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ORIGINAL RESEARCH

Family Resilience and Fear of Disease Recurrence in Elderly OVCF Patients and Spouses: A Cross-Lagged Actor-Partner Interdependence Model Analysis

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Aim: This study examines the longitudinal interplay of family resilience and fear of disease recurrence between elderly osteoporotic vertebral compression fracture (OVCF) patients and their spouses using the APIM.

Methods: This study employed convenience sampling to recruit 223 elderly OVCF patients with adjacent vertebral fractures and their spouses. Participants were assessed with the Shortened Chinese version of the Family Resilience Assessment Scale and the Fear of Disease Progression Questionnaire-Short Form at three time points (T1: during surgery, T2: before discharge, T3: one month post-discharge). Data were analyzed using equivalence tests and cross-lagged analysis within the Actor-Partner Interdependence Model (APIM) framework.

Results: Specifically, patients' family resilience can negatively predict their fear of disease recurrence in subsequent stages (T1→T2: β=−0.14, T2→T3: β=−0.13, both $P<0.01$), and spouses' family resilience can negatively predict their fear of disease recurrence in subsequent stages (T1→T2: β=−0.12, T2→T3: β=−0.13, both $P<0.01$). Additionally, the main effect of fear of disease recurrence on family resilience in patients and their spouses was significant. The fear of disease recurrence in patients negatively predicted their family resilience in subsequent stages (T1→T2: β=−0.18, T2→T3: β=−0.17, $P<0.001$), and the spouse's fear of disease recurrence negatively predicted their family resilience in the first stage (T1→T2: β=−0.15, $P<0.001$, T2→T3: β=−0.13, $P<0.01$). The partner effect of fear of disease recurrence was also significant, indicating that the patient's fear of disease recurrence could positively predict the spouse's fear of disease recurrence in subsequent stages (T1→T2: β=0.16, T2→T3: β=0.15, all $P<0.001$), whereas the spouse's fear of disease recurrence could positively predict the patient's fear of disease recurrence in subsequent stages (T1→T2: β=0.15, $P<0.001$, T2→T3: β=0.12, $P<0.01$).

Conclusion: Healthcare providers should strategically assess and manage family resilience and fear of disease recurrence in elderly OVCF patients and their spouses, leveraging their dyadic interactions to mitigate these fears.

Keywords: elderly, OVCF after surgery, refracture, patients, spouse, actor-partner interdependence model, family resilience, fear of disease recurrence, longitudinal studies, cross-lagged analysis, nursing

Introduction

With the aging society, the incidence of osteoporotic vertebral compression fractures in the elderly has also shown an increasing trend.[1] Imaging diagnoses reveal that the prevalence of osteoporotic vertebral compression fractures increases significantly with age, from about 15% in women aged 50 and above, to a peak of up to 36.6% in women over 80.[2] As the main treatment method, percutaneous kyphoplasty (PKP) relieves symptoms, restores vertebral height, and improves patient

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prognosis, and is widely used in clinical practice.[3,4] However, PKP can only improve the affected vertebrae. Owing to bone loss in patients, it is difficult to effectively prevent vertebral fractures near diseased vertebrae.[5,6] Patients are prone to develop a fear of disease recurrence following such repeated fractures. This fear constitutes a maladaptive cognitive-emotional response, extensively explored in the context of chronic pain and kinesiophobia, which is characterized by catastrophic thinking and avoidance behavior towards pain or re-injury. Therefore, compared with patients with a single fracture, patients with refracture after osteoporotic vertebral compression fracture (OVCF) surgery may fear fracture recurrence.

Family resilience is defined as the process through which individuals and their families recover from or adapt to difficulties or adversity.[7] Serving as a core element that enables the family system to maintain functionality and adaptability in the face of adversity, it has demonstrated a positive impact on patients' psychological adjustment in chronic disease management. Particularly among elderly OVCF patients, the spouse is not only the primary caregiver but also a key component of the patient's rehabilitation environment through their own psychological state and family interaction patterns. Good family resilience is conducive to reducing the fear of recurrence in patients with recurrent fractures after OVCF surgery, thereby enabling better compliance with disease treatment. Therefore, good family resilience is conducive to reducing the fear of recurrence in patients with refracture after OVCF surgery, to better cooperate with disease treatment.

