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Research on a Nursing Plan for Respiratory Function Training After Radical Resection of Lung Cancer Based on Self-Efficacy Theory

Luping Xu

Taizhou Second People's Hospital, Taizhou 225500, Jiangsu, China

Abstract: *Objective:* To conduct an in-depth analysis of the effectiveness and value of applying a nursing plan for respiratory function training based on self-efficacy theory in patients after radical resection of lung cancer. *Methods:* The study subjects were patients undergoing radical resection of lung cancer, all of whom were sourced from our hospital. A total of 60 patients were included, with the time frame spanning from January 2024 to December 2025. Using a random number table method, all patients were divided into a control group and an observation group (n = 30). The control group received conventional nursing care, while the observation group received respiratory function training nursing care based on self-efficacy theory. Relevant indicators were quantified for both groups. *Results:* After nursing care, the observation group showed significant improvements in pulmonary function indicators, blood gas indicators, as well as inflammatory factor and oxidative stress indicators, which were superior to those of the control group ($p < 0.05$). *Conclusion:* For patients after radical resection of lung cancer, the nursing care plan for respiratory function training based on self-efficacy theory has yielded remarkable results, improving indicators such as pulmonary function and blood gas. It is worthy of promotion and application.

Keywords: Self-efficacy theory; Radical resection of lung cancer; Respiratory function training; Effectiveness evaluation

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1. Introduction

Lung cancer is a clinically prevalent malignant tumor of the respiratory system, consistently ranking first in terms of both incidence and mortality among malignant tumors, posing a significant threat to the lives, health, and quality of life of residents [1]. Currently, for early and mid-stage non-small cell lung cancer, radical resection of lung cancer is the preferred treatment for removing the lesion, effectively eliminating the tumor focus and controlling disease progression. However, the surgical procedure requires thoracotomy, which can cause damage to the thoracic muscles, intercostal nerves, and pleural tissue. Additionally, anesthesia suppresses the respiratory center, leading to restricted thoracic movement, weak coughing, and decreased pulmonary ventilation volume after surgery. These conditions are prone to triggering postoperative respiratory complications such as pulmonary infection, atelectasis, and pleural effusion, thereby affecting postoperative recovery [2]. Respiratory function training is a primary intervention measure for improving pulmonary function and reducing complications after lung cancer surgery. It can repair patients' respiratory muscle function and enhance pulmonary ventilation and gas exchange capabilities through methods such as abdominal breathing, pursed-lip breathing, and effective cough training [3]. Currently, conventional clinical respiratory nursing mainly relies on passive guidance to complete basic health education and movement demonstrations, without considering patients' subjective training willingness and psychological state. Most existing related studies focus on improving respiratory training methods, rarely exploring patients' internal rehabilitation motivation in conjunction with psychological theories, and interventions lack individualization and specificity [4]. Therefore, this article will discuss the effectiveness and significance of a nursing plan for respiratory function training based on self-efficacy theory in the care of such patients, as follows:

2. Materials and methods

2.1. General information

The study subjects were patients undergoing radical resection of lung cancer, with the time frame spanning from January 2024 to December 2025. A total of 60 patients were included and divided into two groups, namely the control group and the observation group (n = 30), using a random number table method. The specific baseline information is as follows:

2.1.1. Control group

17 males and 13 females; age range: 42–73 years, with a mean age of (58.64 ± 6.27) years; pathological classification: 16 cases of squamous cell carcinoma and 14 cases of adenocarcinoma; surgical methods: 11 cases of open thoracotomy and 19 cases of thoracoscopic radical resection.

2.1.2. Observation group

16 males and 14 females; maximum age: 75 years, minimum age: 40 years, with a mean age of (58.60 ± 6.26) years; pathological classification: 13 cases of squamous cell carcinoma and 17 cases of adenocarcinoma; surgical methods: 12 cases of open thoracotomy and 18 cases of thoracoscopic radical resection.

