Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Application of Predictive Nursing in Perioperative Care of Elderly Patients Undergoing Thoracoscopic Surgery

chenchen xu
The First People's Hospital of Changzhou
peng song
The First People's Hospital of Changzhou
yuan jin
The First People's Hospital of Changzhou
mengmeng zhao
The First People's Hospital of Changzhou
chao wang
176084039010163.com

The First People's Hospital of Changzhou

Research Article

Keywords:

Posted Date: November 12th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11165241/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Aim

To investigate the application value of predictive nursing in the perioperative care of elderly patients undergoing thoracoscopic surgery, and to compare it with conventional nursing protocols.

Methods

Elderly patients who underwent thoracoscopic surgery at our hospital from January 2023 to December 2024 were enrolled and divided into two groups according to the perioperative nursing model. The control group received routine nursing care, while the study group received predictive nursing intervention in addition to routine care. Surgical-related indicators, postoperative recovery parameters, quality of life scores, and incidence of complications were observed and compared between the two groups.

Results

In total, 120 patients (60 per group) were analysed. Operative time, intraoperative blood loss, postoperative drainage volume, drainage duration, and postoperative hospital stay were all lower in the study group than in the control group (all $P < 0.05$). Postoperative pain scores were lower in the study group at 72 hours and at 1 month, but not at 3 or 6 months. SF-36 scores were higher in the study group at 1 week and at 1 month, with no significant between-group differences at 3 or 6 months. The overall postoperative complication rate did not differ significantly between the two groups (11.7% vs 8.3%; $P = 0.754$).

Conclusion

In this single-centre retrospective cohort with historical controls, a predictive perioperative nursing bundle was associated with shorter postoperative stay and better early quality of life in elderly patients undergoing thoracoscopic lung surgery, but complication rates did not differ significantly. Given calendar-period allocation and limited power for the complication endpoint, these findings are hypothesis-generating and require prospective randomised confirmation.

Background

Thoracoscopic surgery is an important minimally invasive technique in thoracic surgery and is widely employed in the diagnosis and treatment of pulmonary, mediastinal, esophageal, and cardiac diseases, offering advantages such as less trauma and faster recovery[1]. However, perioperative nursing for this procedure still faces challenges, including inadequate postoperative pain management, atelectasis,

pulmonary infection, hemodynamic instability, nausea and vomiting, discomfort during anesthesia recovery, and pain, infection, obstruction, or dislodgement associated with chest drainage tubes[2]. The lack of systematic and predictive evaluation and intervention means that these issues can impede patient recovery, prolong hospital stays, reduce surgical safety, and impair long-term quality of life. Therefore, enhancing refined and individualized perioperative nursing care is of great significance for improving patient outcomes in thoracoscopic surgery.

Predictive nursing refers to a proactive approach in which nurses, drawing on their professional knowledge and clinical experience, anticipate potential physiological and psychological problems and complications, and formulate and implement corresponding interventions before these problems occur, thereby preventing or mitigating adverse outcomes and promoting recovery[3]. This nursing philosophy holds considerable promise in the perioperative care of thoracoscopic surgery, particularly in terms of systematic patient assessment, early risk warning, timely intervention, active prevention of complications, reduction of adverse events, improvement of the surgical experience, and acceleration of postoperative recovery[4]. Although predictive nursing has achieved positive results in some surgical fields, its systematic application in perioperative care for thoracoscopic surgery remains relatively limited, and empirical research in this area is scarce, especially regarding implementation pathways and outcome evaluation, which warrant further investigation[5]. Consequently, this study focuses on elderly patients undergoing thoracoscopic surgery and aims to systematically examine the application of predictive nursing during the perioperative period, with the goal of providing a reference for the scientific and standardized nursing management of minimally invasive thoracic surgery.

Materials and Methods

Participants

This single-center retrospective study was approved by the Institutional Ethics Committee of The First People's Hospital of Changzhou (Approval No. 2021-91). Patients were divided into two groups based on the time point of the perioperative nursing protocol change in the Department of Thoracic Surgery of our hospital. Patients who underwent surgery between January 2023 and December 2023 and received routine perioperative nursing care were assigned to the control group, while those who underwent surgery between January 2024 and December 2024 and received the predictive nursing protocol were assigned to the study group. Nursing interventions in both groups were delivered by the respective nursing teams during the corresponding periods. The surgical and anaesthetic teams and the operative protocol were unchanged between the two periods; however, because enhanced recovery after surgery (ERAS) was being introduced in our institution during the study period, the background standard of routine perioperative care was not identical across the two calendar years (see Limitations). All participants provided written informed consent to participate in this study.

Inclusion criteria

(1) age between 65 and 75 years; (2) underwent thoracoscopic surgery; (3) complete clinical medical records; (4) preoperative pulmonary function and arterial blood gas analysis showed no significant abnormalities, routine blood tests, liver and kidney function, and coagulation parameters were within normal ranges, and patients met the surgical indications; (5) no prior history of thoracic surgery; (6) postoperative pathological examination confirmed primary lung cancer.

Exclusion criteria

(1) poor preoperative cardiopulmonary function that precluded tolerance to surgery and anesthesia; (2) underwent compromised pulmonary wedge resection;(3)extensive pleural metastases detected intraoperatively;(4) intraoperative conversion to thoracotomy due to unexpected circumstances; (5) incomplete clinical data or missing key information.

