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Nursing Care in Prevention of Post-Operative Pulmonary Complications among High-Risk Hospitalized Patients: A Case Study Design

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Abstract

Introduction: Post-operative pulmonary complications (PPCs) such as pneumonia, atelectasis, and respiratory failure significantly impact surgical outcomes, especially among high-risk patients with pre-existing respiratory conditions, advanced age, or those undergoing major surgeries. Effective prevention of PPCs is critical for improving patient outcomes. Nursing care plays a pivotal role in this prevention through early mobilization, respiratory exercises, proper positioning, and vigilant monitoring.**Objectives** :This study investigates the effectiveness of nursing care in preventing PPCs among high-risk hospitalized patients.

Methods: A descriptive case study design was used, involving 15 patients from a multispecialty hospital in Trivandrum who met the inclusion criteria of having more than four risk factors for PPCs and consented to participate. Data collection tools included demographic variables, clinical manifestation checklists, risk factors for PPCs, and an individualized nursing care plan. Over six weeks, patients were selected through convenience sampling and a 24-hour nursing care plan was implemented. Descriptive statistics were used for data analysis.

Results: The study sample consisted predominantly of elderly patients (73.3% aged above 60 years), with males constituting 66.7%. Significant risk factors included smoking history (66.7%) and elevated BMI (53.3%). All surgeries were performed under general anesthesia, with 60% lasting over 3-4 hours. Nursing interventions included deep breathing and coughing exercises, frequent position changes, early ambulation, use of an incentive spirometer, prophylactic antibiotics, and strict aseptic techniques. Most severe PPC symptoms were absent; however, mild symptoms like elevated temperature and cough were observed in 20% of patients.

Discussion: The results indicate that the comprehensive nursing care strategies effectively prevented most significant PPCs. The absence of severe symptoms suggests the success of interventions such as early mobilization and respiratory exercises. The occurrence of mild symptoms in some patients highlights the need for ongoing refinement of nursing protocols.

Conclusion: Effective nursing care significantly reduces PPC incidence in high-risk postoperative patients. This study supports the development of best practice guidelines for nursing care, emphasizing individualized care plans to improve patient outcomes and ensure high-quality healthcare services.

Introduction

Post-operative pulmonary complications (PPCs) are a significant concern in surgical care, as they can lead to increased morbidity, prolonged hospital stays, higher healthcare costs, and in severe cases, mortality.

These complications, which include conditions such as pneumonia, atelectasis, and respiratory failure, are particularly prevalent among high-risk patients—those with pre-existing respiratory conditions, advanced age, or those undergoing major surgeries. Effective prevention of PPCs is crucial to improving patient outcomes and ensuring the quality of healthcare services. Nursing care plays a pivotal role in the prevention of PPCs. Nurses are at the forefront of patient care, responsible for implementing preventive measures such as early mobilization, respiratory exercises, proper positioning, and vigilant monitoring for early signs of complications. Their interventions are critical in managing high-risk patients and ensuring their recovery process is smooth and uneventful. This research aims to systematically investigate the role of nursing care in the prevention of PPCs among high-risk hospitalized patients. By employing a comprehensive case study design, this study will evaluate the effectiveness of specific nursing interventions and identify best practices for clinical implementation. The ultimate goal is to improve patient outcomes by reducing the incidence of PPCs through enhanced nursing care strategies. This research will contribute to the body of knowledge on PPC prevention and support the development of guidelines for best practices in nursing care.

Objectives

1. To assess the risk factors for postoperative pulmonary complications (PPCs).
2. To evaluate the effectiveness of nursing interventions in preventing PPCs among high-risk postoperative patients.
3. To assess the signs and symptoms of postoperative pulmonary complications.