The actor-partner interdependence model believes that there is a strong interpersonal interaction between husband and wife in a close relationship, and that individual thoughts and behaviors are not only affected by themselves but also by each other.[8] Therefore, family resilience and fear of disease recurrence may affect each other in patients with refracture after OVCF surgery and their spouses. However, existing research is limited to the cross-sectional analysis of a single individual and still involves the analysis of the static relationship between the variables, which makes it difficult to provide the dynamic trajectory and predictive relationship of the variables of the actor and partner.[9,10]

Therefore, this study employs a cross-lagged analysis within the actor-partner interdependence model (APIM) framework to longitudinally examine the developmental trajectories and bidirectional predictive relationships between family resilience and fear of disease recurrence in elderly patients with adjacent vertebral refracture after OVCF surgery and their spouses. The findings aim to address theoretical gaps in psychosocial research for this population and provide an empirical basis for developing family-centered interventions to reduce fear of disease recurrence.

Partners and Methods

Survey Respondents

From March 2023 to June 2024, convenience sampling was used to select 223 elderly patients with adjacent vertebral refracture after OVCF surgery and their spouses in the Department of Orthopedics at our hospital as survey partners. Inclusion criteria: ① Patients underwent PKP after the first fracture (operated by the same diagnosis and treatment group), and the refracture was adjacent or interval segment; ② The patients and their spouses were 60 years old or older; ③ Patients and their spouses had basic communication skills. Exclusion criteria: Patients and their spouses with a history of malignant tumors, psychological or psychiatric diseases, and so on. Patients who did not complete the three longitudinal surveys were excluded. According to the sample size requirements of the structural equation model, the sample size was at least 10 times the number of included variables. Five variables were included in this study were 5, and considering that the sample size was not less than 200, and a dropout rate of 10% was considered. Therefore, the minimum sample size for this study was set as n=200× (1+10%) =220. This study was approved by the Ethics Committee of the Second Affiliated Hospital of Xuzhou Medical University (zy202302205). All participants voluntarily participated in this study and signed an informed consent form.

Survey Instrument

General Information Questionnaire

The general information questionnaire was designed by the researchers and contained specific patient information, including age, sex, education level, residence, economic income, and number of fractures. Specific information on the spouse included age, sex, education level, residence, and economic income.

The Shortened Chinese Version of the Family Resilience Assessment (FRAS-C)

FRAS-C is a simplified Chinese version of the original Family Resilience Assessment developed by Li et al.[11] This scale consists of three dimensions: utilization of social resources (3 items), holding positive views (6 items), and family communication and problem-solving (23 items). Each item is scored from "strongly disagree" to "strongly agree", with scores ranging from 1 to 4. The total score ranges from 32 to 128, and a higher score indicates a higher level of family resilience. The Cronbach's α coefficient of the scale was 0.96, and the test-retest reliability and split-half reliability were 0.79 and 0.93, respectively.

Fear of Progression Questionnaire-Short Form (FOP-Q-SF)

The Fear of Progression Questionnaire-Short Form (FOP-Q-SF) was translated into Chinese and validated by Wu et al.[12] The scale contains two dimensions: physical health (six items), and social and family (six items). Each item was scored from 1 to 5 from "never" to "always", and the total score ranged from 12 to 60. The higher the score, the higher was the fear of disease recurrence. Cronbach's α coefficient for the scale was 0.883.