Intervention Methods

Group I: The Control Group

Patients in the control group received routine perioperative nursing care. During the preoperative preparation phase, the nursing team followed standard protocols, including guidance on bowel emptying, strict adherence to fasting and fluid restriction, and standardized respiratory function training to enhance postoperative pulmonary tolerance. After surgery, patients were transferred to the intensive care unit for continuous observation, during which vital signs were dynamically monitored, with emphasis on assessing bleeding tendency, detailed recording of the characteristics and volume of chest drainage fluid, and observation of bowel function recovery (e.g., flatus and defecation), along with corresponding measures to maintain overall patient comfort. The recovery-phase nursing focus included: close monitoring of consciousness level and core indicators such as respiration, heart rate, and blood pressure; early identification and management of complications such as exacerbated pain, nausea, and vomiting; and guidance on proper breathing, coughing, and positional changes to reduce the risk of pulmonary infection. Additionally, urine output and color were regularly monitored to prevent urinary retention and urinary tract infections; regular position changes were assisted to promote circulation and reduce the likelihood of venous thrombosis; and when conditions permitted, early bedside mobilization was encouraged to accelerate recovery[12].

Group II: The Study Group

Patients in the study group received predictive nursing intervention in addition to routine nursing care. During the preoperative phase, emphasis was placed on prehabilitation training and risk screening, including systematic respiratory exercises such as pursed-lip breathing, diaphragmatic breathing, and the use of a tri-ball respiratory trainer, combined with multiple strategies including exercise therapy, nutritional support, psychological counseling, and analgesic management to improve patients'

preoperative physiological reserve[6]. In addition, preoperative visits were conducted by nurses to assess physical and psychological status and provide targeted psychological support[7]. During the intraoperative phase, a predictive cooperation protocol was developed to address potential high-risk factors such as bleeding and complications related to one-lung ventilation, thereby optimizing the intraoperative nursing pathway[8]. In the postoperative phase, multi-dimensional predictive measures were implemented: during the anesthesia recovery period, pain intervention and agitation control were strengthened to improve recovery quality; vital signs and the color, characteristics, and volume of closed thoracic drainage fluid were closely monitored to detect bleeding and air leakage; effective coughing and expectoration, along with early breathing exercises, were guided to prevent atelectasis and infection; early postoperative mobilization was encouraged, combined with ankle pump exercises and the use of elastic stockings to prevent venous thromboembolism; drainage tubes and intravenous lines were securely fixed and regularly inspected to prevent accidental dislodgement; and urine output and characteristics were monitored to prevent urinary retention and urinary tract infection. These predictive nursing strategies, implemented throughout the preoperative, intraoperative, and postoperative phases, helped reduce the incidence of postoperative complications in patients undergoing thoracoscopic lung surgery and promoted enhanced recovery[9].

Outcome Measures

1. Surgical-related indicators: Operative time, intraoperative blood loss, duration of postoperative drainage, and postoperative hospital stay were recorded and compared between the two groups.
2. Postoperative pain was evaluated with the VAS at predetermined intervals: 24 hours, 72 hours, 1 month, 3 months, and 6 months following the operation, covering both the early postoperative period and the post-discharge phase.

(3) Quality of life assessment

The 36-Item Short Form Health Survey (SF-36) was used to evaluate the quality of life of patients in both groups. This scale covers eight dimensions, including physical functioning, role physical, emotional role, and social functioning, with each dimension scored on a 0–100 scale; higher scores indicate better quality of life.Follow-up evaluations were conducted at four designated time points, namely 1 week, 1 month, 3 months, and 6 months after surgery. The SF-36 is a previously published and validated instrument [27]; the Chinese-language version has also been validated in a Chinese population [28].

(4) Incidence of complications

The occurrence of postoperative complications, including atelectasis, pneumothorax, pulmonary infection, and hemorrhage, was recorded during the hospital stay, and the overall complication rate was calculated for each group.

Statistical Analysis

All data were processed and analyzed using IBM SPSS Statistics version 24.0. For quantitative variables, the Kolmogorov–Smirnov (K-S) test was used to assess normality, and the homogeneity of variances was examined. Data that followed a normal distribution with equal variances were expressed as mean ± standard deviation (SD), and differences between groups were compared using the independent samples t-test. For data that did not meet these assumptions, medians with interquartile ranges (IQR) were used for descriptive statistics, and intergroup comparisons were performed using the Mann–Whitney U non-parametric test. For categorical variables, the chi-square test or rank-sum test was applied as appropriate. A significance level of $\alpha = 0.05$ (two-tailed) was set, and $P < 0.05$ was considered statistically significant.

For the primary surgical outcomes, a post-hoc power analysis was performed using G*Power (version 3.1). With 60 patients per group, a two-sided α of 0.05 and 80% power, the minimum detectable effect was Cohen's $h = 0.51$ for between-group differences in proportions (equivalent to an odds ratio of approximately 3.6 for a baseline event rate of 11.7%) and a standardised mean difference of $d = 0.51$ for continuous outcomes; detecting an effect of $h = 0.26$ would have required approximately 232 patients per group. For the composite complication outcome, the observed difference corresponded to $h = 0.11$ and a post-hoc power of approximately 9%.

Result

A total of 120 patients (60 per group) were included and analysed, and the flow of participants is shown in Fig. 1. Baseline characteristics, including age, sex, tumor location, and body mass index, were comparable between the two groups, with no statistically significant differences (all $P > 0.05$) (Table 1).

