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Analysis of Actor-Partner Interdependence Model for Family Resilience and Coping Styles in Patients with Early-Stage Non-Small Cell Lung Cancer Post-Surgery and Their Caregivers

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Abstract: *Based on the actor-partner inter-dependence model(APIM), this paper aims to analyze the family resilience and coping styles on the early-stage non-small cell lung cancer(NSCLC) and their caregivers. Using purposive sampling, 243 pairs of early-stage NSCLC postoperative patients and their caregivers treated in the Thoracic Surgery Department of a tertiary hospital in Xi'an from August 2024 to February 2025 were selected. A general information questionnaire, the Chinese version of the Family Resilience Assessment Scale (C-FRAS), and the Simplified Coping Style Questionnaire (SCSQ) were used for the survey. The APIM was constructed to analyze the relationship between coping styles and family resilience. Family resilience scores of early-stage NSCLC postoperative patients (138.90 ± 11.54) were significantly higher than those of caregivers (136.23 ± 13.14). Coping style scores showed statistically significant differences (P< 0.05), with both groups at a moderate level. Positive coping in patients was significantly positively correlated with their own family resilience and caregivers' positive coping and family resilience (P< 0.001). Caregivers' positive coping was significantly positively correlated with their own family resilience and patients' positive coping (P< 0.001). Regarding the actors' effects, both patients' and caregivers' positive coping styles positively predicted their own family resilience (P < 0.05). Regarding the partners' effects, the coping styles of both parties had a significant impact on the family resilience (P< 0.05). Family resilience of patients with early-stage non-small cell lung cancer post-surgery and their caregivers interacts with their coping styles. Clinical practitioners should implement family-centered resilience interventions, strengthen dyadic support through joint training, and promote positive coping styles to enhance overall family resilience.*

Keywords: *Lung Cancer, Caregiver, Family Resilience, Coping Style, Actor-Partner Interdependence Model*

1. Introduction

Lung cancer is the leading cause of cancer-related deaths worldwide[1], with non-small cell lung cancer (NSCLC) being the most common type. Surgical resection is the primary treatment for early-stage NSCLC[2].

Postoperatively, patients face pain, respiratory limitations, and psychological fears of recurrence/metastasis, compounded by adjuvant therapy side effects (e.g., fatigue, hair loss)[3-5]. Within interconnected family systems, members' emotions, cognitions, and behaviors mutually influence each other[6]. These stressors impact both patients' recovery/quality of life and caregivers' burden, reducing family resilience—defined as a family's capacity to maintain/restore function through resource integration during adversity while achieving positive adaptation[7].

Studies have shown that higher levels of family resilience help individuals to adopt positive coping styles[8], enhance the quality of life of cancer patients and caregivers[9] , and may reduce patients' fear of cancer recurrence and enhance caregiver motivation[10] .

However, most studies focus solely on individual-level family resilience (patient or caregiver), neglecting its interdependence within patient-caregiver dyads and bidirectional effects on coping styles—especially during the critical early postoperative NSCLC recovery phase. Applying Kenny et al.'s Actor-Partner Interdependence Model (APIM)[11]—which analyzes dyadic data through actor effects (self-

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influence) and partner effects (cross-influence)—this study examines coping-resilience interactions to develop family-centered psychosocial interventions strengthening dyadic support.

2. Research methods

2.1 Research design

In this study, a cross-sectional research design was used to collect the coping styles and family resilience of patients and caregivers of early-stage postoperative non-small cell lung cancer through a questionnaire to explore the subject-object reciprocal relationship between patient and caregiver coping styles and family resilience. The study focused on quantitative research, combining descriptive and inferential statistical methods for data analysis.

2.2 Research object and sample source

Using purposive sampling method, early postoperative NSCLC patients and their caregivers who were hospitalized in the thoracic surgery ward of a tertiary hospital in Xi'an City, China, from August 2024 to February 2025 were selected as survey subjects. The subjects of this study were distinguishable data, and the required sample size was calculated according to the APIM PowerR, with 1-β=0.9 and α=0.05 when the subject-object effect value was set to 0.25, and the sample size was 160 pairs, and considering a 10% probability of sample loss, 243 pairs of early postoperative NSCLC patients and caregivers were finally included in this study.

Patient Inclusion criteria: patients with stage I or II NSCLC who met the diagnostic criteria of the Chinese Medical Association Lung Cancer Clinical Diagnostic and Treatment Guidelines, Revision 2024[12]and were diagnosed after surgical treatment; patients ≥ 18 years old or older, with clear consciousness and basic reading and writing communication ability; informed consent and voluntary participation in the study. Exclusion criteria: patients with serious postoperative complications, such as respiratory failure, severe pulmonary atelectasis; those who have suffered other major stress in the recent past.

