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A Study on the Effect of Symptom Management Education Based on the Knowledge-Attitude-Practice (KAP) Theory on the Symptom Cluster of Fatigue, Pain, and Sleep Disturbances in Lung Cancer Patients

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Abstract: *Objective*: To investigate the intervention effect of symptom management education based on the Knowledge-Attitude-Practice (KAP) theory on the symptom cluster of fatigue, pain, and sleep disturbances in lung cancer patients. *Methods*: A total of 232 lung cancer patients treated in the oncology department from October 2024 to October 2025 were included and randomly divided into an experimental group and a control group, with 116 cases in each group. The control group received routine nursing care for lung cancer, while the experimental group received additional symptom management education intervention based on the KAP theory. Fatigue, pain, and sleep conditions were quantified at the 4th and 8th weeks after the intervention. *Results*: After 4 and 8 weeks of intervention, the RPFS scores, VAS scores, and PSQI scores in the experimental group were lower than those in the control group at the same time points ($p < 0.05$); moreover, the scores in the experimental group at each time point were lower than those before the intervention ($p < 0.05$). *Conclusion*: Symptom management education based on the KAP theory can effectively improve the symptom cluster of fatigue, pain, and sleep disturbances in lung cancer patients, enhance their quality of life, and has clinical promotion value.

Keywords: Knowledge-Attitude-Practice (KAP) theory; Lung cancer; Symptom management education; Fatigue; Pain; Sleep disturbances; Symptom cluster

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1. Introduction

Lung cancer ranks first in terms of both incidence and mortality among the global cancer spectrum. In China, there are over 800,000 new cases each year, with approximately 70% already at an advanced stage at the time of initial diagnosis [1]. A longitudinal survey published by Zhang Huanhuan et al. revealed that lung cancer surgery patients consistently experience a cluster of symptoms including pain, fatigue, and sleep disturbances during

the perioperative period [2]. Although these symptom clusters exhibit dynamic changes at different time points, they persist steadily, and their incidence remains high across all stages of the perioperative period. Current ward management primarily focuses on symptomatic nursing, with interventions that are fragmented and have single objectives, lacking an integrated perspective on symptom clusters and resulting in suboptimal intervention outcomes. The Knowledge-Attitude-Practice (KAP) theory, through its progressive interventions targeting cognition, beliefs, and behaviors, has been proven effective in improving patients' health behaviors in chronic disease management [3]. Based on this context, this study took 232 lung cancer patients as subjects to analyze the intervention effects of symptom management education based on the KAP theory on symptom clusters. The specific content is presented below.

2. Materials and methods

2.1. General information

A total of 232 lung cancer patients who received treatment in the oncology department from October 2024 to October 2025 were selected as the research subjects. They were divided into an experimental group and a control group using the random number table method, with 116 cases in each group. In the experimental group, there were 72 male and 44 female patients, with a mean age of (62.35 ± 7.89) years. The clinical staging was as follows: 32 cases in stage II, 56 cases in stage III, and 28 cases in stage IV. In the control group, there were 75 male and 41 female patients, with a mean age of (63.12 ± 8.15) years. The clinical staging was as follows: 30 cases in stage II, 58 cases in stage III, and 28 cases in stage IV. The baseline data distribution between the two groups was balanced ($p > 0.05$), indicating comparability. This study was approved by the Medical Ethics Committee of our hospital.

2.1.1. Inclusion criteria

(1) Pathologically confirmed primary lung cancer [4]
(2) Age ≥ 18 years, clear consciousness, able to communicate normally and cooperate in completing scale assessments
(3) Accompanied by fatigue, pain, and sleep disorders
(4) Patients and their family members are informed and consent to the research content

2.1.2. Exclusion criteria

(1) Concurrent other malignant tumors
(2) Concurrent severe liver or kidney dysfunction
(3) Cognitive or psychiatric disorders
(4) Withdrawal or loss to follow-up

2.2. Methods

2.2.1. Control group

Patients in this group received conventional nursing care for lung cancer, which included

(1) Basic nursing care

Dynamic monitoring of vital signs, assessment of disease progression, medication education, and

supplementary psychological support interventions

(2) Symptom guidance

Informing patients about the common causes of fatigue, pain, and sleep disturbances, as well as simple coping strategies.

2.2.2. Experimental group

In addition to the conventional care, patients in this group received symptom management education interventions based on the Knowledge-Attitude-Practice (KAP) theory. The specific intervention contents are as follows.

(1) Cognitive intervention (Weeks 1–2)

Through individualized face-to-face guidance, distribution of graphic promotional materials, and observation and learning from popular science audiovisual materials, patients were educated on concepts related to the disease and symptom clusters, their occurrence mechanisms, impacts on disease treatment and quality of life, as well as symptom management methods based on the KAP theory. Weekly centralized lectures were conducted, each lasting 60 minutes.

