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Article

The mediating role of social support in the relationship between self-disclosure and fear of cancer recurrence in breast cancer patients

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Abstract: Aim: To describe self-disclosure, social support, and fear of cancer recurrence (FCR) in breast cancer patients, explore their correlations, analyze factors influencing FCR, and examine the mediating role of social support between self-disclosure and FCR. Design: Cross-sectional survey design. Methods: A cross-sectional study of 350 breast cancer patients recruited from a tertiary tumor hospital in Guangzhou. Data were collected using general information questionnaire, Fear of Progression Questionnaire-Short Form, Distress Disclosure Index, and Social Support Rating Scale. Results: The total FCR score was 33.43 ± 8.00, with 46.3% of patients scoring ≥ 34. Self-disclosure score was 38.75 ± 9.18, and social support score was 70.57 ± 14.04. Univariate analysis showed that age, economic burden, family relationship, and sleep status significantly influenced FCR ($P < 0.05$). Multivariate analysis showed that four variables—patient age, sleep status, self-disclosure, and social support—had a significant impact in the multivariate analysis of the physical health dimension of FCR ($P < 0.05$); patient age, economic burden, self-disclosure, and social support had a significant impact in the multivariate analysis of the social and family dimension of FCR ($P < 0.05$). Self-disclosure and social support were negatively correlated with FCR ($r = -0.311$ to -0.400, $P < 0.01$). Structural equation modeling revealed that social support partially mediated the relationship between self-disclosure and FCR, with a mediating effect of 30.4%. Patient or Public Contribution: Breast cancer patients who received treatment at a tertiary-level Class A oncology hospital in Guangzhou between February and July 2023.

Keywords: mediating role; self-disclosure; social support; fear of cancer recurrence; breast cancer

1. Introduction

According to the most recent data from the International Agency for Research on Cancer, approximately 2.3 million new cases of breast cancer were reported globally in 2022, representing 11.7% of all new malignant tumor cases worldwide and ranking as the most prevalent form of cancer among females in terms of incidence [1]. In the United States, the incidence of breast cancer has been on the rise over the past few decades, especially among younger women. Studies have shown a significant increase in breast cancer incidence in women aged 20 to 39 [2,3]. With the widespread adoption of early screening and advancements in treatment technologies, the five-year survival rate for breast cancer patients in my country has surpassed 73% [4,5]. However, tumor recurrence and metastasis remain major challenges in clinical practice, and

patients under 40 years of age undergoing breast-conserving surgery have a significantly increased risk of local recurrence [6]. Over the extended course of managing the disease, individuals diagnosed with breast cancer must contend not only with physical symptoms and the adverse effects of treatment but also with considerable psychological distress. Among these psychological challenges, the FCR emerges as one of the most prominent and enduring issues [7–9].

FCR encompasses the apprehension, concern, and anxiety experienced by patients regarding the potential return, progression, or metastasis of cancer at the original or other sites [10–13]. While moderate levels of FCR can motivate patients to remain vigilant and actively monitor their health, persistently elevated levels of FCR may lead to anxiety and depression, impair social functioning, diminish treatment adherence and quality of life, and perpetuate a detrimental cycle of "fear-avoidance-worsening" [14–16]. Self-disclosure is the process through which individuals articulate their personal thoughts, feelings, and experiences to others, either verbally or in writing. This practice is recognized as an effective coping strategy for stress and has been validated as a modifiable psychological resource [17,18]. Social support, defined as the emotional, informational, and material assistance provided by one's social network, can mitigate the adverse effects of stressful events and enhance adaptability to disease and psychological resilience [19–21]. Research indicates a significant positive correlation between self-disclosure and social support [22], with both variables exhibiting a significant negative correlation with FCR [23]. Conversely, limited self-disclosure or perceived social constraints can intensify cognitive avoidance and intrusive thoughts, leading to increased FCR [24,25]. Consequently, social support may mediate the relationship between self-disclosure and FCR. Nonetheless, this pathway has not been thoroughly empirically validated in breast cancer patients, and there is a paucity of quantitative research within this theoretical framework [26].

Research on FCR commenced earlier in international contexts, resulting in the development of a relatively mature conceptual framework and assessment instruments. Systematic reviews indicate that between 33% and 96% of cancer survivors experience varying degrees of FCR, with some patients continuing to exhibit mild to moderate symptoms even after more than five years post-treatment completion [27]. The level of FCR among breast cancer patients is notably higher compared to those with lung, colorectal, and prostate cancers [28]. Longitudinal studies have demonstrated that FCR can manifest at the initial diagnosis and persist for many years without a natural trend towards remission [29–32]. In the context of breast cancer patients in China, FCR is also observed at a moderate to severe level [33–35], with 64.4% of patients meeting clinically significant criteria [36], and 46.3% experiencing psychological dysfunction. The factors influencing this phenomenon encompass demographic variables (such as age, family income, economic burden, and place of residence), disease and treatment characteristics (including stage and surgical method), and psychosocial elements (such as disease perception, anxiety and depression, coping style, self-disclosure, and social support), among others [37–42]. Current research on the FCR predominantly employs univariate or multivariate regression analyses. However, there is a paucity of studies investigating the mediation mechanisms from the perspective of self-disclosure while simultaneously considering social support as a central variable. Moreover, empirical examinations of the interaction pathways among these three factors are insufficient. Additionally, existing research predominantly utilizes generalized social support rating scales, with limited application of medical social support scales specifically designed for patients with chronic diseases. This limitation hinders the accurate assessment of the multidimensional support resources available to breast cancer patients within the context of their

disease.

Recent psychological interventions have increasingly focused on enhancing emotional regulation capabilities and improving the quality of life for cancer survivors. For instance, studies indicate that mindfulness-based stress reduction programs can improve interoception and body image in breast cancer patients, while structured psychological interventions effectively boost emotional regulation skills [43,44]. Furthermore, the use of decision aids in oncology care has been shown to alleviate patient distress and improve clinical outcomes. These approaches highlight the importance of addressing psychological factors such as self-disclosure and social support; these are modifiable variables that can be targeted through specific interventions to reduce FCR [45,46].

