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Effectiveness A Nurse Guided Enhanced Recovery Pathway on Postoperative Respiratory Tract Infection in Hepatico-Pancreatic –Biliary Surgery

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ABSTRACT

Background: Postoperative pulmonary are the most serious complication following upper abdominal surgery complications as result of significant consequences including increased mortality, hospital costs, and prolonged hospitalization. Enhanced recovery after surgery (ERAS) could shorten hospital stay and decrease postoperative complications for patients undergoing colorectal surgery.

Objectives: Evaluate the effect of a nurse guided enhanced recovery pathway on postoperative respiratory tract infection in Hepatico-Pancreatic –Biliary surgery [pre-operative patient counselling for postoperative respiratory physiotherapy techniques and emphasis on perfect training].

Design: Quasi-experimental study.

Setting: The study was conducted in the surgical department, operation unit and intensive care unit at AlRajhy liver hospital.

Subjects: Sixty patients undergoing hepatobiliary pancreatic surgeries. The sample was divided into two groups: control and study group (30patient each). The control started the first then the study group. **Tools**: Three tools were used. Tool I: Patient assessment sheet. Tool II: Clinical pathway protocol. Tool III: Clinical outcome evaluation. The control group received tools I and III only while the study group received the three tools including clinical pathway protocol [tool II].

Results: There was a statically significant difference between control and study groups regarding the respiratory tract infection and oxygen therapy with acceptance ABG in first 12 hour and first day after surgery and no statically significant difference regarding fever, admission and readmission to ICU and length of stay in hospital.

Conclusions: Implementation a nurse guided enhanced recovery pathway has beneficial effects on postoperative respiratory tract infection in Hepatico-Pancreatic –Biliary surgery.

Recommendations: A guided enhanced recovery pathway should be carried out as routine care in Hepatico-Pancreatic –Biliary surgery.

Keywords: *Enhanced recovery pathway, Hepatico-Pancreatic –Biliary surgery, Nurse, postoperative respiratory tract infection, preoperative patient counselling, postoperative respiratory physiotherapy*

INTRODUCTION

Hepato-pancreato-biliary (HPB) surgeries are among the most frequently performed worldwide within gastrointestinal surgery field [1, 2]. HPB surgery includes surgery of the liver, bile ducts, gall bladder, and pancreas. HPB surgery is an important principle of treating HPB procedures which are considered complicated with major risk, such as pancreaticoduodenectomy or hepatectomy, and are not performed in every institution [3]. Despite significant advances in perioperative care, complications remain major. Enhanced recovery after surgery (ERAS) programs applied

multidisciplinary, evidence-based interventions in preoperative, intraoperative, and postoperative care that work synergistically to reduce the undesirable effects of the surgical stress response [4].
Enhanced recovery after surgery (ERAS) is worldwide surgical quality improvement initiative that was started in early 2000s by a group of European surgeons who challenged the evidence surrounding several historical perioperative practices including prolonged fasting (NPO after midnight), mechanical bowel preparation, nasogastric drainage and delayed postoperative feeding among others. What they found, in fact, was very little evidence supporting these practices and many were associated with considerable, morbidity including dehydration, hypotension, decreased patient satisfaction and prolonged hospital stay [1].

Successful implementation of ERAS protocol requires proper coordination between the surgeon, the anesthesiologist and the nursing personnel in the perioperative period. Here, an anesthesiologist plays the most important role of guiding and monitoring some important elements such as preoperative patient selection and optimization, select of anesthetic regimen, fluid and pain management and thus facilitates and bridges the gap between pre- and post-operative care [5].
Nursing role is necessary in all ERAS Pathways and when applied correctly, ERAS should empower nurses. ERAS includes many elements relate to nursing roles such as preoperative education and postoperative mobilization, nutrition and pain relief. Many hospitals have found that the introduction of an ERAS coordinator, often a nurse is beneficial for the implementation and sustainability of ERAS pathways[6].

