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Latent profile analysis of spousal information concealment in patients with cancer: A cross-sectional study

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ABSTRACT

Objective: This study aimed to investigate spousal information concealment in patients with cancer and analyse its influencing factors.

Methods: Between April and July 2024, 371 spouses of patients with cancer were surveyed using the Demographic and Clinical Characteristics Questionnaire, the Information Concealment Scale for Caregivers, Fear of Progression Questionnaires for Partners, and the Medical Coping Modes Questionnaire. Influencing factors were analysed using latent profile analysis.

Results: Based on the degree of information concealment, spouses of patients with cancer were categorised into three subgroups: the low concealment - low control (19.14%), medium concealment (50.40%), and high concealment - high dissimulation group (30.46%). Multivariate logistic regression analysis revealed that sex, age, educational level, disease stage, fear of disease progression, and medical coping modes were the influencing factors of the information concealment subgroups ($P < 0.05$).

Conclusions: Information concealment among spouses of patients with cancer has individualized characteristics. Analysing the demographics, disease features, and psychological conditions of spouses in different information concealment subgroups can help medical staff formulate more targeted and personalized interventions and reduce the degree of information concealment among patients' spouses.

Introduction

According to the Global Cancer Data Report,[1] in 2022, China recorded 4.83 million new cases of cancer and 2.57 million deaths. Delivering distressing news regarding cancer diagnosis to patients and their families is one of the most challenging tasks for health care professionals. It can be devastating for patients and family members to receive this news, regardless of whether it pertains to a diagnosis, prognosis, recurrence, discontinuing active treatment, or switching to palliative care.[2]

According to family systems theory, within an interactive system, each member is influenced by the emotions, cognition, and behaviors of the other members.[3] Studies indicate that over 52% of cancer patient caregivers are the patients' spouses.[4] Due to the long-term intimate relationship between spouses, they are emotionally closer to the patient and can keenly perceive the patient's emotional fluctuations. They often need to invest more time and energy, and therefore, during the patient's treatment process, the role of the spouse is often more critical than that of other family caregivers.[3] Although most children demonstrate a profound sense of responsibility and obligation towards their parents during the treatment period, due to physical exhaustion, work pressures, and financial constraints, they often find it difficult to fully assume the role of caregiver.[5]

Consequently, cancer is viewed as a shared life challenge for the couple, and frequently termed "our disease".[6] Following a cancer diagnosis, the spouse, as the primary caregiver, faces multiple challenges, including role conflicts and psychological distress.[7] They frequently assume the role of the patient's proxy for informed consent, engage with health care providers, obtain critical medical information, and

subsequently determine whether to disclose the severity of the illness to the patient.[8] Furthermore, Influenced by traditional culture, Chinese individuals typically exhibit a more implicit and nuanced approach to expressing emotions.[9] To protect patients, spouses often opt to withhold the truth about the illness.

Information concealment refers to concealing or distorting a patient's true medical information, including medical diagnosis and prognosis.[4] In Western countries, the information concealment phenomenon is less common, as patients' autonomy is highly valued. They believe that open communication helps patients make better decisions about their care and encourages patients to organize their personal affairs at an early stage so that they have no regrets at the end of their lives.[5,10,11] However, in some Eastern countries, such as China and India, information concealment by spouses to protect patients is more common.[12] This may be due to cultural preferences. Western culture generally emphasizes the importance of enabling patients to confront their illnesses independently, whereas Eastern culture, particularly influenced by Confucian values, places greater emphasis on the benevolence and protective role of spouse and other family members to patients.[13] Family responsibility and harmony are highly valued in traditional Confucian culture. Thus, when the patient is threatened with death, the spouse often assumes a protective role and chooses to conceal the medical diagnosis and prognosis from the patient.[14] Ni et al. reported that 35.8% to 50.3% of Chinese patients experienced information concealment at the request of their spouses and other family members.[15]

However, withholding information does not protect patients; on the contrary, it causes patients to experience negative emotions such as depression, anxiety, and a sense of being cheated, increasing their symptom burden.[16–18] Furthermore, patients do not completely grasp medical decisions owing to information concealment, and it might be challenging to ensure treatment adherence. Therefore, it is necessary to explore the spouse's perspective on information concealment in cancer care and examine the variables influencing the level of information withholding.