Caregivers Inclusion criteria: Understand the patient's condition, give informed consent and voluntarily participate in this study; Caregiving time ≥4h per day, as the main caregiver. Exclusion criteria: patients with psychiatric disorders or speech disorders; participating in other studies.

2.3 Research tools

1) General Information Questionnaire: Self-designed, covering demographics (patient: gender, age, education, tumor type, surgery type, pre-illness economic role, comorbidities; caregiver: age, gender, education, monthly income, relationship to patient, co-caregiver availability).

2) Chinese Family Resilience Assessment Scale (C-FRAS)[13]: Adapted by Fan Yingwei from Sixbey's FRAS[14] based on Walsh's resilience model. Contains 51 items across six dimensions: Family Communication and Problem Solving (24 items), Maintaining a Positive Outlook (6 items), Utilizing Social and Economic Resources (8 items), Positive Reframing of Adversity (3 items), Family Spirituality (4 items), and Family Connectedness (6 items). Rated on a 4-point Likert scale (1=Strongly Disagree, 4=Strongly Agree). Total score range: 51~204 (higher = greater resilience). Items 30, 34, 42, 47 are reverse-scored. Cronbach's α = 0.944, content validity = 0.97.

3) Simplified Coping Style Questionnaire (SCSQ)[15]: Developed by Xie Yaning. Contains 20 items across two dimensions: Positive Coping (items 1~12) and Negative Coping (items 13~20). Rated 0~3 (0 = Never, 3 = Often). Higher subscale scores indicate greater use of that coping style. Cronbach's α = 0.90, test-retest reliability = 0.89.

2.4 Data collection process

Eligible early postoperative NSCLC patients and caregivers were screened by uniformly trained investigators based on the inclusion and exclusion criteria to participate in the questionnaire survey. Before the survey, the surveyed patients and their caregivers were explained the purpose of the survey content, the requirements for filling out the survey and the principle of voluntary participation, and the questionnaire was distributed after obtaining their consent. A unified instruction was used, and study

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participants were asked to fill out the questionnaire truthfully according to their own situation, and patients and caregivers filled out the questionnaire independently to avoid mutual interference. If the study participant was unable to complete the questionnaire independently, the researcher filled in the questionnaire on his/her behalf according to his/her dictation. The investigator filled in the section on the patient's disease-related information after consulting the hospital's electronic medical record system. The questionnaires were collected on the spot and checked for quality, and patients were asked to add any missing items.

2.5 Data processing and statistical methods

Statistical methods SPSS26.0 software was used for statistical analysis, quantitative information was described by ($\bar{\chi}\pm s$), and qualitative information was expressed by frequency and percentage (%). Comparison of the scores of each variable in early postoperative NSCLC patients and their spouses was performed using independent samples t-test, and correlations between variables were analyzed using Pearson correlation analysis. AMOS 24.0 software was used to establish a subject-object reciprocity model to analyze the subject-object effect of family resilience of early postoperative NSCLC patients and caregivers on their own coping styles. The test level $\alpha = 0.05$.

3. Data analysis and results

3.1 General Characteristics of Patients and Caregivers

A total of 496 sets of questionnaires were distributed, and 486 sets of valid questionnaires were recovered (243 for patients and 243 for caregivers), with a valid recovery rate of 97.98%. The age of the 243 patients was (60.46±8.98) years old; the age of the 243 caregivers was (46.14±11.64) years old, and the other general data of the patients and caregivers are shown in Tables 1 and 2.

Table 1: General Characteristics of Patients (n=243)

Item	Category	n (%)
Gender	Male	142 (58.4)
	Female	101 (41.6)
Residence	Rural	93 (38.3)
	Town	17 (7.0)
	County	32 (13.2)
	City	101 (41.6)
Religion	Yes	12 (4.9)
	No	231 (95.1)
Marital Status	Married	227 (93.4)
	Divorced	3 (1.2)
	Widowed	13 (5.3)
Education	Primary or below	78 (32.1)
	Junior High	69 (28.4)
	Senior High	54 (22.2)
	College or above	42 (17.3)
Pre-illness Breadwinner	Yes	127 (52.3)
	No	116 (47.7)
Pathology	Squamous Carcinoma	69 (28.4)
	Adenocarcinoma	174 (71.6))
Number of Comorbidities	<2	167 (68.7)
	≥2	76 (31.3)

