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Evaluation of Enhanced Recovery After Surgery (ERAS) Components in Hemodynamically Stable Subjects Undergoing Emergency Abdominal Surgery in VMKVMCH

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ABSTRACT

Introduction and Objectives- Intestinal obstructions and perforations are common acute abdominal conditions seen in our emergency department, carrying significant risks if not promptly treated. Implementing Enhanced Recovery After Surgery (ERAS) protocols in this context offers potential for reducing surgical stress response. To study on the evaluation of ERAS components in hemodynamically stable subjects undertaking Emergency abdominal surgery in a 30 care hospital.

Methodology: The study was a descriptive study done among 30 subjects with the main objective to study on the evaluation of ERAS components in hemodynamically stable subjects undertaking Emergency abdominal surgery in a 30 care hospital. The study included haemodynamically stable subjects requiring emergency abdominal surgeries and National Early Warning Score (NEWS) scoring-Mild to moderate. Subjects with elective gastrointestinal surgeries, haemodynamically unstable patient, Subjects not willing for surgery and NEWS scoring high risk- aggregate score>7. The subjects were assessed with preoperative, intraoperative and post operative ERAS protocols. The data was inputted into Microsoft Excel and analyzed utilizing SPSS 23.

Results: All the subjects had Patient, Family Education and Shared Decision, early imaging, anti-microbial prophylaxis, preoperative pain medication, nasogastric intubation, open surgical access, goal directed fluid therapy, warm IV fluids, non-opioid analgesia, received Ondansetron 4 mg iv as Post Operative Nausea and Vomiting(PONV), Post- Operative Analgesia, Thromboprophylaxis, Net Zero Fluid And Electrolyte Balance, Glycaemic Control and Sham Feeding. Among the subjects, 27 (90%) had quick Sequential Organ Failure Assessment (qSOFA) score 1 and 3 (10%) had qSOFA score 2. Among the subjects, 29 (96.67%) had score 0 and 1 (3.33%) had score 1.5 as Modified Wells Score for Venous Thrombo-embolism. Among the subjects, 6 (20%) received Fresh Frozen Plasma (FFP) Transfusion and remaining 24 (80%) received no anti thrombotic medication.

Conclusion: This study showed a significant alteration in management on the basis of preoperative, intraoperative and postoperative protocols by ERAS. When applied to trauma laparotomy, which involves surgical exploration of the abdomen due to traumatic injuries, implementing ERAS protocols has been demonstrated to have beneficial effects.

Keywords: *Enhanced Recovery after Surgery, Emergency laparotomy, Evaluation.*

1. INTRODUCTION

Emergency surgery involves performing urgent procedures to address imminent threats to life, organs, or tissues caused by factors such as trauma, acute diseases, exacerbation of chronic conditions, or complications from previous medical interventions. It is crucial to act swiftly, ideally within a 24-hour window, to mitigate the risks associated with these conditions, as they can lead to significant illness and death, with rates reaching as high as 80%. In essence, emergency surgery is a critical medical intervention aimed at promptly resolving life-threatening situations to improve patient outcomes and survival chances. These conditions stimulate an intensified physiological reaction after surgery, resulting in an increased breakdown of molecules in the patient's body. This increased breakdown of molecules adds to the development of insulin resistance, a critical component in prolonging the time it takes to recover and worsening the severity of illness. Insulin resistance hampers the body's capacity to adequately regulate blood sugar levels, hence hindering the healing processes and elevating the chances of problems after surgery. Therefore, addressing insulin resistance becomes paramount in mitigating prolonged recovery periods and reducing the risk of adverse health outcomes post-surgery.(1–5)

ERAS is a comprehensive and integrated method for caring for surgical subjects that is supported by scientific data. Its goal is to enhance the management and results of the perioperative period. The objective of this technique is to mitigate postoperative complications, enhance functional recuperation, minimize the duration of hospitalization, and facilitate prompt recovery for the patient.(6)

Intestinal obstructions and perforations represent significant portions of the acute abdominal conditions that subjects present with in our emergency department. These conditions carry a substantial risk of morbidity and mortality if not promptly addressed. Therefore, implementing ERAS protocols in this context holds promise for reducing the heightened surgical stress response associated with such emergencies. By adhering to ERAS principles, we can potentially enhance postoperative recovery for subjects undergoing surgery for intestinal obstructions or perforations. These protocols focus on optimizing various aspects of perioperative care, such as preoperative nutrition, pain management, intraoperative techniques, and early mobilization, all of which can contribute to mitigating the physiological impact of surgery and improving patient outcomes in this critical setting.