2.1.3. Inclusion criteria

(1) Diagnosed with primary lung cancer through imaging and pathological biopsy, meeting the surgical indications for radical resection of lung cancer;
(2) Clear consciousness, normal cognitive and communication functions, able to cooperate in completing respiratory training and scale assessments;
(3) Patients and their families are informed about the study content and voluntarily sign the informed consent form for the study.

2.1.4. Exclusion criteria

(1) Patients with mental illnesses, cognitive impairments, or those who actively withdraw from the study

midway;

(2) Patients with underlying respiratory diseases such as chronic obstructive pulmonary disease and asthma;

(3) Patients with severe dysfunction of important organs such as the heart, liver, and kidneys, unable to tolerate postoperative rehabilitation training.

2.2. Methods

Control group (conventional nursing care): Conduct unified health education before surgery, orally explaining postoperative respiratory training methods, postoperative precautions, and complication prevention points; regularly monitor vital signs after surgery, guide patients to independently complete pursed-lip breathing and abdominal breathing training twice daily; routinely provide incision care, pain care, and dietary guidance, and uniformly distribute rehabilitation education brochures before discharge.

Observation group (nursing care for respiratory function training based on self-efficacy theory): On the basis of the conventional nursing care in the control group, superimpose individualized respiratory function training interventions based on self-efficacy theory. Stratified nursing care was conducted in four stages: preoperative, early postoperative, postoperative recovery, and home continuation after discharge, centered around the four major sources of self-efficacy construction (direct successful experience, vicarious experience, verbal persuasion, and emotional arousal):

(1) 1 day before surgery

Emotional arousal + preoperative pre-training. Patients commonly experience surgical anxiety and fear of postoperative pain before surgery, which may lead to resistance to subsequent rehabilitation training. Nursing staff conduct one-on-one psychological assessments and counseling to arouse patients' rehabilitation motivation; simultaneously, provide pre-adaptation guidance for respiratory training, completing one set each of pursed-lip breathing, abdominal breathing, and effective cough training daily, with 10 repetitions per set, to help patients master basic movements proficiently, eliminate the strangeness of postoperative training, and alleviate preoperative negative emotions.

(2) 1–3 days after surgery (peak pain period)

Build basic self-efficacy relying on direct successful experience. Postoperative incision pain is the main obstacle to compliance. Low-intensity, progressive training is adopted: After patients are fully awake 6 hours after surgery, conduct passive abdominal breathing in bed every 2 hours, 5 minutes each time; gradually increase the amount 24 hours after surgery, with three training sessions in the morning, afternoon, and evening daily, 15 minutes each for pursed-lip breathing and abdominal breathing, and 8 repetitions per set for effective cough training. Nursing staff provide one-on-one guidance and corrections throughout the process, record the training completion status daily, and promptly offer positive encouragement to patients who complete the training, helping them build initial rehabilitation confidence through one small rehabilitation success after another.

(3) 4–7 days after surgery (pain relief period)

Strengthen self-efficacy through vicarious experience + verbal persuasion. Organize patient experience exchange sessions twice a week, each lasting 30 minutes, inviting patients of the same surgical method, similar age, and with excellent rehabilitation results to share their training experiences on site, allowing patients to refer to similar rehabilitation cases and dispel training concerns directly; nursing staff conduct 10-minute one-on-one communications daily, offering targeted encouragement based on patients' daily pulmonary function monitoring results and training compliance, and correcting patients' misconceptions that training will aggravate incision pain. Training is conducted three times daily, 20 minutes each time during this stage, with the addition of thoracic expansion training to improve restricted thoracic movement further.

(4) Discharge and home follow-up stage

Consolidate self-efficacy and continue rehabilitation management. Assess patients' mastery of training before discharge, distribute illustrated manuals and teaching videos, and recommend training once in the morning and once in the evening at home, 25 minutes each time. Conduct weekly 15-minute online follow-ups after discharge to urge training; patients return to the hospital for follow-up visits at 2 and 4 weeks after surgery to evaluate rehabilitation effects based on pulmonary function. Adjust training intensity throughout the process according to the visual analog scale for pain to prevent incision traction and ensure the safety and effectiveness of respiratory training.