The relationship intimacy model indicates that open communication regarding needs, information, and beliefs between couples has substantial benefits in regulating emotions and providing support.[19] However, in real life, spouses often conceal cancer-related information from their partners and avoid transparent communication under the influence of multiple factors such as fear and uncertainty about disease progression and avoidance attitudes toward cancer.[20,21] Studies have shown that fear of cancer progression not only involves patients, but also affects their spouses. The study of Peikert pointed out that the level of fear of disease progression in caregivers is higher than that in patients, which often affects their judgment of disease information transmission.[22] This high level of fear places great stress on spouses, who find it frightening to even mention the name of cancer in front of a patient, let alone to communicate openly about the disease.[23] In addition, spouses, as key participants in the medical decision-making process, often need to find a balance between protecting the patient's fear of illness and ensuring the patient's right to know when processing disease-related information.[8] The realization of this balance often depends on the spouse's understanding of the patient's condition and medical coping ability. According to research by Lazarus et al., coping strategies refer to the behaviors and cognitive efforts made by individuals to deal with and respond to stress events.[24] Studies have shown that different coping strategies have a significant impact on an individual's self-regulation ability. For example, positive coping strategies can enhance an individual's ability and confidence to deal with setbacks, while avoidance coping styles are often accompanied by higher levels of anxiety and depression.[25] Positive medical coping strategy can help the spouse communicate efficiently with medical professionals and make informed medical choices with the patient. Alternatively, the demographic and clinical characteristics of the spouse of a cancer patient, such as the patient's sex, education level, and disease stage, may have an effect on information withholding.[13,26]

Currently, there is limited quantitative research examining the degree of information concealment among spouses of patients with cancer.

Latent profile analysis (LPA) is a person-centred approach to determining the presence of diverse subgroups in a survey population. Identifying the factors impacting these categories can assist health care providers in developing targeted measures to reduce information withheld by the spouses of patients with cancer.

Thus, this study aimed to (1) describe latent profiles of information concealment among spouses of patients with cancer, (2) explore the individual characteristics of these profiles, and (3) investigate the relationship between these potential features using the Fear of Progression Questionnaire for Partners (FoP-Q-SF/P) and Medical Coping Modes Questionnaire (MCMQ).

Methods

Study design and sample

This cross-sectional descriptive study was conducted between April 1 and July 1, 2024, at the oncology department of a tertiary hospital in Jiangsu Province, China. Participants were recruited using convenience sampling. Inclusion criteria: (1) aged $\geq$ 18 years; (2) was the spouse and the primary caregiver of a diagnosed cancer patient; (3) was familiar with the patient's condition and caring for more than one month; (4) had normal communication ability; and (5) voluntarily participated in this study. Participants who had cognitive, mental disorders, or other serious organic diseases were not considered for enrolment.

Based on Kendall's method for sample size estimation,[27] the minimum sample size should be at least 5–10 times greater than the number of independent variables. In this study, 13 independent variables were examined. Considering a 20% inefficiency rate, the sample size required was estimated to be between 78 and 156 spouses of patients with cancer. In addition, several studies have shown that LPA requires at least 300 to 500 subjects.[28,29] Therefore, 371 subjects were finally recruited after comprehensive consideration.

Ethical considerations

This study was approved by the Nanjing Grum Tower Hospital in China (IRB No. 2024-055-02). The study was conducted in accordance with local legal and institutional requirements. Participants in this study signed an informed consent form.

Instruments

Demographic and clinical characteristics questionnaire

Demographic and clinical data of the participants were collected using a self-administered questionnaire. The primary variables included sex, age, place of residence, education level, work status, per capita monthly household income, amount of time spent caring for the patient, and the pathological stage of the patient's cancer.

Information Concealment Scale for Caregivers (ECOI)

The 15-item ECOI was compiled by de la Piedra-Torres et al.[30] The Chinese version of the ECOI[31] contained three dimensions, namely Concealment or dissimulation about the disease (6 items), misrepresentation of the real situation (5 items), and control of the information (4 items). A four-point Likert scale was used, from 0 (never) to 3 (always), with a total score of 45. Higher scores indicate a higher degree of the information concealed. The validity and reliability of the scale were well established in this study (the construct validity was 0.879; Cronbach's α value was 0.877).

Fear of Progression Questionnaires for Partners (FoP-Q-SF/P)

The 12-item FoP-Q-SF/P was developed by Zimmerman et al.[32] The Chinese version comprises two dimensions: family health (6 items) and social functioning (6 items).[33] A 5-point Likert scale was employed, from 1 (never) to 5 (always) with a total score of 60; higher scores denote a

higher level of fear of disease progression in the spouse. The scale demonstrated strong reliability and validity in this study (the construct validity was 0.912; Cronbach's α value was 0.899).

