Journal of Multidisciplinary Healthcare

Dovepress
Taylor & Francis Group

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ORIGINAL RESEARCH

Improving Nursing Care Models is Beneficial for the Perioperative Phase for Esophageal Cancer Patients

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Objective: This study aimed to compare the effectiveness of traditional and enhanced nursing models in the perioperative care of patients undergoing esophageal cancer surgery.

Methods: A total of 98 patients with esophageal cancer treated from January 2021 to December 2022 were selected by convenient sampling method for this retrospective study. They were categorized into the traditional care model and the improved care model with 49 patients in each group. The traditional care received standard care, and the improved care model group received the improved care model. The improved care group, on the basis of routine perioperative care, provided psychological intervention and cough training to patients before surgery. After surgery, sedation intervention, pipeline fixation, assistance for early patient activity and early enteral nutrition were given according to the assessment of the patients' conditions. Satisfaction with care, postoperative complications, postoperative ambulation time, length of hospitalization, and total hospital costs were compared between the two groups.

Results: The nursing satisfaction rate in the enhanced care group was 93.98%, significantly higher than the 87.67% observed in the traditional care group ($\chi^2 = 4.210$, $p < 0.05$). The incidence of postoperative complications was notably lower in the enhanced care group (6.12%) compared to the traditional care group (34.69%) ($\chi^2 = 9.800$, $p < 0.05$). Additionally, the enhanced care group demonstrated shorter postoperative ambulation time by an average of 1.38 days ($t = -9.082$, $p < 0.05$), reduced hospital stay by 3 days ($t = -5.658$, $p < 0.05$), and lower hospitalization costs by RMB 3,906 ($t = -5.510$, $p < 0.05$).

Conclusion: The implementation of an enhanced perioperative nursing model for patients undergoing esophageal cancer surgery is associated with reduced postoperative complications, shorter hospital stays, and decreased healthcare costs. Standardizing and optimizing nursing care protocols may improve patient outcomes and overall satisfaction with perioperative care.

Keywords: improving care models, esophageal cancer, peri-operative

Introduction

Esophageal cancer is one of the most common malignant tumors of the digestive system, with an increasing incidence rate reported annually.[1] Cases in China account for more than 50% of the global burden of esophageal cancer.[2] Due to the anatomical characteristics of the esophagus and the clinical presentation of the disease, surgical resection remains the most effective treatment approach.[3]

Despite advancements in esophagectomy techniques, the incidence of postoperative complications remains high, contributing to prolonged hospital stays.[4,5] Pulmonary infections and anastomotic fistulas are among the most frequently observed complications.[6] The incidence of pulmonary complications ranges from 25% to 40%, which is associated with extended hospitalization and increased postoperative mortality among patients undergoing esophageal cancer surgery.[7]

Previous research has demonstrated that patients receiving comprehensive, high-quality perioperative nursing care—including psychological support, pain management, nutritional care, respiratory care, and respiratory function training—experience a lower incidence of postoperative complications compared to those receiving conventional care. Additionally, patient satisfaction has been reported to be higher in groups receiving enhanced nursing interventions.[8] Given the impact of perioperative nursing care

Received: 12 October 2024
Accepted: 14 March 2025
Published: 26 March 2025

on patient outcomes, implementing effective interventions is essential to reduce postoperative complications in this population. Furthermore, studies have demonstrated that high-quality nursing care may influence overall survival rates among patients with esophageal cancer.[9]

Thus, optimizing preoperative and postoperative nursing strategies is necessary to decrease complication rates, shorten hospital stays, and improve patient satisfaction. The present study evaluates differences in hospitalization outcomes between patients receiving traditional nursing care and those managed with an enhanced care model.

Data and Methods

General Data

This study employed a time-sequential grouping method. A total of 98 patients diagnosed with esophageal cancer and hospitalized between January 2021 and December 2022 were retrospectively reviewed. Patients admitted from January 2021 to December 2021 (n = 49) were assigned to the traditional care group, while those admitted from January 2022 to December 2022 (n = 49) were allocated to the enhanced care group.

Inclusion Criteria

Patients were eligible for inclusion if they had a confirmed diagnosis of primary esophageal cancer based on pathological examination, had agreed to undergo radical esophagectomy, were conscious, and demonstrated basic cognitive function. Additionally, written informed consent was obtained from all patients and their families.

Exclusion Criteria

Patients were excluded in case there were pre-existing chronic conditions such as cardiac, hepatic, renal, or other systemic diseases, as well as a history of mental disorders. Patients in critical condition with signs of cachexia, those diagnosed with invasive or perforated esophageal cancer, and those with distant metastases were also excluded. Furthermore, individuals who developed postoperative complications such as anastomotic leakage or chylothorax were not included in the study.

