Correlation Analysis of Mood State and Symptom Clusters in Patients With Stage-Ⅲ Lung Cancer During Immunotherapy

Weichao Huang
Tongji University
Yifan Luo
Tongji University
Ying Huang
Tongji University
Chunhong Yang
The First Affiliated Hospital of China Medical University
Yumei Li (1500179@tongji.edu.cn)
Tongji University https://orcid.org/0000-0001-7275-1792

Research Article

Keywords: lung cancer, immunotherapy, mood state, symptom clusters

Posted Date: March 26th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-299760/v1

Abstract

Purpose: To investigate the status of symptom clusters and mood states and analyze the correlation between them in patients with stage-IV lung cancer undergoing immunotherapy.

Methods: Using a convenience sampling method, we selected 259 patients for analysis with stage-IV lung cancer who were admitted to the oncology department of a hospital for immunotherapy from February to December 2020. Three instruments were used: a general situation questionnaire, the Chinese version of the M. D. Anderson Symptom Inventory, and the Brief Profile of Mood State Short Form.

Results: An exploratory factor analysis identified three main symptom clusters: the disturbance influence, general, and pain–fatigue related symptom clusters. The total score for mood state was (25.71 SD: ±8.32). The score of the depression dimension was the highest (3.30 ±1.85) in the negative mood state; the total score of mood state and the score of negative mood state at different latitudes were significantly positively correlated with the total score of symptom clusters (r = 0.420–0.529, p < 0.01).

Conclusion: There are many symptom clusters in patients with lung cancer undergoing immunotherapy. The negative mood state is significant and changes along with changes in symptom clusters; moreover, there is high correlation between them. There should be more focus on the evaluation and management of symptom clusters of patients in nursing to improve the patients' quality of life.

1. Introduction

Among malignant tumors, lung cancer has the highest incidence and mortality globally [1]. It is one of the most common malignant tumors in China, and in the past 40 years, its mortality has been the highest and it has been increasing year by year [2]. Most patients are already at an advanced stage by the time of diagnosis, which affects the mood state of patients to different degrees and influences their physical and mental health. The concept of mood state comprises a positive mood state and a negative mood state. Positive mood state is mostly manifested in two aspects: high spirits and happiness. Negative mood state includes depression, fatigue, tension, distress, and panic. Mood states that are contagious and last for a long time are patients' emotional or affective responses to their situations and treatments. These situations can cause negative emotions and influence the patients' physical and mental health, attitude, and behavior for a long time.

After chemotherapy and molecular targeted therapy, the treatment of lung cancer has now entered a new era: that of immunotherapy represented by immune checkpoint inhibitors. Chemotherapy combined with immunotherapy has become a clinically effective therapeutic method of prolonging the life of patients with advanced lung cancer [3]. However, the toxic side effects of the treatment process increase patients' physical and psychological discomfort, leading to different degrees of symptom pressure [4]. Negative mood has an adverse effect on the quality of life of patients [5]. To date, the relationship between symptoms and mood state has not been appropriately investigated.

Therefore, this study analyzes the correlation between symptom clusters and mood states of patients with lung cancer during immunotherapy and provides evidence for clinical nursing staff for appropriate symptom management. Our findings could play a vital role in the clinical practice of symptom management and nursing practice to improve the quality of life of patients with advanced lung cancer.

2. Subjects And Methods

2.1. Research Subjects

Using convenience sampling, we conducted a questionnaire survey involving patients with stage-IV lung cancer who were admitted to the oncology department of a specialized Grade-A tertiary hospital in Shanghai, China, for immunotherapy from February to December 2020.

The inclusion criteria were as follows: patients who (1) were pathologically diagnosed as having primary lung cancer in stage IV; undergoing the therapeutic scheme for non-small cell lung cancer: pemetrexed + carboplatin chemotherapy + immunotherapy or paclitaxel + carboplatin chemotherapy + immunotherapy; and undergoing the therapeutic scheme for small cell lung cancer: etoposide + carboplatin + immunotherapy; (2) were aged ≥18 years; (3) were voluntarily participating in this survey; and (4) could consciously, without communication barriers, give informed consent and sign the informed consent form.

The exclusion criteria were patients (1) with current mental illness or a history of mental illness and (2) who were currently participating in other clinical studies. The removal criteria were patients (1) whose questionnaire answers were unreasonable (always choosing the same option) or had serious omissions that could not be remedied and (2) who dropped out due to diverse reasons.