Medical Coping Modes Questionnaire (MCMQ)

The 20-item MCMQ was used to assess the coping style of spouses of patients with cancer across three dimensions: confrontation (8 items), avoidance (7 items), and acceptance resignation (5 items).[34] Each item was assessed on a range of 1–4. The overall score for each dimension was computed individually, with higher scores indicating a greater tendency to adopt that coping mechanism. The MCMQ had good validity (the construct validity was 0.851) and internal consistency (Cronbach's α values of the three dimensions were 0.847, 0.703, and 0.865, respectively) in this study.

Data collection

A questionnaire survey was conducted among spouses of patients with cancer, adhering strictly to the inclusion and exclusion criteria. All participants were recruited from the oncology department and general surgery ward of a hospital in China. All investigators received specialized training before the study began. The purpose and methods of the survey were explained in detail to each participant before the survey was conducted. The participants received a paper-based questionnaire after providing their informed consent. Each respondent completed the questionnaire independently and anonymously. A researcher was present throughout the investigation. Upon completion of the questionnaire, the researcher promptly retrieved it to verify the accuracy of the data. All participants were assured that their information would be kept private and used exclusively for research.

Data analysis

Descriptive statistics

Data were statistically analysed using IBM SPSS 25.0 and Mplus. Categorical data are presented as frequencies and percentages (%). Normally distributed data are presented as mean ± SD. Quantitative data were compared between groups using one-way analysis of variance (ANOVA) or the Kruskal–Wallis test, while categorical data were compared using the χ^2 test or the Kruskal–Wallis H-rank sum test. Factors with statistical differences in univariate analysis were included in multivariate logistic regression for analysis.

Latent profile analysis (LPA)

To detect the ideal number of latent profiles to describe the participants' perceptions for each information concealment domain, LPA was conducted using Mplus 8.3.[35] The number of classes in the model progressively increased from a single class model until the model fit the best index. In total, we tested models with 1–4 profiles. We plotted a line graph using the average scores for each item to better visualize the participants' responses to the various items. The three fitting indexes of LPA are Akaike information criteria (AIC), Bayesian information criteria (BIC), and sample-adjusted BIC (aBIC). The lower the value, the better the fitting degree. Entropy values ranged from 0 to 1, with values closer to one indicating more precise classification. Lo–Mendel–Rubin (LMR) test and Bootstrap-based likelihood ratio test (BLRT) were used; a P value < 0.05 suggests that the k-model is better than the k-1 model. The model used in the study was selected based on clinical relevance and theoretical usefulness.

Results

Demographic, sociological characteristics of the participants

A total of 400 questionnaires were distributed, and 371 effective questionnaires with complete information were recovered, yielding an effective recovery percentage of 92.75%. We excluded 29 questionnaires because six participants declined to take part in the study, and 23 participants returned

questionnaires with missing data. The data of the remaining 371 questionnaires were complete and met the answering requirements. The mean age of the participants was 59.43 ± 10.49 years. Most participants surveyed were women (56.87%), lived in rural areas (55.52%), had an education level of junior high school and below (57.95%), were employed (62.80%), had a per capita monthly family income of 3000–7000 Yuan (38.54%), had provided care for < 3 months (29.65%), and had a spouse with a cancer stage III (31.54%). The score of the survey on the information concealment of spouses of patients with cancer was 26.29 ± 6.07.

Subgroups identified by LPA

Based on the three dimensions of the ECOI scale, four potential profile models were fitted (Table 1). The results revealed that model 4 has the highest entropy (0.996) as well as the lowest AIC, BIC, and aBIC values; however, the P-value of LMR was > 0.05, which was not statistically significant, suggesting that model 4 was not better than model 3. Although the entropy of model 3 was lower than that of model 2, its AIC, BIC, and ABIC values were lower, making its classification more reasonable. Moreover, the P values of LMR and BLRT in Model 3 were both < 0.05, which had statistical significance. Model 3 was ultimately determined to be the best-fitting model after meticulously considering all fitting indexes and clinical importance. The three participant classes had an average probability of 90.3% to 97.5%, suggesting that the model's categorization results were reliable.