(2) Belief intervention (Weeks 3–4)

Through case sharing, group discussions, and one-on-one communication, patients who had achieved good symptom management outcomes were invited to share their experiences, thereby enhancing patients' confidence in symptom management, helping them establish the belief that "active interventions can improve symptoms" and stimulating their willingness to actively participate in symptom management. Weekly group discussions were held, each lasting 45 minutes, with 8–10 patients per group.

(3) Behavioral intervention (Weeks 5–8)

Develop personalized symptom management behavior plans based on each patient's specific condition and guide patients in their implementation.

2.2.3. Integrated management of fatigue–pain–sleep symptom cluster

(1) Fatigue management

Instruct patients to arrange reasonably rest and activity times, engage in moderate aerobic exercises such as brisk walking or Tai Chi for 20–30 minutes each session, 3–4 times a week; conduct breathing relaxation training for 15 minutes per session, twice a day.

(2) Pain management

Guide patients in the correct use of pain assessment tools, master non-pharmacological pain relief methods such as heat therapy, cold therapy, massage, and distraction techniques; if necessary, collaborate with doctors for pharmacological pain relief treatment while observing drug efficacy and adverse reactions.

(3) Sleep management

Assist patients in establishing healthy sleep habits and optimizing their sleep environment, including maintaining an appropriate bedroom temperature, soft lighting, and quietness; instruct patients to perform pre-sleep relaxation training 30 minutes before bedtime, including progressive muscle relaxation or mindfulness breathing, lasting approximately 20 minutes.

(4) Symptom cluster interaction management

Address the interrelated nature of fatigue, pain, and sleep disturbances by guiding patients to recognize the interconnected relationships among these symptoms. When sleep disturbances are caused by pain, first employ cold compress or distraction techniques from pain management to alleviate the pain, while simultaneously optimizing the sleep environment and conducting relaxation training as part of sleep management to concurrently improve both pain and sleep issues and reduce fatigue. If muscle soreness arises due to reduced physical activity caused by fatigue, intervene through moderate stretching combined with local massage to prevent pain from affecting sleep. Additionally, establish a symptom cluster diary to guide patients in recording daily the onset time and severity of fatigue and pain, as well as the duration and quality of sleep, while noting factors that exacerbate the interconnectedness of these three symptoms. Nurses will analyze the patterns of interconnection weekly based on the diary entries and adjust personalized intervention plans accordingly.

2.3. Observation indicators

The following indicators will be assessed before intervention (T0), at 4 weeks post-intervention (T1), and at 8 weeks post-intervention (T2).

(1) Fatigue severity

Quantified using the Revised Piper Fatigue Scale (RPFS), which encompasses behavioral, emotional, sensory, and cognitive dimensions, with scores ranging from 0 to 10 in ascending order, where higher scores indicate more severe fatigue.

(2) Pain severity

Assessed using the Visual Analog Scale (VAS), with 0 representing pain-free and 10 representing extreme pain, where a linear increase indicates worsening pain.

(3) Sleep quality

Assessed using the Pittsburgh Sleep Quality Index (PSQI), which encompasses seven aspects: subjective quality, latency, duration, efficiency, disturbances, use of sleep medication, and daytime dysfunction. The total score ranges from 0 to 21, with higher scores indicating poorer sleep quality.

2.4. Statistical methods

Comparisons were made using SPSS 23.0 software. Count data were expressed as percentages (%) and tested using the χ^2 test. Measurement data conforming to a normal distribution were expressed as (mean ± standard deviation) and tested using the *t*-test. A statistically significant difference was considered when $p < 0.05$.

3. Results

3.1. Comparison of RPFS scores

As shown in **Table 1**, the RPFS scores of the experimental group at T1 and T2 were both lower than those of the control group, with $p < 0.05$.

Table 1. Comparison of RPFS scores before and after intervention between groups [$\overline{x}$ ± s, score]

Group	n	RPFS score		
		T0 (Baseline)	T1	T2
Experimental group	116	7.34 ± 1.12	4.12 ± 1.11	2.32 ± 1.18
Control group	116	7.38 ± 1.17	5.78 ± 1.13	3.89 ± 1.16
t-value		0.266	11.287	10.219
p-value		0.790	0.001	0.001

3.2. Comparison of VAS scores

As shown in **Table 2**, the VAS scores of the experimental group at T1 and T2 were both lower than those of the control group, with $p < 0.05$.

Table 2. Comparison of VAS scores before and after intervention between groups [$\overline{x}$ ± s, score]

Group	n	RPFS score		
		T0 (Baseline)	T1	T2
Experimental group	116	8.21 ± 1.09	4.45 ± 1.21	1.50 ± 0.34
Control group	116	8.23 ± 1.07	5.67 ± 1.15	2.96 ± 0.38
t-value		0.141	7.871	30.839
p-value		0.888	0.001	0.001

3.3. Comparison of PSQI scores

As shown in **Table 3**, the PSQI scores of the experimental group at T1 and T2 were both lower than those of the control group, with $p < 0.05$.