The sample size was calculated based on the experience and methods of sample size determination in multivariate analyses from the literature [6]. Further, the sample size was 5–10 times the number of variables. As this study used the Chinese version of the M. D. Anderson Symptom Inventory (MDASI-C), which contains 19 items, and the Brief Profile of Mood State Short Form (BPOMS-SF), which contains 30 items, the minimum sample size was 245 cases. Finally, considering a 10% attrition rate, 270 questionnaires were finally distributed, and 259 valid questionnaires were recovered. The effective response rate was 95.9%.

2.2. Research Tools

2.2.1. Patient General Situation Questionnaire

This questionnaire was designed by researchers to obtain the patients' basic information, including age, gender, religious belief, education level, marital status, place of residence, disease course, monthly household income, payment method of medical expenses, and occupational status.

2.2.2. MDASI-C

The scale was developed by the University of Texas M. D. Anderson Cancer Center in 2000 and has been translated into 29 languages (including Chinese). This study draws on the MDASI-C scale developed by Zang Yu of the Southern Medical University [7]. The first part of this scale comprises 13 questions to assess the severity of patients' common symptoms experienced during the previous day. The second part includes six options to mainly evaluate the level of influence symptoms have on the life of patients with cancer. Each item is scored on a numerical scale ranging from 0 to 10, in which 0 indicates no symptoms and 10 very severe symptoms. The internal consistency reliability was 0.84–0.86, confirmed through 20 pretests with a small sample size.

2.2.3. BPOMS-SF

The Chinese version of the BPOMS-SF [8, 9] was compiled by American scholar McNair and revised by Professor Chi Song of the Brain Behavior Research center at the Chinese Academy of Sciences. It comprises 30 items in six dimensions: (1) tension (T), (2) depression (D), (3) anger (A), (4) fatigue (F), (5) confusion (C), and (6) vigor (V). Among them, vigor is a positive mood state, while the other five dimensions are negative mood states; these are measured on a five-point Likert scale from 0 = not at all to 4 = very much. The total score is the scores of the five negative mood states minus the score of the positive mood state. The higher the score, the greater the degree of psychological distress. This scale is widely used in clinical evaluation, sports, and scientific research to measure the mood, emotion, and emotional state of the individual. The scale has good reliability [9, 10]. In this study, 20 pretests with a small sample size showed that the total Cronbach's alpha of the scale was 0.756 and the internal consistency reliability was 0.705–0.892.

2.2.4. Statistical Methods

An MS Excel database was established for data input and treatment, and SPSS 22.0 software was used for the analysis. The measured data were described by mean and standard deviation (SD), and the enumeration data were described by percentage. The internal consistency coefficient was used to describe the scale's reliability. The scale's exploratory factors were analyzed by principal component analysis. A Pearson's correlation analysis was used to describe the correlation between variables.

3. Results

3.1. Basic Information for Patients

This study included a sample of 259 patients with stage-IV lung cancer: 172 males (66.4%) and 87 females (33.6%). The average age was 63.25 (±9.76) years (Table 1).

Table 1
Basic Information of the Patients (*N* = 259)

Demographic variable	Category	Number of cases	Percentage (%)
Gender	Male	172	66.4
	Female	87	33.6
Age (years)	Under 60	121	46.7
	60 and above	138	53.3
Religious belief	Yes	55	21.2
	No	204	78.8
Education level	Primary school	64	24.7
	Middle school	107	41.3
	High school or technical secondary school	53	20.4
	College or higher	35	13.5
Marital status	Married	232	89.6
	Single (divorced or widowed)	27	10.4
Occupational status	Incumbency	23	15.4
	Inoccupation	34	22.8
	Retirement	92	61.7
Monthly household income (RMB)	Above 10k	15	10.1
	5–10k	37	24.8
	Below 5k	55	36.9
Payment method of medical expenses	At own expense	30	20.1
	Rural cooperative medical insurance	91	61.1
	Medical insurance for urban employees	25	16.8
Smoking	No	118	79.2
	Yes	31	20.8
Long-term carers	Parents	5	3.4
	Husband and wife	97	65.1
	Children	38	25.5
	Brothers, sisters, and others	9	6.1
Pathological type	Small C	18	12.1
	Non-small C	13	8.7

3.2. Score and Analysis of Patients' Symptom Clusters

A symptom is considered to exist when MDASI ≥ 1. Symptoms with a higher frequency of occurrence include fatigue (83.01%), sleep disturbance (74.13%), pain (71.81%), lack of appetite (67.79%), and shortness of breath (65.10%). Symptoms with higher severity are fatigue (5.49 ± 2.37), sleep disturbance (4.21 ± 2.27), lack of appetite (4.01 ± 2.29), pain (3.95 ± 2.11), sadness (2.85 ± 1.06), and distress (2.82 ± 1.17; Table 2).

