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Symptom Clusters in Postoperative Chemotherapy Patients with Ovarian Cancer and the Relationship with Self-Efficacy: A Network Analysis

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Abstract

Objectives: The study aims to construct symptom networks for patients undergoing postoperative chemotherapy for ovarian cancer in the chemotherapy interval, identify core symptoms and core symptom clusters, and explore the relationship between self-management efficacy and these symptom clusters.

Methods: This study employed convenience sampling to recruit ovarian cancer patients undergoing postoperative chemotherapy at the gynecologic oncology ward of a tertiary hospital in Beijing, China. A total of 339 participants completed the survey, which included the Chinese version of the Memory Symptom Assessment Scale and the Cancer Self-Management Efficacy Scale during at-home period before the next treatment. Statistical analyses were performed using SPSS 26.0 and R software.

Results: Three symptom clusters were identified: psychological emotional symptoms, sensory and body image symptoms and gastrointestinal symptoms. In the symptom severity network, centrality indices revealed that "I don't look like myself" (r_S=1.780, r_C=1.320, r_B=1.700, r_E=1.962) was identified as the core symptom. The psychological emotional symptoms showed the strongest negative correlation with self-efficacy (r=-0.678).

Conclusions: Three symptom clusters have been identified in patients undergoing postoperative chemotherapy for OC, with "I don't look like myself" being the core symptom during chemotherapy interval. Psychological emotional symptoms form a central cluster that is negatively correlated with self-efficacy.

Introduction

Ovarian cancer (OC) is recognized as one of the most aggressive tumors in the female reproductive system. According to the latest global cancer statistics from 2022, there were approximately 324,000 new cases and 207,000 deaths worldwide[1]. The five-year survival rate for patients is less than 50%, representing a significant threat to women's health[2]. China reports the highest number of new global cases[3]. Due to the absence of effective early diagnostic and screening methods, most patients are diagnosed at advanced stages. The standard treatment protocol for these patients includes surgery followed by chemotherapy[4–6]. Research indicates that OC patients undergoing chemotherapy endure a substantial symptom burden, experiencing 10 to 13 concomitant symptoms including nausea, vomiting, fatigue, sadness, and sleep disturbances, which severely affects their quality of life and adherence to treatment[7–9].

Currently, although some scholars have investigated symptom clusters in cancer patients from exploratory and cluster analysis perspectives, the symptom burden has not been sufficiently explored in OC patients. Therefore, investigating the current status of symptom occurrence and identifying symptom clustering patterns in OC patients are crucial for developing targeted interventions, guiding patients in managing symptoms at home, and ultimately improving their quality of life.

Self-efficacy is a fundamental component of social cognitive theory that significantly influences behavioral change, health maintenance, and overall health status. Research has demonstrated that patients with lower self-efficacy in self-management often experience more pronounced symptoms[10–12]. To date, we have found no studies exploring the relationship between symptom clusters and self-efficacy in OC patients. Therefore, this study aims to (1) identify symptom clusters, core symptoms, and symptom groups through exploratory factor analysis and network analysis; and (2) explore the relationship between self-efficacy and symptom clusters, thereby providing a reference for effective symptom intervention and promoting patient-centered, personalized, and refined management.

Methods

Study design and participants

This retrospective study employed convenience sampling to recruit OC patients undergoing chemotherapy in the gynecological oncology ward of a tertiary hospital in Beijing, China, from September 2023 to December 2025. The inclusion criteria were as follows: (1) aged 18 years or order; (2) pathological diagnosed with ovarian cancer; (3) undergoing postoperative chemotherapy, having completed at least one cycle of chemotherapy, and currently in the chemotherapy interval; (4) possessing good verbal expression and reading comprehension abilities; being conscious, and having normal communication and comprehension skills. The exclusion criteria were: (1) combined with tumor metastasis, recurrence, other serious diseases, malignant tumors or severe mental disorders (including but not limited to severe cardiovascular and cerebrovascular diseases, autoimmune diseases, digestive system diseases, hematological diseases, etc.); (2) expected survival time of ≤ 6 months. Sample size calculation: Network analysis typically requires a minimum sample size of 250–350 cases[13]. Accounting for survey attrition of 20%, the required sample size was at least 300 cases, and a total of 339 subjects were enrolled. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Medical Ethics Committee of Peking University First Hospital (Approval No.: 2022 Yan 203-002). All participants provided written informed consent.

Intruments

General information survey form

This study used a self-designed questionnaire to collect demographic characteristics and clinical data on patients receiving chemotherapy for ovarian cancer. Data include age (years), education level, marital status, children status, occupational status, medical reimbursement, tumor stage, chemotherapy regimen, treatment cycle, and complications.