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Table 2: General Characteristics of Caregivers (n=243)

Item	Category	n (%)
Gender	Male	142 (58.4)
	Female	101 (41.6)
Relationship to Patient	Spouse	97 (39.9)
	Child	131 (53.9)
	Parent	5 (2.1)
	Sibling	6 (2.5)
	Other	4 (1.6)
Occupation	Worker	26 (10.7)
	Farmer	52 (21.4)
	Retired/Unemployed	29 (11.9)
	Enterprise/Institution Staff	61 (25.1)
	Self-employed/Other	75 (30.9)
Monthly Income	<2000	45 (18.5)
	2001-3000	37 (15.2)
	3001-4000	46 (18.9)
	>4000	115 (47.3)
Co-Caregiver Available	Yes	189 (77.8)
	No	54 (22.2)
Cumulative Care Days		
	<7days	126 (51.9)
	7~14days	71 (29.2)
	>14days	46 (18.9)
Daily Care Duration		
	4~8h	9 (3.7)
	8~12h	44 (18.1)
	12~24h	190 (78.2)
Understanding of Patient's Illness		
	Fully Understand	111 (45.7)
	Mostly Understand	67 (27.6)
	Basically Understand	59 (24.3)
	Poorly Understand	6 (2.5)

3.2 Comparison of Coping Styles and Family Resilience Scores

Early postoperative NSCLC patients had significantly higher total family resilience scores than their caregivers and significantly lower positive coping style scores than their caregivers, as shown by independent samples t-test. The results are shown in Table 3.

Table 3: Comparison of Family Resilience and Coping Style Scores ($\bar{\chi} \pm s$)

Item	Patient (n=243)	Caregiver (n=243)	t	*p*
Family Resilience (Total)	138.90±11.54	136.23±13.14	2.381	<0.05
Family Comm and Solving	65.13±6.43	70.50±6.13	-9.432	<0.05
Maintaining Positive Outlook	16.75±1.72	16.71±2.44	0.194	>0.05
Utilizing Soc-Econ Resources	22.58±1.77	18.70±3.06	17.114	<0.05
Positive Reframing	8.78±1.46	7.87±1.61	6.531	<0.05
Family Spirituality	11.73±1.44	5.59±2.27	35.652	<0.05
Family Connectedness	13.93±2.68	16.91±1.73	-14.591	<0.05
Coping Styles				
Positive Coping	16.70±7.27	34.07±6.47	-27.829	<0.05
Negative Coping	12.78±5.24	8.14±5.38	9.636	<0.05

3.3 Correlation Analysis between Coping Styles and Family Resilience

Pearson's correlation analysis showed that family resilience in early postoperative NSCLC patients was significantly and positively correlated with caregiver family resilience (r=0.524, P<0.001), and with caregiver positive coping (r=0.223, P<0.001); caregiver family resilience was significantly and positively correlated with their own positive coping (r=0.380, P<0.001), and with patient Positive Coping were

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significantly positively correlated (r = 0.310, $P< 0.001$). The results are shown in Table 4.

Table 4: Correlation Coefficients between Coping Styles and Family Resilience (n=243)

Variable	FR (P)	PC (P)	NC (P)	FR (C)	PC (C)	NC (C)
FR (Patient)	1					
PC (Patient)	0.281**	1				
NC (Patient)	-0.073	0.049	1			
FR (Caregiver)	0.524**	0.310**	-0.036	1		
PC (Caregiver)	0.223**	0.122	0.002	0.380**	1	
NC (Caregiver)	0.000	0.104	0.092	-0.019	-0.073	1

Note: FR=Family Resilience, PC=Positive Coping, NC=Negative Coping, P=Patient, C=Caregiver. "**" denotes $P < 0.001$.

3.4 APIM Analysis of Coping Styles and Family Resilience

A subject-object reciprocity model was constructed with positive coping of early postoperative NSCLC patients and caregivers as the independent variable, and family resilience of both as the dependent variable. The model was a saturated model, and the model fit indices of chi-square degrees of freedom and root mean square of residual variance were all 0, and the goodness-of-fit, canonical fit index, and fit index were 1.000, which made the model well-fitted. The results of the path analysis showed that for the subject effect, positive coping of both patients and caregivers in early postoperative NSCLC positively predicted their own family resilience (β = 0.258, 0.347, both $P < 0.01$), and for the object effect, positive coping of the patient positively predicted the family resilience of the caregiver (β = 0.267, $P < 0.01$), positive coping of the caregiver positively predicted the patient's family resilience (β = 0.191, $P < 0.05$), see Fig. 1