Table 2
Occurrence, Degree of Symptoms, Scores, and Incidence Rates of Patients ($\bar{x} \pm m$ *s*, *n* = 259)

Symptoms	Score of degree (SD)	M (p25–p75)	Incidence rate	Sorting of incidence rate
Fatigue	5.49 (± 2.37)	5 (1, 8)	215 (83.01)	1
Sleep disturbance	4.21 (± 2.27)	4 (1, 6)	192 (74.13)	2
Pain	3.95 (± 2.11)	4 (1, 6)	107 (71.81)	3
Lack of appetite	4.01 (± 2.29)	3 (0, 6)	101 (67.79)	4
Shortness of breath	2.74 (± 1.17)	2 (0, 5)	97 (65.10)	5
Drowsiness	2.60 (± 1.75)	2 (0, 4)	96 (64.43)	6
Difficulty remembering	2.69 (± 1.02)	2 (0, 4)	95 (63.76)	7
Distress	2.82 (± 1.17)	2 (0, 4)	95 (63.76)	8
Sadness	2.85 (± 1.06)	2 (0, 4)	95 (63.76)	9
Dry mouth	2.62 (± 1.08)	2 (0, 4)	94 (63.09)	10
Nausea	1.44 (± 1.03)	1 (0, 3)	90 (60.40)	11
Numbness	1.30 (± 1.08)	1 (0, 3)	80 (53.69)	12
Vomiting	1.03 (± 0.82)	1 (0, 3)	74 (49.66)	13
M = mean, SD = standard deviation.				

3.3. Factor Loadings Analysis of Symptom Clusters

An exploratory factor analysis was used to extract patient symptom clusters. Moreover, a principal component analysis and varimax rotation were conducted. The principle of factor extraction involved symptoms with incidence rate ≥ 20%, characteristic value > 1, and factor loading ≥ 0.5. The results showed that four common factors were obtained and the accumulated variance contribution was 67.10%. Factors 1–4 included the disturbance influence, general, pain–fatigue related, and gastrointestinal symptom clusters (see Table 3).

Table 3
Factor Loading Analysis of Patients' Symptom Clusters

Symptom cluster	Symptoms within cluster	Factor loading 1	Factor loading 2	Factor loading 3	Factor loading 4
Disturbance influence symptom cluster	Influence on daily work	0.697			
	Influence on general activity	0.741			
	Influence on mood	0.642			
	Influence on walking ability	0.751			
	Influence on relationship with others	0.701			
	Influence on the enjoyment in life	0.825			
General symptom cluster	Shortness of breath		0.626		
	Difficulty remembering		0.799		
	Sleep disturbance		0.671		
	Numbness		0.581		
	Drowsiness				
Pain–fatigue related symptom cluster	Pain			0.704	
	Fatigue			0.686	
	Sadness			0.587	
	Distress			0.548	
Gastrointestinal symptom cluster	Dry mouth				0.585
	Lack of appetite				0.583
	Nausea				0.580
	Vomiting				0.687

3.4. Influence and Analysis of Patient Symptom Clusters on Life

The median score of the patient symptom clusters' influence on life was 3–4 and the incidence rate was 52.12–67.95%. The influence on life in the order of high to low was mood (67.95%), general activity (64.86%), daily work (62.16%), enjoyment in life (59.07%), walking ability (54.83%), and relationship with others (52.12%). The order of severity from high to low was mood, general activity, daily work, enjoyment in life, walking ability, and relationship with others. See Table 4 for specific scores.