Memorial Symptom Assessment Scale

The Memorial Symptom Assessment Scale (MSAS), developed by Memorial Sloan Kettering Cancer Center, was designed to evaluate the occurrence of 32 symptoms in cancer patients over the preceding week[14]. This study used the Chinese version of the MSAS adapted and validated by Cheng KK et al[15]. The assessments covered three dimensions: symptom frequency, severity, and distress. Symptom frequency and severity were rated using a 4-point Likert scale, whereas distress was assessed with a 5-point Likert scale. Higher scores indicated higher frequency, greater severity, or more severe distress. Each symptom was scored on a scale of 0 to 4, where a score of 0 indicated the absence of the symptom and a score of 4 represented the most severe presentation of the symptom. The total score of the symptom scale was calculated as the average of the scores for all 32 symptoms. The Cronbach's coefficient of the scale was 0.933.

Strategies Used by People to Promote Health

The Strategies Used by People to Promote Health (SUPPH), also known as the Cancer Self-Management Effectiveness Questionnaire, was developed by American scholars Lev EL and Owen SV to assess cancer survivors' confidence in self-managing their disease[16]. This study employed the Chinese version of SUPPH, which was localized and validated by Qian Huijuan and Yuan Changrong in 2011[17–18]. This scale comprises three dimensions: positive attitude, stress reduction and self-determination, with a total of 28 items. Each item is scored on a 5-point Likert scale (ranging from 1 to 5), where 1 represents "no confidence" to 5 represents "strongly believe". Higher scores indicate higher levels of self-management efficacy. The Cronbach's coefficient of this scale is 0.997.

Statistics

Statistical analyses were conducted using SPSS version 26.0 and R version 4.5.2, with a $p<0.05$ deemed statistically significant. Descriptive statistics were utilized to summarize demographic and clinical data as well as symptom scores, with categorical variables represented by frequencies and percentages. For quantitative data, results were presented as mean ± standard deviation (SD) if normally distributed; otherwise, they were reported as median M [interquartile range (P_{25}, P_{75})]. In this study, the scores for symptom frequency, severity, and distress did not follow a normal distribution; therefore, they are presented as the median M [interquartile range (P_{25}, P_{75})], with the mean ± standard deviation provided as supplementary information.

Exploratory factor analysis was employed to identify symptom clusters, utilizing orthogonal rotation with maximum variance to extract common factors. To ensure the accuracy and stability of the constructed symptom network, we applied the following criteria: symptom prevalence ≥ 20%; common factors with eigenvalues > 1; factor loadings > 0.5; each factor containing at least two symptoms; and factors with a Cronbach's α coefficient > 0.5. The data analysis results indicated that one symptom cluster comprised only two symptoms (pain and dry mouth), with factor loadings of 0.643 and 0.836, respectively. However, its Cronbach's α coefficient was 0.464, which is less than 0.5. Due to this poor internal consistency, these two symptoms were excluded.

Network analysis was conducted using the EBICglasso function in the qgraph package of the R software[19] to construct a network model of symptoms. Each node represents a symptom, and the thickness of the lines (edges) connecting nodes indicates the absolute value of the partial correlation coefficient, reflecting the strength of the direct association between two symptoms after controlling for all other symptoms. Network visualization was implemented using the spring layout algorithm, and node centrality metrics including strength, closeness, betweenness, and expected influence were calculated and reported. Research indicates that, compared to closeness and betweenness, strength is the most stable indicator[20]. Using the bootnet package[21], we evaluate the accuracy of edge weights and the stability of centrality measures via the Bootstrap algorithm. It is generally accepted that a Correlation Stability Coefficient (CS) of at least 0.25 indicates acceptable stability of the network model, while a value greater than 0.5 indicates good stability[22–23].

Results

Characteristics of Demographic and Clinical Information

A total of 359 OC patients undergoing chemotherapy were surveyed. After excluding 20 questionnaires with blank items, 339 patients were ultimately included in the study. The 339 patients were aged 18 to 74 years; 165 (48.7%) had completed middle school or high school education; 299 (88.2%) were married; 320 (94.4%) had children, and 249 (71.6%) were retired or unemployed. Additionally, 234 patients (69%) had medical

insurance. Regarding clinical stage, 48 cases (14.2%) were at stage I, followed by 63 (18.6%) at stage II, 191 (56.3%) at stage III, and 37 (10.1%) at stage IV. In terms of treatment, 287 (84.7%) patients received paclitaxel/albumin-bound paclitaxel combined with platinum-based chemotherapy regimens, 110 patients (32.4%) were in the second treatment cycle, 70 (20.6%) in the third cycle, and 153 (45.2%) were in the fourth cycle or above; A total of 255 patients (75.2%) had no complications, as shown in Table 1.

