (SD)	Minimum–maximum	t	*p*
Holding back	1.00 (0.92)	0–3	1.13 (0.91)	0–3	−1.22	.224
Marital relationship						
Satisfaction	34.35 (4.49)	10–50	32.1 (0.49)	10–50	4.85	<.001
Communication	34.37 (5.75)	10–50	31.15 (0.58)	10–50	5.56	<.001
Conflict resolution	31.07 (5.41)	10–50	30.17 (0.56)	10–50	1.56	.120
Total score	99.79 (13.42)	30–150	93.43 (14.54)	30–150	4.59	<.001
Quality of life (FACT-G/GP)						
Physical well-being	7.15 (5.25)	0–28	18.52 (4.95)	0–24	−3.50	<.001
Social well-being	17.34 (3.76)	0–28	10.63 (4.30)	0–20	7.66	<.001
Emotional well-being	7.47 (4.38)	0–24	12.31 (3.02)	0–16	−5.12	<.001
Functional well-being	19.11 (6.39)	0–28	14.23 (5.77)	0–24	3.23	.002
Total score	75.70 (15.44)	0–108	55.69 (11.39)	0–84	2.68	.008

Scores of each domain of the FACT-G and the FACT-GP for quality of life were converted into standardized scores ranging from 0 to 100 to compare with the couple.
Note. FACT-G = Functional Assessment of Cancer Therapy − General; FACT-GP = Functional Assessment of Cancer Therapy − General Population; M = mean; SD = standard deviation.

Analyzing the variables influencing the patient's QOL showed that the patient's total actor effect (aA2bA2 + aP1bP2 + c'A2) had a significant positive (+) effect (B = .63, p = .001), whereas the spouse's partner effect was not statistically significant.

Thus, this study showed that the perceived marital relationship of patients and spouses had the greatest direct actor effects on their QOL. The effect was small but had direct partner effect on the patient's QOL. However, the research hypothesis was not proved because indirect effects of mediating variables were absent on both the patients and spouses.

Discussion

This study examined the perceived marital relationship and QOL of patients with lung cancer and their spouses based on the APIMeM, which confirms interdependent couple interactions. In addition, we applied holding back as a variable indicating the degree of low communication of the couple to the APIMeM model. The little empirical evidence offered to date suggests that couples may have difficulty openly communicating their cancer-related concerns. Surprisingly, these findings showed that many

Table 3 χ^2 *Difference Test Between the Basic Model and Equality Constraint Model (N = 150 couples).*

Model	χ^2	*df*	*p*	RMSEA	CFI	NFI	TLI	$\Delta\chi^2$
Basic model	87.27	89	.532	.01	1.00	.92	1.00	–
Equality constraint (1) aA1 = aA2	89.77	90	.487	.01	1.00	.92	1.00	2.50 (p > .114)
Equality constraint (2) c'A1 = c'A2	87.96	90	.541	.01	1.00	.92	1.00	0.68 (p > .408)
Equality constraint (3) c'P1 = c'P2	88.15	90	.536	.01	1.00	.92	1.00	0.87 (p > .350)

Note. RMSEA = root mean square error of approximation; CFI = comparative fit index; NFI = normed fit index; TLI = Tucker–Lewis index.

Table 4 *The Total Effects, Total Indirect Effects, Simple Indirect Effects, and Direct Effects in the APIMeM for Participants (N = 150 couples).*

Effects	Coefficient	Estimate	SE	*p*	Standard Estimate	SMC
Patient actor effect						.38
Total effect	aA1bA1 + aP2bP1 + c'A1	.52	.12	.001	.63	
Total indirect effect	aA1bA1 + aP2bP1	.03	.03	.195	.04	
Actor–actor simple indirect effect	aA1bA1	.03	.03	.214	.04	
Partner–partner simple indirect effect	aP2bP1	.01	.01	.449	.00	
Direct effect c'	c'A1	.49	.12	.001	.59	
Patient partner effect						
Total effect	aA2bP1 + aP1bA1 + c'P1	−.11	.05	.053	-.15	
Total indirect effect	aA2bP1 + aP1bA1	.01	.02	.748	.01	
Actor–partner simple indirect effect	aA2bP1	.01	.01	.337	.02	
Partner–actor simple indirect effect	aP1bA1	−.01	.01	.304	−.01	
Direct effect c'	c'P1	−.11	.06	.061	−.16	
Spouse actor effect						.75
Total effect	aA2bA2 + aP1bP2 + c'A2	.63	.09	.001	.84	
Total indirect effect	aA2bA2 + aP1bP2	.01	.02	.608	.01	
Actor–actor simple indirect effect	aA2bA2	.02	.02	.211	.02	
Partner–partner simple indirect effect	aP1bP2	−.01	.01	.506	−.01	
Direct effect c'	c'A2	.62	.10	.001	.83	
Spouse partner effect						
Total effect	aA1bP2 + aP2bA2 + c'P2	.02	.07	.828	.02	
Total indirect effect	aA1bP2 + aP2bA2	.03	.04	.341	.04	
Actor–partner simple indirect effect	aA1bP2	.03	.04	.374	.04	
Partner–actor simple indirect effect	aP2bA2	.01	.01	.719	.00	
Direct effect c'	c'P2	−.02	.09	.839	−.02	