Data Collection Methods

All the participants were trained and assessed prior to the experiment. A general information questionnaire was obtained from patients' medical records. The data of Family Resilience Scale and Fear of Recurrence Assessment Scale were collected at the time points of postoperative (T1), before discharge (T2) and 1 month after discharge (T3). The data at the T1-T2 time node were collected by face-to-face survey in the orthopedic ward, and the data at the T3 time node were obtained by telephone follow-up combined with home visits. The survey was conducted under the condition of relative privacy and the questionnaire was conducted anonymously.

Statistical Methods

SPSS 26.0 software was used for descriptive statistics and correlation analysis. The count data are expressed as the number of cases and percentages, and the measurement data in accordance with a normal distribution are expressed as the mean ± standard deviation. The measurement equivalence test was performed using Mplus8.3. A cross-lagged actor-partner interdependence model was constructed to investigate the interaction between the family resilience of patients and their spouses and fear of disease recurrence at three time points, as well as the actor and partner effects. The actor effect refers to the effect between the predictor and outcome variables of the same individual, while the partner effect refers to the effect of the predictor variable of one individual and the outcome variable of another individual. Patient and spousal family resilience and fear of disease recurrence at each time point were calculated using the latent variables.

Results

General Information of Respondents

During the study, a total of 11 dyads dropped out. No significant differences in demographic characteristics were observed between the dropouts (n=11) and the final participants (n=212) ($P > 0.05$). A total of 212 valid questionnaires were collected for this study (effective recovery rate: 95.07%); the basic information is shown in Table 1.

Common Method Deviation Test

The common method deviation was tested using the Harman single factor. This study had a longitudinal design; therefore, the common method deviation of the data recovered from three measurements was tested. The results showed that the variance interpretation rates of the first factor of the three measurements were 19.37%, 23.42%, and 25.33%, which were lower than the critical value of 40%,[13] indicating that there was no serious common method bias.

Table 1 General Information of Respondents (n=212)

Patient Information	Classification	N	Percentage (%)	Spouse Information	Classification	N	Percentage (%)
Age (years)	60 ~	31	14.62	Age (years)	60 ~	32	15.09
	70 -	87	41.04		70 -	88	41.51
	80 -	94	44.34		80 -	92	43.40
Gender	Male	87	41.04	Gender	Male	125	58.96
	Female	125	58.96		Female	87	41.04
Level of education	Junior high school and below	123	58.02	Degree of education	Junior high school and below	126	59.43
	High school	72	33.96		High school	73	34.43
	Junior college and above	17	8.02		Junior college and above	13	6.14
Place of residence	Town	130	61.32	Place of residence	Town	130	61.32
	Rural	82	38.68		Rural	82	38.68
Monthly income (yuan)	< 2000	34	16.04	Monthly income (yuan)	< 2000	32	15.09
	2000 -	94	44.34		2000 -	93	43.87
	5000 -	61	28.77		5000 -	62	29.25
	> 8000	23	10.85		> 8000	25	11.79
Number of fractures (times)	2	181	85.38				
	≥3	31	14.62				

Family Resilience, Fear of Disease Recurrence Scores and Correlation Analysis of Patients with Adjacent Vertebral Refracture After OVCF and Their Spouses

At T1, the scores of family resilience of patients and their spouses were (85.14±13.23) and (86.06±12.33), and the scores of fear of recurrence of patients and their spouses were (44.88±8.21) and (44.67±7.38). At T2, the scores of family resilience of patients and spouses were (86.93±13.47) and (88.34±13.14), and the scores of fear of disease recurrence of patients and spouses were (43.52±7.24) and (43.10±8.37). At T3, the scores of family resilience of patients and their spouses were (87.06±12.86) and (89.14±10.59), and the scores of fear of disease recurrence of patients and their spouses were (42.05±7.14) and (41.56±6.34). Correlations between the scores on each scale were significant ($P < 0.05$). Table 2.