Patient inclusion was conducted independently by two team members. This study adhered to the principles outlined in the Declaration of Helsinki and received approval from the Ethics Committee of Beijing Luhe Hospital, Capital Medical University (Approval No. 2022-LHYW-015-01). Written informed consent was obtained from all participants.

Nursing Methods

Traditional Care Group

Patients in the traditional care group received standard perioperative nursing care, which included basic care measures such as intestinal preparation and cessation of smoking and alcohol consumption. Dietary management was provided preoperatively and postoperatively, along with pharmacological care, which included the administration of antibiotics and postoperative analgesics. Additionally, health education focused on the prevention of respiratory infections, while continuous monitoring of vital signs was conducted before and after surgery.[10]

Enhanced Care Group

Patients in the enhanced care group received comprehensive perioperative nursing interventions in addition to routine nursing care. The enhanced care program included the following specific components:

Preoperative Nursing Care

(i) Psychological intervention:

Detailed explanations were provided to patients and their families concerning the pathophysiology of esophageal cancer, the surgical approach, perioperative considerations, and postoperative care protocols to mitigate the risk of complications. Preoperative assessments of patients' psychological well-being were conducted by trained nursing staff through structured communication. Tailored psychological support and counseling were subsequently delivered based on the individualized needs identified during these assessments.

(ii) Cough training:

Patients were instructed to assume a sitting or semi-recumbent position, take a deep breath, and then forcefully expel air from the trachea to produce an effective cough. This technique was emphasized to prevent ineffective coughing characterized by post-laryngeal sound production.

Postoperative Nursing Care

(i) Sedation and pain management:

Pain intensity was assessed daily at 14:00 using the Numeric Rating Scale (NRS), an 11-point scale ranging from 0 to 10. Patients were asked to rate their pain level using a combination of facial expressions and numerical values. Patients scoring above 4 on the scale were administered appropriate pain management interventions.

(ii) Drainage tube care:

(a) Proper fixation: All drainage tubes were securely fixed by nursing staff. Patients were educated on how to mobilize safely with the tubes to prevent accidental dislodgement.
(b) Monitoring drainage output: If drainage exceeded 200 mL per hour for three consecutive hours postoperatively, it was considered indicative of potential progressive bleeding. In such cases, the attending physician was promptly notified, and thorough documentation was maintained for shift handover.
(c) Medication and early mobilization: Acid-suppressing and gastrokinetic medications were administered as prescribed. Early mobilization was encouraged to minimize the risk of esophageal reflux. The nasogastric tube was removed as early as clinically appropriate.

(iii) Early mobilization:

(a) During the immediate postoperative period, patients were repositioned every two hours to prevent pressure injuries while still under the effects of anesthesia.
(b) Upon regaining consciousness, patients were assisted into a semi-recumbent position and guided through bed-based exercises, including limb movements, bridge exercises, and ankle pump exercises.
(c) Back percussion was performed every two hours to promote deep breathing, effective coughing, and sputum expectoration, thereby reducing the risk of pulmonary infections.
(d) On the first postoperative day, patients were assisted to sit by the bedside for five minutes, stand for five minutes, and ambulate more than 10 meters within the room, including trips to the bathroom.
(e) On the second postoperative day, patients were encouraged to walk more than 20 meters within the ward, with activity levels gradually increased based on individual tolerance and clinical condition.

(iv) Early postoperative enteral nutrition:

(a) A tailored enteral nutrition plan was developed by a dietitian based on the patient's height and weight.
(b) On the first postoperative day, saline was administered through the enteral nutrition tube to assess tolerance. If no abdominal discomfort was observed, a nutritional solution was introduced on the following day, adhering to the principles of starting slowly and increasing gradually in volume and rate. The nutrient solution was maintained at a temperature of 38–40 °C.
(c) During nasogastric feeding, patients were positioned in a sitting or semi-recumbent position to minimize the risk of aspiration. Nurses monitored for adverse symptoms such as diarrhea, abdominal pain, or reflux.
(d) Between the 7th and 10th postoperative days, patients were transitioned from liquid to semi-liquid, then to soft foods, and finally to a regular diet as tolerated.
(e) Nursing staff implemented the nutrition plan as per medical orders, monitored for complications, and provided nutritional education to patients and their caregivers.

The head nurse conducted regular audits to ensure adherence to these protocols, analyzed reasons for non-compliance, and implemented targeted supervision to address any gaps in care.

