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# ORIGINAL

## NURSING OF POSTOPERATIVE EXERCISE REHABILITATION IN THORACIC SURGERY FOR THE PREVENTION AND MANAGEMENT OF MULTIPLE ORGAN DYSFUNCTION SYNDROME

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## ABSTRACT

**Purpose:** To investigate the effects of postoperative exercise rehabilitation nursing intervention on the prevention and management of multiple organ dysfunction syndrome (MODS) in thoracic surgery patients. **Methods:** A total of 224 patients who underwent thoracic surgery at a tertiary hospital in The First College of Clinical Medical Science, China Three Gorges University and Yichang Central People's Hospital, Yichang, China. province from October 1, 2021, to March 10, 2023, were selected and randomly divided into a control group and an observation group, with 112 cases in each group. The control group received routine nursing care, while the observation group received postoperative exercise rehabilitation nursing intervention in addition to routine nursing care measures. The lung function scores, incidence of multiple organ dysfunction, self-management levels, and postoperative recovery time were observed and compared between the two groups. **Results:** Before nursing intervention, there were no significant differences in lung function parameters (FEV1/FVC, respiratory rate, and oxygen saturation) between the two groups ($P>0.05$). After nursing intervention, both groups showed significant changes in lung function parameters compared to before intervention ($P<0.05$), with the observation group showing significantly better lung function levels than the control group ($P<0.05$). The incidence of MODS in the observation group (2

cases, 1.79%) was significantly lower than that in the control group (9 cases, 8.04%) after nursing intervention (P<0.05). The ESCA score and ADL score in both groups were significantly higher after nursing intervention compared to before (P<0.05). The ESCA score and ADL score in the observation group (133.53±10.52 and 49.35±7.56, respectively) were significantly higher than those in the control group (41.75±7.64 and 121.47±10.04, respectively) after nursing intervention (P<0.05). The postoperative recovery time in the observation group (13.31±2.20 hours for first time out of bed, 19.31±2.20 hours for first time passing gas, and 33.01±2.20 hours for first time defecation) was significantly shorter than that in the control group (14.28±2.60 hours, 20.43±2.89 hours, and 34.62±2.88 hours, respectively) (P<0.05). **Conclusion:** Exercise rehabilitation nursing intervention can promote improvement in lung function levels in patients after thoracic surgery, prevent the occurrence of postoperative MODS, and improve patient self-management levels. This has important implications for improving treatment outcomes and enhancing quality of life.

**KEYWORDS:** Thoracic surgery; Exercise rehabilitation nursing; Multiple organ dysfunction syndrome; Lung function

## 1. INTRODUCTION

Compared with other operations, thoracic surgery has greater trauma to patients, generally severe conditions, rapid changes, and high mortality. If complicated with Multiple organ dysfunction syndrome (MODS), the risk is higher (Chen et al., 2023). The pathogenesis of multiple organ function syndrome (MODS) is complex, the clinical manifestations are diverse, the treatment is difficult, and the prognosis is poor. How to early prevent, identify and judge the prognosis of MODS is of great significance for clinical practice [-]. The postoperative nursing intervention measures of thoracic surgery are based on the characteristics of patients, comprehensive consideration of all aspects of patients' needs, combined with the changes of patients' condition, to give patients' condition, postoperative nursing, pain nursing, psychological nursing, respiratory and expectoration nursing, exercise nursing and other nursing interventions, and reasonable allocation of nursing time, can save nursing resources and improve nursing efficiency. To comprehensively improve the nursing effect of patients from all aspects (Zhou et al., 2022). With the progress of medical technology, the complementary advantages of modern medicine can significantly improve the clinical efficacy of thoracic surgical diseases, especially surgical treatment. The occurrence of postoperative complications has been gradually paid attention to, which is conducive to the development of medicine (Besely & Mowla, 2014). However, there is still a lack of high-quality and systematic research, especially in the prevention of multiple organ dysfunction syndrome after thoracic surgery (Ji et al., 2023). Studies have

shown that the early use of rehabilitation exercise nursing training after thoracic surgery is more conducive to the recovery of postoperative thoracic organ function and shortening the time of chest tube indwelling. In 2021, the National Comprehensive Cancer Network guidelines recommended that lung cancer patients should carry out regular exercise after surgery (Zhang, 2019). At present, exercise rehabilitation exercise after thoracic surgery has been partially reported, but there is no clear description of the clinical application of exercise rehabilitation nursing in postoperative nursing of thoracic surgery (Zhou & Xu, 2022). The purpose of this study is to explore the application effect of exercise rehabilitation nursing in postoperative nursing of thoracic surgery. The clinical efficacy of prevention and management of MODS in 224 patients admitted to thoracic surgery department was observed, so as to provide reference for postoperative rehabilitation management. The remarkable results are reported as follows.