As shown in Table 2, the study group had significantly shorter operative time, duration of postoperative drainage, and postoperative hospital stay compared with the control group. In addition, intraoperative blood loss and total postoperative drainage volume were significantly reduced in the study group. All differences were statistically significant ($P < 0.05$); these associations should not be interpreted as causal effects of the nursing intervention (see Discussion).

The peak of pain after thoracoscopic lung surgery generally occurs within the first 24 and 72 hours postoperatively. Accordingly, pain scores were compared between the two groups during hospitalisation at both time points; the between-group difference reached statistical significance at 72 hours. Pain mainly arises from wound pain and pain induced by chest drainage tubes; therefore, shortening the duration of postoperative drainage may also alleviate patients' pain. At the 72-hour time point, the pain score in the study group was significantly lower than that in the control group, and this advantage persisted until one month after surgery. However, at 3 months postoperatively, there was no significant difference in pain scores between the two groups (Fig. 2).

Table 1
Baseline clinical characteristics of the patients (mean ± SD). Group I:the control group;Group II:the study group;BMI, body mass index;RUL,right upper lobe;RML, right middle lobe;RLL, right lower lobe; LUL, left upper lobe; LLL, left lower lobe;

Age (years)	**Group I**	**Group II**	***p***
	69.81 ± 3.43	**70.13 ± 3.27**	**0.606**
Female/male(N)	32/28	34/26	0.267
BMI (kg/m²)	23.33 ± 3.53	23.44 ± 2.72	0.848
Smoking history			0.178
Yes	24	17	
No	36	43	
Percentage of predicted FEV_1(%)	85.36 ± 3.25	84.58 ± 3.19	0.185
Comorbidity			0.637
Hypertension	13	17	
Diabetes	5	2	
Coronary artery disease	4	3	
Tumor location			0.194
LUL	24	11	
LLL	9	9	
RUL	14	21	
RML	5	7	
RLL	8	12	

Table 2
Surgical indicators of patients

Operative time	**Group I**	**Group II**	***p***
	123.08 ± 22.04	**100.81 ± 32.61**	**<0.05**
Intraoperative blood loss	95.01 ± 3.79	84.05 ± 2.07	<0.05
Postoperative drainage volume	455.16 ± 183.46	361.58 ± 186.74	<0.05
Postoperative drainage duration	2.51 ± 0.85	1.83 ± 0.97	<0.05
Postoperative hospital stay	3.85 ± 1.17	3.25 ± 1.71	<0.05

Group I:the control group;Group II:the study group

Quality of life, as evaluated by the 36-Item Short Form Health Survey (SF-36), demonstrated significant between-group differences at the 1-week and 1-month postoperative assessments, with the study group outperforming the control group across all subscales. This points to a more favorable early recovery trajectory in the study group. Nevertheless, by the 3-month and 6-month follow-up time points, the differences in both Physical Component Summary and Mental Component Summary scores were no longer statistically significant, suggesting comparable quality of life restoration during the later stages of rehabilitation(Fig. 3).

During hospitalization, a total of 12 postoperative complications were recorded across both groups. Specifically, the study group had 1 case of atelectasis, 2 of pneumothorax, and 2 of pulmonary infection (5/60, 8.3%), while the control group had 2 cases of atelectasis, 3 of pneumothorax, 1 of postoperative hemorrhage, and 1 of pulmonary infection (7/60, 11.7%). The overall complication rate did not differ significantly between the two groups (Fisher exact P = 0.754; Table 3). All patients were discharged uneventfully after standard care and showed good recovery, and no patient was readmitted within 30 days.

No severe complications occurred in either group during the perioperative period, indicating that both nursing approaches were safe. Although the overall incidence of complications was lower in the study group than in the control group, the difference was not statistically significant, and post-hoc analysis indicated that the study had limited power to detect a difference of this magnitude (approximately 9%). This result should therefore be regarded as inconclusive rather than as evidence of equivalence or of a beneficial effect of predictive nursing on complications.

Table 3
Postoperative complications between the two groups (n = 60 per group)

Atelectasis	**Group I**	**Group II**	***p***
	2	**1**	**0.554**
Pneumothorax	3	2	0.640
Hemorrhage	1	0	0.313
Pulmonary infection	1	2	0.554
Overall incidence rate	11.7%	8.3%	0.754

Group I: the control group; Group II: the study group; P values were calculated using Fisher's exact test.

Discussion

Video-assisted thoracoscopic surgery (VATS) is a minimally invasive technique that uses small chest incisions, an endoscope, high-definition imaging, and specialized instruments for diagnosing and treating thoracic lesions. Compared with open thoracotomy, VATS offers less trauma, less postoperative pain, faster recovery, and better preservation of pulmonary function, which have led to its widespread adoption[10–11]. Indications include early-stage lung cancer, spontaneous pneumothorax, mediastinal masses, and pleural diseases. With advances in VATS equipment and the growing implementation of enhanced recovery after surgery (ERAS), greater emphasis has been placed on postoperative recovery quality, and perioperative nursing has become increasingly important [12]. Perioperative care provides systematic, whole-course support—covering preoperative preparation, intraoperative cooperation, and postoperative rehabilitation—aimed at mitigating surgical trauma, controlling pain, minimizing complications, improving patient satisfaction, and enhancing recovery outcomes [13].

Predictive nursing is a proactive model centered on risk prediction and early intervention. It emphasizes early identification of potential adverse events and their triggers, followed by individualized preventive strategies to reduce clinical risks and improve patient outcomes and well-being [14].