Postoperative pulmonary complications (PPCs) are major cause morbidity and mortality after open abdominal surgery. Postoperative pulmonary complications (PPCs) following abdominal surgery are frequent with an incidence ranging from 1% to 30% [7]. Optimized lung expansion may decrease the synergistic factors responsible for the multiple-hit perioperative pulmonary dysfunction[8].
Since the beginning of the 20th century, respiratory physical therapy is often used for PPCs prevention and treatment to strengthen ventilation-perfusion matching and increase lung volumes and airway clearance[9]. It consists of various airway clearance techniques and lung expansion therapy including diaphragmatic breathing exercises, mobilization, and mechanical breathing devices such as incentive spirometry[8].
Early ambulation after postoperatively spirometry is frequently employed for usual care of surgical patients as an attempt to optimize lung expansion and prevent complications after surgery[8].
Inspiratory training is cornerstone of postoperative physiotherapy and has been performed routinely for a long time. The purpose of all inspiratory muscle training in any exercise regimen is to strengthen the muscle and increase breathing volume, thus leading better physiological reserve[10].

Subject and method

Research design
A quasi-experimental research design was used in current study.
Setting: The study was conducted in surgical department, operation unit and intensive care unit at Alrajhy liver hospital, Assiut university hospitals, Egypt.
Subject: Sixty patient undergoing hepatobiliary pancreatic surgeries. The sample was divided into two groups; control and study group [30patient each]. The control started the first then the study group.
The sample size was calculated according to Epi Info 2000. A sample size was selected using a special formula based on prevalence of disease at a confidence interval of 95% and precision of (2%). The sample was increased by 10% to overcome problems related to non-responses and missing data. The power of study was 80%. Considering the following matching criteria age group, sex, diagnosis, comorbidity diseases.
The patients'inclusion criteria: Age 18-65 years old, able to communicate and Patients without vital failure (renal, hepatic, cardiac).
The patients'exclusion criteria: Past history of other organ cancer and patient refusal.

Tools:
Tool one; Patient assessment sheet:
This tool was developed by researchers based on related literature to assess the surgical patient[11]. It consisted of three parts:

Part1: it included socio-demographic data about the patients such as: age, gender, level of education, material status, physical assessment included anthropometric measurement [weight, height and body mass index] body mass index measured through dividing weight by kg on the square of height by m^2, and clinical data such as patient diagnosis, past medical history, past surgical history, surgical procedure and type of anesthesia.

Classification	BMI(Kg/m^2)	Risk of comorbidities
Underweight	<18.5	Low (but risk of other clinical problems increased)
Normal range	18.5-24.9	Average
Overweight (pre-obese)	25.0-29.9	Mildly increased
Obese Class I Class II Class III	≥30.0 30.0-34.9 35.0-39.9 ≥40.0	 Moderate Severe Very severe
WHO body mass index (BMI) classification 2012.		

Part 2: Intra-operative data which included estimated blood loss, urine output, fluid and blood replacement, final balance, intraoperative complications, duration of anesthesia, duration of surgical procedure and duration of recovery.
Part 3: Post-operative assessment that included
Assessment of vital signs [temperature, pulse, respiration, and blood pressure], monitoring signs of respiratory infection (cough, dyspnea, hypoxemia, and tachypnea) and the need to oxygen therapy were also recorded besides monitoring arterial blood gases and oxygen saturation.