Building upon the aforementioned background, this study employs the self-disclosure model as its theoretical framework [47] and utilizes a cross-sectional survey design. Between February and July 2023, a cohort of 350 breast cancer patients was selected from a tertiary-level oncology hospital in Guangzhou. Data were collected using a general information questionnaire, the short-form Fear of Disease Progression Scale, the revised Distress Disclosure Index, and the Chinese version of the Medical Social Support Scale. The primary objectives were to: (1) describe the current status of self-disclosure, social support, and FCR among breast cancer patients; (2) examine the correlations among these three variables; (3) identify the main factors influencing FCR; and (4) test the mediating effect of social support between self-disclosure and FCR, and quantify the magnitude of this effect. We hypothesized that FCR would differ significantly across demographic and disease-related characteristics, that both self-disclosure and social support would be negatively correlated with FCR, and that social support would partially mediate the relationship between self-disclosure and FCR. This study is expected to offer a theoretical foundation and empirical evidence for reducing FCR levels and for developing psychosocial interventions centered on self-disclosure and social support. It also aims to provide clinical nurses with practical guidance for identifying high-risk patients and delivering targeted psychological care.

It is important to clarify that the current study is distinct from our previously published work [48]. While the earlier paper reported on the descriptive status and bivariate correlation between self-disclosure and social support in the same cohort, the present study investigates a substantively different research question: the mediating mechanism through which social support influences the relationship between self-disclosure and FCR. Moreover, this study employs structural equation modeling (SEM)—a more advanced analytical approach—to test the hypothesized mediation model, thereby offering a novel theoretical contribution to the psycho-oncology literature. The inclusion of FCR as a key outcome variable and the examination of indirect pathways represent significant extensions that were not addressed in our previous publication.

2. Materials and methods

2.1. Study design

This study employs a cross-sectional survey design utilizing convenience sampling. Data pertaining to general information, self-disclosure, social support, and FCR among breast cancer patients were gathered via questionnaires. The relationships and mediating effects among these variables were subsequently analyzed. Ethics Approval and Institution: Approval was obtained from the Ethics Committee of Sun Yat-sen University Cancer Center (Approval No. B2023-700-01). Collection Period: February and July 2023.

It should be noted that the baseline demographic characteristics and the descriptive data on self-disclosure and social support reported were derived from

the same patient cohort as our previously published study [48]. Although some descriptive findings overlap with the prior publication, the current study addresses a distinct research question and provides novel insights beyond the earlier work.

2.2. Study subjects

2.2.1. Target population and accessible population

The target population comprised individuals diagnosed with breast cancer. The accessible population included those breast cancer patients who sought treatment at a tertiary-level Class A oncology hospital in Guangzhou during the period from February to July 2023.

2.2.2. Inclusion and exclusion criteria

Inclusion criteria for the study are as follows: Participants must be aged 18 years or older; They must have a pathologically confirmed diagnosis of breast cancer; They must have attained at least a primary school level of education. Exclusion criteria include: Presence of distant metastasis or recurrence of the disease; A history of significant organ diseases or other malignant tumors; Presence of mental illness or cognitive impairment.

2.2.3. Sampling method and sample size

This study adopted a convenience sampling approach. The sample size was determined in accordance with the requirements of Structural Equation Modeling (SEM). Following the widely accepted rule of thumb that SEM requires at least 10 observations per estimated parameter [49], and given that the proposed model involves approximately 30 parameters, we derived a baseline sample size of 300. To further ensure stable estimation results given the complexity of SEM, and in line with the recommendations of Kline and colleagues (who suggest a minimum of 200 cases for such analyses) [50], we confirmed that our baseline already exceeded this threshold. Anticipating a potential 20% rate of invalid questionnaires, we set the final target at $30 \times 10 \times (1 + 0.20) = 360$. A total of 362 questionnaires were distributed, and 350 valid responses were obtained, yielding a valid response rate of 96.7%, which comfortably satisfies the prerequisites for SEM estimation.

2.3. Research tools

2.3.1. General information questionnaire

Developed by the author following a comprehensive literature review, the framework encompasses both sociodemographic variables—such as age, gender, ethnicity, religious affiliation, marital status, number of children, educational attainment, average monthly household income, economic burden, place and mode of residence, family dynamics, occupational status, and healthcare payment method—and disease-specific information, including pathological stage, tumor classification, surgical approach, familial tumor history, comorbid conditions, sleep patterns, and postoperative adjuvant therapy.

2.3.2. Fear of Disease Progression Simplified Scale (FoP-Q-SF)

Originally developed by Mehnert et al. [51] and subsequently translated into Chinese by Wu Qiyun et al. [52], this instrument comprises 12 items categorized into two dimensions: physical health and social/family. It employs a Likert scale ranging from 1 to 5 points, yielding a total possible score between 12 and 60 points. Higher scores reflect a greater degree of self-disclosure. The scale demonstrated a Cronbach's α coefficient of 0.883, signifying robust reliability and validity.

2.3.3. Revised version of the Disclosure Index (DDI)

The instrument, originally developed by Hessling [53] and subsequently translated and revised by Li Xinmin [54], comprises 12 items. It utilizes a

5-point Likert scale, with 6 of these items reverse-scored. The cumulative score spans from 12 to 60 points, where a higher score signifies an elevated level of self-disclosure. The scale demonstrated a Cronbach's α coefficient of 0.866, indicating good internal consistency.

2.3.4. Chinese version of the Medical Social Support Scale (MOS-SSS-CM)

Originally developed by Sherbourne and Stewart [55] and subsequently translated by Li Huan [56], the instrument comprises 20 items encompassing four dimensions: emotional information support, practical support, resilience support, and emotional support. Each item is assessed using a 5-point Likert scale, with scores linearly transformed to a 0-100 range. Higher total scores reflect greater levels of social support. The scale demonstrates strong internal consistency, with a Cronbach's α coefficient of 0.889, and exhibits satisfactory test-retest reliability, evidenced by a coefficient of 0.77.

2.4. Data collection

2.4.1. Data collection procedures

Prior to data collection, ethical approval was obtained from the hospital's ethics committee. Patient disease-related information was accessed through the hospital's Health Information System (HIS), and eligible participants were identified based on predetermined inclusion and exclusion criteria. During outpatient visits or hospitalization, trained researchers approached potential participants, provided a brief introduction to the study's purpose, significance, and confidentiality measures, and offered detailed information sheets to those who expressed preliminary interest. Written informed consent was secured from all participants before they completed the questionnaires. Standardized instructions were given to clarify the response requirements, and uniform wording was used to address any questions raised by patients, thereby minimizing the possibility of suggestive cues. All questionnaires were collected on-site, and each returned form was systematically checked for completeness.