Table 1
Characteristics of demographic and clinical data for OC patients (N = 339)

Variable		**N (%) or *M* ± SD**
Age (years)		58 ± 31.3
Education	Primary school or below	71 (20.9)
	Middle school or high school	165 (48.7)
	Junior college	71 (20.9)
	Bachelor degree or above	32 (9.4)
Marital status	Married	299 (88.2)
	Unmarried	12 (3.5)
	Divorced	7 (2.1)
	Widowed	21 (6.2)
Children status	Yes	320 (94.4)
	No	19 (5.6)
Occupational status	Retired	135 (39.8)
	Unemployed	114 (33.6)
	Employed	90 (26.5)
Medical reimbursement	Medical insurance	234 (69)
	Commercial insurance	6 (1.8)
	Public medical care	6 (1.8)
	Self-funded	25 (7.4)
	Others	68 (20.1)
Tumor stage	Stage I	48 (14.2)
	Stage II	63 (18.6)
	Stage III	191 (56.3)
	Stage IV	37 (10.1)
Chemotherapy regimen	Paclitaxel/albumin paclitaxel + platinum-based	287 (84.7)
	Anthracyclines+platinum-based/cyclophosphamide	32 (9.4)
	Others	20 (5.9)
Treatment cycle	1st time	6 (1.8)
	2nd time	110 (32.4)
	3rd time	70 (20.6)
	4th time	64 (18.9)
	5th and above	89 (26.3)
complications	Absent	255 (75.2)
	Present	84 (24.8)

Symptom prevalence, frequency, severity and distress

The incidence of symptoms in OC patients during chemotherapy ranges from 2.4% to 72.6%. Among these patients, the three most commonly reported symptoms were hair loss (72.6%), nausea (72%), and vomiting (58.7%). The symptoms with the highest severity and distress scores were hair loss (1.85 ± 1.41; 1.58 ± 1.40), nausea (1.22 ± 1.06; 1.13 ± 1.05), and numbness/tingling in hands/feet (1.09 ± 1.21; 1.02 ± 1.23), as shown in Table 2.

Table 2
The frequency, severity and distress of symptoms (N = 339)