Tool two [the main research investigation] = named as clinical pathway protocol:
Clinical pathway for hepatobiliary pancreatic surgeries, this tool was developed by researchers after extensive review of related literatures and enhanced recovery after surgery pathway. The researchers used enhanced recovery after surgery to develop this tool. This tool was applied on the study group only. The six-time intervals included the three perioperative stages: the first interval represented the preoperative period, the second interval represented the intraoperative period and the next four intervals represented the postoperative period (over three days after surgery, hospitalization period). This tool format was prepared in a matrix form that included vertical column representing applicable or not applicable and horizontal row clinical pathway items (as discussed later).
This tool consisted of three phases:
Pre-operative phase; counseling and education of patient for chest physiotherapy, using spirometry, bowel preparation, early mobilization and how to predict common complications with learning to cooperate with nurses. Emphasis on patients to co-operate postoperatively was strongly stressed in spite of the pain and weakness.
Intra-operative phrase: Optimal fluid management, short acting anesthetics, regional analgesia, opioids-sparing anesthesia, small incisions, avoiding drains, maintaining normothermia, venous thrombo-embolism [VTE] prophylaxis and antibiotic prophylaxis were routinely done.
Post-operative phase components: Early oral nutrition, optimal fluid management, multimodal non-opioid analgesia, postoperative nausea and vomiting PONV prophylaxis, stimulation of gut motility, early removal of catheters and drains, early mobilization, chest physiotherapy and using spirometry effectively.

Tool three: clinical outcome evaluation:
This tool developed by researchers based on reviewing the recent related literature [4]. It was aimed to assess the clinical outcomes for hepatobiliary pancreatic patients three days after surgery and hospitalization period. It was included such as respiratory infection, length of stay in hospital, mortality, fever, admission and readmission to ICU.

Methods
Permission was initially obtained from AlRajhy liver hospital to enable the study to be conducted in the selected unit. Permission was not only granted to conduct the study, but to assist with recruitment of the participants. The Assiut university's and hospital ethics committees granted approval for the study to be conducted in the selected unit with ethical approvals number/ 1120230610.

The study was conducted in three phases:
Phase I:
Development of the clinical pathway was conducted into two stages
Stage I;
The Study of hospital routine as baseline for clinical pathway development. Development of the clinical pathway based on the critical review of relevant literature. The Google Search Engine was undertaken between (2019 to 2023) to identify articles the reported the evidence –based about patient safety, safety in anesthesia, postoperative complications, enhanced recovery after surgery and nursing role in prevent postoperative complications.

The research was restricted to articles published in the last 5 years (2019 to 2023) to ensure recency of evidence. The search was also limited to full-text articles published in English but not to geographic location.
Development of the clinical pathway based on collaborative work with professor of critical care in Assiut faculty of nursing, and faculty of medicine, members of surgery, anesthesiology and nursing staff in the operation unit, intensive care unit and surgical department. The researchers started to develop the clinical pathway through reviewing many theoretical frameworks described the structure, and design of clinical pathway and also through reviewing many developed clinical pathways in different specialties such as upper respiratory tract infection, clinical pathway assessment and guidelines for perioperative care for pancreatoduodenectomy: Enhanced Recovery After Surgery (ERAS) Recommendations 2019 in recent literatures. The following are some types of interventions and actions provided in the clinical pathway.
Stage II: It was included training programs for the nursing team which was included in the clinical pathway application to help implementing the clinical pathway during perioperative period. The training was lasted above two weeks and the programs were explained during the break time.

Phase II: implementation of the clinical pathway:
The developed clinical pathway was implemented in this phase. The clinical pathway was included in two stages.

Stage I: patients' assessment.
Tool I was used to assess the patients in operation theatre, intensive care unit and ward after implementation of clinical pathway to assess the intraoperative data, vital signs, signs and symptoms of respiratory infection and arterial blood gases.
Stage II:
Tool II was used to implement clinical pathway. The six-time intervals included in clinical pathway. The three perioperative stages: first interval represents the preoperative period, second interval represents the intraoperative period and the following four intervals represented the postoperative period (three days after surgery, hospitalization period). Clinical pathway items were observed to be applicable or not applicable
Phase III: Evaluating the clinical pathway outcomes
The efficacy of the pathway was determined by measuring patient's outcomes during 3 days after surgery. By using tool I, tool II, tool III; the outcomes of both control and study groups were compared to measure respiratory infections, mortality, length of stay in hospital, fever, admission and readmission to ICU.