2.4.2. Quality control

Prior to the survey, researchers underwent standardized training to acquaint themselves with the questionnaire content and survey methodologies. Study participants were rigorously selected based on predefined inclusion and exclusion criteria. Post-collection, questionnaires exhibiting regular response patterns, logical inconsistencies, or missing data exceeding 10% were excluded from the analysis. Data entry was conducted independently by two individuals and subsequently cross-verified for accuracy. During the statistical analysis phase, consultation with statistical experts was sought to ensure the methodological rigor and accuracy of the analyses.

2.5. Statistical analysis

Data analysis was performed using SPSS 25.0 and AMOS 26.0, with a two-tailed significance level set at $\alpha = 0.05$. (1) Descriptive statistics: normally distributed continuous variables were expressed as mean ± standard deviation (Mean ± SD), while categorical variables were summarized as frequencies and percentages. (2) Univariate analysis: independent-samples t-tests or one-way ANOVA were used to compare FCR scores across different patient subgroups, with post-hoc pairwise comparisons conducted using the LSD-t method. (3) Correlation analysis: Pearson's correlation coefficients were computed to examine the relationships among self-disclosure, social support, and FCR (total score and subdimensions). (4) Multivariate analysis: variables that reached statistical significance in univariate and correlation analyses were entered as independent variables, with the total FCR score as the dependent variable, in a stepwise multiple linear regression. (5) Mediation analysis: a structural equation model

was constructed using AMOS 26.0, with parameters estimated via maximum likelihood and the model subsequently refined based on modification indices. The mediating effect of social support was tested using bias-corrected bootstrapping (5,000 resamples), and the effect size along with its 95% confidence interval were calculated.

3. Results and discussion

3.1. Baseline demographics of included patients

The demographic characteristics of the 350 breast cancer patients enrolled in this study are presented in **Table 1**. Patients ranged in age from 25 to 77 years, with a mean of 45.39 ± 9.68 years; the majority (57.7%) were aged 41–60 years. Women comprised 99.1% of the cohort. Religious beliefs were reported by 5.7% of participants. Married patients accounted for 89.7%. Among the 321 patients who had given birth, most had 1–2 children; 60.1% had a youngest child still underage, with a mean age of 14.94 ± 11.48 years. In terms of educational attainment, a university degree or above was the most common (48.6%). Household per capita monthly income was predominantly above 5,000 yuan (54.6%). More than half of the patients (63.7%) reported experiencing financial burden to some degree, with 15.7% considering it severe. Urban residents accounted for 51.8%, and the great majority (92.9%) lived with family members. Harmonious family relationships were reported by 84.3% of patients, while 15.1% rated their family relationships as average. Most patients were employed both before and after diagnosis (67.4% and 61.1%, respectively). Medical insurance was the primary payment method (95.7%). Disease-related characteristics are summarized in **Table 2**. The predominant pathological type was invasive carcinoma (89.4%), and the most common clinical stage was stage II (44.9%). Breast-conserving surgery was chosen by 56.9% of patients. A family history of tumors was present in 28.3%. Sixty-seven patients (19.1%) had one or more chronic comorbidities, with hypertension being the most frequent. Postoperative radiotherapy, chemotherapy, targeted therapy, or other treatments were clearly indicated for 20.3% of patients. Regarding sleep quality, 55.7% of patients reported average sleep quality.

Table 1. Baseline demographics of breast cancer patients (n = 350).

Variables	N	(%)
Age		
18–40	121	34.6
41–60	202	57.7
61–77	27	7.7
Gender		
Male	3	0.9
Female	347	99.1
Religious belief		
None	330	94.3
Yes	20	5.7
Children status		
None	29	8.3
1	140	40.0
2	144	41.1
≥ 3	37	10.6
The average age of all children		
< 18	177	55.1

Continued table:

Variables	N	(%)
≥ 18	144	41.1
Per capita monthly income of the household		
≤ 3000	48	13.7
3001–5000	111	31.7
> 5000	191	54.6
Place of residence		
Rural area	81	23.1
Town	88	25.1
City	181	51.8
Family Relationship		
Poor	2	0.6
Mediocre	53	15.1
Harmonious	295	84.3
Current Occupation		
Retirement	59	16.9
Unemployed	77	22.0
Employed	214	61.1
Marital status		
Single/Never married	17	4.9
Married/Widowed	19	5.4
Married	314	89.7
Youngest child’s age		
< 18	193	60.1
≥ 18	128	36.6
Educational level		
Junior high school or below	96	27.4
Senior high school or technical secondary school	84	24.0
College degree or above	170	48.6
Financial burden		
No burden at all	72	20.6
Moderate burden	223	63.7
Heavy burden	55	15.7
Living arrangement		
Living alone	20	5.7
Living with friends	5	1.4
Living with family	325	92.9
Occupation before illness		
Retired	52	14.9
Unemployed	62	17.7
Employed	236	67.4
Medical payment method		
Public-funded	8	2.3
Medical insurance	335	95.7
Self-pay	7	2.0

Note: Medical insurance includes Urban Resident Basic Medical Insurance, Urban Employee Basic Medical Insurance, the New Rural Cooperative Medical Scheme, and Commercial Medical Insurance.

Table 2. Information on disease-related conditions in breast cancer patients (n = 350).

Variables	N	(%)
Pathological staging		
Stage 0	31	8.9
Stage I	93	26.6
Stage II	157	44.9
Stage III	69	19.7
Surgical procedure		
Non-breast-conserving surgery	151	43.1
Breast-conserving surgery	199	56.9
With comorbidity		
Yes	67	19.1
None	283	80.9
Sleep status		
Poor	67	19.1
Mediocre	195	55.7
Good	88	25.2
Tumor type		
Non-invasive carcinoma	37	10.6
Invasive carcinoma	313	89.4
Family medical history of cancer		
None	251	71.7
Yes	99	28.3
Whether surgery is combined with radiotherapy/chemotherapy/targeted therapy/endocrine therapy		
Yes	71	20.3
None	279	79.7

Note: Family history of cancer includes breast cancer, lung cancer, liver cancer, etc.; patients with comorbidities primarily present with one or more chronic diseases, such as hypertension, diabetes, coronary heart disease, and stroke.

3.2. Analysis of the current status of FCR in breast cancer patients

The mean score for FCR among breast cancer patients was 33.43 ± 8.00, with the physiological health dimension score (18.11 ± 4.12) being higher than the social/family dimension score (15.32 ± 4.66), as detailed in **Table 3**. Of the breast cancer patients, 81.4% had a moderate level of FCR, and 169 patients (46.3%) had a score ≥ 34, indicating a psychologically dysfunctional level of FCR, as detailed in **Tables 3 and 4**.