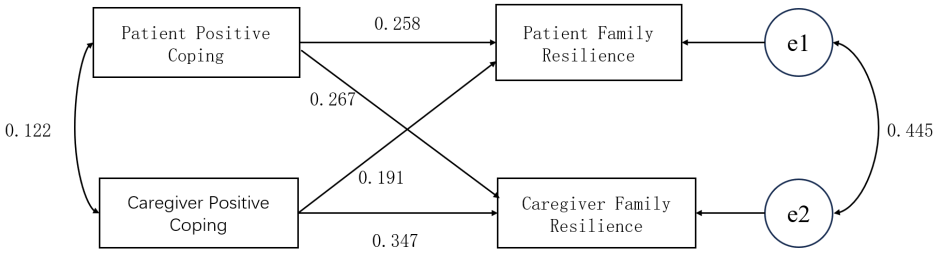

Figure 1: APIM for Coping Styles and Family Resilience

4. Discussion

4.1 Characteristics of Family Resilience Levels in Early Postoperative NSCLC Patients and Caregivers

While overall family resilience was similar between patients and caregivers [16, 17], dimensional differences emerged: Caregivers scored lower than patients on Resource Utilization, Positive Reframing, and Spirituality—attributable to income loss from reduced work hours [18], and emotional depletion from prolonged caregiving[19,20]. Conversely, patients scored lower on Communication/Problem-Solving and Connectedness, aligning with 78.2% of caregivers providing >12h daily care and 24.3% having limited illness knowledge. Patients also demonstrated significantly lower positive coping than caregivers, likely due to postoperative symptoms favoring negative coping. These findings highlight the need for dyadic interventions (e.g., shared coping diaries, role-swapping simulations) to address mutual resilience gaps.

4.2 Interaction between Positive Coping and Family Resilience

4.2.1 Actor Effects

The APIM results of this study demonstrate that higher levels of positive coping among both early-stage postoperative NSCLC patients and their caregivers significantly enhance their respective family resilience, aligning with prior research[21]. As a dynamic system, the family maintains stability and facilitates growth during adversity through three core elements: belief systems, organizational patterns,

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and communication processes[7]. Patients' active engagement in rehabilitation and health information-seeking fosters open communication and strengthens family connectedness, while caregivers' positive coping provides emotional support and enhances organizational flexibility—collectively reinforcing family resilience. Within China's Confucian cultural norms emphasizing familial responsibility, patients and caregivers perceive illness management as a collective obligation. Their reciprocal strategies—caregivers shielding patients from worries and patients demonstrating treatment adherence—reinforce shared family beliefs and cohesion, ultimately enhancing resilience.

4.2.2 Partner Effects

This study confirms reciprocal resilience effects: patients' positive coping enhances caregivers' family resilience (β=0.267), and vice versa (β=0.191), with patients' coping exerting greater influence on caregivers than on themselves (β=0.258)[22]. This directional effect likely stems from patients' proactive behaviors signaling recovery progress to caregivers, bolstering their psychological resources. Within the interdependent family system [6], adaptive adjustments propagate through the patient-caregiver emotional bond. Patients overcoming challenges reinforce caregivers' sense of cohesion and hope, while caregivers' proactive support provides essential resilience for patients navigating recovery.

5. Conclusion

This APIM study provides new insights into the dyadic interplay between coping styles and family resilience in early-stage NSCLC postoperative patients and caregivers. Findings enrich cancer research and inform clinical practice. Promoting psychosocial recovery requires viewing caregivers as key agents, focusing on patient-caregiver interaction, providing skills training (stress management, resource access), and enhancing caregivers' resilience perception to reduce burden. Family-centered resilience interventions and dyadic training should be implemented to foster positive coping and improve overall family resilience. Limitations include the cross-sectional design (unable to track dynamic changes). Future studies should conduct monthly follow-ups and explore impacts of family structure/cultural background to optimize interventions.

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References

[1] Ji Y T, Liu S W, Zhang Y M, et al. [Comparison of the latest cancer statistics, cancer epidemic trends and determinants between China and the United States][J]. Zhonghua Zhong Liu Za Zhi, 2024, 46(7): 646-656.

[2] General Office of National Health Commission of the People's Republic of China. Clinical Practice Guideline for Primary Lung Cancer(2022 Version)[J]. Medical Journal of Peking Union Medical College Hospital, 2022,13(04):549-570.