Note. APIMeM = actor–partner interdependence mediation model; SE = standard error; SMC = squared multiple correlations.

couples shared information with each other. However, with a few topics (e.g., sharing concerns about cancer recurrence), relatively high levels of holding back concerns were observed among couples.

Perceived marital relationship on QOL

In the study, the fact that perceived marital relationship had the greatest influence on an individual's QOL reflects the contemporary phenomenon that couples' individual characteristics have more influence on their well-being than in previous generations [31]. When considering marital satisfaction as a key factor for a positive marital relationship, one can understand how the participants' perceived marital relationship influences QOL [32,33]. A study that investigated QOL in spouses of patients with prostate cancer provides an example. Spouses perceived negative experiences such as "bothering" while waiting for results after treatment, and their QOL lowered when they perceived marital relationship as negative [17]. It is similar to the results of this study in which spouses' perceived marital relationships have a strong "actor effect" on their QOL. In the present study, the partner effect of patients and spouses was not significant; however, both patients and their spouses demonstrated an actor effect of marital relationship on QOL. Therefore, it appears that interventions for improving marital satisfaction can help improve each person's QOL.

Holding back cancer-related concerns on QOL

From a life cycle perspective, elderly couples have a relatively stable marital relationship; however, the sense of crisis that a couple faces from a cancer diagnosis can decrease QOL for both the patient and spouse when the couple does not have open conversations on cancer [34,35]. Examples can be found in studies reporting that damaging communications (unilateral or mutually avoiding) between patients with prostate cancer and their spouse significantly affects psychological distress [13] and that holding back communication affects one's partner's QOL negatively [15]. According to a study that examined the correlation between the partner's self-disclosure and psychological distress by using hesitation in sharing cancer-related concerns to assess the level of holding back, a low level of holding back was correlated with the partner's self-disclosure and low distress [26], which is different from the present study's finding that holding back cancer-related concerns did not significantly affect QOL [15]. Unlike the results of this study, studies of American breast cancer survivors and families show that open communication regarding cancer has had a significant impact on the QOL for the survivors and their families [36]. The author interpreted that in the meaning of that although the culture of the Orient is generally reluctant to reveal and discuss anxieties, it has gradually changed while living within Western cultures, and open communication has affected the QOL. Although the holding back cancer cancer-related concern in this study was not high for both the patient and spouse, it is possible that the degree of holding back was recorded below the actual level because it was not measured by presenting specific circumstances. In this context, because the QOL of the spouses was significantly lower than of patients in this study, further research is needed on the reluctance to cancer-related communication. Among all subcategories in the perceived marital relationship, quality communication got the greatest influence on marital relationship, and it is possible that couples with quality communication have low levels of holding back cancer-related concerns. In this vein, the mediating effect of holding back may not be significant, but the negative effect of holding back cancer-related concerns can be found to be significant depending on the perceived marital relationship.

APIMeM on QOL

Unlike previous studies that demonstrated the partner effect of patients and their spouses on QOL [37], the partner effect in the present study was not significant. A plausible reason is that the explanatory variables for QOL may not be strong factors that bring any psychological shock and behavioral change, or influence the partner's QOL either positively or negatively. Moreover, the sample size in this study might have been too small to control other variables that can greatly influence QOL (for example, gender, age, and so on). Furthermore, considering QOL an outcome that changes over a long period of time, a longitudinal study is required. While the partner effect was verified at the 10% significance level, contrary to the expected outcome, the spouse's perceived marital relationship had a negative effect on the patient's QOL. This finding contradicts a previous study finding that demonstrated a positive correlation between marital relationship and QOL [17]. Although not presented in the results, the correlation results of each measurement variable showed a negative correlation between the conflict resolution variables of the spouse's marital relationship and the social, emotional, and functional QOL of the patient. Given the small effect at the 10% significance level, the patient's spouse may have responded positively to resolve marital conflict, saying "No problem, everything is OK." In the study of several patients and their families, there were incongruence between patients and their families when patients or paired families concealed their condition with respect to physical function and pain [38,39]. Nevertheless, it is difficult to interpret the results because the mediating variable (holding back) is not statistically significant, and this needs to be verified through further research.