Table 3. FCR scores in breast cancer patients (n = 350).

Dimension	Mean±SD	Score range	Actual score
Fear of recurrence score	33.43 ±8.00	12–60	15–57
Physical health dimension	18.11±4.12	6–30	8–30
Social and family dimension	15.32 ±4.66	6–30	6–30

Table 4. Level of FCR (n = 350).

Fear of recurrence level	N	(%)
Low level (12–25)	45	12.9

Continued table:

Fear of recurrence level	N	(%)
Medium level (26–46)	285	81.4
High level (47–60)	20	5.7

3.3. Analysis of the current status of self-disclosure in breast cancer patients

The total score on the Self-Disclosure Scale for breast cancer patients was (38.75 ± 9.18), which was at a moderate level. Graded statistics of patients' self-disclosure scores showed that 15.7% of breast cancer patients were at a low level of self-disclosure, 58.3% were at a moderate level, and 26% were at a high level. See **Table 5** for details.

Table 5. Level of self-disclosure in breast cancer patients.

Self-disclosure level	N	(%)
Low level (12–29)	55	15.7
Medium level (30–44)	204	58.3
High level (45–60)	91	26

3.4. Analysis of the current status of social support in breast cancer patients

In this study, the social support scores of breast cancer patients ranged from 35 to 95, with a mean score of (70.57 ± 14.04). Among the dimensions, the emotional/informational support dimension scored the highest (28.39 ± 6.06), while the affectionate support dimension scored the lowest (11.70 ± 2.55), as detailed in **Table 6**.

Table 6. Scores for each dimension of social support in breast cancer patients.

Dimension	Mean±SD	Score range
Total emotional/informational support score	28.39 ±6.06	15–40
Total tangible support score	15.62 3.31	6–20
Total affectionate support score	14.85 ±3.23	4–20
Total affectionate support score	11.70±2.56	4–15
Total social support score	70.57±14.04	35–95

3.5. Correlation analysis of self-disclosure, social support, and FCR in breast cancer patients

3.5.1. Correlation between self-disclosure and FCR in breast cancer patients

Pearson correlation analysis was used to examine the relationship between self-disclosure and FCR in breast cancer patients. The results showed that self-disclosure was negatively correlated with FCR ($r = -0.394$, $p < 0.01$), and negatively correlated with the physical health and social/family dimensions ($r = -0.319$ to -0.394, $p < 0.01$). See **Table 7** for details.

Table 7. Correlation analysis between self-disclosure and FCR in breast cancer patients.

Variables	FCR	Physical health	Social and family
Self-disclosure	-0.394**	-0.319**	-0.394**

Continued table:

Variables	FCR	Physical health	Social and family

*Note: **p < 0.01, * p < 0.05.*

3.5.2. Correlation between social support and FCR in breast cancer patients

Pearson correlation analysis was used to explore the relationship between social support and FCR in breast cancer patients. The results showed that social support was negatively correlated with FCR and its dimensions ($r = -0.311$ to -0.400, $p < 0.01$); each dimension of social support was negatively correlated with FCR ($r = -0.341$ to -0.382, $p < 0.01$); and each dimension of social support was negatively correlated with each dimension of FCR ($r = -0.261$ to -0.392, $p < 0.01$). See **Table 8** for details.

Table 8. Correlation analysis between social support and FCR in breast cancer patients.

Variables	FCR	Physical health	Social and family
Social support	-0.393**	-0.311**	-0.400**
Emotional/informational support	-0.373**	-0.303**	-0.372**
Tangible support	-0.382**	-0.296**	-0.394**
Affectionate support	-0.345**	-0.272**	-0.352**
Emotional support	-0.341**	-0.261*	-0.354**

*Note:**p < 0.01, * p < 0.05.*

3.5.3. Correlation between self-disclosure and social support in breast cancer patients

Pearson correlation analysis was conducted on self-disclosure and social support in breast cancer patients. The results showed that self-disclosure was positively correlated with social support ($r = 0.433$, $p < 0.01$), and positively correlated with emotional/informational support, tangible support, affectionate support, and emotional support ($r = 0.331$ to 0.453, $p < 0.01$). See **Table 9** for details

Table 9. Correlation analysis between self-disclosure and social support in breast cancer patients.

Variables	Social support	Emotional/informational support	Tangible support	Affectionate support	Emotional support
Self-disclosure	0.433**	0.453**	0.331**	0.401**	0.366**

*Note: * p < 0.05, ** p < 0.01.*

3.6. Univariate analysis of FCR in breast cancer patients

General data were compared between groups using the independent samples t-test and one-way ANOVA to analyze FCR and its dimensions in breast cancer patients. Variables showing statistical significance were further analyzed using the LSD-t test. The results showed that factors such as age, per capita monthly household income, economic burden, place of residence, family relationships, occupational status before and after diagnosis, and sleep status had significant effects on the total FCR score. Specifically, patients aged 18–40 years, with a per capita monthly household income of 3001–5000 RMB, a heavy economic burden, living in rural areas, having average family relationships, being unemployed, and having poor sleep quality reported higher levels of FCR ($P < 0.05$). In addition,

significant differences were found in the physical health and social/family dimension scores among patients with different ages, economic burdens, family relationships, and sleep status. No significant differences were observed in the scores of any FCR dimension based on gender, ethnicity, religious belief, marital status, number of children, living arrangement, medical payment method, disease stage, tumor type, surgical procedure, family history of cancer, comorbidities, or postoperative treatment modality. Differences in social/family dimension scores were found based on the age of children, educational level, per capita monthly household income, place of residence, and occupational status before and after diagnosis.

3.7. Multivariate analysis of factors associated with FCR in breast cancer patients

3.7.1. Multivariate analysis of the physical health dimension of FCR in breast cancer patients

The physical health dimension of FCR in 350 breast cancer patients was set as the dependent variable. Factors with statistical significance in the univariate and correlation analyses were taken as independent variables for multiple linear regression analysis. The independent variables specifically included patient age, average age of the youngest child, average age of all children, economic burden, family relationships, sleep status, self-disclosure, and social support. Stepwise regression was used for the multiple linear regression analysis, with α entry $= 0.05$ and α removal $= 0.10$. The results showed that a total of four variables—patient age, sleep status, self-disclosure, and social support—were included in the multiple linear regression model. The coefficient of determination (R^2) for this model was 0.186, and the adjusted R^2 was 0.177, indicating that 18.6% of the variance in the physical health dimension of FCR in breast cancer patients could be jointly explained by patient age, sleep status, self-disclosure, and social support. The specific results are shown in **Table 10**.

