

Effects of “Enhanced Recovery After Surgery” Protocol on Outcome of Surgical Patients

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ABSTRACT

Objective: To provide evidence that application of Enhanced Recovery after Surgery Protocol can promote rapid recovery of surgical patients in addition to reduction of duration of hospital stay.

Study Design: Quasi-experimental study.

Place and Duration of Study: Sheikh Khalifa Bin Zayad Alnayan Hospital, Rawalakot Azad Kashmir Pakistan, from Jan 2019 to Jun 2020.

Methodology: Respondents included 210 surgical patients from discipline of Otorhinolaryngology, General Surgery, Urology, Gynecology and Obstetrics. Patients were randomly divided into two equal groups by odd and even numbers. Group-A included 105 surgical patients who were managed by conventional protocol. Group-B included 105 surgical patients who were managed by Enhanced Recovery after Surgery Protocol.

Results: Enhanced Recovery after Surgery Group (Group-B) was found to have shorter preoperative fasting time (146.4±0.47 vs 633.6±1.55 minutes, $p<0.001$), reduced postoperative fasting time (139.2±0.41 vs 360±0.09 minutes, $p<0.001$), less use of intravenous fluid (870±0.5 vs 2480ml, $p<0.001$) and reduced hospital stay (52.8±0.91 vs 80.16±1.17 hours, $p<0.001$) as compared to Traditional Group. Compared to traditional group (Group-A), the number of highly satisfied patients were more in Group-B (n-95 or 90.48% vs n-42 or 40%, p -value<0.001). No significant difference was noted in post-operative vomiting, surgical wound infection and rate of re-admission among both groups.

Conclusion: There is a significant reduction in duration of hospital stay and swift recovery after surgery, leading to reductions in treatment cost and resource utilization.

Keywords: Enhanced Recovery after Surgery (ERAS) Protocol, Minimal Invasive Surgery, Multi-Modal Non-Opioid Analgesia, Patient Satisfaction.

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INTRODUCTION

Enhanced recovery after surgery (ERAS) protocol are specific evidence based, perioperative measures which promote enhanced recovery, reduction of duration of hospital stay and minimize complications after surgery.¹ The goal of ERAS protocol is to promote rapid recovery of surgical patients measured by reductions; in length of hospital stay (LOS), complications, use of opioids and cost of surgery.² ERAS protocol has evolved over time into a multimodal and multidisciplinary approach with collaborative efforts of surgeons, anesthetists, nutritionists, physiotherapists, critical care physicians, administrators and nursing staff.^{3,4}

The main aim of ERAS protocol is to minimize the surgical stress response through optimization of nutritional and functional status.⁵ The main

components of ERAS protocol are decreased pre and postoperative fasting time, minimally invasive surgery, multimodal opioid sparing analgesia, early postoperative patient's mobilization & early discharge from hospital.^{6,7} The implementation of these components has facilitated a faster recovery after surgery to patient's preoperative functional state.⁸ After great success in colorectal surgery, ERAS protocol was adopted to other surgical specialties such as general surgery, Otorhinolaryngology, Obstetrics & Gynecology, Orthopedic, Urology, Neurosurgery, Cardiac Surgery, Oncological Surgery, Vascular Surgery, Spine Surgery, Thoracic Surgery and Gastrointestinal Tract (GIT) surgery.^{2,9,10}

The rationale of this study was to assess effects of implementation of ERAS protocol on outcomes of surgical patients of; Otorhinolaryngology, General Surgery, Urology and Obstetrics & Gynecology, in comparison with traditional protocol. We hypothesized that ERAS protocol are significantly effective in achieving better outcomes of surgical patients as

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compared to traditional protocol. There are few studies about this topic in Pakistan and few hospitals are following ERAS protocol as compared to developed countries where extensive research is going on this topic and most of hospitals are following and continuously improving ERAS protocol.

METHODOLOGY

The quasi-experimental study was carried out from January 2019 to June 2020 at Sheikh Khalifa Bin Zayad Alnayan teaching Hospital, affiliated with Poonch Medical College Rawalakot Azad Kashmir Pakistan, after approval from Hospital Medical Ethical Committee was taken (No.1068/SKBZ/CMH REC, dated 22-01-2019). Sample size was calculated using Raosoft calculator taking 50% response distribution.¹¹

Inclusion Criteria: Patients of either gender with age ranging from 3 to 83 years, presenting in Emergency and Outpatient Department of Otorhinolaryngology, General Surgery, Urology, Obstetrics and Gynecology with diseases requiring operation under general anesthesia (GA) or sub-arachnoid block (SAB) were included.