## 2. Materials and Methods

### 2.1 Clinical data

Patients who underwent thoracic surgery in the Department of Thoracic Surgery of a Class iii Grade A hospital in XXX Province from October 1, 2021 to March 10, 2023 were selected as the research objects. Inclusion criteria: (1) patients who planned to undergo surgery; (2) age of 18-75 years old; (3) ability to complete the questionnaire independently; (4) no previous history of thoracic surgery. Exclusion criteria: (1) expected survival time <1 year; (2) with severe mental illness; (3) with malignant tumor metastasis or multiple types of malignant tumors; (4) unable to complete the questionnaire; (5) patients were transferred to intensive care unit (ICU) or needed instruments to maintain vital signs after surgery. A total of 224 patients were divided into control group and observation group by random number table method, 112 cases in each group. There were 70 males and 42 females in the control group, aged from 18 to 45 years (30 cases), from 46 to 59 years (34 cases) and from 60 to 75 years (48 cases). Body mass index (BMI) was < 18. 5 in 36 cases, 18. 5-23. The course of disease was less than 3 years in 46 cases, 3-5 years in 8 cases, and more than 5 years in 12 cases. There were 52 cases of lung cancer, 44 cases of esophageal cancer and 16 cases of others. In the observation group, there were 66 males and 46 females, aged from 18 to 45 years (28 cases), from 46 to 59 years (38 cases) and from 60 to 75 years (46 cases). BMI: 38 cases <18. 5, 46 cases 18. 5 ~ 23. The course of disease was less than 3 years in 90 cases, 3-5 years in 6 cases, and more than 5 years in 16 cases. There were 56 cases of lung cancer, 44 cases of esophageal cancer and 12 cases of other diseases. There was no significant difference in general data between the two groups (P>0.05). This study complied with the relevant ethical principles of ethical research.

### 2.2 Research Methods

The control group was given routine nursing intervention, and the observation group was given exercise rehabilitation nursing intervention on the basis of routine nursing intervention.

#### 2.2.1 Usual care interventions

After the operation, the patient was given drug analgesia, guided the patient to breathe correctly, encouraged the patient to overcome pain and expectoration properly, and avoided resistance to expectoration due to pain. (1) Monitoring of vital signs: the changes of vital signs were closely observed, and the volume and distribution of fluid in the body were evaluated. Heart rate, blood pressure, oxygen saturation, arteriovenous pressure, transmembrane pressure, filter pressure and other indicators were recorded every hour. Pay attention to changes in peripheral circulation, skin temperature and body temperature to prevent hypothermia, adjust the heater according to the patient's condition, and pay attention to keep the body warm. (2) Carefully observe the patient's emotions and explain the reasons. To increase confidence in patients by enumerating cases of similar diseases cured. Avoid causing malignant irritation to the patient. For example, use a screen to properly cover the patient when rescuing the patient or taking care of the corpse. During the invasive treatment and nursing operation, patients should be patiently explained, the significance and purpose of the operation should be explained, the tension should be eliminated, and visits should be arranged properly every day so that patients can feel the care of their relatives. Patients with extreme fear and emotional overreaction should be restrained appropriately and seaged if necessary. (3) Ensure tissue, heart, kidney and peripheral vascular perfusion: closely monitor the patient's heart rate, pulse, respiration, blood pressure and other vital signs, observe the patient's skin color, elasticity and so on. The 24-hour intake and output, especially urine volume, urine color and specific gravity were recorded accurately. (4) Keep the respiratory tract unobstructed: monitor the blood oxygen saturation (SaO2), maintain SaO2> 90%, if there is a decrease in SaO2, we should find the cause in time. Blood gas analysis was performed every 4 hours in patients with mechanical ventilation. The patients with disturbance of consciousness should raise the head of the bed 15 ~ 30 degrees, and the speed of fluid injection should be slow to avoid asphyxia caused by food mistakenly entering the trachea or food reflux. (5) Nutritional support: early enteral nutrition + intravenous nutrition was used within 24-48 hours after vital signs became stable. Enteral nutrition plus intravenous nutrition not only ensures the energy supply of critically ill patients, avoids the complications such as intestinal mucosal atrophy and infection caused by long-term intravenous nutrition alone, but also makes use of enteral nutrition, which is more in line with the physiological state, and can maintain the stability of visceral blood flow and the integrity of gastrointestinal mucosa. (6) Bedside continuous hemofiltration and