Equivalence Test Measurement

Morphological equivalence, factor loading equivalence, and intercept equivalence models of family resilience and fear of disease recurrence of patients and their spouses were constructed, and the fitting degrees of the result models are tabulated in Tables 3 and 4. The results showed that family resilience and fear of disease recurrence of patients and their

Table 2 Family Resilience, Fear of Disease Recurrence Scores and Correlation Analysis of Patients with Adjacent Vertebral Fracture After OVCF Surgery and Their Spouses (*r* Value, n=212)

Items	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
① Patient's family resilience T1	1											
② Patient's family resilience T2	0.610**	1										
③ Patient's family resilience T3	0.531**	0.528**	1									
④ Spousal's family resilience T1	0.547**	0.461**	0.312*	1								
⑤ Spousal's family resilience T2	0.450**	0.503**	0.364**	0.525**	1							
⑥ Spousal's family resilience T3	0.407**	0.465**	0.427**	0.494**	0.416**	1						
⑦ Patient's fear of disease recurrence T1	−0.561**	−0.477**	−0.321*	−0.297*	−0.315*	−0.298[1)]	1					
⑧ Patient's fear of disease recurrence T2	−0.498**	−0.484**	−0.364**	−0.347**	−0.381**	−0.341**	0.563**	1				
⑨ Patient's fear of disease recurrence T3	−0.410**	−0.433**	−0.456**	−0.395**	−0.350**	−0.447**	0.434**	0.518**	1			
⑩ Spouse's fear of disease recurrence T1	−0.501**	−0.422**	−0.311*	−0.312*	−0.420**	−0.283*	0.492**	0.473**	0.298*	1		
⑪ Spouse's fear of disease recurrence T2	−0.434**	−0.454**	−0.350**	−0.365**	−0.415**	−0.315*	0.413**	0.484**	0.314*	0.456**	1	
⑫ Spouse's fear of disease recurrence T3	−0.377**	−0.405**	−0.404**	−0.420[2]**	−0.434**	−0.410**	0.395**	0.395**	0.363**	0.394**	0.405**	1

Note: *$P < 0.05$, **$P < 0.01$.

Table 3 Equivalence Model Fitting Results of Three Measurements of Family Resilience of Patients and Their Spouses

		χ^2	*df*	*P*	CFI	ΔCFI	TLI	RMSEA	SRMR
Patient family resilience	Form equivalent	233.449	72	< 0.001	0.994	–	0.988	0.040	0.024
	Load equivalent	245.628	80	< 0.001	0.994	0.000	0.990	0.037	0.026
	Intercept equivalent	308.507	88	< 0.001	0.988	0.003	0.982	0.042	0.028
Spousal family resilience	Form equivalent	250.493	72	< 0.001	0.994	–	0.987	0.040	0.032
	Load equivalent	269.852	80	< 0.001	0.994	0.000	0.988	0.038	0.033
	Intercept equivalent	332.628	88	< 0.001	0.987	0.001	0.985	0.040	0.035

Abbreviations: χ^2, chi-square; *df*, degrees of freedom; CFI, comparative fit index; ΔCFI, variation comparative fit index; TLI, non-benchmarking fit index; RMSEA, root mean square of progressive residual; SRMR, standardized root mean square residual.

Table 4 Equivalence Model Fitting Results of Three Measurements of Fear of Disease Recurrence in Patients and Their Spouses

		χ^2	*df*	*P*	CFI	ΔCFI	TLI	RMSEA	SRMR
The patient's fear of disease recurrence	Morphological equivalence	422.636	104	< 0.001	0.982	–	0.972	0.048	0.035
	Load equivalent	434.758	112	< 0.001	0.982	0.000	0.976	0.046	0.036
	Intercept equivalent	486.542	120	< 0.001	0.978	0.002	0.970	0.047	0.034
Fear of spouse disease recurrence	Morphological equivalence	476.460	104	< 0.001	0.980	–	0.966	0.053	0.052
	Load equivalent	494.184	112	< 0.001	0.978	0.001	0.974	0.052	0.053
	Intercept equivalent	538.127	120	< 0.001	0.974	0.003	0.966	0.054	0.054

Abbreviations: χ^2, chi-square; *df*, degrees of freedom; CFI, comparative fit index; ΔCFI, variation comparative fit index; TLI, non-benchmarking fit index; RMSEA, root mean square of progressive residual; SRMR, standardized root mean square residual.

spouses met morphological equivalence, factor loading equivalence, and intercept equivalence (ΔCFI≤0.01) across time, which met the prerequisite for cross-lag analysis.

