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# ORIGINAL

# THE IMPACT OF PENDER'S HEALTH PROMOTION MODEL AND ACCELERATED REHABILITATION SURGICAL CONCEPTS ON POSTOPERATIVE HEALTH BEHAVIORS AND RECOVERY OUTCOMES IN ATHLETIC LUNG CANCER PATIENTS: EMPHASIZING THE ROLE OF PHYSICAL ACTIVITY

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## ABSTRACT

This study explores the effect of integrating Pender's Health Promotion Model with the concept of Enhanced Recovery After Surgery (ERAS) on postoperative health behaviors and rehabilitation outcomes in athletic lung cancer patients. Methods: A total of 98 athletic patients with lung cancer admitted to Wuhu Hospital, affiliated with East China Normal University, between January 2023 and June 2023, were randomly divided into an observation group (Group A) and a control group (Group B). The control group (n=49) underwent thoracoscopic lobectomy and received postoperative care under the ERAS nursing model. The observation group (n=49) was additionally introduced to Pender's Health Promotion Model, with a focus on enhancing physical activity and overall health behaviors. The study compared treatment outcomes, postoperative recovery, and health education satisfaction between the two groups. Results: The observation group demonstrated significantly higher scores in role function, physical function, and social function compared to the control group ($P < 0.05$). Furthermore, the observation group showed a significantly lower total incidence of complications, reduced oxygen inhalation time, and shorter hospital stays ($P < 0.05$). Health education satisfaction was also higher in the observation group than in the control group ($P < 0.05$). Conclusions: The integration of Pender's Health Promotion Model with the

ERAS concept effectively enhances the development of healthy behaviors, reduces postoperative complications, and improves surgical treatment outcomes in athletic lung cancer patients.

**KEYWORDS:** Enhanced recovery after surgery; Pender health promotion model; Lung cancer; Healthy behavior pattern; Effect of rehabilitation

## 1. INTRODUCTION

Lung cancer remains one of the most formidable challenges in oncology, not only due to its high incidence and mortality rates but also because of the complex recovery process that follows surgical intervention. Thoracoscopic lobectomy, a minimally invasive surgery, is a common treatment for lung cancer, aiming to remove malignant tissues and extend patient survival. While the surgical procedure itself is critical, the postoperative recovery process is equally vital, especially for patients who are athletes or otherwise highly physically active. For these individuals, recovery is not merely about healing but about regaining their pre-illness levels of physical performance and returning to their active lifestyles as swiftly and safely as possible. Athletes represent a unique subset of the patient population. Their bodies are conditioned to endure high levels of physical stress, and they possess a strong psychological resilience that often drives them to push through challenges that might overwhelm others. However, these same qualities can present specific challenges in the postoperative period. Athletes are often eager to return to their pre-diagnosis routines, which can sometimes lead to impatience or the risk of pushing their bodies too quickly, potentially compromising their recovery. Therefore, tailored postoperative care strategies are necessary to ensure that these patients recover not only in terms of general health but also in a way that supports their return to peak physical performance(Wilmore & Kehlet, 2001). Enhanced Recovery After Surgery (ERAS) protocols have revolutionized postoperative care across various surgical specialties, including thoracic surgery. The ERAS approach is designed to minimize the physiological stress of surgery, reduce the incidence of complications, and accelerate the recovery process. It involves a comprehensive set of evidence-based practices, including preoperative counseling, optimized pain management, early mobilization, and nutritional support. These protocols are particularly beneficial in helping patients recover more quickly and return to their daily activities sooner. However, while ERAS protocols are highly effective, they tend to focus primarily on the immediate postoperative period and may not fully address the long-term health behaviors that are crucial for sustained recovery, especially in athletes(Shirahashi et al., 2018). Pender's Health Promotion Model (HPM) offers a complementary framework that could significantly enhance the effectiveness of ERAS protocols, particularly for athletic patients. Developed by Nola Pender, the HPM emphasizes the importance of individual behaviors, self-efficacy, and personal motivation in achieving optimal health outcomes. The model is grounded in the

