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ENHANCED RECOVERY AFTER SURGERY PATHWAY VS. CONVENTIONAL CARE COST DIFFERENCE IN ELECTIVE LAPAROSCOPIC CHOLECYSTECTOMY

General Surgery

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ABSTRACT

Background: To lessen surgical tension, the perioperative bundle known as "Enhanced Recovery After Surgery" (ERAS) was developed. Numerous studies across all surgical specialties have documented significant decreases in hospital stay length and related expenses. The aim of the research was to compare the impact of enhanced recovery protocols vs. standard care on the cost per patient and length of hospital stay following surgery. **Methods:** The General Surgery department performed this randomized controlled trial from April to December 2021. A consecutive sampling method was used to choose 150 individuals. Based on computer generated numbers, participants were randomly divided into two categories of 75 (ERAS vs. Conventional). Total direct expenses and length of hospital stay were computed. Additionally noted were the rates of death, readmissions, and surgical site infections. Surgical Recovery Scale SRS was used to document patient reported outcomes. **Results:** Patients who participated in the Enhanced recovery group had considerably shorter hospital stays than those in the conventional treatment group ($p<0.001$): 28.9 hours in the ERAS group vs. 40.5 hours. In the ERAS group, the total expenditures per patient was lower PKR 6804 vs. PKR 7682 for standard care ($p<0.001$). There was not a significant distinction between the two groups in patient reported outcomes evaluated using the Surgical Recovery Scale (SRS) on discharge, day 3 of discharge, and day 10 of discharge. **Conclusion:** Despite identical post-discharge recovery scores on the Surgical Recovery Scale SRS and no rise in readmissions, enhanced recovery procedures showed a reduction in the duration of perioperative hospitalization and total cost.

KEYWORDS

Minimally Invasive Surgery; Cholecystectomy; Laparoscopic; Hospital costs; Perioperative Care

INTRODUCTION

Perioperative morbidity and mortality have considerably decreased over the past 50 years. [1,2] According to estimates from Bainbridge et al., the mortality rate following significant surgeries decreased from 10603 per million before the 1970s to 1176 per million in the 1990s and 2000s. [1] Since the 1960s were a time of great medical advancement. [2] The majority of these observed changes have been ascribed to improved perioperative care, the use of newer technology, improved physiology knowledge, and a decrease in surgical stress.

According to a meta-analysis by Vardhan and coworkers, the recent decline in surgical stress has considerably reduced complications by up to 50% in colorectal surgery [relative risk (95% confidence interval): 0.53 (0.44, 0.64)]. [3] Greco and coworkers confirmed this finding as a decrease in overall morbidity [relative ratio (RR) = 0.60, (95% CI 0.40-0.76)].4. And considerably shorter colorectal hospital stays. [5-8] Upper GI, [9-11] gynecological [12–14] hepatobiliary [15–17], and additional procedures.

The idea of bundled perioperative procedures, such as Enhanced Recover Pathway/Fast track surgery, was born as a result. due to the combination of interventions to combat stress in a standardized bundle and understanding the neurohormonal processes involved in reaction to the stress caused by the surgery itself. [18] Henrik Kehlet invented it in colorectal surgery [19], and since then it has been used more frequently in other fields of surgery to lessen surgical stress and the organ dysfunction it causes [20].

Although the individual parts of the Enhanced recovery pathway have been around for a while, Kehlet showed that it is only when these parts are used together as a cohesive unit that the duration of hospital stay following major colorectal surgery can be decreased from 10 to 2 days. [19] The broad range of variations between individual practices at various centers had to be met as more evidence came to light. Sweden's ERAS organization was established and registered in 2010. [21] (www.erassociety.org). The society has thus far provided its advice on a number of operations.

One benefit of ERAS is that it shortens hospital stays [9-17] and lowers the related costs to patients and the healthcare system 22-23 without increasing complications, readmissions, or recovery times [9-11,22,23].