Observational Indicators

The traditional care group and the enhanced care group were evaluated and compared using the following metrics: patient satisfaction with nursing care, incidence of complications, duration of hospital stay, hospitalization costs, and time to initiation of ambulation. Patient satisfaction was assessed using a self-designed questionnaire comprising 10 items, each rated on a 4-point Likert scale (very satisfied, satisfied, dissatisfied, very dissatisfied). Higher scores indicated greater patient satisfaction. The questionnaires were distributed to patients to evaluate their satisfaction with the nursing care provided. Patients were instructed to complete and return the questionnaires immediately upon receipt.

Prior to the commencement of the study, data collection and management personnel underwent standardized training to ensure the accuracy and consistency of data collection. Regular audits of the collected data were conducted by the research team to maintain data integrity and reliability.

Statistical Methods

Data analysis in this study was conducted using SPSS 20.0 software. Measurement data that met the assumptions of normality were expressed as mean ± standard deviation ($\bar{X} \pm S$) and analyzed using the independent samples *t*-test. For data that did not meet the normality assumptions, results were presented as median (interquartile range, M[P25, P75]) and analyzed using non-parametric tests. Categorical data were expressed as frequencies (n) and percentages (%) and analyzed using the chi-squared test. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant.

Results

Comparison of General Data Between the Two Groups

No statistically significant differences were observed in the general baseline characteristics between the two groups ($p > 0.05$) (Table 1).

Comparison of Postoperative Complication Rates

The incidence of postoperative complications was 34.69% in the traditional care group, which was significantly higher than 6.12% in the enhanced care group ($\chi^2 = 9.800$, $p < 0.05$) (Table 2).

Table 1 Comparison of General Data Between the Two Groups

Item	Traditional Care Group	Improved Care Group	X^2/t	P Value
Gender				
Male	30	19	0.043[a]	0.835
Female	31	18		
Age	55.14±9.24	56.97±9.83	−0.952[b]	0.343
Education level				
Primary school and below	13	9	0.961[a]	0.618
Secondary school	24	26		
College or above	12	14		

(*Continued*)

Table 1 (Continued).

Item	Traditional Care Group	Improved Care Group	X^2/t	P Value
Mode of Medical Reimbursement				
Medical Care Insurance	47	45	-[c]	0.678
	2	4		
Hypertension	7	9	0.299[a]	0.785
Diabetes	6	4	-[c]	0.740
Coronary heart disease	3	2	–[c]	1.000
History of smoking				
Yes	25	27	0.164[a]	0.686
No	24	22		
History of alcoholism				
	23	20	0.373[a]	0.541
	26	29		
Eating very hot meals				
	34	31	0.411[a]	0.521
	15	18		
Eating too fast				
	49	49	–	–
	0	0		
Eating meals with a very firm texture				
	30	27	0.377[a]	0.539
	19	22		
Pathological staging			0.473[a]	0.493
Adenocarcinoma	12	9		
Squamous carcinoma	38	40		
Tumor site			1.094[a]	0.579
Upper esophagus	12	9		
Middle part of the esophagus	21	26		
Lower esophagus	16	14		

Notes: The symbol "a" stands for Chi-square test, the symbol "b" stands for two-independent sample *t*-test, and the symbol "c" stands for Fisher's exact test.

Table 2 Comparison of the Incidence Rate of Complications (n[%]) Between the Two Groups

Group	n	Surgical Site Pain	Bleeding	Pulmonary Infection	Reflux	Total Incidence Rate
Traditional care group	49	9(18.37)	3(6.12)	3(6.12)	3(6.12)	15(34.69)
Improved care group	49	0(0.00)	1(2.04)	1(2.04)	1(2.04)	3(6.12)
x^2						9.800
p						<0.05

Table 3 Comparison of Ambulation Initiation Time, Length of Hospital Stay, and Total Hospitalization Costs Between the Two Groups

Group	n	Bed Rest Time	Length of Hospital Stay	Total Hospitalization Costs	Patient Satisfaction
Traditional care group	49	4.39±0.78	16 (13,17.5)	86,185 (85,873,95,442.5)	34.18+3.17
Improved care group	49	3.01±0.45	13 (11,13.5)	82,279 (81,789,82,714)	36.79+2.73
t/F		−9.082	−5.658	−5.510	−4.368
p		<0.05	<0.05	<0.05	<0.05

Comparison of Ambulation Initiation Time, Length of Hospital Stay, and Total Hospitalization Costs

Patients in the enhanced care group initiated postoperative ambulation 1.38 days earlier on average compared to those in the traditional care group. Additionally, the enhanced care group had a shorter hospital stay by 3 days and lower total hospitalization costs by RMB 3,906. All differences were statistically significant ($p < 0.05$) (Table 3).