understanding that health is not just the absence of illness but a dynamic state of well-being influenced by various behavioral, environmental, and psychological factors. For athletes, whose lives are intrinsically linked to physical activity and performance, the HPM provides a valuable approach to promoting behaviors that not only support immediate recovery but also contribute to long-term physical and mental health(He, Xu, & Wang, 2016). Integrating Pender's HPM with ERAS protocols for athletic lung cancer patients could yield significant benefits. Athletes are naturally inclined toward maintaining high levels of physical activity, and their motivation to return to their sport or fitness regimen can be a powerful driver of recovery. By incorporating Pender's model into their postoperative care, healthcare providers can help these patients channel their motivation into health-promoting behaviors that enhance their recovery. This could include tailored physical activity plans, psychological support to manage the stress of recovery, and education on the importance of pacing their return to full activity to avoid setbacks. Moreover, this integrated approach could address the unique psychological needs of athletes during recovery.

The loss of physical capacity, even temporarily, can be a significant psychological blow to athletes, leading to anxiety, depression, or a diminished sense of identity. Pender's HPM, with its focus on enhancing self-efficacy and encouraging proactive health behaviors, can help mitigate these psychological challenges, empowering athletes to take an active role in their recovery and maintain a positive outlook. This study aims to explore the impact of integrating Pender's Health Promotion Model with ERAS-based postoperative care on the recovery outcomes of athletic lung cancer patients. It will investigate whether this combined approach can lead to better postoperative health behaviors, lower complication rates, and improved overall recovery outcomes, particularly in terms of physical function and the ability to return to high levels of physical activity. Specific indicators to be examined include role function, physical function, social function, the incidence of postoperative complications, duration of oxygen therapy, length of hospital stay, and patient satisfaction with health education(Mehrabbeik, Mahmoodabad, Khosravi, & Fallahzadeh, 2017; Zhu & WANG, 2020a). The significance of this study lies in its focus on athletic patients, a group that is often underrepresented in clinical research but whose needs are distinct and require specialized care strategies. The findings could have far-reaching implications for postoperative care not only in lung cancer patients but also across other surgical populations who are physically active. By demonstrating the effectiveness of integrating Pender's HPM with ERAS protocols, this research could pave the way for more holistic, patient-centered approaches to surgical recovery that consider both the physical and psychological dimensions of health(Zhou, 2019). Ultimately, the goal of this research is to establish a new standard of postoperative care for athletic lung cancer patients, one that not only addresses the immediate physical demands of recovery but also supports long-term health and well-being. By promoting

healthy behaviors alongside physical recovery, this combined approach could ensure that athletic patients not only survive but thrive after surgery, returning to their sports or active lifestyles with confidence and resilience. This study seeks to contribute to the evolving field of postoperative care by highlighting the importance of integrating health promotion into surgical recovery, particularly for those who demand the most from their bodies.

## 2. Materials and Methods

### 2.1 General Information

A total of 98 patients who underwent thoracoscopic radical resection of lung cancer in Wuhu Hospital Affiliated to East China Normal University from January 2022 to June 2023 were selected as the research objects, including 62 males and 36 females. The mean age was (61.69±9.72) years (60 years). Smoking level (Zhou, 2019) : 47 cases were grade zero (never smoked), 12 cases were grade one (<200 cigarettes/year), 22 cases were grade two (200-400 cigarettes/year), 17 cases were grade three (>400 cigarettes/year).(HU, 2021) Pathological types: the number of patients with squamous cell carcinoma, adenophosphorus carcinoma and adenocarcinoma were 22, 30 and 46, respectively. In terms of TNM staging, 66 patients were in stage 1 and 42 patients were in stage 2.

In terms of education level, there were 23 patients with lower than primary school education, 46 patients with middle school education, and 29 patients with college degree or above. In terms of monthly income level, there were 36 patients with a monthly income below 3000 yuan and 62 patients with a monthly income no less than 3000 yuan. During the experiment, in order to ensure the authenticity and validity of the experimental results, the experimental objects were divided into the observation group and the control group according to the principle of random sampling, and the number of patients in the two groups was consistent. Through statistical analysis of the general data of the two groups of patients, there was no significant difference between the two groups (P>0.05), which met the experimental requirements.