2.3. Observation indicators

(1) Lung function

The detection indicators include Forced Vital Capacity (FVC), Forced Expiratory Volume in One Second (FEV1), the percentage of predicted FEV1 (FEV1%), and the ratio of FEV1 to FVC (FEV1/FVC). These indicators are measured using the German Jaeger MasterScreen PFT System lung function tester.

(2) Blood gas indicators

Arterial blood gas analyzers are used to measure blood oxygen saturation and arterial partial pressure of oxygen, while respiratory detectors are employed to measure respiratory rate.

(3) Evaluation of inflammatory factors and oxidative stress indicators: This involves serum Tumor Necrosis Factor (TNF-α), Interleukin-8 (IL-8), Malondialdehyde (MDA), and Superoxide Dismutase (SOD). Fasting venous blood samples are drawn from the subjects, and the upper layer of serum is separated through centrifugation. Measurements are then conducted using an automatic biochemical analyzer.

2.4. Statistical methods

Data analysis was performed using SPSS 25.0. Measurement data are presented in the form of ($\bar{x} \pm s$), while count data are displayed in the format of [case (%)]. Comparisons were made using *t*-tests and chi-square tests (χ^2), with differences considered statistically significant when the *p*-value was less than 0.05.

3. Results

3.1. Evaluation of lung function indicators in both groups of patients before and after nursing care

As shown in **Table 1**, when comparing the two groups, the lung function indicators of patients in the observation group were significantly better after nursing care ($p < 0.05$).

Table 1. Evaluation of lung function indicators in both groups of patients before and after nursing care ($\bar{x} \pm s$)

Group	FVC(L)		FEV_1(L)		FEV_1%		FEV_1/FVC(%)	
	After nursing	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing	Before nursing
Control group (n = 30)	2.11 ± 0.28	2.49 ± 0.27	1.52 ± 0.25	1.81 ± 0.27	44.19 ± 5.38	51.58 ± 4.40	53.86 ± 4.55	60.24 ± 4.47

Observation group (n = 30)	2.10 ± 0.26	2.78 ± 0.29	1.51 ± 0.26	2.01 ± 0.29	44.23 ± 5.41	55.98 ± 4.16	54.05 ± 4.73	63.89 ± 4.62
t	0.143	4.009	0.152	2.903	0.029	10.466	0.159	3.110
p	0.887	0.001	0.880	0.005	0.977	0.001	0.875	0.003

3.2. Evaluation of blood gas indicators in both groups of patients before and after nursing care

As shown in **Table 2**, when comparing the two groups, the blood gas indicators of patients in the observation group were superior after nursing care ($p < 0.05$).

Table 2. Evaluation of blood gas indicators in both groups of patients before and after nursing care ($\overline{x} \pm s$)

Group	Respiratory rate (times/min)	Respiratory rate (times/min)	Oxygen saturation (%)	Oxygen saturation (%)	Arterial partial pressure of oxygen (mmHg)	Arterial partial pressure of oxygen (mmHg)
	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Control group (n = 30)	19.36 ± 2.15	17.58 ± 2.08	92.36 ± 4.21	95.02 ± 3.75	81.96 ± 3.02	84.36 ± 3.27
Observation group (n = 30)	19.41 ± 2.23	15.13 ± 1.84	92.42 ± 4.13	98.21 ± 4.11	81.90 ± 3.06	88.82 ± 3.51
t	0.088	4.832	0.140	3.140	0.076	5.09
p	0.930	0.001	0.889	0.003	0.939	0.001

3.3. Evaluation of inflammatory factors and oxidative stress indicators in both groups of patients before and after nursing care

As shown in **Table 3**, after nursing care, the levels of TNF-α, IL-8, SOD, and MDA in the observation group were significantly improved compared to those in the control group ($p < 0.05$).