Symptom	Prevalence	Frequency		Severity		Distress	
	(%)	*M* (P_{25},P_{75})	Mean ± SD	*M* (P_{25},P_{75})	Mean ± SD	*M* (P_{25},P_{75})	Mean ± SD
Difficulty concentrating	23.6	0 (0,0)	0.41 ± 0.83	0 (0,0)	0.38 ± 0.80	0 (0,0)	0.33 ± 0.73
Pain	28.6	0 (0,1)	0.42 ± 075	0 (0,1)	0.37 ± 0.67	0 (0,1)	0.36 ± 0.67
Lack of energy	45.4	0 (0,2)	0.95 ± 1.20	0 (0,2)	0.88 ± 1.15	0 (0,2)	0.84 ± 1.16
Cough	12.7	0 (0,0)	0.14 ± 0.39	0 (0,0)	0.14 ± 0.38	0 (0,0)	0.09 ± 0.31
Feeling nervous	30.7	0 (0,1)	0.50 ± 0.84	0 (0,1)	0.43 ± 0.76	0 (0,1)	0.40 ± 0.71
Dry mouth	28.6	0 (0,1)	0.40 ± 0.72	0 (0,1)	0.35 ± 0.63	0 (0,0)	0.27 ± 0.56
Nausea	72.0	2 (0,2)	1.4 ± 1.06	1 (0,2)	1.22 ± 1.06	1 (0,2)	1.13 ± 1.05
Feeling drowsy	16.8	0 (0,0)	0.26 ± 0.64	0 (0,0)	0.24 ± 0.58	0 (0,0)	0.21 ± 0.54
Numbness/tingling in hands/feet	56.3	1 (0,2)	1.22 ± 1.27	1 (0,2)	1.09 ± 1.21	1 (0,2)	1.02 ± 1.23
Difficulty sleeping	25.7	0 (0,1)	0.40 ± 0.76	0 (0,1)	0.37 ± 0.71	0 (0,1)	0.36 ± 0.70
Feeling bloated	7.7	0 (0,0)	0.10 ± 0.38	0 (0,0)	0.08 ± 0.31	0 (0,0)	0.08 ± 0.32
Urination	3.8	0 (0,0)	0.08 ± 0.43	0 (0,0)	0.07 ± 0.40	0 (0,0)	0.07 ± 0.40
Vomiting	58.7	1 (0,2)	1.01 ± 1.00	1 (0,1)	0.89 ± 0.93	1 (0,2)	0.81 ± 0.95
Shortness of breath	17.4	0 (0,0)	0.23 ± 0.57	0 (0,0)	0.23 ± 0.57	0 (0,0)	0.21 ± 0.54
Diarrhea	4.7	0 (0,0)	0.07 ± 0.37	0 (0,0)	0.07 ± 0.35	0 (0,0)	0.06 ± 0.34
Feeling sad	33.3	0 (0,1)	0.63 ± 1.04	0 (0,1)	0.57 ± 0.99	0 (0,1)	0.54 ± 0.98
Sweats	13.3	0 (0,0)	0.28 ± 0.81	0 (0,0)	0.25 ± 0.75	0 (0,0)	0.24 ± 0.73
Worrying	39.2	0 (0,1)	0.77 ± 1.12	0 (0,1)	0.69 ± 1.06	0 (0,1)	0.65 ± 1.04
Problems with sexual interest or activity	9.7	0 (0,0)	0.31 ± 1.00	0 (0,0)	0.30 ± 0.99	0 (0,0)	0.29 ± 0.98
Itching	21.2	0 (0,0)	0.40 ± 0.88	0 (0,0)	0.39 ± 0.87	0 (0,0)	0.37 ± 0.85
Lack of appetite	31.9	0 (0,1)	0.46 ± 0.76	0 (0,1)	0.42 ± 0.71	0 (0,1)	0.37 ± 0.70
Dizziness	13.6	0 (0,0)	0.17 ± 0.47	0 (0,0)	0.16 ± 0.42	0 (0,0)	0.15 ± 0.41
Difficulty swallowing	2.4	0 (0,0)	0.03 ± 0.20	0 (0,0)	0.02 ± 0.15	0 (0,0)	0.02 ± 0.15
Feeling irritable	23.6	0 (0,0)	0.42 ± 0.89	0 (0,0)	0.40 ± 0.84	0 (0,0)	0.39 ± 0.85
Mouth sores	16.5	-	-	0 (0,0)	0.22 ± 0.54	0 (0,0)	0.20 ± 0.52
Change in the way food tastes	32.2	-	-	0 (0,1)	0.41 ± 0.67	0 (0,1)	0.34 ± 0.63
Weight loss	17.7	-	-	0 (0,0)	0.28 ± 0.67	0 (0,0)	0.24 ± 0.58
Hair loss	72.6	-	-	2 (0,3)	1.85 ± 1.41	1 (0,3)	1.58 ± 1.40
Constipation	31.6	-	-	0 (0,1)	0.58 ± 0.95	0 (0,1)	0.55 ± 0.94
Swelling of arms/legs	3.8	-	-	0 (0,0)	0.05 ± 0.27	0 (0,0)	0.05 ± 0.26
“I don’t look like myself.”	26.5	-	-	0 (0,1)	0.75 ± 1.39	0 (0,0)	0.71 ± 1.39
Changes in skin	34.8	-	-	0 (0,2)	0.81 ± 1.39	0 (0,1)	0.76 ± 1.27

Symptom clusters based on symptom severity score

To identify symptom clusters, exploratory factor analysis (EFA) was performed on 17 symptoms with a prevalence greater than 20%. The results demonstrated that the Kaiser-Meyer-Olkin (KMO) value was 0.941, the Bartlett's test of sphericity yielded $\chi^2 = 3869.412$ ($P < 0.001$), and the cumulative variance contribution rate was 67.244%. Three symptom clusters were identified and named according to their characteristic features: psychological emotional symptoms (i.e., difficulty concentrating, lack of energy, feeling nervous, difficulty sleeping, feeling sad, worrying, feeling irritable), sensory and body image symptoms (i.e., numbness/tingling in hands/feet, skin itching, lack of appetite, change in the way food tastes, hair loss, constipation, "I don't look like myself.", changes in skin), gastrointestinal symptoms (nausea and vomiting), as shown in Table 3.

Table 3
Factor analysis of symptom clusters in OC patients (N = 339)

Factors	Factor loading		
	Psychological emotional symptoms	Sensory and body image symptoms	Gastrointestinal symptoms
Difficulty concentrating	0.656		
Lack of energy	0.633		
Feeling nervous	0.845		
Difficulty sleeping	0.606		
Feeling sad	0.838		
Worrying	0.803		
Feeling irritable	0.782		
Numbness/tingling in hands/feet		0.567	
Skin itching		0.687	
Lack of appetite		0.645	
Change in the way food tastes		0.642	
Hair loss		0.506	
Constipation		0.717	
"I don't look like myself."		0.788	
Changes in skin		0.691	
Nausea			0.733
Vomiting			0.855
Cronbach's α coefficient	0.918	0.882	0.750
Cumulative variance contribution rate (%)	51.182	60.127	67.244