Exclusion Criteria: Patients having gastro-esophageal reflux disorder (GERD), diabetes mellitus, or patients who needed rigid esophagoscopy or extensive gut surgery were excluded.

The proforma was designed to collect data. All 210 selected patients were selected after informed consent was obtained and randomly divided using lottery method into two equal groups; A & B. In Group-A, 105 patients were placed on traditional protocol. In Group-B, 105 patients were placed on ERAS protocol (Figure).

antibiotic. Per-operative ERAS components applied were prevention of hypothermia, minimal invasive surgery, minimal use of opioids during anesthesia and use of antiemetic 30 minutes before end of surgery. Post-operative ERAS components included early start of feeding just like preoperatively, multimodal analgesia with no or minimal opioids, no or minimal use of intravenous (I/V) fluids, early mobilization and early discharge of the patient from hospital. Clear liquid diet advised until 2 hours before & after surgery was ORS, candies, sugar water, juices without pulp, broth, tea/coffee (without milk) and honey water. Until 4 hours before and after surgery, diet advised was milk, milk shake and pulpy juices. Solid soft diet (toast and liquid) was allowed until 6 hours and fatty/meat food 8 hours before and after surgery. Main indicators observed were pre and post-operative fasting time, volume of I/V fluid used, postoperative complications, length of hospital stay, need of re-admission and level of patient’s satisfaction. Amount of I/V fluids used during general anesthesia was not included. All patients were followed up for 3-6 months.

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0 and MS Excel 2016. Mean±SD was calculated for continuous variable. Frequency and percentage was calculated for categorical variables. Chi square test and t test were used for inferential statistics. The *p*-value of ≤0.05 was considered significant.

RESULTS

In this study, 210 patients were divided randomly into two equal groups; A and B. The median age was 25.00 (31.25–19.00) years and range was 3 to 83 years. In Group-A, 51(24.3%) were male and 54 females (25.7%) were as in Group-B, 60(28.6%) were male and 45(21.4%) female. Table-I showed comparison of patient’s outcome in both groups. ERAS Group (Group-B) was found to have shorter preoperative fasting time (146.4±0.47 vs 633.6±1.55 minutes, *p*<0.001), reduced postoperative fasting time (139.2±0.41 vs 360±0.09 minutes, *p*<0.001), less use of intravenous fluid (870±0.5 vs 2480ml, *p*<0.001) and reduced hospital stay (52.8±0.91 vs 80.16±1.17 hours, *p*<0.001) as compared to traditional group. All these factors reduced the cost of treatment, nursing services load and financial burden over Hospital along with increased patient’s satisfaction. Increased turnover of patients enhanced health care to more patients within same resources.

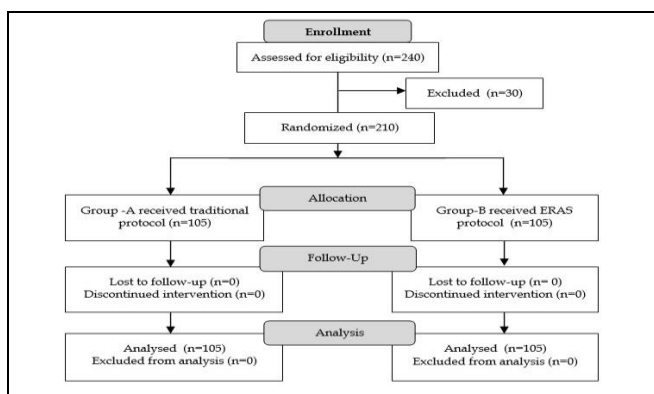


Figure: Patient Flow Diagram (n=210)

Preoperative components of agreed ERAS protocol included counseling of the patients about all events, shorter fasting time and prophylactic

Table-I: Characteristics of Patients (n=210)

Characteristics of patients	Group-A (Traditional Protocol) (n=105)	Group-B (ERAS Protocol) (n=105)	p-value
Preoperative fasting time per patient (minutes)	633.6±1.55	146.4±0.47	<0.001
Post-operative fasting time (minutes)	360.00±0.09	139.2±0.41	<0.001
Amount of IV fluid used per patient (ml)	2480.00±1.21	870.00±0.58	<0.001
Average length of hospital stay (hours)	80.16±1.17	52.80±0.91	<0.001

Table-II indicates that no significant difference was noted in recovery indicators such as postoperative vomiting, surgical wound infection and rate of re-admission. However, number of high satisfied patients were more in ERAS Group as compared to Traditional Group (n-95 or 90.48% vs n-42 or 40%, p-value <0.001).