Objectives:
The main outcome is the effect of applying clinical pathway on incidence of postoperative respiratory tract infection. Secondary outcomes as effect on patient oxygen status [oxygen therapy and oxygen saturation], fever, hospital length of stay, admission and readmission to ICU and mortality rate.

Null hypothesis:
Patients on whom the clinical pathway is implemented don't exhibit improvement at the patient outcomes including postoperative respiratory tract infection and hospital length of stay.

Data collection
Data collection tools; the patient assessment tool I, clinical pathway tool II and clinical outcomes evaluation tool III developed and written by researchers based on reviewing the relevant literature.
The recruitment phase of this study started in May 2023 and completed April 2024. The first three months were for development of the clinical pathway and the approval from committees, administration broad of the hospital and from the nurses and physician included in clinical pathway. Collection of control group ensued for the next four months (Augusts, September, October, and November 2023).
Following this data collection of the study group was achieved in last five months (December, January, February, March, and April 2024).
Therefore, the whole study was achieved within about 12 months.

Control group
All the patients admitted to surgical department during the period from early Augusts 2023until the end November 2023 matching the inclusion criteria for this study were included in the control group. The control group contained 30 patients with the same designed criteria. The control group received routine daily care of the hospital. For the control group, the two designed study tools used to assess the patients daily and detect the clinical outcomes of the patients (tool I and tool III) only.

Study group
After the data collection of the control group was completed, educational training sessions were provided to care providers

including the purpose and the process of implementing the pathway for one week. Following the training thee researchers started to make recruitment and screen for the study group, the researchers received consent from administration to start the data for the study group. The oral and written consent from the patient was also done, to allow the researchers to observe, make daily assessment and manage the patients according to the designed clinical pathway.
After completion of the recruitment and screening, all patients admitted to the surgical unit during the five months period from first December 2023 until the end of April 2024 were assessed and managed as study group (explained above). The study group also estimated 30 patients that met the inclusion criteria. For the study group, the three designed study tools used to assess the patients daily and detect the clinical outcomes of the patients (tool I, tool II and tool III)

Content validity
Content validity of the all tools was done by five experts in the related fields and necessary modifications were done accordingly.

Reliability
The tools were done using appropriate test.

Pilot study
Pilot study was carried out on six patients to test the feasibility and applicability of tools. The necessary modification was done and the data was excluded from the study.
Data was collected from control group first then from the study group to avoid sample contamination. The control group received the routine hospital care while the study group underwent clinical pathway protocol.

Ethical consideration
1-Resrearch proposal was approved from ethical committee in the faculty of nursing and faculty of medicine under number of 1120230610.
2-There was no risk for study subject during application of research.
3-The study was followed common ethical principles in clinical research.
4-Written consent was obtained from patients or guidance that was willing to participate in study, after explaining the nature and purpose the study.
5-Confidentaility and anonymity was assured.
6-Study subject had a right to refuse to participate and or withdraw from the study without any rational any time.
7-Study subject privacy was considered during collection of data.

Statistical analysis
After completion of the data collection for intervention group, the researchers made statistical analysis for 60 patients (30 control+ 30 study). The researchers made interpretation for data on SPSS and then gave data for specialist in statistic to made tabulation and get the results.
All data cleaning and analyses were performed using IBM SPSS (version 27.0) software. Categorical variables were described using ordinal numbers and percentage (number, %), and Chi-square (χ^2) tests used to make comparison between categorical variables. Continuous variables were described using means and standard deviations (means, SD), and comparison made between continuous variables using either t-tests used if the data meet the requirements for non-parametric test or Mann Whitney U tests used when the data not meet the requirements for a parametric test. Continuous variables were also tested for normal distributing using Kolmogorov Smirnov test and Q-Q plots (display the observed values against normally distributed data). A two- tailed $p<0.05$ was considered statistically significant.