Table 10. Multivariate analysis of the physical health dimension of FCR in breast cancer patients.

Variables	Unstandardized coefficient	Std. Error	β	*t*	*p*	R^2	Collinearity test	
							tolerance	*VIF*
(Constant)	5.122	0.26		19.702	< 0.001	0.186		
Age	-0.01	0.003	-0.135	-2.765	0.006		0.996	1.004
Sleep status	-0.191	0.052	-0.185	-3.697	< 0.001		0.943	1.06
Self-disclosure	-0.215	0.048	-0.24	-4.447	< 0.001		0.81	1.235
Social support	-0.156	0.051	-0.168	-3.036	0.003		0.77	1.298

3.7.2. Multivariate analysis of the social and family dimension of FCR in breast cancer patients

Variables that demonstrated statistical significance in the univariate and correlation analyses were entered as independent variables in the linear regression analysis. The candidate set included patient age, average age of the youngest child, average age of all children, economic burden, family relationships, sleep status, educational level, per capita monthly household income, place of residence, occupational status before and after diagnosis, self-disclosure, and social support. A stepwise multiple linear regression was then performed, with an entry criterion of $\alpha = 0.05$ and a removal criterion of $\alpha = 0.10$. The results showed that four variables—patient age, sleep status, self-disclosure, and social support—were retained in the final model. This model yielded a coefficient of determination (R^2) of 0.331 and an adjusted R^2 of 0.321, indicating that these four factors jointly

explained 33.1% of the variance in the social and family dimension of FCR among breast cancer patients. Detailed regression results are presented in **Table 11**.

Table 11. Multivariate analysis of the social and family dimension of FCR in breast cancer patients.

Variables	Unstandardized coefficient	Std. Error	β	*t*	*p*	R^2	Collinearity test	
							tolerance	*VIF*
(Constant)	5.023	0.3		16.764	< 0.001	0.331		
Age	-0.021	0.004	-0.256	-5.702	< 0.001		0.966	1.035
Economic burden								
No burden at all	Reference	/	/	/	/			
Heavy burden	0.461	0.124	0.216	3.703	< 0.001		0.571	1.75
Some burden	0.267	0.089	0.165	2.994	0.003		0.638	1.566
Self-disclosure	-0.275	0.05	-0.271	-5.514	< 0.001		0.807	1.24
Social support	-0.24	0.054	-0.229	-4.455	< 0.001		0.738	1.355

3.8. Structural equation model of self-disclosure, social support, and FCR in breast cancer patients

3.8.1. Model fit

To explore the relationships among self-disclosure, social support, and FCR in breast cancer patients, we constructed a structural equation model and performed path analysis using AMOS 26.0, based on the research hypotheses and preliminary statistical results. In this model, self-disclosure served as the independent variable, social support as the mediating variable, and FCR as the dependent variable. The initial hypothesized model is depicted in **Figure 1**, with all path coefficients presented as standardized estimates. The goodness-of-fit indices were as follows: $\chi^2/df = 3.935$, CFI $= 0.979$, GFI $= 0.962$, AGFI $= 0.912$, NFI $= 0.972$, IFI $= 0.979$, and RMSEA $= 0.092$. While the CFI, GFI, AGFI, NFI, and IFI all exceeded the commonly recommended thresholds (e.g., $>$ 0.90), the χ^2/df ratio and RMSEA were above the acceptable cutoffs (typically $<$ 3.0 and $<$ 0.08, respectively), indicating that the overall model fit was suboptimal and required modification.

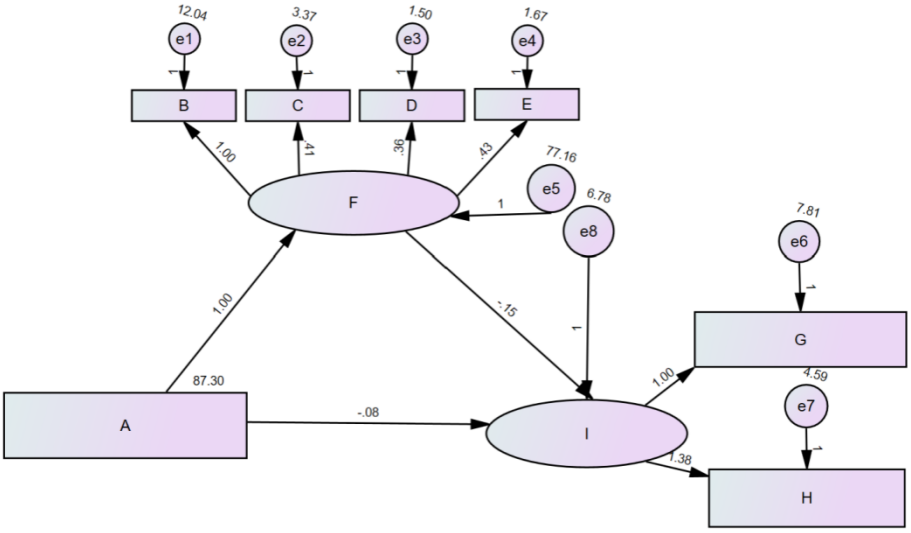

Figure 1. Initial model based on the hypotheses.

Note: A: Self-disclosure; B: Informational support; C: Tangible support; D: Emotional support; E: Affectionate support; F: Social support; G: Physical health dimension; H: Social and family dimension; I: FCR.

3.8.2. Model modification indices

The data were re-imported into the software, and parameter estimation was performed using the maximum likelihood method. The initial model was modified using modification indices (MI). In this study, the initial model was modified twice by establishing covariance relationships between residual terms e1 and e3, and between e1 and e4, resulting in the modified model shown in **Figure 2**. After model modification, the goodness-of-fit indices improved compared to the initial model, indicating a better fit. See **Table 12** for details.