lung care: the basic situation of patients was evaluated. For patients with heart rate >120 beats /min or <40 beats /min or severe heart rate disorder, systolic blood pressure <80 mmHg or >160 mmHg should be corrected before treatment. Biochemistry, electrolytes and prothrombin time were measured before and after operation. (7) Respiratory system nursing: it is difficult to avoid lower respiratory tract infection caused by various reasons in long-term bedridden patients. We should prevent pulmonary infection early, control serious infection, and use traditional Chinese medicine to reduce respiratory tract infection and pulmonary complications through the systemic regulation of the body and the local direct effect on the respiratory tract. Traditional Chinese medicine believes that the syndrome belongs to the syndrome of asthma and sudden asthma, and the pathogenesis belongs to the internal knot of phlegm and heat, closing heart orifices and lung orifices. At this time, the syndrome is true, and the traditional Chinese medicine of clearing heat and resolving phlegm, closing and opening orifices should be given and airway atomization inhalation should be carried out. The amount and nature of sputum of patients were observed and analyzed, and medication and nursing based on syndrome differentiation were performed.

### 2.2.2 Exercise rehabilitation nursing intervention

#### 2.2.2.1 Exercise rehabilitation nursing intervention

(1) Practice abdominal breathing. Specific methods: the patient took a sitting position or standing position, the whole body was relaxed, the hands were placed on the front chest and upper abdomen, the chest was kept still, and the abdomen was slightly pressed when exhaling, and the abdomen was retracted as far as possible. After reaching the maximum lung capacity, the breath was held for 4 to 6 seconds. At the same time, the expiratory time was 1 to 2 times longer than the inspiratory time. The training began with 5 minutes each time, gradually extended to 15 to 20 minutes, 2 to 3 times a day.

(2) Postoperative limb rehabilitation exercise: guide patients to get up early after surgery, reduce constipation, and prevent lower limb venous thrombosis or pressure ulcers caused by long-term bed rest.

(3) Upper limb exercise: guide the patient to increase the activities of lifting and pulling the upper limbs, which can be guided to touch the forehead with the hand, comb the hair with the hand, and climb the wall, 10 times/group, 5 groups /d;

(4) Lower limb exercise, adding pedal and other actions, using the supine position, simulating cycling, 10 times/group, 2 groups/day. In order to ensure the smooth implementation of the intervention measures, team members established a wechat group to communicate with patients and required patients to fill in the patient record manual in the wechat group every

day.

### 2.3 Indicators of evaluation

#### 2.3.1 Lung FUNCTION SCORES

The pulmonary function, including FEV1/ FVC, respiratory rate and finger oxygen saturation, were compared between the two groups after nursing intervention.

#### 2.3.2 Incidence of multiple organ dysfunction

The incidence of multiple organ dysfunction (MODS) = (number of MODS patients/total number of patients) ×100%.

#### 2.3.3 Self-management level

The Exercise of Self-care Agency Scale (ESCA) and the Activities of Daily Living (ADL) Scale (Barthel Index) were used to evaluate. There were 43 items in ESCA, and the total score was 172. The higher the score, the stronger the self-management ability of patients. ADL consists of 10 items with a total score of 100 points, with higher scores indicating greater ability to perform activities of daily living.

#### 2.3.4 Level of postoperative recovery

The time of first out-of-bed activity, the time of exhaust and defecation, and the occurrence of complications (postoperative abdominal distension, pulmonary infection, and deep vein thrombosis of lower limbs) were recorded.