Table 3. Evaluation of inflammatory factors and oxidative stress indicators in both groups of patients before and after nursing care ($\overline{x} \pm s$)

Group	TNF-α (ng/L)		IL-8 (pg/mL)		SOD (U/L)		MDA (nmol/L)	
	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Control group (n = 30)	34.76 ± 7.66	29.48 ± 5.39	30.68 ± 7.45	26.69 ± 5.82	188.58 ± 15.97	289.76 ± 21.85	15.56 ± 3.28	10.79 ± 2.79
Observation group (n = 30)	34.78 ± 7.57	22.84 ± 5.34	30.46 ± 7.37	21.44 ± 5.67	189.77 ± 16.30	379.75 ± 22.69	15.38 ± 3.24	7.47 ± 2.14
t	0.010	4.793	0.115	3.539	0.286	15.647	0.214	5.172
p	0.992	0.001	0.909	0.001	0.776	0.001	0.831	0.001

4. Discussion

The destruction of thoracic anatomical structures during radical surgery for lung cancer, surgical trauma stress, and the inhibition of the respiratory center by general anesthetics can all lead to a decrease in the contractile force of the patient's respiratory muscles and a reduction in lung compliance. Postoperative incisional pain causes patients to adopt protective shallow breathing, actively avoiding coughing and deep breathing, making pulmonary ventilation even more difficult, exacerbating pulmonary ventilation disorders, and triggering a systemic inflammatory response [5]. Conventional respiratory care focuses solely on providing guidance on physical movements, neglecting negative psychological factors such as patients' fear of pain and a sense of powerlessness in recovery, resulting in a significant decrease in training compliance. The self-efficacy theory starts with patients' subjective beliefs in recovery and relies on four major avenues for building efficacy to systematically intervene in patients' resistance to training, mobilizing their intrinsic motivation for recovery and facilitating a shift from passive execution to active adherence in respiratory training, which meets the needs of individualized rehabilitation care after lung cancer surgery.

The results of this study show that the pulmonary function indicators of patients in the observation group were significantly better than those in the control group after nursing care ($p < 0.05$), which is consistent with the research conclusions of scholars such as Lu Hui [6]. This indicates that phased respiratory training based on the self-efficacy theory can effectively repair patients' respiratory muscle function and enhance pulmonary ventilation and gas exchange reserve capacity. The reasons are as follows: This program adjusts training intensity based on the gradient of postoperative pain stages, avoiding discomfort caused by high-intensity training that stretches the wound. At the same time, positive encouragement accumulates successful experiences, improving patients' training compliance and ensuring that respiratory training is carried out in sufficient quantity and in a standardized manner, thereby continuously improving pulmonary function. The improvement in blood gas indicators after nursing care in the observation group was superior to that in the control group ($p < 0.05$). This indicates that systematic respiratory rehabilitation intervention can effectively correct postoperative hypoxemia in patients and stabilize the body's respiratory rhythm. The reasons are as follows: Standardized pursed-lip breathing and thoracic expansion training can prolong the duration of exhalation, reduce residual gas volume in the alveoli, and improve alveolar gas exchange efficiency. Meanwhile, home-based continuous care prevents interruption of rehabilitation after discharge, continuously optimizing the body's blood oxygen levels and improving respiratory disorders [7]. The improvement in inflammatory factors and oxidative stress indicators in the observation group was significantly greater than that in the control group ($p < 0.05$). This indicates that this nursing program can effectively reduce postoperative systemic trauma stress and pulmonary inflammatory responses in patients. The reasons are as follows: On the one hand, efficient respiratory training can reduce the accumulation of pulmonary secretions, lower the risk of pulmonary infection, and downregulate the release of pro-inflammatory factors. On the other hand, psychological counseling and sharing of experiences among peers can alleviate patients' postoperative anxiety, reduce oxidative stress disorders caused by psychological stress, and enhance the body's antioxidant capacity, thereby reducing systemic stress damage in both directions [8].

5. Conclusion

In summary, respiratory function training based on the self-efficacy theory can significantly improve the pulmonary function and blood gas indicators of patients after radical surgery for lung cancer, demonstrating extremely high clinical application value.

Disclosure statement

The author declares no conflict of interest.

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