Characteristics and nomenclature of latent profiles

After the analysis of ECOI scores by the model, three profiles were obtained, and Fig. 1 presented a visual presentation of them. Profile one had a low overall score of 18.39 ± 2.46. Each item had a fairly balanced score, and the scores of items 8 and 14 in the control of the information dimension were the lowest. Consequently, profile one was named as "low concealment - low control group," including 71 participants (19.1%). The score of profile 2 was 24.72 ± 2.33, and its overall score was at a medium level, so it was named the "medium concealment group," with 187 participants, accounting for 50.4%. Profile 3, with 113 participants (30.5%), exhibited a high degree of information concealment, with a score of 33.84 ± 2.75. The scores of item 3, "talking about the disease with his relatives and friends," and item 7, "try not to mention the name of the disease in front of him" were both higher in the profile 3 or among the three groups, which belonged to concealment or dissimulation of the disease dimension. Therefore, this group was named the "high concealment - high dissimulation group."

Univariate analysis of potential categories of spousal information concealment in patients with cancer

Univariate analysis revealed statistically significant differences in sex (P < 0.001), age (P = 0.001), educational level (P < 0.001), per capita monthly income of family (P = 0.030), duration of care from the time the patient's cancer was diagnosed (P = 0.014), and different stages of the patients' disease (P < 0.001). No significant differences were found regarding residence (P = 0.272), employment status (P = 0.163) and type of tumor (P = 0.174). However, according to the degree of information concealment, significant differences were observed regarding fear of disease progression (P < 0.001) and medical coping modes (P < 0.001) between the three groups. The detailed characteristics of the different classes are shown in Tables 2 and 3.

Influencing factors of spousal information concealment in different patients with cancer

Logistic regression was used to analyse the influencing factors of spousal information concealment in patients with cancer, and the factors with statistical differences in univariate analysis were considered independent variables. The variables are assigned the following values. Sex:

Table 1

Latent profile model fit indices.

Model	AIC	BIC	ABIC	Entropy	LMR P-value	BLRT P-value	Relative frequency of smallest class (%)
1	11,281.678	11,399.164	11,303.984	1	–	–	100.0
2	9966.207	10,146.353	10,000.409	0.933	< 0.001	< 0.001	34.2
3	9799.254	10,042.059	9845.353	0.858	0.015	< 0.001	19.1
4	9025.455	9330.919	9083.450	0.996	0.091	< 0.001	3.2

AIC, Akaike information criteria; BIC, Bayesian information criteria; aBIC, sample adjusted BIC; LMR, Lo–Mendel–Rubin; BLRT, Bootstrapped likelihood ratio test.
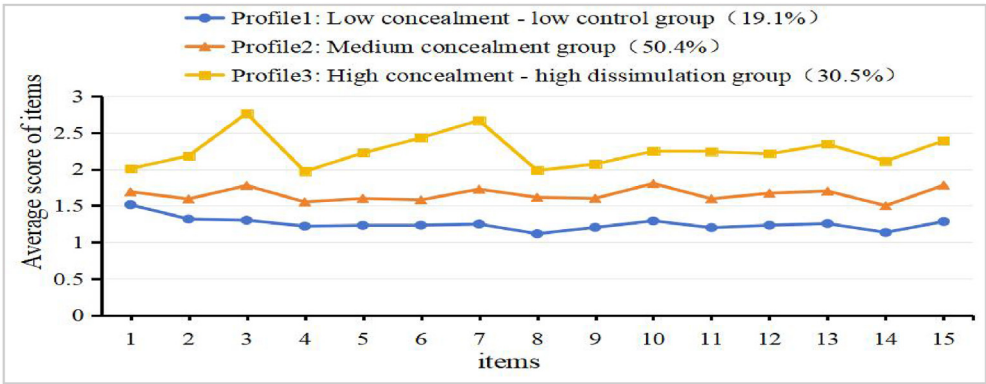

Fig. 1. The characteristic distribution of 3 latent profiles of information concealment in cancer patients' spouse.

Table 2

Comparison of demographic and clinical disease characteristics among 3 groups of cancer patients' spouses [*N* (%)].