Cross-Lag Analysis of the Actor-Partner Interdependence Model of Family Resilience and Fear of Disease Recurrence in Patients with Adjacent Vertebral Refracture After OVCF Surgery and Their Spouses

Establishment and fitting of a family resilience and fear of disease recurrence model for patients with adjacent vertebral refracture after OVCF surgery and their spouses.

In the model, the same observed variables at the three measurement points were allowed to correlate with the latent variable error at the same time point, and then the model was limited (model M2); that is, the autoregressor effect/actor effect and partner effect of patients and their spouses on the same variable were limited to be equal. The actor and partner effects were the same for all variables. The results of the model fitting are listed in Table 5. Compared with M1, M2

Table 5 The Fitting Results of the Actor-Partner Interdependence Model After Limiting the Family Resilience and Fear of Disease Recurrence for Patients with Adjacent Vertebral Refracture After OVCF Surgery and Their Spouses

Model	χ^2	*df*	*P*	CFI	ΔCFI	TLI	RMSEA	SRMR
M1: Saturation model of family resilience and fear of disease recurrence in patients and spouses with adjacent vertebral refracture after OVCF surgery	2124.605	770	< 0.001	0.954	–	0.944	0.042	0.074
M2: Bounded model	2423.378	798	< 0.001	0.958	0.001	0.942	0.041	0.072

Abbreviations: χ^2, chi square; *df*, degrees of freedom; CFI, comparative fit index; ΔCFI, variation comparative fit index; TLI, non-benchmarking fit index; RMSEA, root mean square of progressive residual; SRMR, standardized root mean square residual.

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satisfied $\Delta\chi^2$ (Δdf) and ΔCFI≤0.01, indicating that the difference between M2 and M1 was not significant. Based on this simplification principle, M2 is selected as the final model.

Path analysis of cross-lagged actor-partner interdependence model for family resilience and fear of disease recurrence in patients with adjacent vertebral refracture after OVCF surgery and their spouses.

The standardized coefficients of bounded model M2 are shown in Figure 1. As shown in Figure 1, the three longitudinal measurements of family resilience and fear of disease recurrence of patients and their spouses after adjacent vertebral refracture after OVCF had strong stability, with the autoregression coefficients (β) ranging from 0.38 to 0.50, and all P<0.001. The main effect of family resilience on fear of disease recurrence in patients with adjacent vertebral fractures after OVCF surgery and their spouses was significant; that is, the patient's family resilience could negatively predict the patient's fear of disease recurrence in the next stage (T1→T2: β=−0.14, T2→T3: β=−0.13, both P<0.01), and the spouse's family resilience could negatively predict the spouse's fear of disease recurrence in the next stage (T1→T2: β=−0.12, T2→T3: β=−0.13, both P<0.01). The main effect of fear of disease recurrence in patients and their spouses on family resilience was significant; that is, fear of disease recurrence in patients could negatively predict the family resilience of patients in the next stage (T1→T2: β=−0.18, T2→T3: β=−0.17, P<0.001); that is, the spouse's fear of disease recurrence could negatively predict the spouse's family resilience in the first stage (T1→T2: β=−0.15, P<0.001, T2→T3: β=−0.13, P<0.01). The partner effect of fear of disease recurrence was significant, that is, the patient's fear of disease recurrence could positively predict the spouse's fear of disease recurrence in the next stage (T1→T2: β=0.16, T2→T3: β=0.15, all P<0.001), and the spouse's fear of disease recurrence could positively predict the patient's fear of disease recurrence in the next stage (T1→T2: β=0.15, P<0.001). β=0.12, T2→T3: β=0.13, all P<0.01).