### 2.4 Statistical methods

The statistical software SPSS 23.0 was used for data analysis. The measurement data were expressed by ($\bar{x}\pm S$) for t-test analysis, and the count data were expressed by $\chi 2$ for chi-square test. When $P<0.05$, the difference was statistically significant.

## 3. Results

### 3.1 Lung FUNCTION SCORES

Before nursing intervention, there was no significant difference in the levels of lung function FEV1/FVC, respiratory rate and blood oxygen saturation between the two groups, $P>0.05$, without statistical significance. After nursing intervention, the lung function levels of the two groups were significantly changed compared with those before intervention ($P<0.05$). After nursing intervention, the levels of lung function FEV1/FVC, respiratory rate and blood oxygen saturation of the observation group were significantly better than those

of the control group, P<0.05, with statistical significance, as shown in Table 1.

**Table 1:** Lung function scores [%，（$\bar{x} \pm S$）]

| The Project | Before Care | | T Value | P Value | After Care | | T Value | P Value |
|---|---|---|---|---|---|---|---|---|
| | Observation Group (112 Cases) | Control Group (112 Cases) | | | Observation Group (112 Cases) | Control Group (112 Cases) | | |
| **Fev1/Fvc(%)** | 66.51±7.04 | 65.46±7.26* | 0.777 | 0.439 | 83.49±9.88 | 78.34±9.26* | 2.846 | 0.005 |
| **Respiratory Rate (Times /Min)** | 16.14±1.41 | 16.20±1.23# | 0.24 | 0.811 | 12.71±1.33 | 14.15±1.52# | 5.335 | <0.001 |
| **Oxygen Saturation (%)** | 95.05±0.46 | 95.19±0.64△ | 1.329 | 0.187 | 98.72±0.77 | 96.44±0.84△ | 14.97 | <0.001 |

***Note:*** ** compared with before nursing intervention, P<0.05, statistically significant; # compared with before nursing intervention, P<0.05, with statistical significance; △ Compared with before nursing intervention, P<0.05, which was statistically significant.*

### 3.2 Incidence of multiple organ dysfunction

There were 2 cases of multiple organ dysfunction syndrome in the observation group, accounting for 1.79%, which was significantly less than 9 cases in the control group, accounting for 8.04%, the difference between the two groups was P<0.05, which was statistically significant and comparable, as shown in Table 2. The observation group demonstrated a significantly lower incidence of multiple organ dysfunction syndrome compared to the control group. This disparity highlights the effectiveness of the intervention applied in the observation group. The data underscores a noteworthy reduction in the risk of developing multiple organ dysfunction syndrome, suggesting that the observed intervention may have a protective effect. Further statistical analysis confirms the robustness of these findings, with a p-value of less than 0.05, indicating that the observed difference is unlikely to be due to chance. This statistical significance reinforces the reliability of the results and supports the potential benefits of the intervention.

**Table 2:** Comparison of the incidence of multiple organ dysfunction

| Grouping | Number of Cases (N) | Incidence of Multiple Organ Dysfunction [Example, N (%)] |
|---|---|---|
| **Observation Group** | 112 | 2（1.79） |
| **Control Group** | 112 | 9（8.04） |
| **$X^2$** | —— | 4.685 |
| **P** | —— | 0.0304 |

### 3.3 Self-management ability

After the nursing intervention, the ESCA score and ADL score of the two groups were significantly higher than those before the intervention, and the difference between the two groups was P<0.05, which was statistically significant and comparable.

After nursing intervention, the ESCA score and ADL score of the observation group were (133.53±10.52) points and (49.35±7.56) points, respectively, which were significantly higher than those of the control group [(41.75±7.64) points and (121.47±10.04) points], the difference between the two groups was statistically significant and comparable. The results of specific data are shown in Table 3.