The primary healthcare providers in India are autonomous hospitals that are supported by the government.Very few centers use the rapid track protocol as a standard of care, despite the fact that ERAS components are in use [24, 25]. Being a developing nation with limited resources, a perceived rise in cost is one barrier to the implementation of the Enhanced recovery route. [26] Due to mounting evidence from various specialties around the globe that the expense and length of hospital stays are decreasing. [22,23] We aimed to show how the surgical elimination of the gallbladder, known as a cholecystectomy, had an impact. Cholecystectomy was our choice due to the comparatively widespread use of this procedure in public hospitals. [27] The few studies that were conducted showed a decrease in hospital stay duration without an uptick in complications or return rates. [28] Our study will give our surgical, nursing, and anesthesia personnel exposure to the ERAS protocols. While there is a severe deficiency of health staff and resources by international standard (one doctor for 957 persons and one hospital bed for 1,580 person according to 2020-2021 Indian Economic survey. [29] ERAS has the potential to treat more patients in the same limited resources if a cost benefit is demonstrated in a limited resource setting. According to our understanding, none of the cost analysis studies were carried out in an Indian government-funded fixed resource hospital.

MATERIAL AND METHODS

The ethics committee at Narayana medical college and hospital gave its approval to the research. Following the patients who met our inclusion and exclusion criteria, 150 were chosen by sequential sampling. After receiving informed permission, they were divided into two groups at random (Table-1). Computer generated integers were used to create the randomness. The ERAS cohort was one, and the conventional care group was the other. Blinding was not possible. Patient information included age, sex, BMI, ASA score, tobacco use, and diabetes condition. Each group received the proper perioperative bundle during the postoperative time. (Table-2) For each patient, outcomes like length of hospital stay (in hours) and overall hospitalization cost were noted. The price was limited to the drugstore and disposables.

Since our hospital already receives government funding for personnel and other fixed hospital resources, those costs were not documented. It was noted how frequently surgery site infections and readmissions occurred. The total amount of opioids was measured in morphine equivalents. In order to evaluate recovery, the surgical recovery scale (SRS)30 was used at baseline (prior to surgery), release, day 3 of

discharge (call home), and day 10 of discharge. (follow up). The difference between each score and the baseline for all cases was computed, and the means of the two groups were compared.When 31 patients met the criteria listed below for discharge, they were granted their release.

- Adequate pain relief using oral analgesia
- No evidence of wound complications
- No post op complications
- Vitals in normal range
- Ambulatory
- Tolerating free oral fluids.

SPSS for Windows, version 21, was used to analyze the data. (SPSS Inc, Chicago, IL). The distribution of the data was evaluated using the Kolmogorov-Smirnov test. When appropriate, data were given as meanSD or frequencies (%). By using a student t test, the mean difference between the groups was examined. A p number of 0.05 or less was regarded as statistically significant. The chi-squared test was used to analyze categorical factors.

RESULTS

The research included 150 patients. Divided into two sets of 75 each. Two patients in the ERAS group and one in the conventional group were dropped from the final analysis due to the conversion of their procedure to open cholecystectomy for different reasons. There were no statistically significant variations in age, gender, diabetes, BMI, or ASA status between the groups. However, the proportion of smokers was higher in the ERAS group than in the conventional group. (Table-3).

When compared to the conventional care group, which received 40.54±11.00 hours of care, the enhanced recovery after surgery group showed a statistically significant decrease in mean duration of hospital stay, which was 28.93±9.55 hours (mean±SD). The direct expense per patient was found to be lower in the ERAS group (PKR 6804±1032) compared to the group receiving conventional care (PKR 7682±1422) ($p<0.05$). (Table-4) The ERAS group's overall opioid use decreased by 11.4±3.7 morphine equivalent units compared to the conventional care group's 18.2±6.3 morphine equivalent units ($p<0.01$) in the results. (Table-4).

Variation of Patient reported outcomes scores based on SRS were computed from the baseline score at release, day 3, and day 10 after discharge. Between the two groups, there was no statistically significant variation. (Table-4) In the ERAS group, readmissions were 4%, compared to 8% in the traditional group (p=0.312). Surgery site infections occurred at an incidence of 2.7% in the ERAS group and 5.4% in the conventional care group (p=0.414). However, none of these variations were statistically significant. (Table-5) The death rate was zero in both groups.