The Results

The study included after excluded cases as shown in consort chart: 60 patients in total, 30 in each group. The two groups did not differ significantly from one another. Clinical and personal traits of patients. It was discovered that 56.7% of the study's participants and the control group age were over 50 years. In terms of gender, it was discovered that 43.3% of the study group and 56.7% of the control group were men. It was discovered that 40% of the study group was illiterate and 40% of the control group had only completed secondary school. In terms of marital status, 93.3% of the study group and 83.3% of the control group were married. pertaining to clinical information shared by both groups. It turned out that 56.7% of the study group and 60% of the control group were overweight. In the study group, the mean and standard deviation of the patients' weight were 69.1±14.1 and 72.4±13.3 in the control group. In the control and study groups, the mean and standard deviation of the patients' heights were 165.1±7.8 and 164.9±7.6, respectively. With a p-value > 0.05, there is no discernible difference between the two groups **(Table 1).**

Table (1) Personal and clinical characteristics of the studied patients (N=60):

Variables	Control (n=30)		Study (n=30)		X^2 or T-test	P-value
	No	%	No	%		
Age group:						
Less than 30 yrs	5	16.7	4	13.3	0.20	0.977
From 30-40 yrs	5	16.7	6	20.0		
From 40-50 yrs	3	10.0	3	10.0		
More than 50 yrs	17	56.7	17	56.7		
Mean±SD(range)	46.5±14.2		49±14.1		-0.69	0.495
Gender:						
Female	13	43.3	17	56.7	1.07	0.302
Male	17	56.7	13	43.3		
Level of education:						
Illiterate	5	16.7	12	40.0	4.45	0.217
read and write	10	33.3	9	30.0		
Secondary	12	40.0	7	23.3		
high education	3	10.0	2	6.7		
Marital status:						
Single	2	6.7	1	3.3	1.50	0.472
Married	25	83.3	28	93.3		
Widow	3	10.0	1	3.3		
Weight	72.***4***±13.3		69.1±14.1		0.91	0.365
Height	165.1±7.***8***		164.***9***±7.***6***		0.12	0.907
Body Mass index	26.***6***±4.9		25.4±5.1		0.89	0.377
Body Mass index						
Underweight	0	0.0	3	10.0	3.21	0.225
Normal Weight	12	40.0	10	33.3		
Overweight	18	60.0	17	56.7		

Chi square test for qualitative data between the two groups
Independent T-test quantitative data between the two groups

Concerning intra-operative data **table (2)** showed that the mean and SD of duration of anesthesia was 5.1 hours ±1.95 in the control group and 6.15 hours ±2.1 in the study group with significant difference between the two groups at p- value 0.05. There were no significant differences between the two groups regarding duration of surgery, number of invasive procedures, fluid and blood replacement, estimated blood loss, urine output, and final balance at p-value > 0.05.

Table (2): Intra-operative data related in both groups (n=60)

	Control	Study	T	P-value
Duration of anesthesia (hours)	5.1 ± 1.9	6.15 ± 2.1	-2.00	0.050*
Duration of surgery (hours)	4.5 ± 1.8	5.3 ± 1.8	-1.7	0.101
Number of invasive procedures for each surgery	6.17±1.23	6.6±1.43	-1.26	0.214
Fluid and blood replacement (in milli liters)	3271±1417.2	3851.7±1726.9	-1.42	0.160
Estimated blood loss in milli liters	706.7±504.3	711. 7±492.1	-0.04	0.969
Urine output in milliliters	880±706.8	865±387.5	0.10	0.919
Final balance in milli liters	+1684.3±830.8	+2275±1534.1	-1.85	0.069

Independent T-test quantitative data between the two groups presented in mean ± SD.
*Significant level at P value < 0.05.

**Invasive procedures for each surgery included: CVP insertion, invasive arterial either radial or femoral or both, Ryle, urinary catheter, drains, intercostal tubes, and endotracheal intubation.

Related surgical and medical data **Table (3)** showed that the wipple surgery represented 36.7% in the control group and 50 % in the study group. Majority of groups didn't have any past medical and surgical history.