Table 4
Influence of Patient Symptom Clusters on Daily Life (n = 259)

Symptom disturbance	M (p25–p75)	Score of severity	Incidence rate (%)	Sorting
Mood	4 (1, 6)	4.97 (± 1.21)	176 (67.95)	1
General activity	4 (1, 6)	4.85 (± 1.16)	168 (64.86)	2
Daily work	4 (1, 6)	4.77 (± 1.18)	161 (62.16)	3
Enjoyment in life	4 (1, 6)	4.54 (± 1.09)	153 (59.07)	4
Walking ability	3 (0, 6)	4.37 (± 1.05)	142 (54.83)	5
Relationship with others	2 (0, 6)	3.25 (± 104)	135 (52.12)	6
M = mean, SD = standard deviation				

3.5. Analysis of Patients' Mood State

The total BPOMS score was 25.71 (± 8.32). The negative mood dimensions were ordered as follows, based on their scores from high to low: depression, fatigue, tension, anger, and confusion (Table 5).

Table 5
Brief Profile of Patients' Mood State Short Form Scores (n = 259, points)

Dimensions	M (± SD)	Sorting
Total score	25.71 (± 8.32)	
Depression (D)	3.30 (± 1.85)	1
Fatigue (F)	3.23 (± 1.75)	2
Tension (T)	2.99 (± 1.80)	3
Anger (A)	2.62 (± 1.00)	4
Confusion (C)	2.36 (± 1.60)	5
Vigor (V)	2.31 (± 1.56)	6
M = mean, SD = standard deviation.		

3.6. Correlation Analysis of Mood State and Patients' Symptom Clusters

A Pearson's correlation analysis was conducted between the total scores of the mood state and scores of all dimensions and the scores of symptom clusters in patients with lung cancer. The total scores of the mood state and scores of other dimensions except vigor were shown to be significantly positively correlated with the scores of symptom clusters (r = 0.420–0.529, p < 0.01). The scores of the disturbance influence, general, pain–fatigue related, and gastrointestinal symptom clusters were closely and positively correlated with the total scores of the mood states (r = 0.304–0.516, p < 0.01), as shown in Table 6.

Table 6
Correlation Analysis of Patients' Mood States and Symptom Groups (n = 259)

State of mind	Total score of symptom clusters	Disturbance influence symptom cluster	General symptom cluster	Pain–fatigue related symptom cluster	Gastrointestinal symptom cluster
Tension (T)	0.434**	0.321**	0.301**	0.345**	0.435**
Depression (D)	0.529**	0.415**	0.377**	0.445**	0.225**
Anger (A)	0.420**	0.356**	0.323**	0.435**	0.355**
Fatigue (F)	0.526**	0.209**	0.453**	0.585**	0.467**
Confusion (C)	0.462**	0.155*	0.230**	0.356**	0.142
Vigor (V)	-0.106	-0.165*	-0.164*	-0.325**	-0.203**
Total score	0.469**	0.508**	0.304**	0.516**	0.405**
*p < 0.05; **p < 0.01.					

4. Discussion

Fatigue, sleep disturbance, and pain are the most prominent symptoms of patients with lung cancer receiving immunotherapy [11]. Immunotherapy restores and increases the immunocompetence of immune T-cells, reverses the immunosuppressive state of tumor cell microenvironment, and increases the endogenous anti-tumor immune effect. Once the immune response occurs, it may produce lasting clinical effects [12]. In recent years, the continuous development of immunotherapy has updated the treatment strategy and concept of non-small cell lung cancer and theoretically has the potential to cure tumors. However, clinical practice shows that only a few patients can benefit from it, and the related adverse reactions are serious because of the combined application with chemotherapy or targeted therapy [13]. The survey results in Table 2 show that fatigue is the most serious symptom cluster of patients with lung cancer during immunotherapy, with a degree score of 5.49 (± 2.37), followed by sleep disturbance and pain. The incidence rates of all the above three symptoms are above 70%, likely, because all the subjects studied in this group were patients with stage-IV lung cancer with distant metastasis. The literature reports that 68.4% of patients with advanced lung cancer suffer from insomnia, and 70–80% suffer from different degrees of pain [14, 15]; these results are very similar to the results of this study. Physical discomfort and pain can also cause fatigue and sleep disturbance. Besides therapeutic factors, the main factors influencing fatigue are also related to cancer itself. Considering patients with stage-IV lung cancer, distinguishing cancer-related fatigue from drug-induced fatigue needs further research.