[3] Li Shunshun, Chen Yang, Wang Lili. Analysis of fear of cancer recurrence and social status support in patients with non-small cell lung cancer [J]. China Medical Herald, 2021,18(08):106-109.

*[4] Pan Feng, Zhang Haochen. Adjuvant Therapy Offers Increased Clinical Benefit for Patients with Early to Mid-Stage Lung Cancer: Release of the *Guidelines for Adjuvant Therapy After Complete Resection of Stage I–IIIB Non-Small Cell Lung Cancer (2021 Edition) [J]. China Medical Herald, 2021, 18(16):1-3.*

[5] Guo J, Zhu J, Li X, et al. Exploring barriers to resilience among preoperative non-small cell lung cancer patients: a qualitative study in China[J]. BMC Nurs, 2025,24(1):575.

[6] Papero D V. Family Systems Theory and Therapy[M]//WOLMAN B B, STRICKER G, FRAMO J, et al. Handbook of Family and Marital Therapy. Boston, MA: Springer US, 1983:137-158.

[7] Walsh F. Family resilience: a framework for clinical practice[J]. Fam Process, 2003,42(1):1-18.

[8] Zhang Yifan, Li Zhenying, Liu Lamei, et al. Family resilience and its influencing factors among postoperative breast cancer patients: a longitudinal study[J]. Journal of Nursing Science, 2023, 38(21): 54-58.

[9] Northouse L L, Mood D, Kershaw T, et al. Quality of life of women with recurrent breast cancer and their family members[J]. J Clin Oncol, 2002,20(19):4050-4064.

ISSN 2616-5791 Vol. 6, Issue 7: 30-36, DOI: 10.25236/AJMHS.2025.060705

[10] Shin J Y, Steger M F, Shin D W, et al. Patient-family communication mediates the relation between family hardiness and caregiver positivity: Exploring the moderating role of caregiver depression and anxiety[J]. J Psychosoc Oncol, 2019,37(5):557-572.
[11] Nestler S. Chapter 36 - Dyadic data analysis[M]//RAUTHMANN J F. The Handbook of Personality Dynamics and Processes. Academic Press, 2021:935-948.
[12] Wang Zhongzhao, Tang Hao. Interpretation of key updates in the Chinese Medical Association guidelines for clinical diagnosis and treatment of lung cancer (2024 edition)[J]. Journal of Naval Medical University, 2025,46(01):17-23.
[13] Fan Yingwei, Mi Xue, Zhang Lili. Reliability and Validity of the Chinese Version of the Family Resilience Assessment Scale among Families with a Cancer Patient[J]. Chinese General Practice, 2017,20(23):2894-2899.
[14] SIXBEY M T. Development of the family assessment scale to identify family resilience controucts[D]. Gainesville: University of florida, 2005.
[15] Jie Yaning. Psychometric Evaluation of the Brief Coping Orientation Scale[J]. Chinese Journal of Clinical Psychology, 1998(02):53-54.
[16] Cui P, Shi J, Li S, et al. Family resilience and its influencing factors among advanced cancer patients and their family caregivers: a multilevel modeling analysis[J]. BMC Cancer, 2023,23(1):623.
[17] Ke J, Lin J, Lin X, et al. Dyadic effects of family resilience on quality of life in patients with lung cancer and spousal caregivers: The mediating role of dyadic coping[J]. Eur J Oncol Nurs, 2023, 66: 102400.
[18] Chan A, Ke Y, Tanay M, et al. Financial Toxicity in Cancer Supportive Care: An International Survey[J]. JCO Glob Oncol, 2024,10:e2400043.
[19] Salehi M, Ghasemian A, Najar A V, et al. From compassion to burnout: emotional labor in oncology nursing - a qualitative study[J]. BMC Nurs, 2025,24(1):272.
[20] G S, Tan W A, Lee A R Y B, et al. Behavioral Interventions for the Patient-Caregiver Unit in Patients with Chronic Heart Failure: A Systematic Review of Caregiver Outcomes[J]. J Multidiscip Healthc, 2022,15:921-939.
[21] Zhang Q, Liu Q, Zhang L, et al. The mediating effect of family resilience between coping styles and caregiver burden in maintenance hemodialysis patients: a cross-sectional study[J]. BMC Nephrol, 2024,25(1):83.
[22] Huang Y, Pan Y, Chen M, et al. The resilient process of the family after diagnosis of childhood chronic illness: a qualitative meta-synthesis[J]. J Pediatr Nurs, 2022,67: e180-e190.