In this study, neither the indirect actor effect for both patients and their spouses nor the mediating effect of holding back cancer-related concern was significant. However, the total actor effect for both patients and their spouses (for example, direct actor effect of the patient's perceived marital relationship on the patient's QOL + indirect actor effect of the patient's holding back cancer-related concerns on the patient's QOL + indirect partner effect of the spouse's holding back cancer-related concerns on the patient's QOL) was found to be significant. This can be interpreted that the total effect is significant because direct actor effect is significant.

Although the effect of holding back cancer-related concerns on QOL was insignificant, having open communication with a spouse about cancer does not negatively influence the patient's QOL. This can be confirmed by many previous studies that demonstrated a positive effect [14] of open communication between patients with cancer and their spouses [40] or a positive outcome of the couple's cognitive behavioral therapy that helped decrease hesitancy to share cancer-related concerns [25,41].

These findings confirmed that the perceived marital relationship of patients with lung cancer and their spouses is a key factor that can be considered for improving one's QOL, while partially confirming the interdependence effect of patients with lung cancer and their spouses. Although this aspect needs to be confirmed by follow-up research, the research model in this study demonstrated the actor effect and the total effect of both patients and their spouses at significant levels. Therefore, this study will be helpful in nursing practice. The nurses know that evaluating the perceived marital relationship in patients with lung cancer is useful for assessing the QOL of the patients and may be the basis for providing communication enhancement activities including spouses. Furthermore, nurses can improve the self-efficacy and QOL of patients and their spouses.

Limitations

This study had several limitations. The participants were patients with lung cancer recruited at an outpatient lung cancer center of one hospital, most of whom were in fair condition and capable of doing daily activities although the cancer stage at the time of diagnosis was either stage 3 or 4 (90 patients, 60%). This condition is most likely to change when participants become highly dependent on their spouses because of the severity of their cancer. Therefore, a follow-up study targeting patients with advanced cancer and their spouses is needed. In addition, the data sample does not represent all patients with lung cancer and cannot be generalized because the patients and spouses who participated in this study were recruited through nonprobability convenience sampling at an outpatient lung cancer center. Finally, the research model was tested with cross-sectional data, which have limitations in explaining causal relationships between the variables; therefore, a longitudinal follow-up study is needed.

Conclusion

The results of this study showed that the marital relationship perceived by patients with lung cancer and their spouses had “actor effects” on QOL. Partners who perceived the marital relationship more positively had better QOL. In addition, when the perceived marital relationship was better, the level of holding back cancer-related concerns was also lower. Therefore, health professionals should be aware of the importance of how patients and spouses perceive their marital relationship and be able to recommend various intervention programs to improve their relationship. New statistical analysis techniques, such as the APIMeM used in this study, could enhance understanding of the complex interactions between patients and their spouses, which could inform novel dyad-based interventions.

Funding

This work was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF), South Korea funded by the Ministry of Science, ICT and Future Planning (grant number: 2014R1A2A2A01006008). This research was supported by Chung-Ang University, South Korea research grant in 2017.

Declaration of competing interest

No conflict of interest has been declared by the authors.

Acknowledgments

The authors would like to thank all the patients and their spouses for participation in this study.