FLOW DIAGRAM

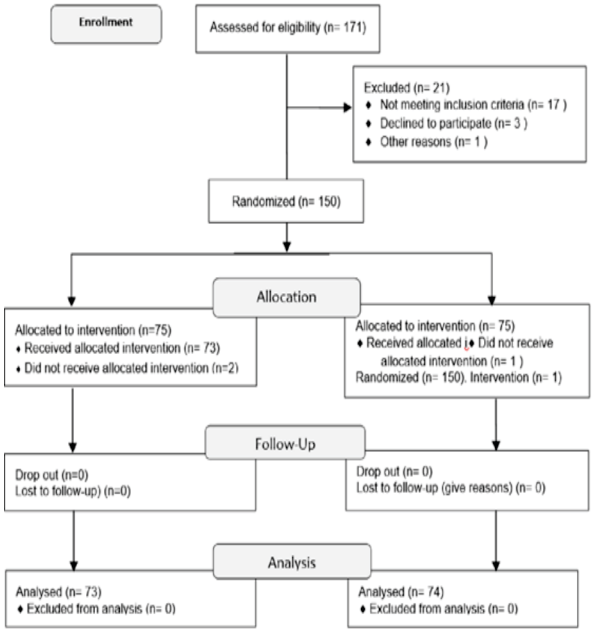

Table-1: Inclusion And Exclusion Criteria

Inclusion criteria	Exclusion criteria	Drop out criteria:
• Age 18 to 70 • Indications: Gallbladder stones, polyp • Outpatient visit • Informed consent	• Age less than 18 • Acute Cholecystitis, gall bladder empyema • CBD stone • Visit via emergency • ASA 3 or greater • Biliary tract injury • Pulmonary disease • Previous operation history affecting laparoscopic surgery • OP complication; biliary tract injury	Less than 80% compliance Refuse discharge Conversion to Open cholecystectomy

Table-2: ERAS Group Vs Conventional Care Group (Detailed Eras Recommendations[36])

ERAS group	Conventional group
PRE_OP • Day of surgery admission • Eras specific counselling • Normal meal at night+ Carbohydrate drinks x 2 (Galaxose-D) • Antibiotics at the time of induction INTRA-O PTime of operation • Preemptive nausea vomiting prophylaxis • No NG or Drain placement • Preemptive multimodal analgesia • Goal directed fluid use POST OP • Early feeding • Early mobilization • Opioid sparing multimodal analgesia • Early planned discharge after fulfilling discharge criteria.	PRE_OP • Day of surgery admission • Normal counselling • Overnight fast • Antibiotics at the time of induction. INTRA-O PTime of operation • Drain/NG by surgeons' preference • Analgesia as decided by care team. • Post op opioid analgesia when required. • Fluid use as decided by the care team POST OP • Feeding, mobilization and discharge as per conventional • care and discharge criteria.

Table-3: Demographics

	ERAS Group (n-=73)	Conventional group (n=74)	p*
Sex Male Female	33 (45%) 40 (54%)	36 (48%) 38 (51%)	0.676
Age	44.57±13.09	44.93±13.56	0.537
BMI	28.06±5.402	26.50±5.364	0.081
ASA Status I II III	66 3 4	67 3 4	1.000
Diabetic status	12 (16.4%)	11 (14.8%)	0.793

ASA = American Society of Anaesthesiologists physical status. $p<.05$ was considered statistically significant.

Table-4: Outcomes. Mean±Standard Deviation

	ERAS Group (n-=73)	Conventional Group (n=74)	p
LOHS*	28.93±9.55	40.54±11.00	<0.001
Total cost (PKR)	6804±1032	7682±1422	<0.001
Total Opioid Use (Morphine equivalent units)	11.44±3.77	18.24±6.38	<0.001
SRS Baseline - SRS discharge Baseline – SRS Day 3** Baseline – SRS day 10***	8.58±3.51 3.69±2.63 0.97±2.74	8.96±3,96 3.15±2.69 0.78±2.05	0.539 0.221 0.632

*Length of hospital stay
**Surgical Recovery Scale score day 3 of discharge
***Surgical Recovery Scale score day 10 of discharge