2. MATERIALS AND METHODS

It was a Descriptive study conducted at Department of surgery , Vinayaka Mission's Kirupananda Variyar Medical College and Hospital, Salem for a period of 2 years among subjects who were hemodynamically stable arrived to Casualty for abdominal emergencies. The participants who met the specified criteria for inclusion and exclusion were chosen using a suitable sampling method.

Inclusion criteria:

- Hemodynamically stable subjects requiring emergency abdominal surgeries.
- NEWS scoring-Mild to moderate

Exclusion criteria:

- Elective gastrointestinal surgeries
- Haemodynamically unstable subjects
- Subjects not willing for surgery
- NEWS scoring high risk- aggregate score>7

Based on the research conducted by Purushothaman et al(4), the sample size is estimated with a 7% prevalence of readmission rates among the ERAS group, with a precision of 10% and a 95% confidence interval.

$$\mathbf{N = Z^2_{1-\alpha/2} * \text{ percent value} * (1 - p) / d^2}$$

$Z_{1-\alpha/2}$ - 2 tailed probability associated with a 95% confidence interval = 1.96, p (%) - occurrence of proportion of readmission rates among ERAS group = 0.07, d (%) - The precision or permitted error for the fraction of readmission rates among the ERAS group. = 0.1

$N = 1.96^2 * 0.07 * (1 - 0.07) / 0.1^2$

$N = 25.01$

Thus the total sample size required for the study is 30 with 20% non-response rate.

Prior to commencing the study, we got approval from the Institutional Ethical Committee at Vinayaka Mission's Kirupananda Variyar Medical College and Hospital in Salem. Explicit written consent was acquired.

Funding Source: No declaration made

No conflict of interest has been declared.

ERAS components

PREOPERATIVE COMPONENTS

Patient and family education and shared decision	Provide Clear, concise, written information(Brochure) combined with verbal patient education.
Early identification of physiological derangement	Rapid assessment of the patient using National Early Warning Scoring
Assessment of venous thromboembolism risk	Risk is assessed using modified wells scoring based on risk mechanical/pharmacological VTE prophylaxis is used.
Reversal of antithrombotic medications	based on patient's risk of procedure-related bleeding and the risk of thrombo -embolism(FFP/PCC;platelet transfusion)
Screen and monitor for sepsis	assessed with a qSofa sepsis score as early in their presentation as possible. If SIRS, sepsis are diagnosed they are managed accordingly.
Early imaging, surgery, and source control of sepsis	
Pre-anaesthetic medication	Avoid sedative medications. IV paracetamol 1gm Iv can be given
Antimicrobial prophylaxis and skin preparation	Iv antibiotics-given 60 mins before surgery,
Preoperative electrolytes	Correction of k+,Mg+2,Po4-2, prior to surgery should be done but this should not delay the surgery
Preoperative glucose	Blood Glucose maintenance-144-180 mg/dl Hyperglycaemia-According to sliding scale Hypoglycaemia-50%dextrose;maintenance
Preoperative carbohydrate loading	Strictly not recommended as the body is already in insulin resistance state.
Nasogastric Intubation	NG tube insertion should be considered on an individual basis assessing for the risk of aspiration and gastric distention.

NEWS SCORING(7)

The NEWS utilizes a straightforward method of assigning a score to physiological data that are routinely documented during ordinary hospital practice, when patients arrive or are under observation.