### 2.2 Inclusion and exclusion criteria

Inclusion criteria: ① patients who had clear indications for radical resection of lung cancer and underwent thoracoscopic surgery; ② Those who can communicate effectively, understand and cooperate with the implementation of the content of health education, informed consent to the content of this study; ③ without chronic cardiopulmonary disease. Exclusion criteria: ① patients who underwent thoracotomy or repeated thoracoscopic surgery; ② patients with ventilator support for more than 24 hours after surgery;

## 2.3 Methods

Patients in the control group were given routine nursing intervention and health education during the perioperative period of thoracoscopic radical resection of lung cancer, including distribution of health education materials, explanation of disease rehabilitation knowledge, implementation of specialized nursing, prevention of complications, follow-up after discharge, etc. The control group was treated with enhanced recovery after surgery nursing. On this basis, the observation group was introduced Pender health promotion model. (1) Establish HPM health education team: Internal members, including thoracic surgeons, specialist nurses and head nurses, reviewed the theory of HPM together, especially the understanding and application of personal characteristics and experience, previous related behaviors, personal factors (psychological, biological, social, cultural) and other aspects of knowledge. After passing the examination, they were allowed to participate in the multimedia health education group work of HPM. (2) Evaluation: According to the purpose and content of this experiment, the correlation between a series of individual characteristics such as age, gender, and case classification and health behavior patterns was explored, and on this basis, targeted health education programs were designed in combination with the actual situation of patients. (3) Making audio and video materials of "health education for radical resection of lung cancer under thoracoscope", including psychological counseling, the necessity of smoking cessation, deep breathing and effective cough training methods, defecation and turning over in bed, diet guidance, postoperative position guidance, early rehabilitation training, pipeline safety management, complication prevention, etc. Each content was accompanied by pictures or videos, text, and voice instructions, such as breathing and cough training methods, which were demonstrated by real person. The video could clearly see that: during abdominal breathing training in the supine position, the abdomen of the demonstrator fluctuated rhythmally with inhalation and exhalation; After deep inspiration, abdominal muscle contractions were visible in the video during the application of abdominal force to cough. (4) Methods of health education: preoperative centralized education and individual explanation by nurses in charge of beds, postoperative pre-bed guidance, WeChat support and family support were combined to carry out health education throughout the five stages of patients' health behavior transformation: pre-intention, intention, preparation, action and maintenance. ① Preoperative health education: One day before surgery, specialized nurses organized patients and their families to watch the audio and video materials of "health education of radical resection of lung cancer under thoracoscope" in the propaganda classroom of ward, and emphasized the key points and difficulties. After the patients were admitted to the ward for recovery, the nurses in charge of the bed repeatedly asked the patients and their families to watch, and timely answered the questions generated by the patients and their families during the watching. ② Postoperative guidance: postoperative bed tube nurses were responsible for

supervising patients to implement breathing and cough training, defecation and turning over in bed, diet intervention, body position intervention, rehabilitation training, tube safety management, and complication prevention. ③ Wechat support: the communication group of "Cancer friends' home after lung cancer surgery" was established, and the audio and video materials of "Health education of radical resection of lung cancer under thoracoscope (patient Chapter)" were sent to the communication group, so as to facilitate patients to watch and simulate rehabilitation repeatedly. At the same time, health education was carried out through interaction on topics that patients were interested in and sending disease rehabilitation knowledge. ④ Family support: family members are required to participate in the whole process of health education, so as to play a supervisory and auxiliary role in the development of patients' healthy behavior.