In our study, the study group had significantly shorter operative time, less intraoperative blood loss, and shorter postoperative hospital stay than the control group, consistent with several previous reports. One study in VATS patients found that an interventional nursing approach significantly reduced operative time, extubation time, and hospital stay compared with routine care [15]; another study on pulmonary rehabilitation after VATS lung resection reported improved mid-term pulmonary function and exercise tolerance, along with lower complication rates and shorter hospital stays [16]. However, most earlier literature has broadly attributed such improvements to “skilled intraoperative cooperation” without exploring the underlying pre-emptive mechanisms. Although the observational design cannot establish causality, we hypothesise that the shorter operative time was not attributable to faster intraoperative nursing manoeuvres but may reflect systematic preoperative optimisation of patients’ physiological reserve. Specifically, preoperative breathing exercises (pursed-lip and diaphragmatic breathing) improved pulmonary compliance and oxygenation reserve in elderly patients, reducing intraoperative interruptions due to oxygen desaturation [6]; preoperative smoking cessation and airway clearance interventions lowered the risk of ventilation obstruction from excessive secretions [17]; and comprehensive preoperative assessments of coagulation, nutritional status, and organ function allowed the surgical team to anticipate high-risk conditions such as pleural adhesions or coagulopathies [18]. Similarly, reduced blood loss could be traced back to preoperative identification of bleeding risk factors, rather than relying solely on intraoperative monitoring.

The core value of predictive nursing lies not only in anticipation and response, but in shifting the intervention window forward to the preoperative phase, thereby enhancing patients’ “surgical tolerance” and indirectly improving intraoperative metrics. This mechanism has rarely been systematically addressed in the literature and warrants further quantitative validation.

Our study also showed that the study group scored significantly higher on the SF-36 at the 1-week and 1-month assessments ($P < 0.05$), aligning with findings from similar studies. Du et al. reported that a multidisciplinary precision nursing strategy improved quality of life and reduced anxiety and depression scores compared with routine care, with emotional improvement correlating with pulmonary function and quality of life [19]; Zheng et al. [20] found that combining exercise rehabilitation with behavioral intervention significantly enhanced postoperative recovery quality in lung cancer patients. Thus, the beneficial effect of predictive nursing (and its variants) on postoperative quality of life has been replicated across independent samples. Based on our data, we propose three overlapping pathways: First, an “acceleration” of physiological recovery—shorter hospital stay and less drainage suggest reduced stress response, directly boosting Physical Function (PF) and Role-Physical (RP) scores. Second, proactive symptom burden management—preoperative screening and intervention prevent cascading symptom clusters (e.g., worsening pain and respiratory function), alleviating discomfort in Bodily Pain (BP) and Vitality (VT) domains [21]. Third, positive psychological shaping—risk communication and individualized coping education give patients a sense of control over recovery, which may be more durable than passive reassurance, possibly explaining improvements in Mental Health (MH) and Social Function (SF) domains [22].

In terms of postoperative complications, the study group had fewer total events than the control group, but the between-group difference was not statistically significant ($P > 0.05$). Therefore, we cannot conclude that predictive nursing is superior in reducing complications; however, it did not appear to increase postoperative safety risks. With the current sample size, these findings provide preliminary safety evidence for clinical application of this nursing protocol. Although previous studies reported that individualized, meticulous nursing interventions effectively reduced complications [23], our results differ. We consider several possible reasons. First, limited statistical power for subgroup analyses—the overall sample size was adequate only to detect large effect sizes (Cohen's $h \approx 0.51$) for the composite outcome, but complications are low-incidence events; when categorized into atelectasis, pneumothorax, pulmonary infection, etc., expected event counts were extremely low (mostly 1–3 cases per subgroup), severely compromising power for type-specific comparisons [24]. Second, a temporal drift in baseline complication rates of the control group. Given the retrospective design, controls were from 2023 and intervention cases from 2024; as ERAS has been increasingly implemented in our institution, routine perioperative management has improved substantially [25], narrowing the marginal benefit that predictive nursing could add and making it harder to detect significant differences. Third, inherent selection bias in retrospective designs—although baseline characteristics were comparable, retrospective studies cannot fully eliminate confounding from annual changes in nursing teams or case mix [26]. Future research should more precisely identify high-risk subgroups most likely to benefit from predictive nursing, rather than expecting uniform gains across all patients.

Limitations

Several limitations of this study should be acknowledged. First, the non-randomized, retrospective design may have introduced selection bias, as group allocation was based on the nursing interventions

received rather than through a formal randomization process. Second, this was a single-center study with a narrow age range (65–75 years), which limits the generalizability of our findings to older elderly populations or to patients treated in different healthcare settings. Third, although the predictive nursing protocol comprised multiple components, the intervention lacked standardization in terms of frequency, duration, and intensity, making it difficult to replicate in other clinical contexts. Fourth, due to the nature of nursing interventions, it was not feasible to blind patients, nurses, or outcome assessors, which may have introduced performance and detection biases, including the Hawthorne effect. Fifth, complications were recorded only during the index hospital stay, and follow-up was limited to 6 months; 12-month readmission, survival, and functional recovery were not captured. Additionally, we did not apply a standardized severity grading system for complications, and some potentially important confounders (for example, ASA physical status, pathological stage, extent of resection, and attending surgeon) were not recorded. Finally, no a priori sample size calculation was performed; post-hoc analysis showed that the study could detect only large effects and was substantially underpowered for the complication endpoint (post-hoc power approximately 9%). Future prospective, multicenter, randomized controlled trials with larger sample sizes and extended follow-up are warranted to confirm our findings.