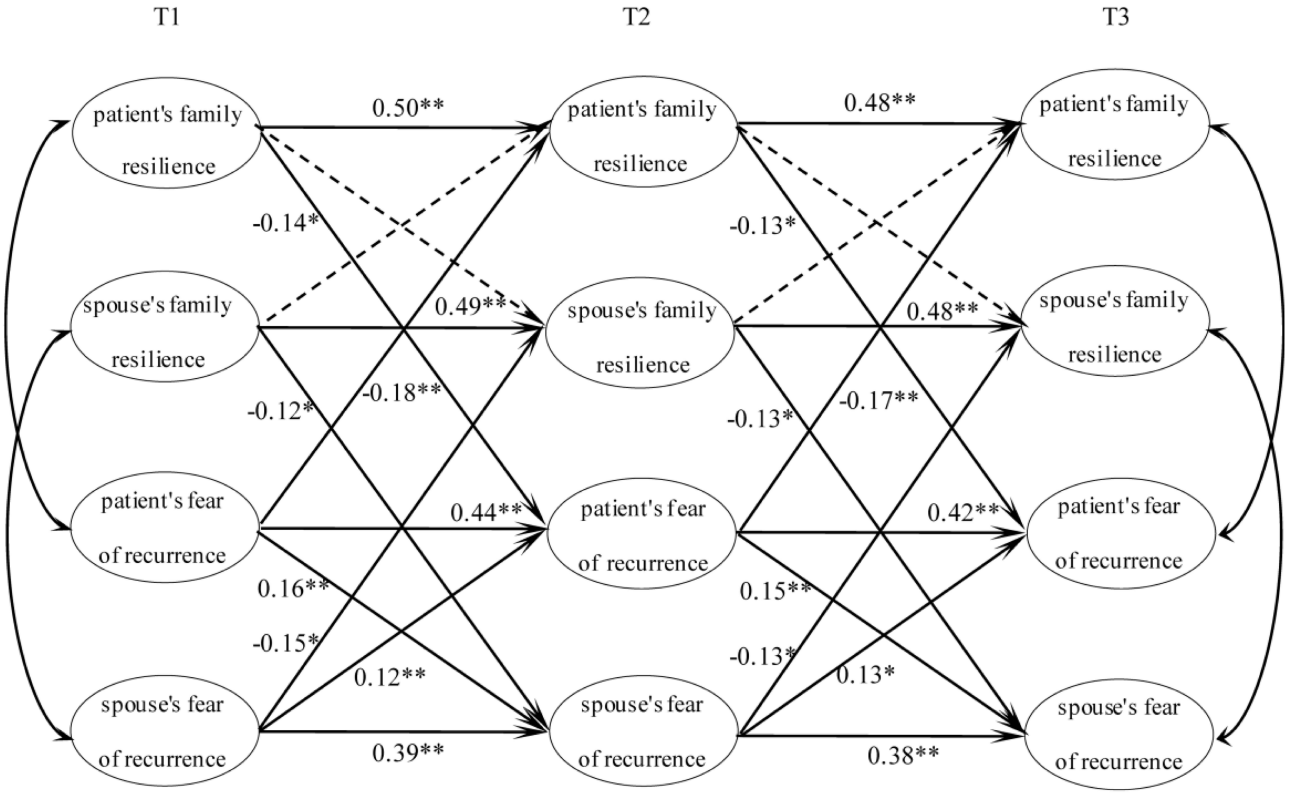

Figure 1 Cross-lagged actor-partner interdependence model of resilience and fear of disease recurrence in patients with adjacent vertebral refracture after OVCF and their spouses' families.