Table (3): Distribution of Medical and surgical data related to groups (n=60)

	Control		Study		X2/T	P.value
	No	%	No	%		
Surgery						
Abdominal exploration	0	0.0	1	3.3	13.48	0.263
Bile duct repair	1	3.3	0	0.0		
CBD exploration	10	33.3	2	6.7		
Laparoscopic distal pancreatectomy	1	3.3	0	0.0		
Heller myotomy	0	0.0	1	3.3		
Hepaticojejunostomy	2	6.7	3	10.0		
Hepaticoduodenostomy	1	3.3	3	10.0		
Klatskin tumor resection	0	0.0	1	3.3		
Liver resection	2	6.7	2	6.7		
Laparoscopic liver resection	1	3.3	0	0.0		
Removal cyst (hydatid)	1	3.3	2	6.7		
Wipple	11	36.7	15	50.0		
Past medical history						
None	25	83.3	27	90.0	1.41	0.842
DM	2	6.7	1	3.3		
DM&HTN	1	3.3	1	3.3		
COPD	1	3.3	1	3.3		
Intracranial he with V.Pshunt	1	3.3	0	0.0		
Past surgical history						
No	26	86.7	23	76.7	1.00	0.317
Yes	4	13.3	7	23.3		
If Yes						
CBD stent	1	3.3	0	0.0	5.52	0.479
Cholecystectomy	1	3.3	4	13.2		
ERCP	2	6.7	1	3.3		
ERCP&wipple	0	0.0	1	3.3		
Surgical removal renal stones	0	0.0	1	3.3		

Chi square test for qualitative data between the two groups
Independent T-test quantitative data between the two groups
*Significant level at P value < 0.05.

Table (4) showed that there were highly statistical significance difference between the control and the study group related to oxygen therapy P value < 0.01 in first 12 hour and first day after surgery.

Table (4): Comparison Between oxygen therapy related to groups (n=60)

	Control		Study		X2	P. value
	No	%	No	%		
Oxygen therapy						
Day(0)						
None	10	33.3	26	86.7	22.53	0.001**
Nasal	3	10.0	2	6.7		
Mask	17	56.7	1	3.3		
MV	0	0.0	1	3.3		
1st day						
None	13	43.3	28	93.3	18.72	0.001**
Nasal	1	3.3	1	3.3		
Mask	16	53.3	1	3.3		
2nd day						
None	26	86.7	29	96.7	5.16	0.076
Nasal	0	0.0	1	3.3		
Mask	4	13.3	0	0.0		
3rd day						
None	29	96.7	29	96.7	0.00	1.000
Mask	1	3.3	1	3.3		
SpO_2						
Day (0)	97.67±2.5		96.3±2.82		1.99	0.051
1st day	97.3±2.77		96.4±2.19		1.40	0.168
2nd day	96.63±2.04		97±1.72		-0.75	0.455
3rd day	97.33±1.69		98±1.6		-1.57	0.122

Chi square test for qualitative data between the two groups
Independent T-test quantitative data between the two groups
*Significant level at P value < 0.05, ** highly Significant at P value < 0.01.
Day (0) first 12 hours after surgery

Table (5) showed that the signs of respiratory tract infection related groups were statistical significance difference in in first 12 hour P value < 0.05, highly statistical significance difference in first day after surgery and no significance difference in second and third day P value > 0.05.

Table (5): Comparison Between signs of respiratory infection related to groups (n=60)

Signs of Respiratory infection	Control		Study		X2	P. value
	No	%	No	%		
Day(0)	12	40.0	4	13.3	5.46	0.020*
1st day	12	40.0	3	10.0	7.20	0.007**
2nd day	5	16.7	4	13.3	0.13	0.718
3rd day	2	6.7	4	13.3	0.74	0.389

Chi square test for qualitative data between the two groups
*Significant level at P value < 0.05, ** highly Significant at P value < 0.01. Day (0) first 12 hours after surgery

Regarding post-operative ABG data **table (6)** reported that there were significant differences between groups in in the first 12 hour after surgery, the first and second day after surgery regarding HCO3 and Base deficit, and there were significant difference between groups in in the first 12 hour after surgery regarding PH and PaO2, p-value 0.012 and 0.04 respectively.