Conclusion

In conclusion, in this single-centre retrospective cohort with historical controls, the introduction of a predictive perioperative nursing bundle was associated with shorter postoperative hospital stay and better early quality-of-life scores (at 1 week and 1 month) in elderly patients undergoing thoracoscopic lung surgery. No statistically significant difference in postoperative complication rates was detected (11.7% in the control group vs 8.3% in the study group; P = 0.754), and the study was not powered to detect one. Because allocation was by calendar period and nursing care cannot be blinded, residual confounding by calendar time and performance bias cannot be excluded, and the observed associations should be regarded as hypothesis-generating. Prospective, randomised, adequately powered studies with standardised intervention protocols and longer follow-up are required before predictive nursing can be recommended for routine adoption in thoracic surgical practice.

Declarations

Ethics approval and consent to participate

This single-center retrospective study was approved by the Institutional Ethics Committee of The First People's Hospital of Changzhou (Approval No. 2021-91) and was conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent to participate in this study.

Consent for publication

Not applicable. This manuscript does not contain any individual person’s data in any form.

Peng Song

Data curation, Formal analysis, Investigation, Validation, Writing-review & editing.

Yuan Jin

Data curation, Investigation, Writing -review & editing.

Mengmeng Zhao

Data curation, Investigation, Writing-review & editing.

Chao Wang

Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing-original draft, Writing-review & editing.

Conflict of Interest

The authors declare that they have no competing interests.

Funding:

No funding or sponsorship was received for this study or publication of this article. The Rapid Service Fee was funded by the authors.

Author Contribution

Chenchen Xu: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing -original draft, Writing-review & editing.Peng Song: Data curation, Formal analysis, Investigation, Validation, Writing-review & editing.Yuan Jin: Data curation, Investigation, Writing -review & editing.Mengmeng Zhao: Data curation, Investigation, Writing-review & editing.Chao Wang:Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing-original draft, Writing-review & editing.

Acknowledgement

We thank all the participants who took part in this study.

Data Availability

The datasets generated and/or analysed during the current study are not publicly available because they contain information that could compromise patient privacy, but are available from the corresponding author on reasonable request.

References

1. Wang J, Xu MM, Chen ZJ, Jiang Y, Zhu J, Wang S, Shi JH, Chen JL. Short-term outcomes of multi-arm uniportal robotic thoracic surgery versus uniportal video-assisted thoracoscopic surgery for non-small cell lung cancer. J Robot Surg. 2026 Feb 26;20(1):295.
2. Raz DJ, Sun V, Kim JY, Williams AC, Koczywas M, Cristea M, Reckamp K, Hayter J, Tiep B, Ferrell B. Long-Term Effect of an Interdisciplinary Supportive Care Intervention for Lung Cancer Survivors After Surgical Procedures. Ann Thorac Surg. 2016 Feb;101(2):495–502; discussion 502-3.
3. Dong J, Liu T. The application value of anticipatory nursing in pediatric fiberoptic bronchoscopy. Medicine (Baltimore). 2025 Jul 11;104(28):e43095.
4. Jiang X. Anticipatory Nursing Care in Pulmonary Embolism and Its Impact on Treatment Adherence: A Randomised Controlled Trial. Scand J Caring Sci. 2025 Dec;39(4):e70147.
5. Song X, Wan F. Improving surgical outcomes through anticipatory care in orthopaedic nursing. Medicine (Baltimore). 2026 May 15;105(20):e48725.
6. Hu X, Wen L, Zhang C. Effect of Anticipatory Nursing on Psychological Status and Quality of Life in Patients with Chronic Obstructive Pulmonary Disease: A Quasi-Experimental Study. Int J Chron Obstruct Pulmon Dis. 2025 Dec 24;20:4091–4101.
7. Rood PJT, Zegers M, Ramnarain D, Koopmans M, Klarenbeek T, Ewalds E, van der Steen MS, Oldenbeuving AW, Kuiper MA, Teerenstra S, Adang E, van Loon LM, Wassenaar A, Vermeulen H, Pickkers P, van den Boogaard M; UNDERPIN-ICU Study Investigators. The Impact of Nursing Delirium Preventive Interventions in the ICU: A Multicenter Cluster-randomized Controlled Clinical Trial. Am J Respir Crit Care Med. 2021 Sep 15;204(6):682–691
8. Sun L, Mu Y, Liu J, Wang J. The preventive effect of feedforward control nursing on complications and adverse events during the recovery period of gynecological general anesthesia patients. Perioper Med (Lond). 2026 Jun 10.
9. Xu M, Yang X, Guo L. Effectiveness of preoperative and perioperative pulmonary rehabilitation nursing program for the management of patients undergoing thoracic surgery: A systematic review and meta-analysis. Pak J Med Sci. 2024 Jul;40(6):1280–1286.
10. Feray S, Lubach J, Joshi GP, Bonnet F, Van de Velde M; PROSPECT Working Group *of the European Society of Regional Anaesthesia and Pain Therapy. PROSPECT guidelines for video-assisted thoracoscopic surgery: a systematic review and procedure-specific postoperative pain management recommendations. Anaesthesia. 2022 Mar;77(3):311–325.
11. Altorki N, Wang X, Kozono D, Watt C, Landrenau R, Wigle D, Port J, Jones DR, Conti M, Ashrafı AS, Liberman M, Yasufuku K, Yang S, Mitchell JD, Pass H, Keenan R, Bauer T, Miller D, Kohman LJ,