Variables	Low concealment - low control group (*n* = 71)	Medium concealment group (*n* = 187)	High concealment - high dissimulation group (*n* = 113)	χ^2/H	P
Sex				18.280[a]	< 0.001
Male	46 (64.79%)	66 (35.29%)	48 (42.48%)		
Female	25 (35.21%)	121 (64.71%)	65 (57.52%)		
Age (years)				13.020[b]	0.001
< 45	5 (7.04%)	11 (5.88%)	16 (14.16%)		
45–60	27 (38.03%)	84 (44.92%)	60 (53.10%)		
> 60	39 (54.93%)	92 (49.20%)	37 (32.74%)		
Place of residence				2.607[a]	0.272
Rural	35 (49.30%)	75 (40.11%)	54 (47.79%)		
Urban	36 (50.70%)	112 (59.89%)	59 (52.21%)		
Educational level				28.822[b]	< 0.001
Primary and below	28 (39.44%)	131 (70.05%)	56 (49.56%)		
Senior and technical school	25 (35.21%)	44 (23.53%)	35 (30.97%)		
College or above	18 (25.35%)	12 (6.42%)	22 (19.47%)		
Monthly income per capita (RMB)				7.011[b]	0.030
< 3000	26 (36.62%)	82 (43.85%)	34 (30.09%)		
3000–7000	21 (29.58%)	71 (37.97%)	51 (45.13%)		
> 7000	24 (33.80%)	34 (18.18%)	28 (24.78%)		
Employment status				3.633[a]	0.163
On job	38 (53.52%)	119 (63.64%)	76 (67.26%)		
Unemployed	33 (46.48%)	68 (36.36%)	37 (32.74%)		
Duration of care from the time the patient's cancer was diagnosed				8.588[b]	0.014
1–3 months	12 (16.90%)	62 (33.16%)	36 (31.86%)		
4–6 months	19 (26.76%)	53 (28.34%)	27 (23.89%)		
7–12 months	16 (22.54%)	31 (16.58%)	25 (22.12%)		
> 12 months	24 (33.80%)	41 (21.93%)	25 (22.12%)		
Disease staging				19.974[b]	< 0.001
I	29 (40.85%)	28 (14.97%)	6 (5.31%)		
II	18 (25.35%)	62 (33.16%)	31 (27.43%)		
III	18 (25.35%)	64 (34.22%)	47 (41.59%)		
IV	6 (8.45%)	33 (17.65%)	29 (25.66%)		
Type of tumor				8.989[a]	0.174
Gastrointestinal neoplasms	43 (60.56%)	119 (63.64%)	77 (68.14%)		
Thyroid neoplasms	5 (7.04%)	26 (13.90%)	13 (11.50%)		
Lung neoplasms	13 (18.31%)	31 (16.58%)	12 (10.62%)		
Other types	10 (14.08%)	11 (5.88%)	11 (9.73%)		

[a] χ^2-value.

[b] H-value.

Table 3
Comparison of scores of FOR-Q-SF, MCMQ among 3 latent profiles (Mean ± SD).

Variables	Low concealment - low control group ($n = 71$)	Medium concealment group ($n = 187$)	High concealment - high dissimulation group ($n = 113$)	F	P
FoP-Q-SF/P	26.23 ± 6.19	34.86 ± 7.82	37.77 ± 10.84	40.768	< 0.001
Family Health	14.08 ± 3.65	18.36 ± 4.11	19.72 ± 5.47	35.888	< 0.001
Social Functioning	12.14 ± 3.33	16.47 ± 4.43	18.05 ± 5.80	35.275	< 0.001
MCMQ					
Confrontation	10.04 ± 2.63	10.67 ± 2.48	12.18 ± 3.33	24.744	< 0.001
Avoidance	14.07 ± 3.47	16.08 ± 2.64	17.69 ± 3.46	34.324	< 0.001
Acceptance Resignation	23.21 ± 4.21	19.52 ± 4.14	18.82 ± 5.43	23.200	< 0.001

FoP-Q-SF/P, Fear of Progression Questionnaires for Partners; MCMQ, Medical Coping Modes Questionnaire.

male = 1, female = 2; Age: < 45 years = 1, 45–60 years = 2, > 60 years = 3; Educational level: Primary and below = 1, Senior and technical school = 2, College or above = 3; Duration of care from the time the patient's cancer was diagnosed: 1–3 months = 1, 4–6 months = 2, 7–12 months = 3, > 12 months = 4; Disease staging: I = 1, II = 2, III = 3, IV = 4.

Compared with the low concealment - low control group, sex (OR = 0.331, $P = 0.003$) and confrontation medical coping mode (OR = 0.845, $P < 0.001$) were protective factors in the medium concealment group. Educational level (OR = 6.537, $P = 0.012$), fear of disease progression (OR = 1.137, $P < 0.001$), and avoidance of medical coping mode (OR = 1.159, $P = 0.028$) were risk factors. Disease staging I (OR = 0.088, $P = 0.003$) and confrontational medical coping mode (OR = 0.804, $P < 0.001$) were protective factors in the high concealment - high dissimulation group. Ages < 45 years (OR = 9.547, $P = 0.018$), fear of disease progression (OR = 1.150, $P < 0.001$), and avoidance of medical coping mode (OR = 1.395, $P < 0.001$) were considered risk factors, as shown in Table 4.