There are four main symptom clusters during immunotherapy, identified through exploratory factor analysis in Table 3: disturbance influence, general, pain–fatigue related, and gastrointestinal symptom clusters. Symptom clusters influenced by disturbance include effects on daily work, general activity, mood, walking ability, relationship with others, and enjoyment in life. General symptom clusters include shortness of breath, difficulty remembering, numbness, sleep disturbance, and drowsiness. Pain–fatigue related symptom clusters include pain, fatigue, distress, and sadness. Gastrointestinal symptom clusters include dry mouth, lack of appetite, and nausea and vomiting. This result differs from the results of Liu et al.'s [16] study on symptom clusters of patients with lung cancer who are treated with palliative methods. There are differences in the internal composition of symptom clusters, mainly because of the different

research subjects. The result is similar to that of Meng et al. [17]. Table 4 shows that symptom clusters have a certain impact on the life of patients, with the incidence rate ranging from 52.12–67.95%. Based on severity, the order from high to low is mood, general activity, daily work, enjoyment in life, walking ability, and relationship with others. All patients in this group have advanced lung cancer, have experienced multiple chemotherapies, and continue to search for updated therapeutic schemes to prolong the survival period. The uncertain outcome of immunotherapy affects the mental and emotional reactions of the patients, causing anxiety, worry, depression, or distress and feeling of losing the enjoyment in life, and even affecting interpersonal communication. Because of the existence of multiple physical and mental symptoms, the patients' activities, work, and daily life are affected, and some patients have problems in communicating with their family members.

The mood state of the patients in this group was found to be good. Table 5 shows the total score of the mood state (25.71 ± 8.32). Based on their scores, the order of negative mood dimensions from high to low is depression, fatigue, tension, anger, confusion, vigor. The situation is optimistic – better than the previous literature reports [18]. This may be related to long illness time, regular chemotherapy, continuous professional guidance from doctors and nurses, health education, and psychological care. Judging from the psychological reaction process of patients with tumors, advanced patients have already gone through the fear, doubt–denial, and depression stages [19]. With the progress of radiotherapy, chemotherapy, targeted therapy, and current immunotherapy, patients have entered the adaptation stage; however, the depression dimension is more serious. The negative, over-generalized, and self-reproaching thinking naturally leads to a depressing sense of despair. The depressed mood state, which is the core of other negative emotions, leads to negative thinking. Therefore, the negative viewpoint of patients with cancer amplifies the painful experience. When the patients' mood hits rock bottom, their thinking enters another mode. The bad mood state dominates their attitude toward negative events, which may lead to extreme negative emotions such as tension and anger.

This research shows that the total score of the mood state, tension, depression, anger, fatigue, and confusion of patients are highly positively correlated with the total score of symptom clusters ($r = 0.420–0.529$, $p < 0.01$); moreover, the total score of the mood state is highly positively correlated with the total score of the disturbance influence, general, pain–fatigue related, and gastrointestinal symptom clusters ($r = 0.304–0.516$, $p < 0.01$). Relevant studies show that symptom clusters have an important influence on the quality of life of patients with lung cancer, and the emotional symptoms are independent factors influencing quality of life. The more severe the symptom clusters of patients, the less satisfactory the quality of life [16, 17, 20]. For patients with advanced cancer, if the symptoms cannot be alleviated, the patients' prognosis, such as mood state and quality of life, will be affected by many negative emotions [5]. In particular, worries about things such as diseases, desire for treatment, and tolerance to adverse reactions will be internalized into the patients' emotional symptoms. Symptom clusters such as sadness and distress are a type of negative feeling that patients with lung cancer often experience in the late stage of the disease. The uncertainty of the therapeutic effects of most new immunotherapy drugs makes patients prone to anxiety and uneasiness, thus aggravating the negative mood state. Because tumor metastasis can cause more pain and fatigue, which will lead to a decline in patients' vigor, cause a lack of spirit, and affect daily activities and quality of life, it is very unfavorable to the rehabilitation and treatment of patients.

A longitudinal study conducted by the University of California in the United States shows that there are six symptom clusters in patients with lung cancer receiving chemotherapy. The symptom clusters change with time and the patients' experience also changes. However, three symptom clusters remain relatively stable: lung cancer-specific, psychological, and nutritional symptom groups [21]. It is suggested that medical staff should pay close attention to the psychological changes in patients with lung cancer at various treatment stages. Appropriate psychological counseling and psychological nursing can help alleviate the patients' experience symptom clusters to improve their negative mood [22].