Stinchcombe TE, Vokes E. Lobar or Sublobar Resection for Peripheral Stage IA Non-Small-Cell Lung Cancer. N Engl J Med. 2023 Feb 9;388(6):489–498

12. Fu Q, Zhao Z, Yin D. Integrated Strategies for Nursing and Rehabilitation in Lung Cancer Patients. Asia Pac J Clin Oncol. 2026 Apr 6. doi: 10.1111/ajco.70087. Epub ahead of print. PMID: 41937719.
13. Wu W, Qiu R. The Effect of Nursing-Based Enhanced Recovery After Surgery on Quality of Life in Lung Cancer Patients Receiving Surgery: A Systematic Review and Meta-Analysis. Nurs Health Sci. 2025 Jun;27(2):e70094. doi: 10.1111/nhs.70094. PMID: 40204634.
14. Xue L, Deng J, Zhu L, Shen F, Wei J, Wang L, Chen Q, Wang L. Effects of predictive nursing intervention on cognitive impairment and neurological function in ischemic stroke patients. Brain Behav. 2023 Mar;13(3):e2890. doi: 10.1002/brb3.2890. Epub 2023 Feb 3. PMID: 36738135; PMCID: PMC10013941.
15. Dong Y, Ma G, Wu S, Zhang S. Effect of Refined Nursing on Wound Complications After Thoracoscopic Surgery for Lung Cancer. Clin Respir J. 2025;19(1):e70039.
16. Zou H, Qin Y, Gong F, Liu J, Zhang J, Zhang L. ABCDEF pulmonary rehabilitation program can improve the mid-term lung function of lung cancer patients after thoracoscopic surgery: A randomized controlled study. Geriatr Nurs. 2022;44:76–83.
17. Lu Y, Liang X, Tian J, Qu Y. Practical value of predictive nursing in the operating room for stress reaction and risk events in elderly patients with lower limb fractures. Am J Transl Res. 2023 Nov 15;15(11):6565–6575. PMID: 38074822; PMCID: PMC10703651.
18. Shasha Li, Qiaomei Sun,Predictive nursing management of postoperative nausea and vomiting in the anesthesia recovery period: From risk scoring to individualized intervention strategies,Asian Journal of Surgery,2026,ISSN 1015–9584.
19. Mei S, Wu X, Yang J, et al. Sichuan Da Xue Xue Bao Yi Xue Ban. 2023;54(5):1052–1057.
20. Zheng W, Ji J. Impact of exercise rehabilitation and behavioral interaction nursing on postoperative quality of life and psychological outcomes in lung cancer patients. Front Oncol. 2026;16:1742210. Published 2026 Jun 17.
21. Qi A, Li P, Lv C. The Effect of Predictive Nursing Care for the Treatment of Senile Cerebral Tumors Treated by Craniotomy. Altern Ther Health Med. 2025 Jan;31(1):386–395.
22. Harris J, Purssell E, Ream E, Jones A, Armes J, Cornelius V. How to Develop Statistical Predictive Risk Models in Oncology Nursing to Enhance Psychosocial and Supportive Care. Semin Oncol Nurs. 2020 Dec;36(6):151089.
23. Wang B, Qi F, Wang Y, Zhang J, Li W, Li X. Effectiveness of refined nursing intervention on postoperative recovery and respiratory function in lung cancer patients after thoracic surgery. Medicine (Baltimore). 2024;103(44):e40209.
24. Zhao D, Ma A, Li S, Fan J, Li T, Wang G. Development and validation of a nomogram for predicting pulmonary complications after video-assisted thoracoscopic surgery in elderly patients with lung cancer. Front Oncol. 2023;13:1265204. Published 2023 Oct 13.

25. Wang Z, Lin M, Geng G, Wu W, Tao Y. Application of Enhanced Recovery after Surgery in the Perioperative Period for Elderly Patients with Lung Cancer. JSLS. 2024;28(3):e2024.00037.
26. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol. 2008;61(4):344–349.
27. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30(6):473 – 83.
28. Li L, Wang HM, Shen Y. Chinese SF-36 Health Survey: translation, cultural adaptation, validation, and normalisation. J Epidemiol Community Health. 2003;57(4):259 – 63.