Table 1: NEWS scoring

Physiological Parameters	3	2	1	0	1	2	3
Respiration Rate (BPM)	≤8		9-11	12-20		21-24	≥25
Oxygen Saturations (%)	≤91	92-93	94-95	≥96			
Any Supplemental Oxygen		Yes		No			
Temperature (°C)	≤35		35.1-36.0	36.1-38.0	38.1-39.0	≥39.1	
Systolic Blood Pressure (mmHg)	≤90	91-100	101-110	111-219			≥220
Heart Rate (BPM)	≤40		41-50	51-90	91-110	111-130	≥131
Level of Consciousness				A			V, P or U

2. intraoperative components

Standard Anaesthetic Protocol	*Avoid benzodiazepines,short acting general anestheticagents,propofol for anesthesiainduction* *Propofol for induction +/-short acting opioids* *Avoid nitrous oxide*
Intraoperative fluid and electrolyte therapy	*Near zero fluid balance.Goal directed fluid therapy should considered* *if large intra vascular fluid loss.*
Preventing intraoperative hypothermia	*Warmed IV fluids to maintain core body temperature >36*
Surgical access	*Laparotomy (based on surgical pathology)*
Drainage of the peritoneal cavity and pelvis	*Based on the Intraoperative findings*
Nasogastric Intubation	*considered on an individual basis* *(Risk of aspiration and gastric distension)*
Prevention of nausea and vomiting (PONV)	*Ondansetron 4mg I.V/* *Droperidol 0.625-1.25 mg I.V given at the end of surgery*

3 post operative components

Postoperative analgesia	Opioid sparring multimodal Anesthesia-RA,LA, NSAIDS-Parenteral paracetamol.
Thromboprophylaxis	Mechanical/pharmacological prophylaxis to be continued for 28 days based on rogers risk scoring.
Postoperative fluid and electrolyte therapy	Maintain Net near-zerofluid and electrolyte balance,maintenance needs, hypotonic crystalloids,replacement of losses, saline & based solutions should be avoided
Urinary drainage	Low risk:Day1; High risk :Day 3.(pelvic surgeries, epidural in place)
Prevention of postoperative ileus	Bisacodyl,chewing gums(sham feeding),MgO
Postoperative glycaemic control	Insulin is give according to blood glucose,hypoglycaemia is prevented.
Postoperative nutritional care	Starting orals as early as 12 hrs Supplementation- L-argine,w3 fatty acids,L-glutamate.
Early mobilisation	POD#0 try to make the patient to sit POD#1 m
Prevention of nausea and vomiting (PONV)	Rescue therapy with antiemitics of different class as used in intraop if nausea/vomiting devolop with in 6hrs

Discharge criteria:

1. The C-reactive protein (CRP) level should be below 150 mg/dl on the day of discharge.
2. Dietary tolerance
3. Pain less than 5 of 10 on visual analog scale
4. Being afebrile.
5. Return of bowel function

Statistical Analysis-

Numerical parameters, such as Age, are typically represented using statistical measures such as mean, standard deviation (SD), median, and mode. Categorical factors is depicted using frequencies and percentages. Pie charts and bar graphs are employed as suitable visual representations. The data was inputted into an MS Excel spreadsheet and then analyzed using SPSS software, namely version 23.