### 2.4 Indicators of observation

① Quality of life: 30 days after surgery, based on the support of Quality of life core scale (Gao, Li, Zhang, Zhang, & Li, 2020), the quality of life of patients was analyzed and evaluated, including role function, physical function, social function and other dimensions. In general, the actual index levels maintained a significant positive relationship with patient quality of life. ② Rehabilitation effect: the oxygen inhalation time, admission time, incidence of complications and other indicators of the two groups were compared and analyzed. The incidence of complications included but was not limited to atelectasis and infection, pleural hemorrhage, and pleural air leakage. ③ Health education satisfaction: according to the existing literature, a special questionnaire was designed to investigate and analyze the patients' satisfaction with health education. According to the satisfaction degree of patients, it was divided into the following levels: extremely satisfied, satisfied and dissatisfied, and the corresponding scores of each level were above 90 points, 70-90 points and below 70 points. The proportion of patients with a score of 70 or above in the total is the overall satisfaction. The Cronbach's α value of the scale was 0.831, and all the questionnaires were recovered in the survey.

### 2.5 Statistical methods

The obtained data were analyzed with the support of SPSS 21.0 software. The measurement data and count data were expressed in the form of mean ± standard deviation (x±s) and [(n) %], respectively, and $P<0.05$ was statistically significant.

## 3. Results

### 3.1 Postoperative quality of life score

After the operation, the scores of each dimension of the two groups of

patients were compared and analyzed based on the core quality of life scale. The results showed that compared with the control group, the quality of life score of the observation group was higher than that of the control group (P < 0.05), and the difference was statistically significant (see Figure 1).

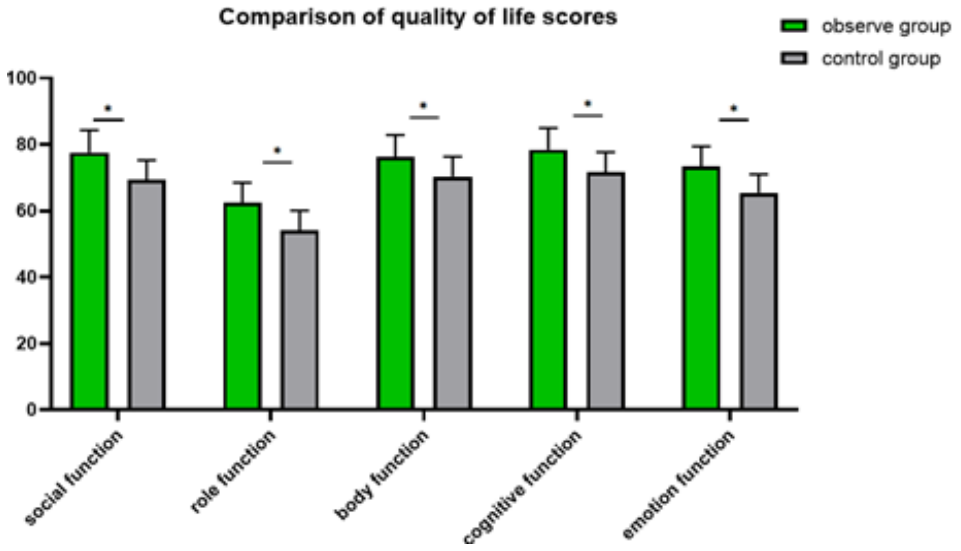


**Figure 1:** Comparison of quality of life scores between the two groups of lung cancer patients after surgery

***Note:*** **P < 0.05, the difference was statistically significant*

### 3.2 Postoperative recovery related indicators

Compared with the control group, the oxygen inhalation time and hospitalization time of the observation group were significantly shorter (P < 0.05), and the difference was statistically significant (see Figure 2).