Figures

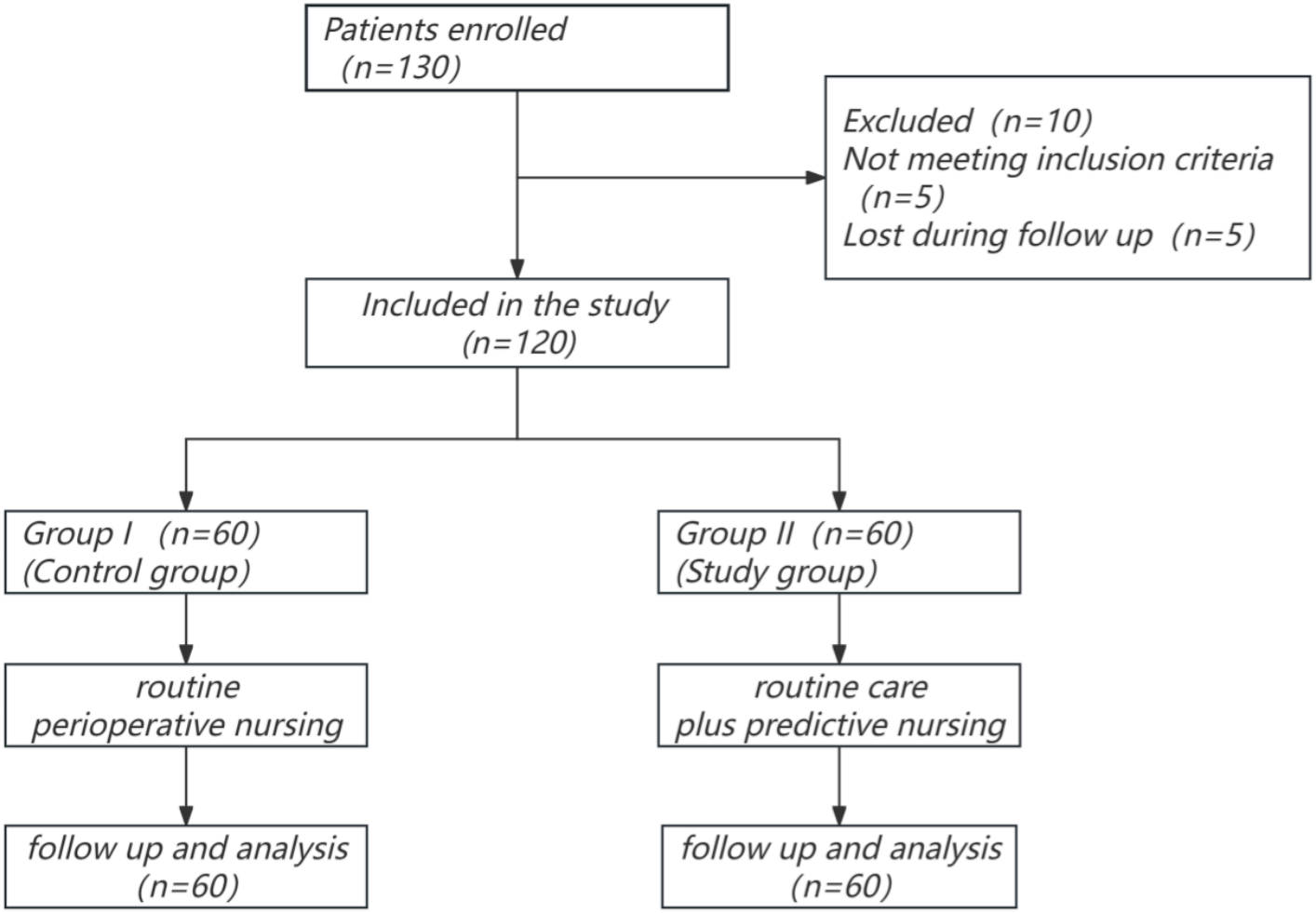


Figure 1

Flow of participants through the study

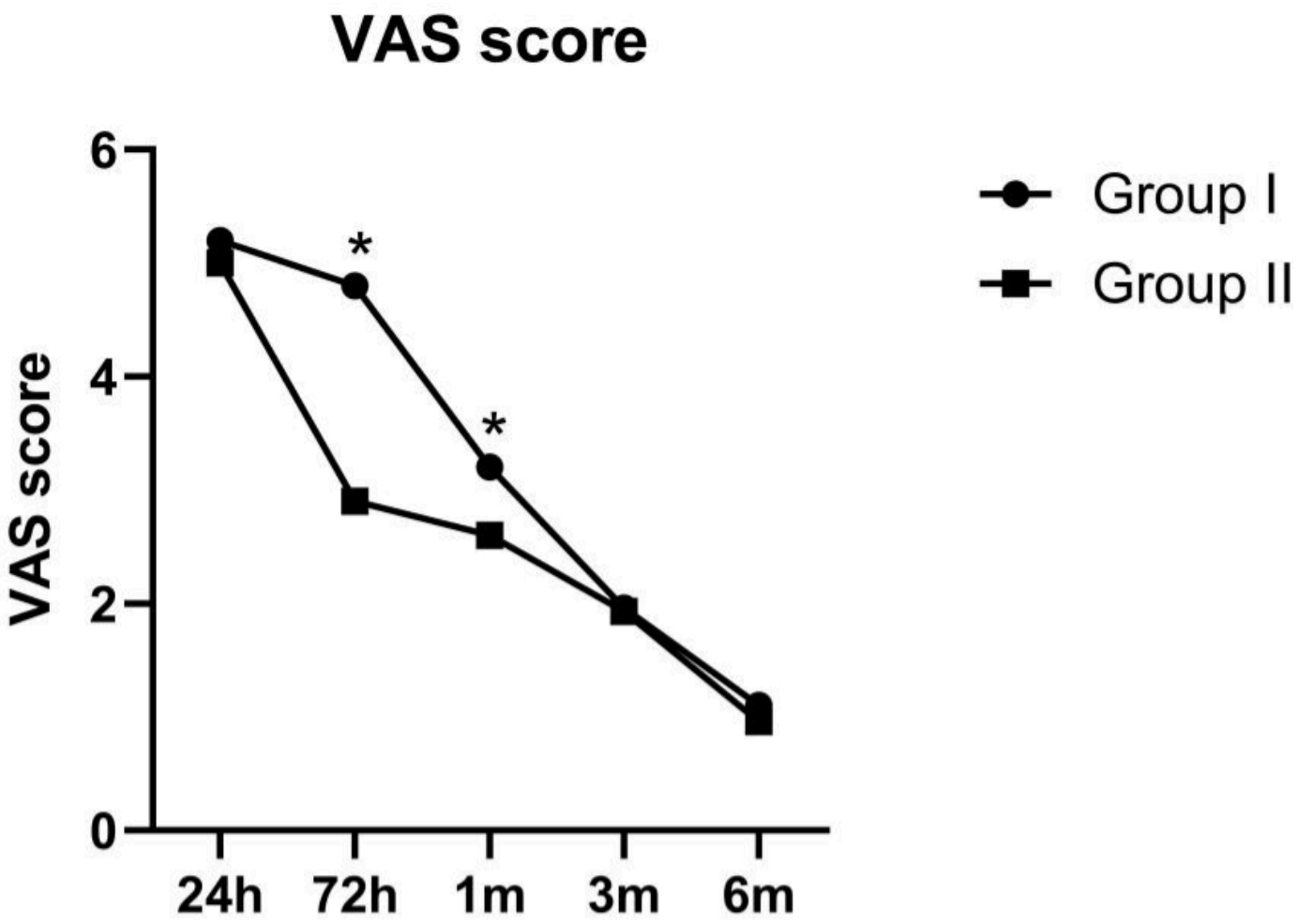


Figure 2

Comparison of postoperative pain scores between the two groups,Group I:the control group;Group II:the study