Discussion

Discussion of the study

Based on previous research, this study used LPA in spouses of patients with cancer to analyse the extent of information concealment and identified three latent categories. As expected, spouses of patients with cancer had a higher degree of information concealment. Based on the model fitting evaluation index, spouses of patients with cancer were categorized into three groups: low concealment - low control, medium concealment, and high concealment - high dissimulation groups. Influenced by Confucian culture and the unique Chinese cultural background, cancer is often associated with fear and death. Therefore, when confronted with a patient's cancer, the family, especially spouses with whom the patient has a long-term close relationship, will be distressed and worried.[11,36] Based on China's "family as a whole" socio-cultural context, many Chinese believe that families have a responsibility to care for vulnerable members, and therefore protect patients from the burden of difficult choices and harsh realities.[37] Following the patient's illness, the spouse is more inclined to assume responsibility for the patient's care, communicate with the doctor on behalf of the patient, and make medical decisions based on the overall interests of the family.[38] For a variety of reasons, spouses frequently lack the courage to be honest with the patient out of concern that doing so may increase the patient's psychological burden and accelerate the course of the disease.

Additionally, a line graph of average item scores across various profiles revealed some characteristics of information concealment among spouses of patients with cancer. In our study, participants in all subgroups scored relatively high on item 3, "talking about the disease with his relatives and friends," (among the top three in the same group), although there was a rank difference (the high concealment - high dissimulation group was higher than the other two groups). The item 3 falls under the category of concealment or dissimulation of the disease dimension. Under the socio-cultural context of China, people tend to make decisions for others based on the "principle of benevolence,"[39] resulting in a tendency for participants to exhibit poor articulation. Moreover, this strong and secure relationship guarantees that the spouse takes the initiative to care for the patient and becomes a key participant in the medical decision-making process following the patient's illness.[40] To evaluate the patient's right to be informed, the spouse often engages in communication with the physician and possesses direct insight.[8] Furthermore, the Chinese culture generally avoids discussions about death, viewing these discussion on the imminence of death as inauspicious occurrences. In addition, the culture emphasizes on the principle of the "Mandate of Heaven" and advocates for appreciation of the present moment. Therefore, spouses may be reluctant to directly inform patients of their disease diagnosis and progression or avoid mentioning the word "cancer" in front of patients, fearing that it may overwhelm the patient and diminish their confidence and hope for treatment.[41,42]

Our results revealed that men had a lower degree of information concealment and were more probable to belong to the medium concealment group, which aligns with the findings of Sun et al.[13] Women typically demonstrate weaker psychological resilience and are more prone to pessimism. Moreover, female participants have strong empathic abilities. When perceiving the emotional distress of patients affected by cancer, female participants worry that discussing the real condition will be unfavourable to patients, leading to a higher tendency to conceal information from patients.[43,44] Therefore, medical workers need to pay particular attention to women, promptly identify their psychological distress, and provide support to help them manage their emotions, communicate effectively with patients, and reduce the level of information concealment.

Moreover, our results indicated that participants < 45 years old exhibited a higher level of information concealment and were more likely to belong to the high concealment - high dissimulation group, which is consistent with the findings of Syse et al.[45] After the patient is diagnosed with cancer, the spouse not only needs to assume the original social responsibility, but also needs to take on some of the patient's chores, such as raising young children and taking care of elderly parents alone.[46] Spouses are at risk for high levels of psychosocial diseases, including mental disorders like anxiety and depression, due to a variety of stressors.[47] The fact that the spouse can not afford the patient's cancer further promotes the occurrence of withholding information from the patient. Therefore, medical staff should closely monitor the mental health problems of young and middle-aged spouses and provide guidance to help spouses bravely communicate disease information with patients and cope with cancer jointly.

Furthermore, our results revealed that the level of information concealment was relatively higher among participants with junior high school education and below and were more likely to belong to the medium concealment group. Those with higher education had better access to information about the disease and greater respect for patients' right to know, leading to a stronger willingness to tell the patient about their true condition.[48] However, spouses with low education levels have less knowledge of disease, treatment information such as chemotherapy and molecular targeted therapy, making it challenging for them to distinguish between true and false information; hence, the negative impact of cancer

Table 4

Multivariate logistic regression analysis of spouse information concealment in cancer patients.