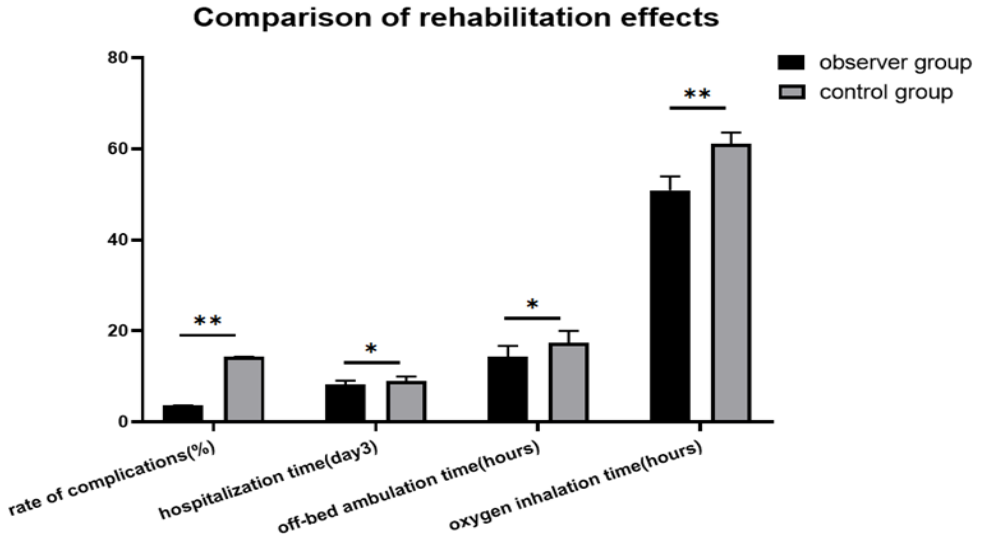


**Figure 2:** Comparison of rehabilitation effects between the two groups of patients with lung cancer after surgery

***Note:*** **P < 0.05, the difference was statistically significant*

### 3.3 Two groups of patients with health education

The probability of complications in the observation group and the control group was 3.57% and 14.29%, respectively, with a significant difference (P < 0.05), as shown in Figure 3.

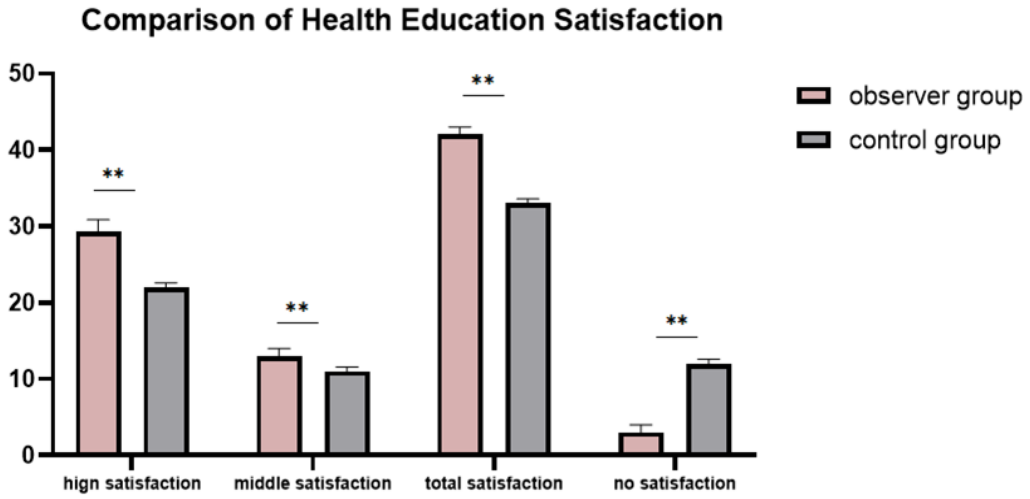


**Figure 3:** Comparison of satisfaction with postoperative health education between the two groups of lung cancer patients

***Note:*** **P < 0.05, the difference was statistically significant*

## 4. Discussion

With the development of minimally invasive technology, thoracoscopy can clearly see the tumor site with the help of high-definition television camera technology, and its application in radical resection of lung cancer is worthy of affirmation (W.-w. Wang, WU, & LI, 2020). After investigation and analysis, when a patient is diagnosed with lung cancer, it usually causes a strong impact on the patient's body and mind. Thoracoscopic surgery itself is also a strong stressor, including patients' lack of adequate cognition of thoracoscopic surgery, fear of the surgery itself and concerns about the recovery effect of surgery. A series of factors will increase the degree of stress response of patients, and then have a direct impact on the physical and mental health of patients (Shi & Li, 2021), which will lead to the increase of the difficulty of surgical treatment. At the same time, it is not conducive to the postoperative recovery of patients. The inherited health education methods are mostly oral education, or use the fragmented time between treatment and nursing to explain the patients' disease-related rehabilitation knowledge, which is mostly "transient" health education, and the education effect is limited. However, rehabilitation exercises such as deep breathing function training and out-of-bed activities with tubes are highly professional and require multiple propaganda and guidance practices. Only when patients accurately understand their importance and master the practical points can they actively cooperate with relevant exercises to ensure