group;*P<0.05 indicates study group vs control group.

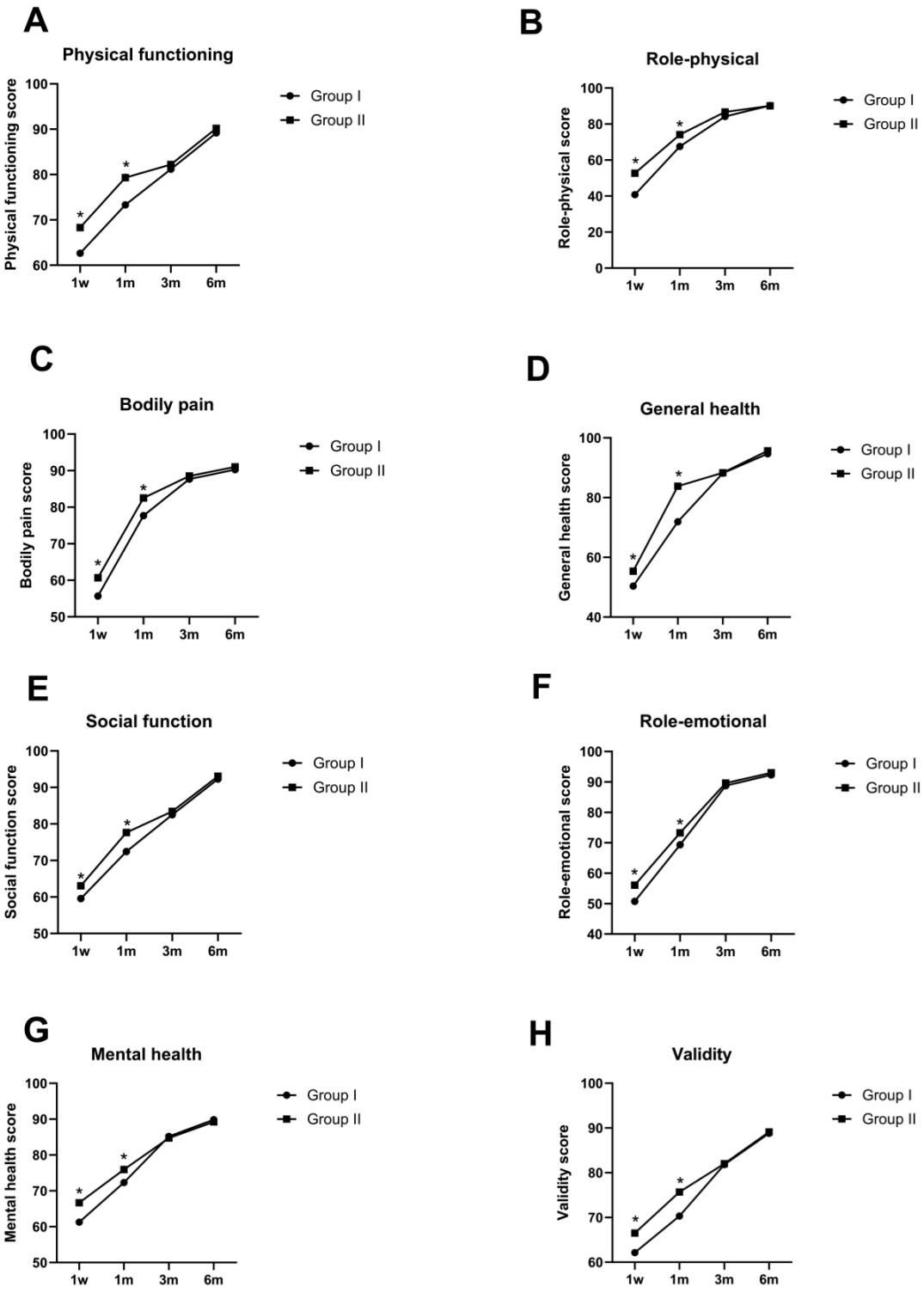


Figure 3

Postoperative quality of life scores of the two groups,Group I:the control group;Group II:the study group;*P<0.05 indicates study group vs control group.