Table 3. Comparison of PSQI scores before and after intervention between groups [$\overline{x}$ ± s, points]

Group	n	RPFS score		
		T0 (Baseline)	T1	T2
Experimental group	116	17.67 ± 1.22	8.56 ± 1.42	5.47 ± 1.21
Control group	116	17.56 ± 1.25	10.45 ± 1.44	7.56 ± 1.26
t-value		0.678	10.065	12.886
p-value		0.498	0.001	0.001

4. Discussion

The Knowledge-Attitude-Practice (KAP) theory, as a health behavior change theory, consists of three core elements: cognition, belief, and behavior. Its core concept lies in promoting behavioral changes by altering individuals' cognition and beliefs [5]. In recent years, this theory has been widely applied in the field of health management for chronic disease patients and has achieved promising results. This study applied symptom management education based on the KAP theory to the intervention of symptom clusters of fatigue, pain, and

sleep disturbances in lung cancer patients. The results indicated that after 4 and 8 weeks of intervention, the RPFS scores, VAS scores, and PSQI scores of the experimental group were all lower than those of the control group ($p < 0.05$). This suggests that symptom management education based on the KAP theory can effectively improve fatigue, pain, and sleep disturbances in lung cancer patients. The reasons for this are analyzed as follows.

(1) During the cognitive intervention phase, through various forms of health education, patients were fully informed about the knowledge related to the symptom cluster of fatigue, pain, and sleep disturbances, correcting their misconceptions about the symptoms [6].

(2) During the belief intervention phase, through methods such as case sharing and group discussions, the patients' willingness to actively participate in symptom management was stimulated, leading to a transformation from "passively receiving care" to "actively participating in management" [7].

(3) During the behavioral intervention phase, personalized symptom management behavior plans were formulated based on the individual conditions of patients. With continuous follow-up and guidance, patients were helped to translate health knowledge into practical health behaviors, effectively improving their symptom status.

In clinical interventions, there was a case of a stage III lung cancer patient who scored 7 on the VAS, 18 on the PSQI, and 7.5 on the RPFS before intervention. The patient suffered from night awakenings due to chest and back pain and was too fatigued to get out of bed, creating a vicious cycle and lacking confidence. In the initial stage of intervention, cognitive education was used to clarify the mechanism of symptom interaction, and successful cases were utilized to strengthen belief. During the behavioral phase, cold compresses combined with deep breathing were employed for pain relief, while the sleep environment was simultaneously optimized and relaxation training was conducted. After identifying emotional triggers through symptom diaries, the plan was adjusted accordingly. After 4 weeks of intervention, the three scores dropped to 4, 10, and 5, respectively, and after 8 weeks, they reached 2, 6, and 3. The patient was able to engage in independent activities, fully demonstrating the efficacy of the "cognition-belief-behavior" and symptom cluster interaction management approach. From a mechanistic perspective, the Knowledge-Attitude-Practice (KAP) theory utilizes cognitive restructuring to correct negative perceptions of "uncontrollable symptoms", reducing sympathetic nervous system excitability and cortisol levels, thereby alleviating stress-related fatigue and sleep disturbances. Strengthening beliefs can enhance self-efficacy and activate endogenous analgesic mechanisms to alleviate pain. Behavioral interventions such as regular exercise and relaxation training can improve mitochondrial function, regulate circadian rhythms, and break the neuroendocrine vicious cycle of "fatigue-pain-sleep disorders" [7]. Zhou Ningning et al. conducted similar research [8], and their results showed that the intervention group had lower quantitative scores for the severity of three core symptoms, including cough, fatigue, and respiratory distress if compared to the conventional group ($p < 0.05$). Moreover, the scores across all dimensions of quality of life were significantly better in the intervention group than in the control group ($p < 0.05$). This indicates that a group education model centered on the knowledge-attitude-practice framework can simultaneously reduce the burden of lung cancer-related symptom clusters and enhance patients' overall life experiences, providing evidence-based support for clinical promotion.

5. Conclusion

In summary, symptom management education based on the knowledge-attitude-practice theory can effectively improve symptom clusters of fatigue, pain, and sleep disorders in lung cancer patients and enhance their quality of life. This intervention method is simple to operate and highly feasible, making it worthy of clinical promotion and application. However, this study has limitations: single-center samples are prone to bias and have limited generalizability; the follow-up period was only 8 weeks, leaving the long-term effects unclear; and quality of life and adherence were not evaluated. Subsequent research should involve multi-center, large-sample, long-term follow-up studies with the addition of multidimensional indicators to comprehensively validate the efficacy of knowledge-attitude-practice interventions.

Disclosure statement

The author declares no conflict of interest.

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