3. RESULTS

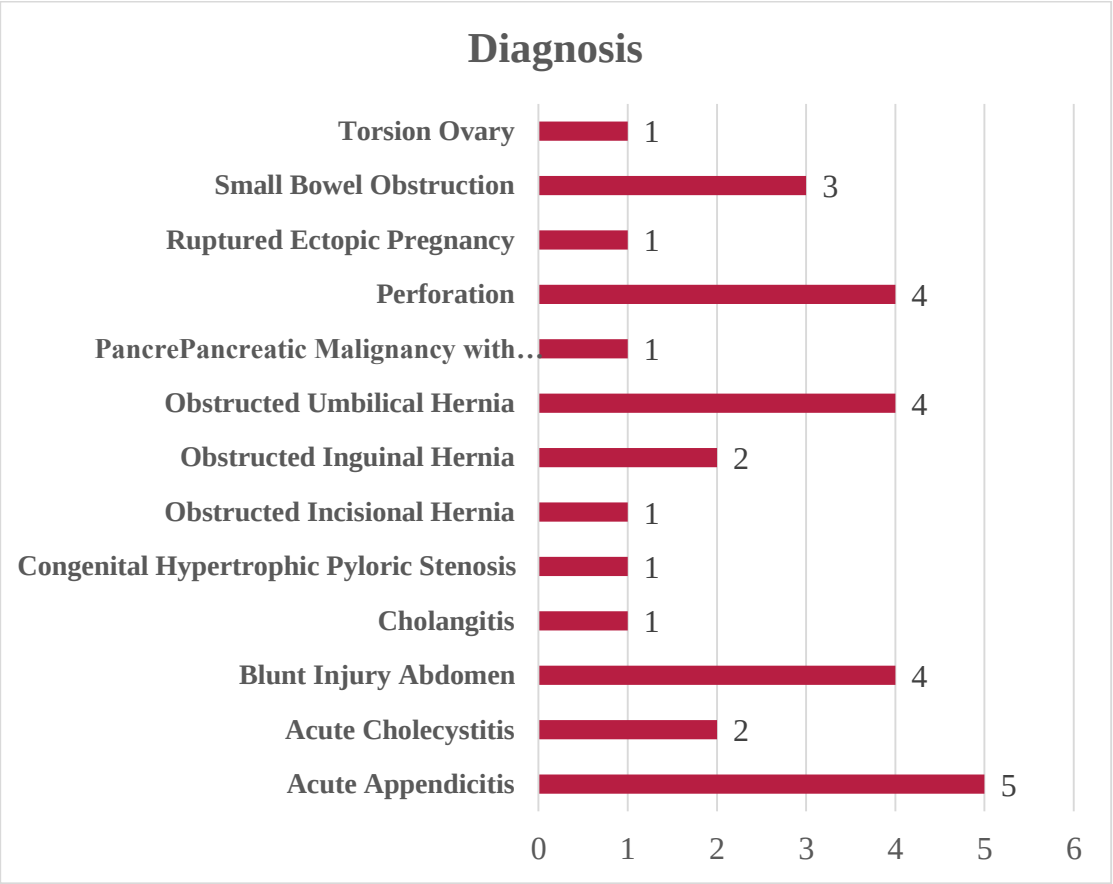
Table 1- Age and Gender wise distribution of Study participants

Age (years)	
Mean	39.04
Median	39.00
Std. Deviation	17.39
Range	69.75
Minimum	0.25
Maximum	70

The mean age was 39.04 (± 17.39) years ranging from 3 months to 70 years. Out of the subjects, 23 (76.67%) were male and

7 (23.33%) were female. Two of the males were children.

Figure 3- Diagnosis and Procedure done



Among the subjects, 5 (16.67%) had Acute Appendicitis, 4 (13.33%) had Blunt Injury Abdomen, 4 (13.33%) had Obstructed umbilical hernia, 4 (13.33%) had perforation and 3 (10%) had Small Bowel Obstruction. Among the subjects, 5 (16.67%) had Appendicectomy, 4 (13.33%) had Ileal Resection and anastomosis, 4 (13.33%) had Open Mesh Repair, 3 (10%) had Graham's Live Omental Patch Repair and 2 (6.67%) had Cholecystectomy.

Table 2-NEWS Scoring

NEWS scoring	Frequency (%)
1	3(10%)
2	6(20%)
3	5(16.67%)
4	6(20%)
5	5(16.67%)
6	5(16.6%)

Table showed the NEWS scoring. In the study 6(20%) had score 2 and 4 , 5(16.6%) had score of 3, 5 and 6 respectively. Among the subjects, 27 (90%) had qSOFA score 1 and 3 (10%) had qSOFA score 2. Among the subjects, 29 (96.67%) had score 0 and 1 (3.33%) had score 1.5 as Modified Wells Score for Venous Thrombo-embolism.

Table 3- Reversal of Anti Thrombotic Medication

Reversal of Anti Thrombotic Medication	Frequency	Percent
FFP Transfusion	6	20.00
No	24	80.00
Total	30	100.00

Among the subjects, 6 (20%) received FFP Transfusion and remaining 24 (80%) received no anti thrombotic medication. All the subjects had Anti-Microbial Prophylaxis. All the subjects had Pre-Operative Pain Medication (Paracetamol iv). Among the subjects, 15 (50%) had Pre-Operative Glucose Correction. All the subjects had Nasogastric intubation

Table 4- Anaesthesia

Anaesthesia	**Frequency**	**Percent**
General	5	16.67
General / Epidural	11	36.67
Spinal	14	46.67
Total	30	100.00

Among the subjects, 14 (46.67%) had Spinal, 11 (36.67%) had General/Epidural and 5 (16.67%) had General anaesthesia. All the subjects had open Surgical access. All subjects received Goal Directed Fluid Therapy. All the subjects received Ondansetron 4 mg iv as PONV.