the effect of health education (Q. WANG & XU, 2020). Multimedia health education changes the traditional monotone health education model, and comprehensively uses sensory stimulation such as text, pictures, animations and videos to provide health guidance to patients. It has the advantages of fast, efficient, intuitive image and simulation of real scenes, which can attract the attention of patients and stimulate their interest (Frentsos, 2015). At the same time, the form of multimedia health education makes full use of the powerful functions of the Internet to make the content of health education more comprehensive, and can make up for the deficiencies of educators themselves, achieve full staff, full space and full range of health education, and effectively improve the breadth and depth of health education (D. S. Wang et al., 2015). HPM believes that individuals will adopt new health behaviors in order to achieve better health status. Health educators should analyze the factors that affect individual health-promoting behaviors in view of the characteristics and experience, behavioral structure, specific behavioral cognition and emotion of the educated individuals, so as to formulate personalized health education methods (Du, Ye, & Han, 2021). Compared with the traditional health education methods, the health education model under the HPM theory lays more emphasis on the importance of health promotion. On the premise of having an accurate understanding of the physical and mental status of patients, the targeted health education program is designed, which can enhance the enthusiasm and initiative of patients and correct the wrong cognition and experience of patients. So as to actively pursue healthy behavior (Zhu & WANG, 2020b). Lung cancer is a lifestyle related disease, and smoking is the first known cause of lung cancer. It has been reported that the incidence of lung cancer in smokers is 10 times that in non-smokers, and 80% of male lung cancer patients are related to smoking (Seguin-Givelet, Lutz, Brian, Grigoroiu, & Gossot, 2018). Pender health promotion model, through the evaluation of gender, age, smoking degree and other individual characteristics, formulated a multimedia health education program around the focus of this study (health behavior), produced "Health education of radical resection of lung cancer under thoracoscope" audio and video materials, on this basis, combined with diversified education means, finally concluded: There were significant differences in postoperative quality of life scores between the two groups, that is to say, the Pender health promotion model introduced on the basis of enhanced recovery after surgery nursing has a more significant positive effect on the cultivation of patients' scientific and healthy behavior. Further analysis showed that the audio and video materials of "Health education for radical resection of lung cancer under thoracoscope" made by the health education team based on HPM were shown in front of the patients in the form of video before and after surgery, such as breathing and cough training methods, diet, rehabilitation training, prevention of complications, etc., through demonstration, explanation, guidance and other progressive ways. Giving patients repeated visual impact is conducive to improving the accuracy of patients' health

behavior, so that patients have significant improvement in oxygen inhalation time, admission time and other indicators. Moreover, the establishment of WeChat group also Narrows the distance between patients and medical staff, and patients are more willing to accept this health education method.

## 5. Conclusion

The integration of Pender's Health Promotion Model with the Enhanced Recovery After Surgery (ERAS) concept demonstrates a significant positive impact on the postoperative recovery of athletic lung cancer patients. By emphasizing physical activity and targeted health behaviors, this combined approach not only improves physical, role, and social functioning but also reduces the incidence of postoperative complications, shortens recovery time, and enhances patient satisfaction with health education. These findings suggest that incorporating structured health promotion models into surgical recovery protocols can lead to better health outcomes and more efficient recovery processes, particularly in athletic populations. This approach offers a valuable framework for improving the overall effectiveness of surgical treatment and rehabilitation in lung cancer patients, emphasizing the importance of tailored health interventions in enhancing patient recovery.

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