Symptom network analysis

For network analysis, the severity scores of each symptom in the MSAS were used, as they best reflect symptom intensity and are most commonly adopted in symptom network research. In the symptom network of OC patients receiving chemotherapy, green lines represent positive correlations, while the red line indicates negative correlation. Thicker lines between nodes indicate stronger relationships, while thinner lines indicate weaker connections. Strong correlations were observed between feeling sad and worrying, "I don't look like myself" and changes in skin, feeling irritable and feeling sad, with correlation coefficients of 0.903, 0.872, and 0.868 respectively. In the network diagram, the symptom ranking highest in strength, closeness, betweenness and expected influence was: "I don't look like myself" (r_S=1.780, r_C=1.320, r_B=1.700, r_E=1.962). Among the four centrality metrics, the symptom ranking second were: vomiting (r_S=1.407), feeling irritable (r_C=1.250), feeling sad (r_B=1.700) and feeling sad (r_E=1.512), respectively. The third-ranked symptoms were: feeling irritable (r_S=1.220), skin itching (r_C=1.201), feeling irritable (r_B=1.162) and skin itching (r_E=1.110), respectively, as shown in Fig. 1 and in Appendix Fig. 1.

Node stability was tested using the Bootstrap method. The results showed that the stability coefficients for strength, closeness, betweenness and expected influence were 0.596, 0.440, 0.050 and 0.749, respectively, as shown in Appendix Fig. 2. For the precision test of network edge weights, a small gray shaded area was observed, indicating narrow 95% confidence intervals for the edge weights. This finding suggests that the network estimation is highly accurate, as shown in Appendix Fig. 3.

Symptom clusters network analysis

Network analysis of symptom clusters indicate that the psychological emotional symptom and sensory and body image symptoms exhibit the strongest correlation, with a correlation coefficient of 0.720. Conversely, the strongest negative correlation is observed between self-efficacy and the psychological emotional symptoms, with a correlation coefficient of -0.678. Regarding centrality metrics, the psychological emotional symptoms demonstrates the highest node in strength (r_S=1.253), closeness (r_C=0.853), and betweenness centrality (r_B=0.866). This suggests that it occupies a central position in the symptom network and serves as a key node influencing the occurrence, development, and interactions of other symptoms, as shown in Fig. 2 and in Appendix Fig. 4. In the symptom cluster network, the correlation coefficients for all four indicators exceeded 0.5, indicating good network stability, as shown in Appendix Fig. 5 and Fig. 6.

Discussion

This study identified three symptom clusters among patients undergoing postoperative chemotherapy for OC during the chemotherapy period: psychological emotional symptoms, sensory and body image symptoms, and gastrointestinal symptoms. A network was constructed to identify core symptoms and symptom clusters, as well as the relationship between symptom clusters and self-efficacy. These findings provide a crucial basis for optimizing symptom management strategies for cancer patients. Implementing targeted interventions for core symptoms in clinical nursing practice will enhance OC patients' ability to manage symptoms at home and improve their self-efficacy, thereby increasing the precision and effectiveness of symptom management.

The Symptom Burden in OC Patients

Our study found that 19 symptoms were reported by over 20% of OC patients during chemotherapy interval. The most prevalent symptoms were hair loss, nausea, and vomiting. Moreover, the symptoms associated with the highest levels of severity and distress included hair loss, nausea, and numbness or tingling, highlighting the significant symptom burden experienced by patients. These findings align with those of studies conducted by Hwang K's team in South Korea and Feng Y et al. in China, which documented that OC patients endure a range of physical and psychological symptoms during chemotherapy, such as sensory abnormalities, nausea/vomiting, hair loss, depression, and sleep disturbances[9,24]. It is important to note that these symptoms often interact and recur throughout treatment, in severe instances, they may lead to treatment interruptions or delays, ultimately impacting patients' quality of life.

Identified three symptom clusters

This study identified three symptom clusters experienced by patients undergoing postoperative chemotherapy for OC during treatment intervals: psychological emotional symptoms, sensory and body image symptoms, and gastrointestinal symptoms. These findings contrast with the number of symptom clusters identified through factor analysis in studies conducted by Hwang KH et al., Huang J et al., and Nho JH et al., which also involved OC patients receiving chemotherapy[24–26]. Nonetheless, all studies concluded that symptom clusters during the chemotherapy period are common and severe among OC patients. This discrepancy may be attributed to variations in research tools and study populations. Consequently, it is imperative for healthcare providers to focus on and promptly assess these symptoms to enhance patients' quality of life, treatment adherence, and prognosis.