Table (6): Comparison between Study and Control group related to ABG (n=60)

	Control	Study	T	P. value
	Mean±SD	Mean±SD		
PH				
Day(0)	7.43±0.06	7.47±0.06	-2.60	0.012*
1st day	7.44±0.07	7.47±0.06	-2.05	0.045*
2nd days	7.43±0.04	7.44±0.06	-0.72	0.475
$PaCO_2$				
Day(0)	31±6.02	30.67±4.36	0.25	0.807
1st day	30.03±3.45	31.77±4.02	-1.79	0.078
2nd days	32.57±4.52	33.87±5.52	-1.00	0.322
PaO_2				
Day(0)	101.77±27.63	86.13±29.92	2.10	0.040*
1st day	91.2±21.9	85.03±25.19	1.01	0.316
2nd days	84.47±20.67	90.97±25.41	-1.09	0.282
Lactate				
Day(0)	1.65±0.67	1.61±0.89	0.18	0.858
1st day	1.38±0.33	1.83±1.26	-1.88	0.066
2nd days	1.41±0.22	2.37±4.51	-1.16	0.251
HCO_3				
Day(0)	21.6±2.71	23.94±2.29	-3.61	0.001**
1st day	21.74±2.55	24.41±2.41	-4.17	0.000**
2nd days	22.34±2.08	24.4±2.89	-3.18	0.002**
Base Deficit				
Day(0)	-4.04±8.43	-0.15±3.44	-2.34	0.023*
1st day	-1.99±3.21	0.22±3.01	-2.75	0.008**
2nd days	-2.87±7.99	0.74±3.47	-2.27	0.027*
SaO_2				
Day(0)	96.67±2.94	95.3±2.84	1.83	0.072
1st day	96.67±3.06	95.57±2.34	1.56	0.123
2nd days	95.97±2.44	96.4±1.92	-0.76	0.448

Independent T-test quantitative data between the two groups
*Significant level at P value < 0.05, ** highly Significant at P value < 0.01.
Day (0) first 12 hours after surgery

Table (7) showed that there were statistically significant difference between the study and control groups regarding postoperative outcomes (no complication, and pneumonia) at p-value <0.05 and no statistically significant difference in other postoperative outcomes (admission ICU, Fever, and length of stay) at P value > 0.05.

Table (7): relationship Between Study and Control group related to outcomes (n=60)

	Control		Study		X2	P. value
	No	%	No	%		
No Complication	6	20.0	14	46.7	4.80	0.028*
Pneumonia	12	40.0	***5***	16.7	***4.02***	0.045*
Mortality	0	0 0	0	0 0	-	-
Admission ICU	3	10.0	2	6.7	0.22	0.640
Readmission To ICU	0	0 0	0	0 0	-	-
Fever	7	23.3	3	10.0	1.92	0.166
Length of stay:						
Less than 10 days	16	53.3	15	50.0	0.49	0.785
From 10-15 days	10	33.3	9	30.0		
More than 15 days	4	13.3	6	20.0		

Chi square test for qualitative data between the two groups
*Significant level at P value < 0.05.

Discussion

Despite advances in perioperative care for patients undergoing major surgery, postoperative pulmonary complications (PPCs) consider a leading cause of morbidity and mortality. The term PPC encompasses range of conditions affecting the respiratory system, typically within first days after surgery[1].

The incentive spirometer after surgery use to keep the lung clear. Deep inhalations promote the mobilization of secretions and the opening up of lung areas that may have collapsed. Also, it exercises the lunges, keeping them active especially during recovery from surgery [12].

Early mobilization is necessary aspect of ERAS pathways, with the ERAS society recommending its implementation in elective colonic, rectal/pelvic and decreases respiratory and thromboembolic post-surgical complications, which are associated with bed rest[13].