**Table 3:** Self-management scores of patients after nursing intervention [score，（$\bar{x} \pm S$）]

| Groups | Case (N) | Esca Score | | Adl Score | |
|---|---|---|---|---|---|
| | | Before Care | After Care | Before Care | After Care |
| **Observation Group** | 112 | 86.24±8.55 | 133.53±10.52 | 32.83±6.76 | 49.35±7.56 |
| **Control Group** | 112 | 85.75±8.42 | 121.47±10.04 | 33.76±6.65 | 41.75±7.64 |
| **T Value** | | 0.306 | 2.089 | 0.734 | 2.506 |
| **P Value** | | 0.761 | 0.039 | 0.465 | 0.014 |

### 3.4 Postoperative recovery time

Comparison of postoperative rehabilitation time between the two groups: the first time to get out of bed, the first time to exhaust and the first time to defecate in the observation group were respectively: (13.31±2.20) h, (19.31±2.20) h, (33.01±2.20) h in the control group were significantly better than (14.28±2.60) h, (20.43±2.89) h, (34.62±2.88) h in the control group, there was significant difference between the two groups, P> 0.05, there was statistical significance. It is comparable, as shown in Table 4.

**Table 4:** Comparison of postoperative rehabilitation levels [h, （$\bar{x} \pm S$）]

| Groups | Number of Cases | First Time Out of Bed | \ Time of First Exhaust | Time to First Bowel Movement |
|---|---|---|---|---|
| **Observation Group** | 112 | 13.31±2.20 | 19.31±2.20 | 33.01±2.20 |
| **Control Group** | 112 | 14.28±2.60 | 20.43±2.89 | 34.62±2.88 |
| **T** | —— | 3.014 | 3.260 | 2.949 |
| **P** | —— | 0.000 | 0.000 | 0.000 |

## 4. Discussion

The common diseases in thoracic surgery include lung cancer, esophageal cancer, gastric cardia cancer, mediastinal disease, etc. Lung cancer patients account for about 40% of thoracic surgery patients. Chest surgery is traumatic and time-consuming, and the stimulation of the hilum and bronchus can reflexive cause an increase in respiratory secretions (Batchelor et al., 2019). Postoperative complications of thoracic surgery mainly include atelectasis, bronchitis, pneumonia, respiratory failure, bronchospasm, exacerbation of underlying chronic lung diseases, and multiple organ dysfunction syndrome. With the development of modern society, patients' requirements for medical technology and medical services are also increasing, and the development of postoperative nursing intervention in thoracic surgery can not only promote the rapid recovery of patients, shorten the length of hospital stay, reduce hospitalization costs, reduce postoperative complications, but also relieve the medical pressure of hospitals, showing two-way advantages for patients and medical units (Zhu et al., 2023). However, with the deepening of the research on complications after thoracic surgery, it is found that surgical treatment alone can not meet the needs of thoracic surgery patients more and more. Some scholars try to integrate the concept and method of nursing intervention adjuvant treatment, which not only greatly enrichs the content of medical technology, but also greatly enrichs the knowledge of medical technology. It also provides more effective methods for the medical requirements of postoperative rehabilitation patients (Peng et al., 2021). Foreign studies have shown that 17%-88% of patients may suffer from pulmonary complications after thoracic surgery. The National Surgery Quality Management Improvement Program of the United States reported that pulmonary complications accounted for 6% of more than 160,000 patients undergoing thoracic surgery (Yao, 2011). Domestic literature indicates that infection is one of the common complications of thoracic surgery, and multiple organ dysfunction syndrome is one of the serious complications of infection. There are few reports on postoperative nursing practice for complications of patients after thoracic surgery. Postoperative strategies of multidisciplinary cooperation are needed to prevent and reduce the occurrence of MODS (Zhou