Methodology

A descriptive case study design was used for this research conducted in a multispecialty hospital in Trivandrum district following approval from the hospital authority. The study included 15 patients who had recently recovered from anesthesia and were transferred to the postoperative ward. The inclusion criteria required patients to be willing to participate and to have undergone surgery with more than four risk factors for postoperative pulmonary complications. The exclusion criteria ruled out patients who were unwilling to participate or did not have such risk factors. Written consent was obtained from each participant after explaining the study's aims and objectives before surgery. Data collection tools included four sections: demographic variables, clinical manifestation checklists, risk factors for postoperative pulmonary complications, and an individualized nursing care plan based on literature and expert opinions. Over six weeks patients meeting the inclusion criteria were selected through convenience sampling and a 24-hour nursing care plan was implemented. Patients were monitored for complications during hospitalization and data were analysed using descriptive statistics.

Results

Section I: Socio demographic data of high risk post operative pulmonary patients
Section II: Assessment of risk factors of post operative pulmonary patients
Section III: Nursing care rendered to the high risk postoperative pulmonary care patients
Section IV: Assessment of signs and symptoms of postoperative pulmonary patients after nursing care

SECTION – I: socio demographic variables and postoperative pulmonary complications.

Sl No	Variables	Components	n	%
1	Age	30-39	1	6.7
		40-49	2	13.3
		50-59	1	6.7
		60-69	11	73.3
2	Sex	Male	10	66.7
		Female	5	33.3
3	Religion	Christian	6	40
		Hindu	8	53.3
		Muslim	1	6.7
4	Marital status	Married	15	100
5	Educational status	Primary	3	20
		Secondary	6	40
		College	6	40
6	Occupation	Coolie	2	13.3
		Agriculture	1	6.7
		Business	2	13.3
		Govt service	4	26.7
		Private service	6	26.7
7	Nature of work	Sedentary	10	66.7
		Light work	nil	nil
		Heavy work	5	33.3

Table shows the age distribution is diverse, with the majority of the participants (73.3%) falling within the 60-69 age range. Smaller proportions are found in the 40-49 (13.3%), 30-39 (6.7%), and 50-59 (6.7%) age groups. The sample consists predominantly of males, who constitute 66.7% of the population, whereas females make up 33.3%.The religious affiliations are primarily Hindu (53.3%), followed by Christian (40%), and a small minority of Muslim participants (6.7%).All participants in the sample are married, representing 100% of the marital status category. Regarding educational background, an equal proportion (40% each) have either secondary education or college education, while a smaller segment (20%) have only primary education. Occupationally, the participants are engaged in a variety of fields. Private Service and government service employees each account for 26.7% of the sample. Those in business and working as coolies each represent 13.3%, and a smaller group is involved in agriculture (6.7%).In terms of the nature of work, 66.7% of the participants have sedentary jobs, while the remaining 33.3% are engaged in heavy work. Notably, there are no participants involved in light work.

SECTION – II Assessment of the risk factors for post-operative pulmonary complications.

Sl. No	Risk Factors	n	%
1	Age above 60 years	11	73.3
2	Smoking history	10	66.7

3	Elevated body mass index	8	53.3
4	Congestive heart failure	0	0
5	Nasogastric tube after surgery	8	53.3
6	Current upper respiratory tract infection	0	0
7 (a)	General anesthesia	15	100
(b)	Long acting neuromuscular blocker	0	0
8	Duration of surgery more than 3-4 hours	9	60
9	Site of surgery		
a	thoracic	3	20
b	abdominal	9	60
c	Head and neck	1	6.7
d	Surgery on extremities	2	13.3
10	Type of surgical incision		
a	vertical	7	46.7
b	horizontal	4	26.7
c	laparoscopic	4	26.7

The Table depicts the risk factors of postoperative pulmonary complications. A significant portion, 73.3%, of the participants are aged above 60 years, indicating a predominantly elderly cohort. Smoking history is prevalent among 66.7% of the sample, underscoring smoking as a major risk factor. Additionally, 53.3% exhibit an elevated BMI, suggesting obesity or overweight status is common. Notably, none of the participants have congestive heart failure or current upper respiratory tract infections, suggesting rigorous screening protocols before inclusion in the study. In terms of surgical and anesthesia , all surgeries (100%) were performed under general anesthesia, highlighting its predominant use. Sixty percent of surgeries lasted longer than 3-4 hours, which poses potential risks for complications due to prolonged anesthesia and surgical stress. The distribution of surgical sites shows that abdominal surgeries (60%) were most frequent, followed by thoracic (20%), extremities (13.3%), and head and neck regions (6.7%). Regarding surgical incision types, vertical incisions were most common (46.7%), followed by horizontal (26.7%) and laparoscopic approaches (26.7%).