Psychological symptom clusters and gastrointestinal symptom clusters are commonly observed in cancer patients undergoing chemotherapy, which is consistent with findings from multiple studies[25,27–30]. This may be attributed to a variety of factors, including disease prognosis, changes in appearance, and the risk of recurrence, compounded by chemotherapy-induced discomfort and the effects of long-term treatment. In previous studies, researchers have reported body image-related symptom clusters, including hair loss, changes in self-image, and constipation, among OC patients undergoing chemotherapy[25,31]. A study by Korean researchers on symptom clusters in OC patients undergoing chemotherapy also identified a peripheral neuropathy symptom cluster characterized by numbness or loss of sensation in the hands and feet[24]. Unfortunately, there have been no reports integrating somatosensory abnormalities, skin changes, gastrointestinal symptoms, and body image changes into a single symptom cluster for discussion. A possible explanation is that these symptoms don't exist in isolation but are interrelated and cluster together to form a complex symptom cluster under the combined effects of OC surgery and chemotherapy. It is hoped that future large-scale, multicenter studies will be conducted to supplement these findings.

"I don't feel like myself" is the core symptom among OC patients undergoing chemotherapy

The results indicate that the symptom with the highest centrality score among patients undergoing postoperative chemotherapy for OC was "I don't feel like myself". This suggests that this symptom has the broadest and closest associations with other symptoms, establishing it as the most central and fundamental symptom in the symptom network. A symptom network analysis conducted on patients with advanced liver cancer undergoing targeted immunotherapy identified "I don't feel like myself" as one of the core symptoms in the symptom network[32]. This finding is consistent with the results of our study. In a network analysis by Zhang J. et al. involving patients with gynecological cancer receiving chemotherapy, fatigue was found to be the most central symptom; the discrepancies in research findings may be attributed to differences in study populations and research methodologies employed[27,33]. The phrase "I don't look like myself" signifies more than just a change in appearance; it encapsulates a concentrated manifestation of impaired physical, psychological, and social functioning following chemotherapy, serving as a significant indicator of

compromised patient self-identity. Consequently, clinical nurses should prioritize addressing psychological symptoms such as body image distress and alterations in self-perception as key targets for intervention.

Psychological emotional symptoms strongly correlate negatively with self-efficacy

A network analysis of symptom clusters and self-management efficacy among OC patients during chemotherapy intervals revealed that the psychological emotional symptom cluster exhibited the highest node strength, closeness, and betweenness centrality, suggesting it occupies a central hub position within the entire symptom network. It showed the strongest correlation with the perception and physical appearance symptom cluster, indicating that these two symptom clusters influence each other, coexist to a high degree, and are prone to forming stable symptom clusters. A strong negative correlation was observed between self-efficacy and the psychological and emotional symptom cluster, indicating that the more severe a patient's psychological and emotional issues, the poorer their self-management ability, a key target for clinical intervention. This finding is consistent with the conclusion from previous studies that increased self-efficacy is positively correlated with patients' physical and mental well-being, both suggesting a positive association between self-efficacy and positive health outcomes[34–35]. The more severe the psychological emotional symptoms, the lower the patient's confidence and ability in self-management; conversely, enhancing self-efficacy can effectively alleviate emotional distress and improve physical and mental well-being. OC patients face organ loss after surgery, side effects such as nausea and vomiting caused by chemotherapy, and psychological symptoms such as sadness and anxiety. The combined effect of these multiple symptom burdens further reduces their level of self-efficacy. However, multiple intervention studies have confirmed that personalized guidance and training, pre-chemotherapy education, and audiovisual interventions can enhance cancer patients' self-efficacy in symptom management, providing feasible approaches for clinical practice[36–37].

Limitations

This study has several limitations. First, this is a single-center cross-sectional study that included only patients receiving postoperative chemotherapy for OC at one hospital in China. Furthermore, the small sample size may result in limited representativeness and generalizability of the research findings, making it difficult to extrapolate to broader populations. Second, our study collected symptom data from patients at a single point time during the chemotherapy interval and did not conduct longitudinal follow-up, making it impossible to reflect the long-term dynamic changes in symptoms. Third, the symptom network analysis is capable of uncovering associations among symptoms but is unable to determine causal relationships. Fourth, both the closeness centrality and betweenness centrality values of nodes were relatively low, indicating that no singular symptom exhibiting complete dominance has arisen within the symptom network. It may to some extent limit the effectiveness of precise targeted intervention. Therefore, the results of our study should be interpreted with caution. Future research could involve multicenter, large-sample, longitudinal studies to further explore differences in symptom clusters across various populations. Additionally, Cross-Lagged Panel Network models could be employed to analyze the predictive role of symptoms over time and potential causal relationships, thereby providing high-quality evidence to inform the development of more targeted symptom management strategies in clinical practice.

Conclusion

In the chemotherapy interval, "I don't look like myself" is the core symptom, while psychological emotional symptoms constitute the core symptom cluster. Clinical healthcare professionals should take core symptoms and symptom clusters as the entry point for symptom management, with a focus on intervening in patients' psychological emotional cluster, and adopt targeted measures to enhance their self-efficacy levels. Through comprehensive intervention models, such as personalized training, remote symptom monitoring, and digital self-management strategies, we hope to alleviate patients' symptom burden, improve self-efficacy among cancer patients, and thereby enhance the quality of life for OC patients during chemotherapy breaks.