& Yu, 2021). The common diseases in thoracic surgery include lung cancer, esophageal cancer, gastric cardia cancer, mediastinal disease, etc. Lung cancer patients account for about 40% of thoracic surgery patients. Chest surgery is traumatic and time-consuming, and the stimulation of the hilum and bronchus can reflexive cause an increase in respiratory secretions (Kehlet, 1997). Postoperative complications of thoracic surgery mainly include atelectasis, bronchitis, pneumonia, respiratory failure, bronchospasm, exacerbation of underlying chronic lung diseases, and multiple organ dysfunction syndrome. With the development of modern society, patients' requirements for medical technology and medical services are also increasing, and the development of postoperative nursing intervention in thoracic surgery can not only promote the rapid recovery of patients, shorten the length of hospital stay, reduce hospitalization costs, reduce postoperative complications, but also relieve the medical pressure of hospitals, showing two-way advantages for patients and medical units (Feng, 2014). Multiple organ dysfunction syndrome (MODS) is a serious complication of various critical diseases such as trauma, major surgery, shock and infection (Yang et al., 2015). Excessive stress response and systemic inflammatory response after thoracic surgery may cause a series of dysfunction of 2 or more organs mentioned above, and eventually develop into MODS, leading to death [-]. At present, there is no specific intervention for MODS, and prevention is the best treatment. The inflammatory mediator theory of the pathogenesis of MODS has the characteristics of cascade, sequential and waterfall dominoes (Meng et al., 2022). When there is a primary pathogenic basis of MODS and a precipitating factor, the best strategy is early prevention, not to let the first domino fall, that is, to find and remove the precipitating factor and treat the primary disease. Once the first domino falls and inflammatory mediators are released, that is, the first organ damaged in MODS becomes dysfunctional, it is necessary to block this transmission within a limited time window as much as possible. The concept of time window is proposed here because the timing is more important than the means for MODS treatment. The main management strategies of MODS are: control of primary diseases; Strengthen the supportive treatment of dysfunctional organs, especially the circulatory system and respiratory system; Metabolic support and conditioning; Rational use of antibiotics to prevent and control infections; Immunomodulatory therapy; continuous renal replacement therapy (CRRT); Gene therapy; Others, such as recombinant human activated protein C (rhAPC), low-dose corticosteroids, and the use of insulin for tight glycemic control, have been used in clinical practice (Langer, 2021). However, with the deepening of the research on complications after thoracic surgery, it is found that surgical treatment alone can not meet the needs of thoracic surgery patients more and more. Some scholars try to integrate the concept and method of nursing intervention adjuvant treatment, which not only greatly enrichs the content of medical technology, but also greatly enrichs the knowledge of medical technology. It also provides more effective methods for the medical

requirements of postoperative rehabilitation patients (Ji JinFang et al., 2017). Foreign studies have shown that 17%-88% of patients may suffer from pulmonary complications after thoracic surgery. The National Surgery Quality Management Improvement Program of the United States reported that pulmonary complications accounted for 6% of more than 160,000 patients undergoing thoracic surgery (Gao et al., 2004). Domestic literature indicates that infection is one of the common complications of thoracic surgery, and multiple organ dysfunction syndrome is one of the serious complications of infection. There are few reports on postoperative nursing practice for complications of patients after thoracic surgery. Postoperative strategies of multidisciplinary cooperation are needed to prevent and reduce the occurrence of MODS. The inclusion of nursing intervention in thoracic surgery can effectively alleviate the condition and improve the treatment effect of patients. Through the postoperative nursing intervention of thoracic surgery, the postoperative nursing and nursing measures are more in line with the needs of patients, and for patients with mild conditions, unnecessary routine nursing measures for some critical patients are reduced. For high-risk patients, corresponding nursing measures can be added according to their conditions, so as to avoid the occurrence of "iatrogenic" complications and improve the quality of nursing. Reasonable and effective postoperative nursing intervention can effectively evaluate the preventive effect of MODS. For patients, intervention from pure medical care, psychological care, life care, vital signs, circulation care, organ protection and other aspects can effectively and significantly improve the preventive effect of MODS. In this study, patients continued to carry out rehabilitation exercise for a period of 1 month after surgery, which significantly improved the self-management ability of patients and eased the postoperative rehabilitation level. During the intervention period, nurses provided patients with postoperative exercise and daily life guidance, which was conducive to improving the communication between patients and nurses. Various forms of health education can help to increase patients' awareness of postoperative anti-infection, improve patients' trust in nurses, and improve the enthusiasm of self-management, improve the rehabilitation effect, and reduce the occurrence of infection, which is the main cause of multiple organ dysfunction syndrome. In conclusion, the application of postoperative nursing intervention strategies in patients after thoracic surgery can improve the lung function of patients, effectively improve the self-management level of patients, and significantly prevent the incidence of complications of multiple organ dysfunction syndrome, which is of great significance to improve patient satisfaction and may reduce the risk of death during surgery.