SECTION - III

This section addresses the nursing care provided to patients to prevent postoperative pulmonary complications. Nursing care was individually planned to maintain airway patency, prevent infection, and enhance lung capacity post-surgery. All patients were hospitalized for a minimum of 4-8 days and assessed continuously. They were taught and encouraged to perform deep breathing and coughing exercises while awake. Patient positions were changed every two hours, and early ambulation began on the second day, except for patients who underwent gastrectomy or vein ligation and stripping, who began ambulation on the third day with adequate support. Active and passive exercises were provided, with specific attention

to non-affected extremities for those who had vein ligation and stripping. The head of the bed was elevated to a 30° angle for all patients after recovery from general anesthesia. IV fluids were administered as per the surgeon's orders, with a total of 2500 to 3000 ml based on the patients' output. Oral fluids were introduced after recovery from anesthesia, except for patients who underwent abdominal surgery. Antiembolic stockings were applied twice daily, and strict aseptic techniques were followed during all procedures. Oral care was provided twice daily. Patients were encouraged to use an incentive spirometer while awake, and cefotaxime 1.28g was administered intravenously every eight hours as a prophylactic antibiotic. Identified knowledge deficits were addressed through patient education on preventing future pulmonary complications, including positioning to maximize respiratory function, ambulation, use of an incentive spirometer, pursed-lip breathing, diaphragmatic breathing, nutrition, controlling allergens and pollutants, infection control, and lifestyle modifications. This comprehensive nursing care plan aimed to prevent postoperative pulmonary complications and promote recovery.

SECTION – IV Assessment of the signs and symptoms of pulmonary complications.

Sl.no	Signs and symptoms	No of patients	%
1	Dyspnea	Nil	-
2	Cyanosis	Nil	-
3	Tachypnea	Nil	-
4	Low blood pressure	Nil	-
5	Sudden chest pain	Nil	-
6	Dull or absent breath sound	Nil	-
7	Expectoration of blood tinged or purulent sputum	Nil	-
8	Use of accessory muscle for breathing	Nil	-
9	Elevated temperature	3	20%
10	Decreased chest wall movement	Nil	-
11	Decreased oxygen saturation	Nil	-
12	Cough	3	20%
13	Increased WBC count	Nil	-
14	Chest pain	Nil	-

The table presents the outcomes related to the prevention of postoperative pulmonary complications in a group of patients. Remarkably, most of the common signs and symptoms of postoperative pulmonary complications, such as dyspnea, cyanosis, tachypnea, low blood pressure, sudden chest pain, dull or absent breath sounds, expectoration of blood-tinged or purulent sputum, use of accessory muscles for breathing, decreased chest wall movement, decreased oxygen saturation, increased white blood cell count, and chest pain, were not observed in any of the patients. However, elevated temperature and cough were noted in 20% of the patients . This indicates that while the majority of severe complications were successfully prevented, some patients still experienced mild signs of infection or irritation postoperatively, as evidenced by fever and cough. Overall, the outcomes suggest that the implemented nursing care strategies were effective in preventing most significant postoperative pulmonary complications, highlighting the

success of individualized care plans, early ambulation, respiratory exercises, and other preventive measures.