References

1. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer. 2015;136(5):E359–86. https://doi.org/10.1002/ijc.29210
2. Jung KW, Won YJ, Kong HJ, Lee ES, Community of Population-Based Regional Cancer Registries. Cancer statistics in Korea: incidence, mortality, survival, and prevalence in 2016. Cancer Res Treat. 2019;51(2):417–30. https://doi.org/10.4143/crt.2019.138
3. Jung KW, Won YJ, Kong HJ, Lee ES. Prediction of cancer incidence and mortality in Korea, 2019. Cancer Res Treat. 2019;51(2):431–7. https://doi.org/10.4143/crt.2019.139
4. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. CA Cancer J Clin. 2019;69(1):7–34. https://doi.org/10.3322/caac.21551
5. Taylor CL, Badr H, Lee JH, Fossella F, Pisters K, Gritz ER, et al. Lung cancer patients and their spouses: psychological and relationship functioning within 1 month of treatment initiation. Ann Behav Med. 2008;36(2):129–40. https://doi.org/10.1007/s12160-008-9062-7
6. Ellis J. The impact of lung cancer on patients and carers. Chronic Respir Dis. 2012;9(1):39–47. https://doi.org/10.1177/1479972311433577
7. Lapid MI, Atherton PJ, Kung S, Sloan JA, Shahi V, Clark MM, et al. Cancer caregiver quality of life: need for targeted intervention. Psycho Oncol. 2016;25(12):1400–7. https://doi.org/10.1002/pon.3960
8. Badr H, Taylor CL. Social constraints and spousal communication in lung cancer. Psycho Oncol. 2006;15(8):673–83. https://doi.org/10.1002/pon.996
9. Ellis KR, Janevic MR, Kershaw T, Caldwell CH, Janz NK, Northouse L. Meaning-based coping, chronic conditions and quality of life in advanced cancer & caregiving. Psycho Oncol. 2017;26(9):1316–23. https://doi.org/10.1002/pon.4146
10. Manne SL, Ostroff JS, Norton TR, Fox K, Goldstein L, Grana G. Cancer-related relationship communication in couples coping with early stage breast cancer. Psycho Oncol. 2006;15(3):234–47. https://doi.org/10.1002/pon.941
11. Manne S, Badr H, Kashy DA. A longitudinal analysis of intimacy processes and psychological distress among couples coping with head and neck or lung cancers. J Behav Med. 2012;35(3):334–46. https://doi.org/10.1007/s10865-011-9349-1
12. Hagedoorn M, Puterman E, Sanderman R, Wiggers T, Baas PC, van Haastert M, et al. Is self-disclosure in couples coping with cancer associated with improvement in depressive symptoms? Health Psychol. 2011;30(6):753–62. https://doi.org/10.1037/a0024374
13. Manne S, Badr H, Zaider T, Nelson C, Kissane D. Cancer-related communication, relationship intimacy, and psychological distress among couples coping with localized prostate cancer. J Cancer Surviv. 2010;4(1):74–85. https://doi.org/10.1007/s11764-009-0109-y
14. Song L, Rini C, Ellis KR, Northouse LL. Appraisals, perceived dyadic communication, and quality of life over time among couples coping with prostate cancer. Support Care Cancer. 2016;24(9):3757–65. https://doi.org/10.1007/s00520-016-3188-0
15. Manne SL, Kissane D, Zaider T, Kashy D, Lee D, Heckman C, et al. Holding back, intimacy, and psychological and relationship outcomes among couples coping with prostate cancer. J Fam Psychol. 2015;29(5):708–19. https://doi.org/10.1037/fam0000096
16. Milbury K, Badr H. Sexual problems, communication patterns, and depressive symptoms in couples coping with metastatic breast cancer. Psycho Oncol. 2013;22(4):814–22. https://doi.org/10.1002/pon.3079
17. Harden JK, Sanda MG, Wei JT, Yarandi H, Hembroff L, Hardy J, et al. Partners' long-term appraisal of their caregiving experience, marital satisfaction, sexual satisfaction, and quality of life 2 years after prostate cancer treatment. Cancer Nurs. 2013;36(2):104–13. https://doi.org/10.1097/NCC.0b013e3182567c03
18. Zhou ES, Kim Y, Rasheed M, Benedict C, Bustillo NE, Soloway M, et al. Marital satisfaction of advanced prostate cancer survivors and their spousal caregivers: the dyadic effects of physical and mental health. Psycho Oncol. 2011;20(12):1353–7. https://doi.org/10.1002/pon.1855
19. Kenny DA. Models of non-independence in dyadic research. J Soc Pers Relatsh. 1996;13(2):279–94. https://doi.org/10.1177/0265407596132007
20. Ledermann T, Macho S, Kenny DA. Assessing mediation in dyadic data using the actor-partner interdependence model. Struct Equ Model. 2011;18(4):595–612. https://doi.org/10.1080/10705511.2011.607099
21. Zhang AY, Siminoff LA. Silence and cancer: why do families and patients fail to communicate? Health Commun. 2003;15(4):415–29. https://doi.org/10.1207/S15327027HC1504_03
22. Harju E, Rantanen A, Kaunonen M, Helminen M, Isotalo T, Åstedt-Kurki P. Marital relationship and health-related quality of life after prostate cancer diagnosis. Int J Urol Nurs. 2017;11(2):73–81. https://doi.org/10.1111/ijun.12131
23. Kenny DA, Kashy DA, Cook WL. Dyadic data analysis. New York, NY: Guilford Press; 2006. p. 1–458.
24. Pistrang N, Barker C. Disclosure of concerns in breast cancer. Psycho Oncol. 1992;1(3):183–92. https://doi.org/10.1002/pon.2960010307
25. Edmond SN, Shelby RA, Kimmick GG, Marcom PK, Peppercorn JM, Keefe FJ. Symptom communication in breast cancer: relationships of holding back and self-efficacy for communication to symptoms and adjustment. J Psychosoc Oncol. 2013;31(6):698–711. https://doi.org/10.1080/07347332.2013.835023
26. Porter LS, Keefe FJ, Hurwitz H, Faber M. Disclosure between patients with gastrointestinal cancer and their spouses. Psycho Oncol. 2005;14(12):1030–42. https://doi.org/10.1002/pon.915
27. Fowers BJ, Olson DH. Enrich marital inventory: a discriminant validity and cross-validation assessment. J Marital Fam Ther. 1989;15(1):65–79. https://doi.org/10.1111/j.1752-0606.1989.tb00777.x
28. Olson DH, Larson PJ, Olson-Sigg A. Couple checkup: tuning up relationships. J Couple Relatsh Ther. 2009;8(2):129–42. https://doi.org/10.1080/15332690902813810
29. Cella DF, Tulsky DS, Gray G, Sarafian B, Linn E, Bonomi A, et al. The functional assessment of cancer therapy scale: development and validation of the general measure. J Clin Oncol. 1993;11(3):570–9. https://doi.org/10.1200/JCO.1993.11.3.570
30. Tabachnick BG, Fidell LS. Using multivariate statistics. 7th ed. Boston, MA: Pearson; 2018. p. 848.