Comparison of Patient Satisfaction with Nursing Care

Patient satisfaction scores were significantly higher in the enhanced care group (36.79 ± 2.73) compared to the traditional care group (34.18 ± 3.17) (t = −4.368, $p < 0.05$) (Table 3).

Discussions

Esophageal cancer is a highly debilitating malignant tumor, and with the expansion of surgical indications, its incidence has continued to rise, leading to an increasing number of patients opting for surgical treatment.[11] High-quality perioperative nursing care plays a crucial role in reducing pain and adverse events [8Optimization of nursing interventions has the potential to lower the incidence of postoperative complications, shorten the duration of bed rest and hospitalization, reduce healthcare costs, and enhance patient satisfaction with nursing services.

The improved nursing care model in this study incorporated targeted interventions to address common postoperative complications following esophageal cancer surgery. Pain management is a critical component of postoperative care, as pain is one of the most frequently reported complications after esophageal cancer surgery.[12] Early and routine pain assessments, along with individualized adjustments in analgesic type and dosage, were employed to effectively alleviate pain. Adequate pain relief not only improves sleep quality but also facilitates effective coughing and sputum clearance, thereby reducing the risk of pulmonary complications.

Pulmonary complications, including pneumonia, are among the most prevalent and severe complications following esophageal cancer surgery, with an incidence rate ranging from 25% to 40%.[7,13] The development of pneumonia is strongly associated with prolonged hospitalization and increased medical expenses.[14] Research has demonstrated that pulmonary complications can be mitigated through preoperative rehabilitation strategies, such as psychological counseling and structured exercise programs, as well as postoperative interventions, including positional management, cough training, and early mobilization.[15,16] A study on patients undergoing thoracoscopic lung cancer resection reported that

a combination of patient education, optimized body positioning, and cough training effectively reduced postoperative pulmonary complications, leading to shorter hospital stays and decreased hospitalization costs.[17] Additionally, Silva et al confirmed that early ambulation serves as an independent intervention for reducing pulmonary complications.[18] Early postoperative activity promotes lung expansion, optimizes ventilation-perfusion ratios, and enhances airway clearance, thereby minimizing the risk of respiratory complications.[15] Another significant postoperative concern is gastroesophageal reflux, which can be effectively managed by adopting a semi-decubitus position. Elevating the head of the bed has been shown to significantly reduce reflux incidence in postoperative patients.[19] In the present study, the combination of cough training, positional management, and early mobilization contributed to a reduced incidence of pneumonia and reflux, ultimately leading to shorter bed rest durations and hospital stays.

After esophagectomy, enteral nutrition is preferred over parenteral nutrition, as the latter is associated with a higher incidence of metabolic disorders, elevated liver enzyme levels, and sepsis. Parenteral nutrition should only be considered when enteral feeding is not feasible.[20] In this study, enteral nutrition was initiated on the first postoperative day, beginning with normal saline infusion to facilitate the restoration of gastrointestinal function. Early postoperative enteral feeding plays a crucial role in maintaining basic nutritional support, stimulating intestinal peristalsis, preventing intestinal microbiota imbalance, and reducing intestinal endotoxin production.[21] Moreover, the early recovery of gastrointestinal function may help alleviate postoperative psychological stress and enhance patient satisfaction.

The implementation of enhanced nursing interventions was associated with a reduced incidence of postoperative complications, earlier ambulation, shorter hospital stays, and improved patient satisfaction. Similar findings have been reported in studies evaluating enhanced perioperative care in patients undergoing combined thoracoabdominal resection for esophageal cancer.[22]

Despite the positive outcomes observed with the improved nursing model, certain limitations should be acknowledged: (1) Study design: This study was a retrospective analysis. Future randomized controlled trials are needed to further validate the effectiveness of the intervention; (2) Sample size and study setting: The study was conducted at a single center with a relatively small sample size. Further multi-center, large-scale studies are required to confirm the generalizability of these findings and strengthen the evidence supporting improved perioperative nursing care.

Conclusion

The standardization and optimization of perioperative nursing care for patients undergoing esophageal cancer resection were associated with a reduction in postoperative complications, shorter hospital stays, and lower hospitalization costs, while also improving patient satisfaction with nursing services. Enhancing the nursing care model not only facilitates faster postoperative recovery but also contributes to more efficient utilization of medical resources, highlighting its clinical value and potential for broader application.

Abbreviation

NRS, Numeric Rating Scale.

Data Sharing Statement

Date will be made available on request.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Beijing Luhe Hospital, Capital Medical University (2022-LHYW-015-01). A written informed consent was obtained from all participants.

Consent for Publication

Consent for publication was obtained from every individual whose data are included in this manuscript.

Disclosure

None of the authors have any financial disclosure or conflict of interest.

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