5. Conclusion

Patients with lung cancer experience many symptom clusters during immunotherapy. The negative mood state is a serious issue and it changes along with the change in symptom clusters; there is high correlation between symptom clusters and mood state. In clinical nursing work, medical staff should pay close attention to the mood state of patients with lung cancer undergoing immunotherapy treatment and the interaction between various symptom clusters, so as to actively address and solve them. This will guide patients and their family members to learn to manage symptoms of symptoms, actively participate in rehabilitation activities of various social groups, establish anti-cancer confidence, and improve mood state.

This study has certain limitations. As this survey was carried out in a specialized Grade-A tertiary hospital, the findings do not have broad applicability. Moreover, research on patient symptom clusters during immunotherapy is still in the initial stage. To effectively manage and intervene in patient symptom clusters, future research should investigate the model characteristics of relevant symptom clusters and establish appropriate intervention modes to reduce the physical and mental burdens of patients and improve their quality of life.

Declarations

Acknowledgements

We would like to thank Editage (www.editage.com) for English language editing. This study is supported by the Chinese Medicine Research Office of the Health and Family Planning Commission of Shanghai (Grant No. 2016LP027) and the Shanghai Nursing Association (Grant No. 2017 MS-B 09).

Funding: This study is supported by the Chinese Medicine Research Office of the Health and Family Planning Commission of Shanghai (Grant No. 2016LP027) and the Shanghai Nursing Association (Grant No. 2017 MS-B 09).

Conflicts of interest: The authors have declared there were no conflicts of interest relevant to the content of this article.

Availability of data and material: The data used in this study is available from the first author upon reasonable request.

Code availability: Not applicable

Authors' contributions: Study design and administrative support: Yumei Li; Data collection: Weichao Huang and Ying Huang; Data analysis and interpretation: Yifan Luo and Chunhong Yang; Manuscript writing: All authors; Final approval of manuscript: All authors. The manuscript has been read and approved by all authors, it has never been published, and it is not under consideration with any other journal.

Ethics approval: All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The research protocol was approved by the Tongji university ethics committee (approval NO. K20-252).

Consent to participate: Informed consent was obtained from all individual participants included in the study.

Consent for publication: Not applicable.

Acknowledgments: We would like to thank Editage (www.editage.com) for English language editing.