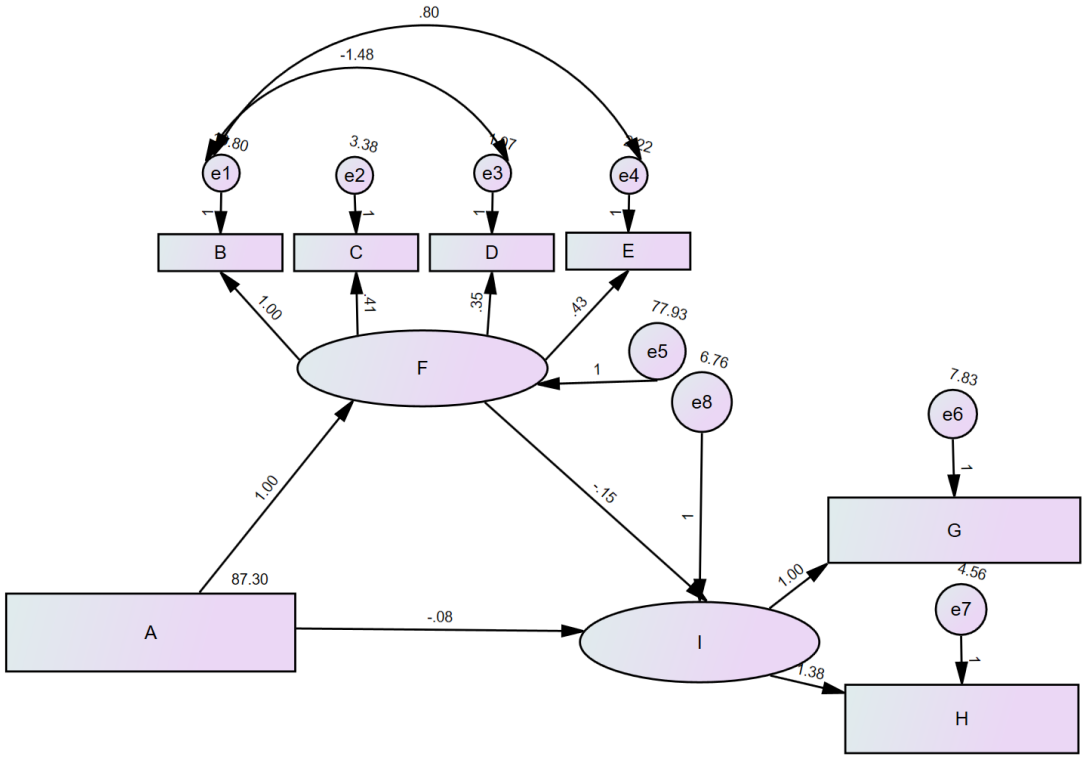

Figure 2. Modified structural equation model.

Note: A: Self-disclosure; B: Informational support; C: Tangible support; D: Emotional support; E: Affectionate support; F: Social support; G: Physical health dimension; H: Social and family dimension; I: FCR.

Table 12. Goodness-of-fit table for the modified structural equation model.

Fit index	CMIN	df	CMIN/DF	NFI	IFI	TLI	CFI	GFI	RMSEA
Recommended value			1 < NC < 3	> 0.9	> 0.9	> 0.9	> 0.9	> 0.9	< 0.05
Observed value	213.713	194	2.645	0.983	0.989	0.979	0.989	0.976	0.057

3.8.3. Path analysis of self-disclosure, social support, and FCR in breast cancer patients

In the path analysis of self-disclosure, social support, and FCR in breast cancer patients, all path coefficients were statistically significant ($P < 0.001$). See **Table 13** for details. For the path social support <— self-disclosure, the standardized path coefficient was 0.435 ($P < 0.05$), indicating that self-disclosure significantly and positively predicted social support. For the path FCR <— social support, the standardized path coefficient was -0.304 ($P < 0.05$), indicating that social support significantly and negatively predicted FCR. For the path FCR

< — self-disclosure, the standardized path coefficient was -0.301 (P < 0.05), indicating that self-disclosure significantly and negatively predicted FCR.

Table 13. Path coefficients for self-disclosure, social support, and FCR in breast cancer patients.

Path			Estimate	B	SE	*C.R.*	*P*
Social support	< —	Self-disclosure	0.435	0.131	0.016	8.341	< 0.001
FCR	< —	Social support	-0.304	-0.468	0.096	-6.531	< 0.001
FCR	< —	Self-disclosure	-0.301	-0.140	0.027	-4.423	< 0.001
M1	< —	Social support	0.834	1			
M2	< —	Social support	0.903	1.980	0.097	20.338	< 0.001
M3	< —	Social support	0.946	1.107	0.053	20.974	< 0.001
M4	< —	Social support	0.892	0.827	0.035	23.366	< 0.001
Y1	< —	FCR	0.722	0.699	0.078	8.98	< 0.001
Y2	< —	FCR	0.913	1			

3.8.4. Mediating effect of social support on the relationship between self-disclosure and FCR in breast cancer patients

We employed the Bootstrap method to test the mediating effect of social support among breast cancer patients. In the model with self-disclosure as the independent variable, social support as the mediator, and FCR as the dependent variable, the direct effect was -0.301, the indirect effect was -0.132, and the total effect was -0.434; all three effects had bias-corrected confidence intervals that excluded zero, supporting the mediation hypothesis. The indirect effect accounted for 30.4% (-0.132/-0.434) of the total effect, indicating that social support partially mediated the relationship between self-disclosure and FCR. See **Table 14** for details.

Table 14. Mediating effect test.

Relationships between variables	Effect size	Bootstrap SE	95%CI		*P*
			Upper	Lower	
Direct effect (self-disclosure → FCR)	-0.301	0.065	-0.424	-0.178	P < 0.01
Indirect effect (self-disclosure → social support → FCR)	-0.132	0.039	-0.209	-0.076	P < 0.01
Total effect (self-disclosure → FCR, and self-disclosure → social support → FCR)	-0.434	0.05	-0.526	-0.325	P < 0.01

4. Discussion

This study included a cohort of 350 breast cancer patients, with a mean age of 45.39 ± 9.68 years (the youngest being 25 years old). The majority (57.7%) were aged 41–60 years. In terms of demographic characteristics, most patients were married (89.7%), had children (91.7%), and lived with their families (92.9%); moreover, 84.3% reported harmonious family relationships, indicating a generally stable family support system. Educational backgrounds were diverse: 48.6% held a college degree or above, whereas 27.4% had completed junior high school or less, reflecting heterogeneity in the capacity to process health information. Economically, 54.6% of patients reported a monthly per capita household income exceeding 5,000 yuan. However, 63.7% experienced financial strain, with 15.7% describing it as severe, underscoring the persistent economic burden imposed by prolonged treatment and the high costs associated with

breast cancer. With regard to clinical characteristics, invasive carcinoma was predominant (89.4%), and stage II patients constituted the largest subgroup (44.9%). Breast-conserving surgery was performed in 56.9% of cases. Regarding sleep quality, 19.1% of patients reported poor sleep, while 55.7% reported average sleep, suggesting that sleep disturbances are a notable concern that warrants attention in this population.