Variables	medium concealment group ($n = 187$)				high concealment - high dissimulation group ($n = 113$)			
	β	OR	95% CI	P	β	OR	95% CI	P
Sex								
Male	−1.104	0.331	(0.159, 0.690)	0.003	−0.705	0.494	(0.216, 1.129)	0.095
Age (years)								
< 45	1.795	6.020	(0.987, 36.700)	0.052	2.256	9.547	(1.475, 61.797)	0.018
45–60	0.227	1.255	(0.578, 2.726)	0.566	0.806	2.239	(0.928, 5.402)	0.073
Educational level								
Primary and below	1.877	6.537	(1.506, 28.370)	0.012	−0.130	0.878	(0.186, 4.133)	0.869
Senior and technical school	0.709	2.032	(0.622, 6.639)	0.240	−0.539	0.583	(0.170, 2.006)	0.392
Monthly income per capita (RMB)								
< 3000	−0.509	0.601	(0.156, 2.315)	0.459	−0.527	0.591	(0.134, 2.603)	0.486
3000–7000	−0.045	0.956	(0.316, 2.894)	0.937	0.210	1.234	(0.378, 4.031)	0.728
Duration of care from the time the patient's cancer was diagnosed								
1–3 months	0.705	2.023	(0.712, 5.753)	0.186	0.246	1.279	(0.396, 4.132)	0.681
4–6 months	0.680	1.974	(0.743, 5.244)	0.173	−0.002	0.998	(0.326, 3.058)	0.997
7–12 months	0.147	1.159	(0.406, 3.303)	0.783	0.153	1.166	(0.369, 3.679)	0.794
Disease staging								
I	−1.157	0.315	(0.085, 1.162)	0.083	−2.433	0.088	(0.018, 0.435)	0.003
II	0.076	1.079	(0.293, 3.979)	0.909	−0.283	0.753	(0.186, 3.044)	0.691
III	0.389	1.476	(0.396, 5.501)	0.562	0.200	1.221	(0.304, 4.909)	0.779
FoP-Q-SF/P	0.128	1.137	(1.069, 1.209)	< 0.001	0.139	1.150	(1.077, 1.227)	< 0.001
MCMQ								
Confrontation	−0.169	0.845	(0.775, 0.921)	< 0.001	−0.218	0.804	(0.731, 0.885)	< 0.001
Avoidance	0.148	1.159	(1.016, 1.323)	0.028	0.333	1.395	(1.204, 1.615)	< 0.001
Acceptance Resignation	−0.089	0.915	(0.795, 1.051)	0.209	0.106	1.112	(0.952, 1.298)	0.180

Model fitness: Nagelkerke $R^2 = 0.470$, $\chi^2 = 897.869$, $P < 0.0001$.

will be amplified, increasing the fear of the disease and consequently elevating the level of information concealment.[13] Therefore, medical personnel need to discuss the disadvantages of cancer information concealment to the spouses and family members of patients and strengthen their knowledge on cancer diagnosis and treatment to facilitate joint decision-making between doctors and patients.[49]

In the early stages of cancer diagnosis, the patients and their spouses typically face significant psychological stress and emotional challenges. For spouses, the transparency of information greatly influences their coping mechanisms and support capabilities. As stage one cancer usually indicates that the condition is still manageable with relatively good treatment outcomes and higher survival rates, spouses may retain hope for the future. This encourages them to maintain open communication and share honest information about the patient's condition. Such transparency helps spouses better understand the patient's situation and fosters emotional exchange between them, enhancing mutual support.[50] In contrast, withholding information may be owing to fear of uncertainty. In the early stages of cancer, spouses might choose to conceal certain information owing to concerns about the patient's condition, aiming to protect them from excessive psychological burden. However, studies have reported that this concealment can lead to feelings of isolation for the patient, increasing the risks of anxiety and depression.[51] In contrast, greater transparency of information among partners of stage one patients with cancer can effectively alleviate these negative emotions and promote the patient's mental well-being.