## References

Batchelor, T. J., Rasburn, N. J., Abdelnour-Berchtold, E., Brunelli, A., Cerfolio, R. J., Gonzalez, M., Ljungqvist, O., Petersen, R. H., Popescu, W. M., & Slinger, P. D. (2019). Guidelines for enhanced recovery after lung

surgery: recommendations of the Enhanced Recovery After Surgery (ERAS®) Society and the European Society of Thoracic Surgeons (ESTS). *European journal of cardio-thoracic surgery*, *55*(1), 91-115.

Besely, W. N. A., & Mowla, H. (2014). Effect of standardized nursing interventions on the recovery outcomes of patients undergoing thoracic surgeries. *Journal of Nursing and Health Science*, *3*, 57-69.

Chen, Y., Xie, G., & Yue, Y. (2023). Characteristics of hospital-acquired pulmonary infections after thoracic surgery and establishment of a predictive model. *Chinese Journal of Coal Industry Medicine*, *26*(2), 184-189.

Feng, X. (2014). Clinical analysis of multiple organ dysfunction syndrome in patients in the neurology intensive care unit. *ilin University*.

Gao, H., Chang, W., & Cao, S. (2004). Prognostic evaluation of APACHE score in patients with MODS after liver transplantation. *Chinese Critical Care Medicine*, *16*(06), 371-372.

Ji JinFang, J. J., Zhao MinJuan, Z. M., Yuan Rong, Y. R., Qian Min, Q. M., & Zhang GuoPing, Z. G. (2017). Application of limited fluid resuscitation and adequate fluid resuscitation in perioperative anesthesia in patients with septic shock.

Ji, Y., Jiang, C., & Wang, W. (2023). Safety analysis of thoracic surgery for patients in plateau medical centers. *Chinese Journal of Thoracic and Cardiovascular Surgery*, *30*(1), 95-99.

Kehlet, H. (1997). Multimodal approach to control postoperative pathophysiology and rehabilitation. *British journal of anaesthesia*, *78*(5), 606-617.

Langer, D. (2021). Addressing the changing rehabilitation needs of patients undergoing thoracic surgery. *Chronic Respiratory Disease*, *18*, 1479973121994783.

Meng, S., Qi, L., & Liu, R. (2022). Analysis of risk factors for MODS secondary to respiratory failure in 210 elderly patients. *Evidence-Based Medicine*, *22*(3), 154-158+168.

Peng, T., Shemanski, K. A., Ding, L., David, E. A., Kim, A. W., Kim, M., Lieu, D. K., Wightman, S. C., Zhao, J., & Atay, S. M. (2021). Enhanced recovery after surgery protocol minimizes intensive care unit utilization and improves outcomes following pulmonary resection. *World Journal of Surgery*, *45*(10), 2955-2963.

Yang, C. K., Teng, A., Lee, D. Y., & Rose, K. (2015). Pulmonary complications after major abdominal surgery: National Surgical Quality Improvement Program analysis. *Journal of Surgical Research*, *198*(2), 441-449.

Yao, L. (2011). Influence of continuous renal replacement therapy at different times on patients with multiple organ dysfunction syndrome. *Jiangsu University*.

Zhang, M. (2019). Application of detailed nursing care in postoperative care of lung cancer patients and its impact on pulmonary function. *Modern*

*Digestion and Interventional Diagnosis and Treatment*, *24*(A02), 1852-1853.

Zhou, F., & Yu, M. (2021). Five-in-one nursing management promotes rapid recovery of patients after thoracic surgery. *American Journal of Translational Research*, *13*(7), 8049.

Zhou, X., Xie, J., & Yang, Y. (2022). Mechanisms and drug therapy progress of coagulation dysfunction associated with sepsis. *Chinese Journal of Internal Medicine*, *61*(2), 224-228.

Zhou, Y., & Xu, M. (2022). Analysis of the effect of quality nursing on recovery after thoracic surgery. *Emergency Medicine International*, *2022*.

Zhu, W., Yin, B., & Zhang, J. (2023). Application of pre-rehabilitation combined with postoperative exercise rehabilitation in elderly lung cancer patients. *Chinese Journal of Modern Nursing*, *29*(35), 4871-4875.