Table-II: Difference in Recovery Indicators of Patients (n=210)

Characteristics of patients	Group-A (Traditional Protocol) (n=105)	Group-B (ERAS Protocol) (n=105)	p-value
Prevalence of post-operative vomiting	10(9.5%)	7(6.6%)	0.470
Surgical site wound infection	5(4.76%)	3(2.86%)	0.403
Rate of Re-admission	3(2.86%)	2(1.9%)	0.460
Number of high satisfied Patients	42(40%)	95(90.48%)	<0.001

DISCUSSION

ERAS Protocol are perioperative pathways having strong evidence that they can reduce surgical stress response enhancing recovery after surgery.¹¹ They recommend optimization of perioperative nutrition, opioid sparing pain control, minimal invasive surgery and early mobilization of patients.¹² Measures adopted in ERAS protocol has been demonstrated to reduce postoperative complications and enhance recovery, both leading to reduction of resource utilization as well as treatment cost.¹³

The results of our study were comparable to other studies. Wu *et al.* in a study on 102 patients having chronic rhino-sinusitis with nasal polyps undergoing functional endoscopic sinus surgery

(FESS), divided into ERAS and control groups found that LOS, postoperative pain and treatment costs were significantly reduced in ERAS as compared to control group.¹⁴ Tan *et al.* divided 84 patients undergoing for tympanoplasty and/or mastoidectomy into ERAS and control groups, found that ERAS protocols application significantly reduced fasting time and postoperative pain.¹⁵ Ljungqvist *et al.* found that ERAS protocol application reduced hospital stay and complications by 30-50% along with significant reductions in treatment cost and re-admission rate.¹⁶ Chorath *et al.* conducted a systematic review of eight clinical studies of patients who underwent for different ear, nose, throat, head and neck operations concluded that ERAS protocol application significantly shortened hospital stay, treatment cost and postoperative pain and anxiety.¹⁷ Somro *et al.* in a Quasi-experimental study on 120 patients of colorectal surgery observed significant shortening of hospital stay and surgical site wound infection in ERAS group as compared to traditional protocol group.¹⁸ The mean length of hospital stay was 8.25±1.58 days with traditional protocol and 3.45±1.73 days with ERAS protocol group (p<0.001). A total of 28(23.3%) patients developed wound infection, of which 19(15.8%) occurred with traditional protocol and nine(7.5%) occurred with ERAS protocol (p=0.031). Masood *et al.* conducted a randomized controlled trial of 42 patients found that in ERAS group, length of hospital stay, postoperative pain score and risk of paralytic ileus were significantly reduced as compared to non-ERAS group.¹⁹ Noba *et al.* performed a meta-analysis of 6 randomized controlled trials and 21 cohort studies of 3739 patients founded that implementation of ERAS protocol is safe and feasible in hepatectomies along with reductions in LOS, risk of complications and treatment cost.²⁰ Stowers *et al.* also did a meta-analysis of 17 research studies, found that ERAS programs in different surgical specialties has resulted in significant (15-49%) cost savings; ranging from about 15% in Urology, about 25% in gynecology to about 49% in Major surgery.²¹ Chen *et al.* emphasized that collaboration between ERAS team members particularly with nutritionist and surgical team improved nutritional condition of patients enhancing postoperative recovery.²² Yuanyuan *et al.* in a retrospective study on 839 patients; divided into modified ERAS protocol (356 patients) and traditional protocol (483 patients) groups found that modified ERAS group was associated with shorter hospital stay, fast recovery of bowl functions and reduced postoperative

complications in patients with obstructive colorectal cancer.²³ Pirzada *et al.* studied 60 patients undergoing bowel stoma reversal surgery, divided into ERAS and traditional groups, found that in ERAS group there was significant reductions in hospital LOS and complications particularly wound infection.²⁴ In a descriptive case study on 140 patients having small bowel resection anastomosis, at department of surgery Services Hospital Lahore Pakistan, Ghufraan *et al.* found that ERAS pathways application has resulted in significant reduction in length of hospital stay, without increase in anastomotic leakage, wound infection or mortality.²⁵

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CONCLUSION

There is a significant reduction in duration of hospital stay and swift recovery after surgery, leading to reductions in treatment cost and resource utilization.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MF & MAM: Data acquisition, critical review, approval of the final version to be published.

SR & MB: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

THT & SH: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of

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