Abbreviations

Ovarian Cancer
OC
Memorial Symptom Assessment Scale
MSAS
Strategies Used by People to Promote Health
SUPPH
Standard deviation
SD
Stability Coefficient
CS
Exploratory Factor Analysis
EFA
Kaiser - Meyer - Olkin
KMO.

Declarations

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Not applicable.

Authors' contributions

Yan Zhang and **Rui Lian** designed the study. **Lin Li** and **Lei Zhang** wrote the initial draft of the manuscript, while **Lei Zhang** contributed to data analysis. **Ning Han** and **Minghui Yao** collected and reviewed the clinical data. **Jun Hu, Rui Lian** and **Yan Zhang** reviewed and edited the manuscript. All authors read and approved the final version of the manuscript.

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Availability of data and materials

All data in our study are available upon request.

Ethics approval and consent to participate

This study has been reviewed and approved by the Medical Ethics Committee of Peking University First Hospital (Approval No.: 2022 Yan 203-002) and all patients provided written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Figures

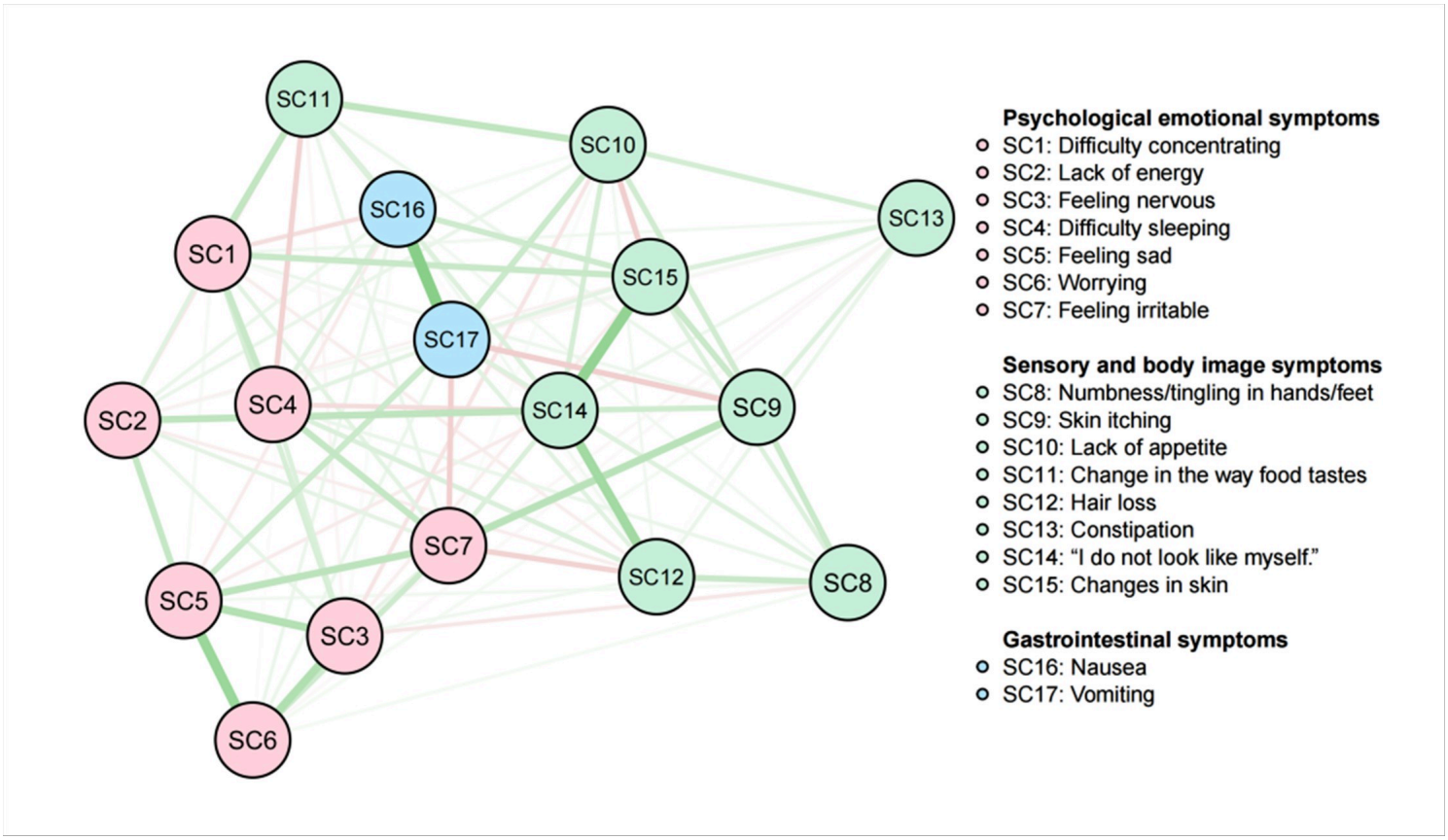


Figure 1

Network analysis of symptom clusters in patients undergoing postoperative chemotherapy for OC patients.