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Discussion

The results of this study found that family resilience increased and fear of disease recurrence decreased in patients with adjacent vertebral refracture after OVCF surgery and in their spouses 1 month after discharge. There are Few studies have examined family resilience in patients with refracture after OVCF. The reason for the increased family resilience of patients and their spouses may be due to the rapid increase in psychological endurance of patients and their families in the face of refracture in a short period of time, which may cause tension, anxiety, depression, self-doubt and other negative emotions[14] The level of family resilience also showed an increasing trend. Boukrab et al[15] found that the pain status of patients after OVCF surgery showed a significant downward trend, and pain was confirmed to be an important cause[16] Pain reduction is the basis for patients to cultivate positive emotions; therefore, patients' fear of recurrence decreases. Due to the multiple fractures of the patient, it is also a traumatic event for the spouse, and the spouse needs to take care of the patient, which requires the spouse to spend a lot of time and energy. Therefore, the spouse has a high level of fear of disease recurrence at the beginning. Most previous studies on fear of disease recurrence have been conducted in patients with malignant tumors, and the developmental trend of fear of disease recurrence was roughly the same as the results of this study.[17,18] This suggests that clinical medical staff, the fear of disease recurrence of patients reaches the highest level after surgery, should not only pay attention to the patient's disease care but also carry out the necessary assessment and management of the patient's psychological status, which has a positive effect on promoting the physical and mental health of patients.

This study found a bidirectional relationship between the family resilience of patients and their spouses and fear of disease recurrence. The actor effect of family resilience of patients with adjacent vertebral fractures after OVCF surgery and their spouses on fear of disease recurrence is significant; that is, the family resilience of patients and their spouses can negatively predict their fear of disease recurrence in the next stage. The psychological status of patients is affected by their own psychological resilience, and the level of family resilience can affect the psychological resilience of patients and their spouses, which can change the acceptance ability of patients and their spouses to deal with negative times to a certain extent.[19] However, the effect of family resilience on psychological resilience lagged behind. This also suggests that the family resilience of patients and their spouses can negatively predict their fear of disease recurrence in the next stage. Additionally, patients and their spouses with a higher level of family resilience have a relatively relaxed family atmosphere, which is conducive to the output of patients' negative emotions.[20,21] With the output of negative emotions, fear of disease recurrence in patients and their spouses decreases. Therefore, there is a lag between family resilience and the fear of disease recurrence. This study also found that the fear of disease recurrence of patients and their spouses had a significant actor effect on family resilience, that is, the fear of disease recurrence of patients and their spouses could negatively predict their own family resilience in the next stage. Patients and their spouses with fear of disease recurrence indulge in their own negative emotions, which is not conducive to the expression of positive emotions. Long-term negative emotions are detrimental to an individual's psychological resilience, thereby reducing family resilience.[22] Therefore, fear of disease recurrence had a lag effect on family resilience.

The results of this study found that the partner effect of fear of disease recurrence was significant; that is, fear of disease recurrence in patients and their spouses could positively predict fear of disease recurrence in the next stage. According to the family system theory,[23] family members can influence each other dynamically, which may cause a lag in the partner effect. Patients and their spouses with fear of disease recurrence often have poor emotional regulation abilities and are unable to effectively alleviate negative emotions caused by events.[24] In the conjugative system, the fear of disease recurrence of patients and their spouses creates a bad emotional family atmosphere, and the long-term effect makes it difficult for the other party to withdraw from the negative atmosphere, thus causing the fear of disease recurrence of the other party in the next stage.[25] This suggests that clinical medical staff should pay attention to the evaluation and management of family resilience and fear of disease recurrence in patients with adjacent vertebral refracture after OVCF surgery and their spouses, and make rational use of their correlation, which is conducive to reducing the level of fear of disease recurrence in patients and their spouses.

This study has the following shortcomings: it was only conducted in a single center, which may have caused large sampling errors. In the future, it will be necessary to expand the scope of sampling surveys to improve the

representativeness and applicability of the conclusions in follow-up research. In the future, parallel latent-variable models can be added to further explore bidirectional relationships and development trajectories.