Table-5: Outcomes

	ERAS Group (n-=73)	Conventional Group (n=74)	p

Readmissions	3 (4.1%)	6 (8.1%)	0.312
Surgical site infection	2 (2.7%)	4 (5.4%)	0.414

DISCUSSION

Day case management for planned laparoscopic cholecystectomy has gained popularity in recent years. By lessening the most typical post-operative issues, such as nausea, vomiting, and pain, this was made feasible. Additional research revealed that the standard of care, recovery, and patient satisfaction are not jeopardized by a quicker discharge.[32,33] The expected readmission rate after an outpatient laparoscopic cholecystectomy is 5%, and the typical duration from surgery to discharge is 6 to 8 hours.[34,35]

Given that government-funded autonomous institutions are the main providers of healthcare in our nationThese institutions have a fixed budget and fixed means, [24,25]. In order to deal with the issue of an ever-increasing patient population with constrained resources, hospitals must deliver effective healthcare without sacrificing quality or patient happiness.

In our research, there was a trend toward a shorter length of hospital stay in the ERAS group (mean±SD: 28.93±9.55 hours) compared to the conventional care group (meanSD: 40.54±11.00 hours). The pattern is consistent with research done in ambulatory surgery using comparable procedures. According to Calland et al., following the implementation of these protocols, same-day discharges greatly increased, rising from 21 to 72%, while there was no discernible difference in patient satisfaction between the pre and post pathway groups.[32] In a meta-analysis, Ahmad et al. attributed the shorter stay to better pain management, less post-operative nausea and vomiting, and decreased hematoma.[33]

As anticipated, a shorter stay resulted in a lower overall direct expense to the patient and hospital.[5] Despite no appreciable difference in the cost of the operations, the direct cost per patient in the ERAS group compared to the conventional care group was reduced by 12.9% in our research.

The trends in these findings are similar to those reported by Chong JU et al., who noted a significant decrease in the length of hospital stay, from 2.51 days to just 1 day, as well as a decrease in all variables linked to cost analysis.[28]

One could contend that by sending patients home sooner than necessary, a quicker discharge could shift the burden from inpatient to outpatient care. To gauge functional healing, we used Surgical healing Scale scores. The fact that there was no statistically significant difference between the two groups highlights the ERAS group's quicker functional improvement. This makes enhanced recovery procedures for laparoscopic cholecystectomy not only possible but favored in our system, along with no increase in readmission rate in the ERAS group. In order to handle more patients within the same constrained resources and shorten the lengthy elective surgery waiting times, ERAS may be able to offer more open beds and resources. As demonstrated by Calland et al the transition of Laparoscopic cholecystectomy to an outpatient procedure by these protocols resulted in the availability of an additional 89 bed-days during the course of a year.[32]

With more institutional expertise and local modifications, there is still space for improvement. However, reducing the duration of hospital stays in our system faces significant cultural and practical challenges. Patients come to our tertiary care hospital from remote parts of the province that frequently lack fundamental healthcare or even a network of hospitals. Due to cultural norms and worries that there won't be a nearby medical facility in the event of a serious complication, patients typically don't prefer to leave the hospital early after major procedures, even after meeting the criteria for release. Despite the fact that preoperative counseling and involving the patient in the discharge plan before admission helped reduce the anxiety, the impact might not be the same in a major operation.

Our study's strict inclusion and exclusion parameters were another drawback. Most of our patients were in good health and had few coexisting illnesses. For the set of guidelines in our setup to be correctly implemented, more data from different nearby hospitals is required. Only in-hospital pharmacy expenses and disposables used during operations or ward care are included in the cost estimates. It excludes expenses for the hospital's fixed resources, such as staff salaries and maintenance.

To organize, audit, and facilitate the significant changes required for the implementation of these guidelines, an institutional endeavor is required.

CONCLUSION

Enhanced recovery after surgery protocols demonstrated a significant decrease in length of hospital stay and overall cost without increasing readmissions or altering patient reported outcome scores despite early release when compared to conventional care.

Disclosure

The only expenses incurred during the course of this research were linked to the calls made to patients on day 3 to ask them to complete a questionnaire. Equal contributions from each of the study's authors covered the expenses.

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