In this study, the overall self-disclosure score among breast cancer patients was found to be 38.75±9.18, indicating a moderate level of self-disclosure, which aligns with the findings of Zhong Qi [57]. Specifically, 58.3% of the patients exhibited a moderate level of self-disclosure, while 15.7% demonstrated a low level, suggesting that a significant portion of patients may conceal their true emotions when managing their illness. Item analysis revealed that patients were inclined to "talk to friends" (mean score of 3.50 ± 1.04) when experiencing low moods, yet they infrequently "talked about things that made them sad" (mean score of 3.05 ± 1.10). This pattern reflects a limited depth of self-disclosure, potentially attributable to concerns about burdening others or being perceived as weak, thereby leading to selective disclosure [58]. The overall social support score was 70.57 ± 14.04, indicating a slightly above-average level, consistent with the findings of Ma Yufeng [59] and Zhang Hailing [60]. Among the various dimensions assessed, the emotional information support dimension had the lowest average score (3.55 points), whereas the actual support dimension had the highest average score (3.91 points). This suggests that while patients received adequate care and financial assistance, their needs for disease-related knowledge, emotional support, and professional advice were not fully addressed. This phenomenon may be attributed to limited doctor-patient communication time, variations in patients' information literacy, and the traditional cultural value of "emotional restraint". The total score for FCR was 33.43 ± 8.00 points, with 81.4% of patients experiencing a moderate level of fear. Notably, 46.3% of patients scored ≥ 34 points, meeting the clinical criteria for psychological dysfunction. These findings align with those reported by Rathi et al. [61]. The Pearson correlation analysis revealed a significant negative correlation between self-disclosure and FCR in breast cancer patients ($r = -0.394$, $P < 0.01$). This indicates that higher levels of self-disclosure are associated with lower levels of FCR, corroborating the findings of Chen et al. [62] and Wang Fan [63]. As a positive emotion regulation strategy, self-disclosure enables patients to alleviate internal repression through verbal expression, thereby reducing catastrophic thinking about cancer recurrence. Additionally, it facilitates feedback and emotional resonance from others [47]. According to the social cognitive processing model, the ability of patients to openly express cancer-related concerns can diminish intrusive thinking and cognitive avoidance, fostering cognitive re-evaluation of disease-related information and consequently reducing fear levels [24]. This study further substantiates that self-disclosure serves as an independent protective factor against FCR ($\beta = -0.291$, $P < 0.01$). Social support demonstrated a significant negative correlation with FCR ($r = -0.393$, $P < 0.01$), aligning with the findings of Ye Chunli [36] and Yu et al. [64]. This suggests that social support can alleviate the adverse effects of stressful events on mental health through a "buffering effect" [65]. Individuals with high levels of social support are more likely to receive emotional comfort, disease management information, and practical assistance, thereby enhancing their confidence in managing their condition and reducing hyper-vigilance regarding physical symptoms. In this study, the negative predictive impact of social support on the social-family dimension of FCR ($r = -0.400$) was more pronounced than its effect on the physical health dimension ($r = -0.311$). This indicates that family function and close relationships hold unique significance in mitigating FCR, consistent with the central role of "family" as a

source of emotional support within the context of Chinese culture. Self-disclosure and social support demonstrated a significant positive correlation ($r = 0.433$, $P < 0.01$), indicating that higher levels of self-disclosure are associated with increased perceptions of social support. This finding aligns with the research of Xu Huiwen [66] concerning patients with type 2 diabetes. Self-disclosure serves as a crucial antecedent behavior for acquiring social support, as patients who actively communicate their needs and concerns are more likely to engage the attention and assistance of relatives, friends, and healthcare professionals, thereby establishing a beneficial cycle of "disclosure-support-benefit" [66]. In contrast, limited self-disclosure or perceived social constraints may lead to patient withdrawal, subsequently diminishing the effectiveness of their social support network [67]. Underlying the aforementioned correlations is a complex, multi-layered mechanism. Firstly, the social cognitive processing model suggests that self-disclosure facilitates patients' emotional processing and integration of cancer-related information by mitigating cognitive avoidance of threatening information and reducing intrusive thoughts, thereby directly alleviating the fear of relapse [24]. Secondly, within the context of Chinese culture, individuals often express their needs through implicit disclosure. This subtle communication prompts relatives and friends to provide tangible care and emotional support, thereby establishing a reciprocal cycle of "disclosure-support-benefit". Such support not only offers material relief but also helps reconstruct patients' cognitive appraisal of the disease's uncontrollability by enhancing their sense of acceptance and self-worth [68]. Furthermore, the act of disclosure itself can activate patients' proactive coping strategies and bolster their self-efficacy in seeking assistance, thereby indirectly increasing their utilization of social support. The relationship among the three is not unidirectional and linear but a dynamic adaptive system with social support at its core.

A multiple linear regression analysis identified patient age, sleep status, economic burden, average monthly household income, self-disclosure, and social support as independent factors influencing FCR, collectively accounting for 32.2% of the total variance (adjusted $R^2 = 0.308$). Age demonstrated a negative correlation with FCR ($\beta = -0.198$, $P < 0.001$), with younger patients (aged 18–40 years) exhibiting significantly higher levels of fear compared to middle-aged and older patients. This finding aligns with the research conducted by Lebel [69]. Young breast cancer patients are often in a critical phase of career development, marriage, childbearing, and family responsibilities. A cancer diagnosis not only poses a threat to their lives but also affects their diverse social roles. Factors such as body image changes due to mastectomy, treatment-related ovarian dysfunction, and the responsibilities of child-rearing further intensify their concerns about disease recurrence. Additionally, this study observed that patients with minor children experienced significantly higher FCR levels compared to those with adult children ($P < 0.05$), reinforcing the notion that family responsibilities constitute a significant source of stress for younger patients. Sleep status emerged as a significant predictor of FCR ($\beta = -0.146$, $P = 0.002$), with patients experiencing poorer sleep exhibiting elevated FCR levels, aligning with the findings of the Lowery-Allison longitudinal study [70]. FCR and sleep disorders exhibit a bidirectional relationship: anxiety about recurrence can result in difficulties with sleep onset and maintenance, while inadequate sleep impairs mood regulation and heightens attentional bias towards threatening information, thereby perpetuating a vicious cycle [71]. Consequently, sleep assessment should be integrated into the routine care of patients at high risk for FCR in clinical settings. The economic burden and average monthly household income serve as indicators of the patient's economic status. In this study, patients who reported a significant economic burden ($\beta = 0.231$, $P < 0.001$) and those with an average monthly