This study aimed to investigate the effect of a nurse guided enhanced recovery pathway on postoperative respiratory tract infection in Hepatico-Pancreatic –Biliary surgery as indicated by signs of respiratory infection, oxygen saturation, hemodynamic parameters temperature, arterial blood gases, oxygen therapy, mortality, admission and readmission to ICU, hospital stay, and occurrence of respiratory infection as compared to control group.

The results of this study revealed no significant difference in sociodemographic data (age, gender, level of education, material status), medical data(patient diagnosis, surgical procedure, past medical history, past surgical history), or intraoperative data (number invasive procedure , fluid intake and output, duration of surgery, duration of recovery) except duration of anaesthesia which had a statistically significant difference between the control and study groups related to the increasing the number of major surgeries (pancreatoduodenectomy) in the study group compared with the control group.

The current study revealed the significant difference in the respiratory infection between the control group and the study groups. This result may be related to the use incentive spirometry and post-operative early embolization. This result is supported by Batra A ,et al. 2020[14], which showed that the incentive spirometry is effective in improving pulmonary functions among the postoperative patients, which further improves blood circulation and hasten early recovery of surgical wounds, and is also supported by Boden I et al 2021[15] which showed that preoperative physiotherapy was associated with fewer antibiotic prescriptions specific for a respiratory infection and fewer oxygen therapy requirements. Unlike our study Balvardi S et al 2021[16] and Fagevic Olsén M et al 2021[17] which showed that the postoperative pulmonary complications were recorded and did not discover significantly different postoperative spirometry results after pancreatic or colorectal surgery with early postoperative mobilization.

The current study revealed that there was no significant difference in length of stay between the control group and the study group. This result may be due to the increased number pancreatoduodenectomy procedures and increased duration of anaesthesia in the study group when compared with the control group, this result is supported by Ayala C, et al 2022[18] which showed the patients using ERAS protocol after pancreaticoduodenectomy failed to meet target length of stay. On contrary Noba L , et al 2020[19] which showed LOS was reduced by 2.22 days in ERAS group compared standard care group.

The current study revealed the significant difference between the study and control groups in oxygen therapy with improved the arterial oxygenation saturation, and with acceptance of ABG in first 12 hour and first day after surgery may be related to use of incentive spirometry and early mobilization. This result is supported by Sweity E et al 2021[20] which showed that the use of incentive spirometry improved arterial blood oxygen and oxygen saturation. It was also supported by Svensson-Raskh a et al 2021[21], which showed mobilization out of bed, with or without breathing exercises, within 2 hours after elective abdominal surgery improved SpO_2 and PaO_2. Also Zhao C et al 2022[7], which showed volume incentive spirometry exercise might be a better option for improving hemodynamics, pulmonary function, and blood gas for patients after open abdominal surgery.

No significance difference between control and study groups related to mortality, admission and readmission to ICU. This result is supported by Bisagni P, et al 2024[22], which showed complications, mortality and readmission rate were similar in ERAS group and control group.

The current study revealed that difference between the control and study groups related to fever is not significant. This suggests that the implementation of the clinical pathway may have improved the management of hyperthermia, possibly because the strategies outlined in clinical pathway were informed by the best evidence. Mohamed W et al 2017[23]. This result is Supported by Barboza H, et al 2023[23] which showed the patient with preoperative education, breathing exercise, early feeding and early mobilization had a lower fever percentage of 6.65%, also AbdelAziz I 2021[24] which showed that no significant difference in mortality and postoperative fever in the ERAS group when compared with the traditional group. On the other way Boden I 2021[15], which states no difference between preoperative physiotherapy group and the group with booklet alone observed for hypoxemia, pyrexia, leukocytosis, auscultation changes, or CXR changes.

Conclusion

In Conclusions, implementation a nurse guided enhanced recovery pathway has beneficial effects on postoperative respiratory tract infection in Hepatico-Pancreatic –Biliary surgery. We recommend further studies with larger population to confirm our results.

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