Our study revealed significant differences in the FoP-Q-SF/P scores among the three information concealment subgroups. Spouses with a heightened fear of the disease progression were more inclined to be in the medium concealment and high concealment - high dissimulation groups. Fear of disease progression is characterised by concern, fear, and anxiety related to the possibility of cancer progression.[52] Bugaj et al. reported that spouses were more afraid of cancer progression during the course of the disease management.[53] As the main caregivers of patients with cancer, spouses' fear of disease progression is influenced by multiple factors, including cancer-related factors, family stressors, and social influences.[54] When a patient's condition deteriorates and as the disease advances, the spouse's expectations on treatment progress will conflict with reality; they fear losing their loved ones, and consequently their psychological distress increases. They frequently confuse the patient's feelings with

their own, fearing that revealing the true status of the disease will worsen the patient's condition. Hence, they decide to withhold information from the patient. Health care professionals should promptly identify the level of fear of disease progression in patients' spouses and take appropriate measures to alleviate their concerns, while providing necessary psychological support. In addition, health care professionals should clarify to the spouses the potential harm of concealing medical information, encouraging them to communicate disease-related information with patients in an appropriate manner, so as to face the cancer challenge together.

In this study, participants in the low concealment - low control group tended to adopt a confrontation approach to dealing with cancer compared to the other two subgroups; the medium and high concealment - high dissimulation groups were more likely to adopt avoidance coping styles. In the three dimensions of MCMQ, confrontation is considered an effective and positive coping style, whereas avoidance and resignation are considered negative coping styles.[55] The profile one group, whose spouses adopted the confrontation coping style, could actively adjust their mentality, view the reality of the disease rationally, and maintain optimistic expectations of the disease process. Therefore, spouses in this group tended to share disease information with patients so that patients have a thorough understanding of their condition and the degree of information concealment was low. In contrast, the spouses in profiles 2 and 3 frequently conceal their emotions, as they find it difficult to see the patients suffer. They assume the worst about the patients' outlook and worry that excessive psychological strain on patients may result in unanticipated outcomes like suicide or treatment abandonment. Consequently, spouses withhold information from patients and selectively disseminate information regarding the disease.[56] This finding underscores the need to assist spouses in developing positive coping modes so that they can accept the reality of cancer and recognize the detrimental effects of information concealment.

Implications for nursing practice and research

This study focused on the spouses of cancer patients, and explored the current situation and influencing factors of disease information concealment in this group through potential profile analysis. The study aims to enhance the comprehensive understanding of the spouses of

cancer patients by medical staff, and provide personalized support and intervention measures, so as to encourage them to actively exchange disease information with patients and jointly cope with cancer challenges. Additionally, analysing the characteristics of spouses of patients with cancer who withhold information can be helpful in identifying potential fear and in conducting timely counselling. Health care professionals should pay close attention to spouses who are female, under the age of 45 years old, less educated, caring for patients with late disease stages, experiencing high fear of disease progression, and employing avoidant coping strategies, as they are more likely to exhibit high levels of information concealment.

Limitations

This study had some limitations. First, all respondents came from a single institution; thus, the results are not generalizable. Multi-centre studies with larger sample sizes are required in the future. Second, this study explored only the spouses' perspective. In the future, we can investigate the willingness of patients to disclose their illness to explore the relationship between caregivers' information concealment and patients' desire to disclose their disease. In addition, it is unfortunate that this study did not take into account the effect of information type, such as disease name, prognosis, and severity, on the degree of spouse information concealment. Future research is needed to further explore how these factors affect information sharing between spouses.

Conclusions

Three latent profiles of spouses of patients with cancer were identified using LPA, with the medium concealment group comprising the majority of participants. Our study revealed that the degree of information concealment was influenced by sex, age, education level, patients' disease staging, fear of disease progression, and coping mechanism. In the future, interventions should be designed for different categories of information concealment, enabling spouses and patients to exchange cancer-related information and collaboratively decide on the best treatment.

CRediT authorship contribution statement

Yue Zhang: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Kaili Zhu:** Conceptualization, Methodology, Formal analysis, Writing – original draft. **Siyu Li:** Resources, Project administration, Supervison, Writing – review & editing. **Xiaoqing Wang:** Project administration, Conceptualization, Methodology, Supervision. **Rui Xu:** Project administration, Data curation, Supervision. **Yiqin Cao:** Project administration, Data curation, Methodology. **Hongfang Ye:** Resources, Supervision, Writing – review & editing. **Peibei Duan:** Resources, Supervision, Writing – review & editing. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Ethics statement

The study was approved by the Institutional Review Board of the Nanjing Grum Tower Hospital in China (IRB No. 2024-055-02). All participants provided written informed consent.

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Declaration of competing interest

The authors have no conflict of interest to declare.

Data availability statement

Because the data contain information that could jeopardize research participants' privacy, they are not publicly available. The data that support the findings of this study are available on request from the corresponding author, upon reasonable request.

Declaration of generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

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