household income of $\leq$ 3000 yuan (β = -0.122, P = 0.012) demonstrated higher levels of FCR. The prolonged duration of adjuvant therapies for breast cancer, such as targeted therapy, endocrine therapy, and radiotherapy, coupled with the substantial out-of-pocket costs for certain medications, directly contribute to the fear of incurring additional medical expenses following disease progression [39]. Even with basic medical insurance, indirect costs (transportation, lost work time, nutrition) still constitute a heavy burden. Self-disclosure (β = -0.291, P < 0.001) and social support (β = -0.188, P < 0.001) emerged as the most significant negative predictors of FCR. These findings indicate that psychosocial resources may have a more substantial impact on mitigating FCR than certain demographic and disease-related factors. Specifically, an increase of one standard deviation in self-disclosure is associated with a reduction of 0.291 standard deviations in the total FCR score, while a similar increase in social support corresponds to a decrease of 0.188 standard deviations in the FCR score. Both self-disclosure and social support are modifiable and dynamically evolving psychological variables, making them essential targets for future precision nursing interventions.

The structural equation model employed in this study demonstrated that social support serves as a partial mediator in the relationship between self-disclosure and FCR, with a mediating effect value of -0.132 (95% CI: -0.209 to -0.076), accounting for 30.4% of the total effect (P < 0.01). This pathway suggests that self-disclosure not only directly mitigates FCR but also indirectly reduces fear levels by enhancing social support. According to the self-disclosure model [47], disclosure behavior influences individual health outcomes through two mechanisms: "social support" and "change in social information." The findings of this study empirically validate the applicability of this theory within the breast cancer population, indicating that patients who engage in self-disclosure gain emotional resonance, informational assistance, and practical support. This process facilitates the reconstruction of their social cognition regarding the disease, thereby diminishing their perceived loss of control over the threat of recurrence. The mediating effect constituted 30.4% of the total effect, indicating that approximately 70% of the impact of self-disclosure operates through alternative pathways, such as cognitive reappraisal, emotional catharsis, and meaning construction. Future research should further investigate these multiple mediating mechanisms. Based on these findings, our study provides several clinical insights for nursing care: (1) FCR screening should be integrated into routine psychological care for breast cancer patients, particularly targeting those who are younger, have minor children, experience economic difficulties, suffer from sleep disorders, or have poor family relationships. (2) Self-disclosure is a skill that can be developed; interventions such as written expression, couples' communication training, and patient support groups can be employed [72,73] to encourage patients to express their concerns appropriately within a safe environment. Social support interventions ought to encompass both "instrumental support" and "emotional informational support." Instrumental support can be delivered by medical social workers and enhanced through optimized medical insurance policies. In contrast, emotional informational support necessitates the enhancement of communication training between medical personnel and patients to facilitate better access to disease-related information. The mediating effect indicates that bolstering social support networks, alongside improving self-disclosure, can produce a synergistic effect in reducing fear. Consequently, it is advisable to integrate family function assessment and intervention into the chronic disease management strategies for breast cancer.

Research indicates that interventions targeting self-disclosure and social support can effectively reduce the FCR. Drawing on recent advances in psycho-oncology, innovative approaches—such as technology-based interventions

and decision aids—hold promise for further enhancing the efficacy of these interventions. For instance, the use of decision aids during cancer care not only improves patient knowledge and reduces decisional conflict but may also alleviate psychological distress [44–46]. Digital platforms offering structured support for emotional disclosure and opportunities for peer interaction can extend the reach of interventions beyond clinical settings to a broader range of environments. Furthermore, personalized psychological interventions delivered via mobile health applications enable real-time monitoring and tailored support for patients with high levels of FCR. However, these methods face certain limitations, including disparities in digital literacy and access, as well as the need for rigorous clinical validation. Future research should explore how to integrate these innovative strategies into routine cancer survivorship care and evaluate their cost-effectiveness and long-term impact.

This study is subject to several limitations. Firstly, the research employed a single-center cross-sectional design, utilizing samples from a tertiary-level oncology hospital in Guangzhou. This approach introduces selection bias, necessitating caution when generalizing the findings. Secondly, all variables were derived from patient self-reports. Despite the use of a reliable and valid scale, potential methodological biases may persist. Thirdly, the cross-sectional nature of the data precludes the inference of causal relationships between variables. The testing of mediation effects is fundamentally based on theoretical assumptions; thus, future research should incorporate longitudinal follow-ups or experimental designs to substantiate these pathways. Additionally, while this study utilized the MOS-SSS-CM to evaluate social support across four dimensions—emotional informational support, practical support, resilience support, and affective support—it treated social support as a singular latent variable within the structural equation model. This approach did not explore the distinct mediating effects of each dimension on the relationship between self-disclosure and FCR. Fianlly, sleep status was assessed via a single self-reported categorical question rather than a validated instrument, which may undermine the precision and reliability of this measurement. Future studies would benefit from employing standardized sleep assessment tools, such as the Pittsburgh Sleep Quality Index (PSQI), to enable a more accurate evaluation of the association between sleep quality and FCR. Future research could further construct a multi-mediation model to analyze the unique contributions of each dimension of social support.

5. Conclusion

This study demonstrates that FCR is prevalent among breast cancer patients, with nearly half (46.3%) reaching a clinically concerning level. Self-disclosure and social support are negatively correlated with FCR, and social support partially mediates the relationship between self-disclosure and FCR, accounting for 30.4% of the total effect. These findings suggest that interventions aimed at enhancing both self-disclosure skills and social support networks may be effective in reducing FCR. Clinical nurses should routinely assess these modifiable psychological resources and implement targeted psychosocial interventions, particularly for younger patients, those with heavy economic burden, and those with poor sleep quality.

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Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to ethical restrictions concerning patient privacy.

Conflict of Interest: The authors declare no conflict of interest.

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