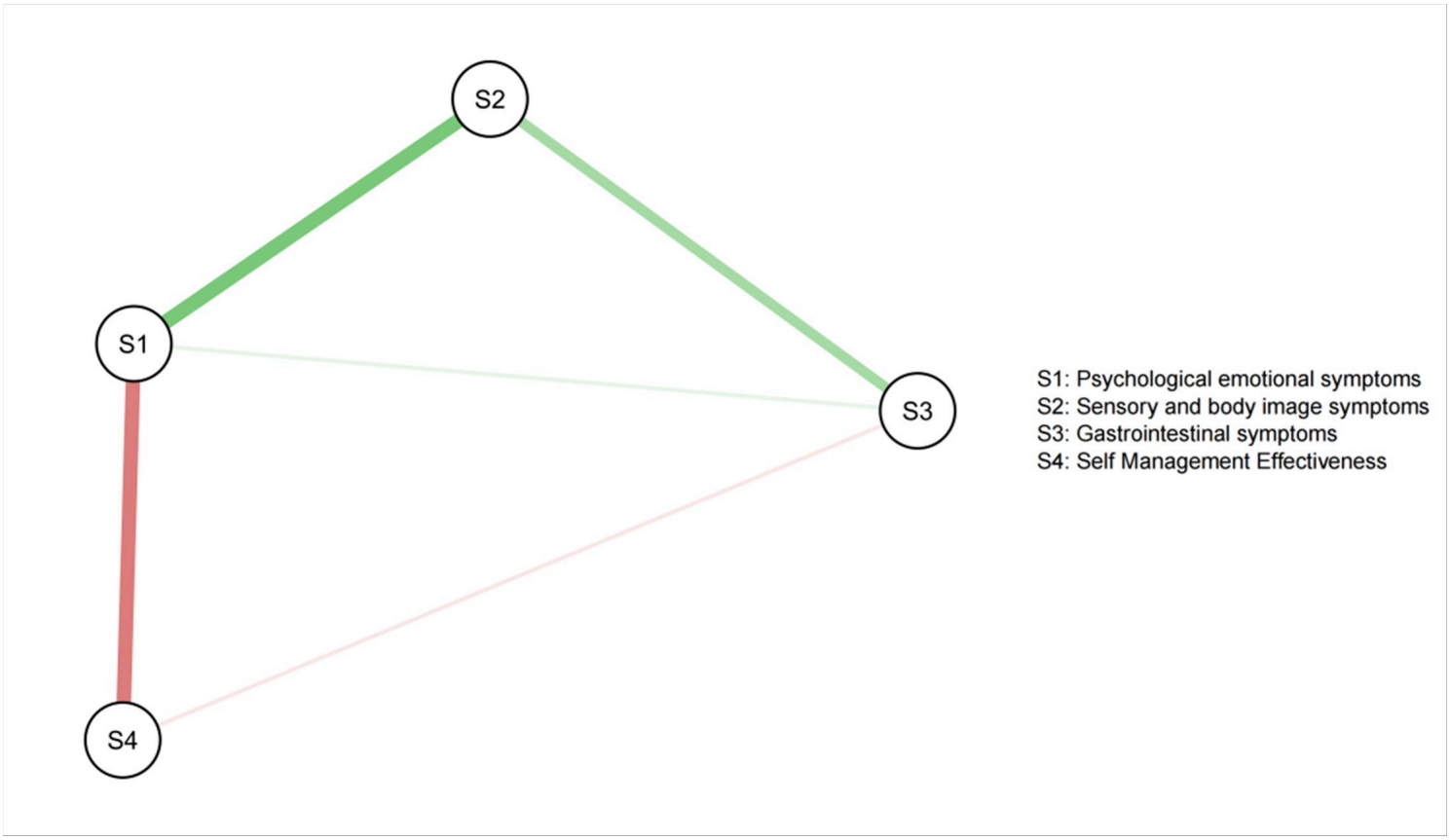


Figure 2

Network analysis of symptoms clusters and self-efficacy in patients undergoing postoperative chemotherapy for OC patients.

Supplementary Files

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- AppendixSymptomClustersinPostoperativeChemotherapyPatientswithOvarianCancerandtheRelationshipwithSelfEfficacyANetworkAnalysis.docx