Limitations

This study has several limitations. First, although the one-month post-discharge (T3) follow-up allowed us to capture early dynamics in family resilience and fear of disease recurrence during the transition from acute hospitalization to short-term home recovery, the one-month observation period inherently restricts insight into the long-term trajectories of these variables, such as their stabilization or potential fluctuations over six months or a year. This timeframe was selected primarily to focus on the critical early rehabilitation phase in OVCF patients with refractures and to minimize participant attrition; nevertheless, future studies should incorporate longer follow-up durations to fully elucidate long-term patterns. Second, despite efforts to control for several variables, unmeasured confounding factors—such as unevaluated personality traits (eg, neuroticism) in both patients and spouses, differences in the structure and quality of social support networks, and variations in adherence to anti-osteoporosis or analgesic medications—may have influenced both family resilience and fear levels. Their potential impact could not be fully ruled out in the present analysis. Future research should aim to include longer follow-up periods and integrate more comprehensive assessments of potential confounding variables.

Conclusion

There was a negative predictive relationship between family resilience and fear of disease recurrence in patients with adjacent vertebral fractures after OVCF and their spouses. The actors' effects were significant. The family resilience of both patients and their spouses could negatively predict fear of disease recurrence in the next stage, and the fear of disease recurrence in both patients and their spouses could negatively predict family resilience in the next stage. The partner effect was partially significant, and fear of disease recurrence in patients and their spouses could positively predict fear of disease recurrence in the next stage. These findings advocate for a clinical paradigm shift toward dyadic family interventions immediately after discharge from OVCF surgery. This shift should particularly focus on managing the spouse's fear of disease recurrence to enhance the patient's long - term family resilience.

Based on the study findings, the following clinical recommendations are proposed for the comprehensive management of elderly patients with adjacent vertebral fractures after OVCF surgery and their spouses:

Healthcare institutions should integrate psychological assessments for both patients and their spouses into routine care protocols. Utilizing standardized scales during the early postoperative phase (eg, hospitalization) and key transition periods (eg, at discharge and one-month post-discharge) allows for dynamic screening and identification of high-risk individuals. Building on this, family-centered intervention strategies should be implemented. Specifically, trained nurses or psychological counselors can provide psychological education based on Cognitive Behavioral Therapy (CBI) principles. This includes helping patients and spouses reframe misconceptions about pain and signs of recurrence, teaching active communication skills, and fostering methods for collaborative emotional regulation to alleviate anxiety and enhance shared coping confidence. Concurrently, standardized pain management adhering to stepwise analgesia principles is crucial. This involves the rational use of NSAIDs, weak opioids, and medications with dual benefits of analgesia and anti-osteoporosis (eg, teriparatide, calcitonin), ensuring effective pain control to establish a foundation for psychological recovery. Furthermore, a structured, phased rehabilitation plan is essential. Patients should be guided in safe bed-based activities and breathing exercises during hospitalization, followed by a gradual introduction of personalized lumbar and back muscle strengthening exercises, balance training, and activities of daily living guidance after discharge. Spouse involvement in supervising and assisting should be actively encouraged to improve function and reduce the risk of re-fracture. Finally, establishing a multi-disciplinary collaborative (MDT) support system is recommended. This system should integrate the expertise of orthopedists, rehabilitation therapists, nurses, and psychologists to provide continuous consultation and guidance for the family. When necessary, developing online support platforms offering resources like mindfulness exercises and health education materials can facilitate long-term home-based management for both patients and spouses. Through the above systematic, phased, and family-involved comprehensive

interventions, the psychological adaptability of patients and their spouses is expected to be effectively enhanced, optimizing long-term rehabilitation outcomes.

Data Sharing Statement

Data available on request from the authors.

The data supporting the findings of this study are available from the corresponding author, [SONG Hong], upon reasonable request.

Code of Ethics

This study was conducted in accordance with the Declaration of Helsinki. The study was approved by the Ethics Committee of the Second Affiliated Hospital of Xuzhou Medical University (approval number: zy202302205) and met ethical requirements. Informed consent was obtained from all patients in this study.

Disclosure

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The authors have no conflicts of interest to disclose.

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