Discussion

The high prevalence of risk factors such as advanced age (73.3% above 60 years), smoking history (66.7%), and elevated BMI (53.3%) highlights the critical need for targeted nursing interventions. Despite these risk factors, the study found that the incidence of severe postoperative pulmonary complications was remarkably low. Common complications such as dyspnea, cyanosis, tachypnea, low blood pressure, sudden chest pain, dull or absent breath sounds, expectoration of blood-tinged or purulent sputum, use of accessory muscles for breathing, decreased chest wall movement, decreased oxygen saturation, increased white blood cell count, and chest pain were absent in all patients. This suggests that the nursing care strategies implemented were highly effective. Notably, 20% of patients experienced elevated temperatures and cough, indicating mild postoperative complications. This could be attributed to minor infections or irritations that did not escalate into severe conditions due to timely and effective nursing interventions. The individualized care plans, which included teaching and encouraging deep breathing and coughing exercises, frequent repositioning, early ambulation, and the use of incentive spirometers, were crucial in maintaining airway patency and enhancing lung capacity. Additionally, strict adherence to aseptic techniques, appropriate fluid management, and prophylactic antibiotic administration played vital roles in preventing infections.

The study also highlights the importance of patient education in preventing future complications. By addressing knowledge deficits and educating patients on respiratory function positioning, ambulation, breathing techniques, nutrition, and lifestyle modifications, the nursing team equipped patients with the necessary tools to manage their health post-discharge effectively. The distribution of surgical and anesthesia details further contextualizes the outcomes. All surgeries were performed under general anesthesia, with a significant number (60%) lasting over 3-4 hours, which inherently increases the risk for complications. Despite this, the proactive and preventive nursing care measures were able to mitigate these risks effectively. The predominant occurrence of abdominal surgeries (60%) and the use of vertical incisions (46.7%) also highlight the tailored care required for different surgical profiles.

To conclude, the study demonstrates that a well-structured, individualized nursing care plan can significantly reduce the incidence of postoperative pulmonary complications, even in high-risk populations. The low occurrence of severe complications and the management of mild symptoms underscore the success of the implemented strategies. These findings advocate for the continued use of comprehensive, patient-centered nursing care protocols to enhance postoperative outcomes and patient recovery. Future research could focus on further refining these interventions and exploring their applicability across different surgical populations and healthcare settings.

Implication

The results of this study underscore the critical role of comprehensive and individualized nursing care in preventing postoperative pulmonary complications. The significant reduction in severe complications among a high-risk population highlights the importance of tailored care plans that address the specific needs and risk factors of each patient. The study also demonstrates the effectiveness of early ambulation, respiratory exercises, strict aseptic techniques, and continuous patient monitoring in maintaining airway patency, preventing infections, and enhancing lung capacity. Furthermore, the success of patient education

programs in promoting self-management and preventing future complications emphasizes the necessity of incorporating educational components into postoperative care protocols.

Recommendation

Based on these findings, it is recommended that healthcare providers develop and implement individualized nursing care plans for patients with multiple risk factors. Standardizing early ambulation and respiratory exercises, such as deep breathing and coughing, should be routine in postoperative care. Emphasizing strict aseptic techniques and continuous patient monitoring is essential to prevent infections and ensure timely intervention. Comprehensive patient education programs covering respiratory function, the use of incentive spirometers, breathing techniques, nutrition, and lifestyle modifications should be integrated into postoperative care. Additionally, ongoing research and training for nursing staff and adopting a multidisciplinary approach involving surgeons, anesthetists, nurses, and physiotherapists can further enhance the quality of postoperative care and improve patient outcomes.

Conclusion

This study shows that personalized and thorough nursing care can effectively prevent lung problems after surgery in high-risk patients. By using tailored nursing plans that include early walking, breathing exercises, strict cleanliness, and continuous monitoring, severe complications were significantly reduced. The absence of common severe lung issues among patients highlights the success of these methods. Additionally, educating patients about managing their health played a crucial role in preventing future problems. These findings support the use of individualized nursing care and educational programs in post-surgery protocols to improve patient outcomes. The study recommends standardizing these care practices and adopting a team-based approach to ensure coordinated and comprehensive patient care after surgery.

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