31. Cho HS. Some Determinants of marital satisfaction. Korean J Sociol. 2003;37:91–115. Korean.
32. Hong S, Chae K. A study on Korean couples' marital satisfaction based on Gottman's theory. J Human Underst Counsel. 2010;31(2):299–316. Korean.
33. Park YH, Ko JH. The effects of self and spouse's self-esteem, communication pattern, and conflict coping behaviors on marital satisfaction. Korean J Soc Pers Psychol. 2005;19(1):65–83. Korean.
34. Kotkamp-Mothes N, Slawinsky D, Hindermann S, Strauss B. Coping and psychological well being in families of elderly cancer patients. Crit Rev Oncol-Hematol. 2005;55(3):213–29. https://doi.org/10.1016/j.critrevonc.2005.03.006
35. Vaske I, Thöne MF, Kühl K, Keil DC, Schürmann W, Rief W, et al. For better or for worse: a longitudinal study on dyadic coping and quality of life among couples with a partner suffering from COPD. J Behav Med. 2015;38(6):851–62. https://doi.org/10.1007/s10865-015-9657-y
36. Lim JW. Communication, coping, and quality of life of breast cancer survivors and family/friend dyads: a pilot study of Chinese-Americans and Korean-Americans. Psycho Oncol. 2014;23(11):1243–51. https://doi.org/10.1002/pon.3532
37. Chung ML, Moser DK, Lennie TA, Rayens MK. The effects of depressive symptoms and anxiety on quality of life in patients with heart failure and their spouses: testing dyadic dynamics using actor–partner interdependence model. J Psychosom Res. 2009;67(1):29–35. https://doi.org/10.1016/j.jpsychores.2009.01.009
38. Lyons KS, Lee CS. The theory of dyadic illness management. J Fam Nurs. 2018;24(1):8–28. https://doi.org/10.1177/1074840717745669
39. Miller LM, Lyons KS, Bennett JA. Incongruent perceptions of pain and physical function among families living with lung cancer. Support Care Cancer. 2015;23(9):2755–62. https://doi.org/10.1007/s00520-015-2640-x
40. Goldsmith DJ, Miller LE, Caughlin JP. Openness and avoidance in couples communicating about cancer. Ann Int Commun Assoc. 2007;31(1):62–115. https://doi.org/10.1080/23808985.2007.11679065
41. Porter LS, Keefe FJ, Baucom DH, Hurwitz H, Moser B, Patterson E, et al. Partner-assisted emotional disclosure for patients with gastrointestinal cancer - results from a randomized controlled trial. Cancer. 2009;115(S18):4326–38. https://doi.org/10.1002/cncr.24578