References

1. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A (2015) Global cancer statistics 2012. CA Cancer J Clin 65(2):87–108. https://doi.org/10.3322/caac.21262
2. Shen X, Wang L (2017) Spatial analysis of regional actors and lung cancer mortality in China, 1973–2013. Cancer Epidemiol Biomarkers Prev 26(4):569–577. https://doi.org/10.1158/1055-9965.epi-16-0922
3. Fu Y, Zhu B, Zhang BC et al (2019) *Wanqi feiai mianyi zhiliao de xianzhuang yu weilai* [Current status and future of immunotherapy for advanced lung cancer]. Yiyaodaobao (In Chinese) 38(8):993–996
4. Wang D, Fu J (2014) Symptom clusters and quality of life in China patients with lung cancer undergoing chemotherapy. Afr Health Sci 14(1):49–55. https://doi.org/10.4314/ahs.v14i1.8
5. Wang XS, Wang Y, Guo H, Mendoza TR, Hao XS, Cleeland CS (2004) Chinese version of the M. D. Anderson Symptom Inventory: Validation and application of symptom measurement in cancer patients. Cancer 101(8):1890–1901. https://doi.org/10.1002/cncr.20448
6. Chen W, Zheng R, Baade PD et al (2016) Cancer statistics in China, 2015. CA: Cancer J Clin 66(2):115–132. https://doi.org/10.3322/caac.213
7. Zang Y (2013) Anderson zhengzhuang pinggu liangbiao feiai mokuai de xiuding ji feiai huanzhe zhengzhuangqun yanjiu [Revision of the lung cancer module of M.D. Anderson Symptom Inventory and symptom clusters inpatients with lung cancer]. Master's thesis, Guangzhou. Southern Medical University. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CMFD&dbname=CMFD201401&filename=1014100276.nh&v=2Cxef7J%25mmd2B2hQrbfoV1byvUcH1rOl1ng9tVi%25mmd2Fjvhn11PGwSTTl8jg Accessed 12 March, 2020
8. McNair DM, Lorr M, Droppleman LF (1992) EdITS manual for the profile of mood states: POMS. Educational and Industrial Testing Service, San Diego
9. Chi S, Lin WJ (2013) Jianming xinjing liangbiao de chubu xiuding [The Preliminary Revision of Brief Profile of Mood States (BPOMS)-Chinese Edition]. Zhongguo Xinli Weisheng Zazhi (In Chinese) 17(11):768–770
10. Wang JP, Chen HY, Su WL et al (2004) Jianshi jianming xinjing wenjuan zai aizheng bingren yingyong Zhong de xin, xiaodu [Reliability and validity of profile of mood state-short form in Chinese cancer patients]. Zhongguo Xinli Weisheng Zazhi (In Chinese)18(6):404–407
11. Hoffman AJ, Given BA, von Eye A et al (2007) Relationships among pain, fatigue, insomnia, and gender in persons with lung cancer. Oncol Nurs Forum 34(4):785–792. https://doi.org/10.1188/07.ONF.785-792
12. Gettinger S, Horn L, Jackman D et al (2018) Five-year follow up of nivolumab in previously treated advanced non-small-cell lung cancer: Results from the CA 209–003 study. J Clin Oncol 36(17):1675–1684. https://doi.org/10.1200/jco.2017.77.0412
13. Liu YX, Zhang TM, Gao Y et al (2019) Danzhonngxinwanqi feixiaoxibao feiai mianyizhiliao zhenshi shijie shuju fenxi [A single center analysis of advanced non-small cell lung cancer patients treated with immunotherapy]. Zhongguo Feiai Zazhi (In Chinese 22(11):687–695
14. Wei TT, Chen XC, Hou YX et al (2015) Feiai hualiao huanzhe aiyinxing shimian ji zhongliu xiangguan zhengzhuang diaochayanjiu [Relationship between cancer-related insomnia and relevant symptoms of tumor in patients with lung cancer during chemotherapy]. Zhongguo Quanke Yixue (In Chinese) 18(21):2564–2567, 2572
15. Choi S, Ryu E (2018) Effects of symptom clusters and depression on the quality of life in patients with advanced lung cancer. Eur J Can Care 27:e12508. https://doi.org/10.1111/ecc.12508
16. Liu RR, Zou ZY, Wang RX et al (2019) Guxi zhiliao de feiai huanzhe zhengzhuangqun yu shenghuo zhiliaong xianggunxing fenxi [Symptom clusters of lung cancer patients with palliative care and its association with quality of life]. Hulixuebao (In Chinese) 26(6):38–42
17. Meng N, Zhong Y, Liu SS et al (2018) Wanqi feiai huanzhe zhengzhuangqun ji shenghuo zhiliang de diaocha ji xiangguanxing fenxi [Investigation and correlation analysis of symptoms and quality of life of patients with advanced lung cancer]. Linchuang Feike Zazhi (In Chinese)23(3):433–437
18. Li YM, Huang Y, Xue ZY et al (2018) Xushi huli dui wanqi feiai huanzhe xinjing yu zhengzhuangqun guanli de xiaoguo [Symptom clusters of lung cancer patients with palliative care and its association with quality of life]. Jiefangjun Huli Zazhi (In Chinese) 35(21):28–31, 41
19. Liu XH (2015) Huli xinlixue [Nursing psychology], 3rd edn. Shanghai Kexue Jishu Chubanshe, Shanghai
20. Henoch L, Lövgren M (2014) The influence of symptom clusters and the most distressing concerns regarding the quality of life among patients with inoperable lung cancer. Eur J Oncol Nurs 18(3):236–241. https://doi.org/10.1016/j.ejon.2013.12.001

21. Russell J, Wong ML, Mackin L et al (2019) Stability of symptom clusters in patients with lung cancer receiving chemotherapy. J Pain Symptom Manage 57(5):909–922. https://doi.org/10.1016/j.jpainsymman.2019.02.002
22. Li YM, Huang Y, Xue ZY et al (2018) Tuanti xinli fudao dui gaishan wanqi feiai huanzhe xinli kunrao ji ziwo ganshou fudan de xiaoguo yanjiu [The effect of group psychological counseling on improving the psychological distress and self-perceived burden of patients with advanced lung cancer]. Huli Guanli Zazhi (In Chinese) 18(5):360–364