Table 5-Post-Operative Analgesia

Post- Operative Analgesia	**Frequency**	**Percent**
Death (NA)	1	3.33
Yes	29	96.67
Total	30	100.00

All the subjects received Post- Operative Analgesia. All the subjects received Thromboprophylaxis. All the subjects had Net Zero Fluid And Electrolyte Balance. All the subjects had Glycemic Control.

Table 6- Nutritional Care Post Surgery

Nutritional Care Post Surgery	Frequency	Percent
Day 0	3	10.34
Day 1	21	72.41
Day 2	4	13.79
Day 3	1	3.45
Total	29	100.00

3 (10.34%) subjects received nutritional care post-surgery on Day 0, 21 (72.41%) on Day 1, 4 (13.79%) on Day 2 and 1 (3.45%) on Day 3. The mean duration of nutritional care post-surgery was 1.1 (± 0.61) days ranged from 0 to 3 days. 28 (96.55%) subjects started mobilization post-surgery on Day 0 and 1 (3.45%) on Day 1. 13 (44.83%) subjects were discharged on Day 2, 12 (41.38%) on Day 3, 2 (6.9%) on Day 4, 1 (3.45%) on Day 7 and 1 (3.45%) on Day 8. The average duration of hospitalization was 2.93 (± 1.41) days, with a range of 2 to 8 days.

4. DISCUSSION

The study's objective was to study on the evaluation of ERAS components in hemodynamically stable subjects undertaking Emergency abdominal surgery

In a study done by Purushohaman et al., the majority of participants, specifically 25 individuals from the ERAS category and 27 individuals from the normal recovery category, fell within the age range of 16 to 40. With the exception of one female in the ERAS category, the vast majority of participants were male. Furthermore, one patient in the ERAS category and two subjects in the normal recovery category had comorbid conditions classified as ASA grade II. Among the participants, there were ten individuals in the ERAS category and four individuals in the normal recovery category who had a smoking history. Moreover, 16 participants in the ERAS category and 13 in the usual recovery category had a body mass index that indicated they were overweight. The main factors contributing to injuries were primarily low-velocity penetrating injuries and road traffic accidents..(4) The study done by Wisely et al comprised a total of 370 participants, consisting of 172 males (47%) and 198 females (53%). The age of the participants varied from 18 to 95 years, with a median age of 68 years. The predominant pathology found was blockage, which affected 203 out of 370 individuals (55%). This was followed by inflammatory diseases (63/370, 17%) and ischemia (37/370, 10%).(8)

In 2022, Pranavi et al. found that the adapted ERAS category had a significantly lower durationof hospitalization by 3 days ($p < 0.001$). In addition, participants in the modified ERAS category had a shorter duration (in days) to reach certain milestones, including first faeces (4.38 vs. 6.08,), first flatus (2.84 vs. 4.22,), and commencement of a solid meal (4.67 vs. 8.37,). In addition, the modified ERAS category showed lower rates of postoperative nausea and vomiting and surgical site infections. Nevertheless, the presence of pre-existing malignancy, respiratory difficulties, and stoma - high-output were contributing variables that caused a delay in the discharge of subjects in the adapted ERAS category..(9)

In 2020, Hajibandeh et al demonstrated that implementing ERAS protocols resulted in shorter postoperative recovery periods compared to non-ERAS protocols. This was seen in the decreased duration of time until the first release of gas, the first bowel movement, the first intake of liquid diet, and the first intake of solid diet. In addition, patients in the ERAS category had a reduced duration of hospitalization (mean difference: -3.09 to -2.80 days).In addition, the implementation of ERAS protocols was linked to a reduced likelihood of experiencing different difficulties when compared to non-ERAS protocols. The issues observed in this study were classified into overall complications, major complications, pulmonary complications, paralytic ileus, and surgical site infection. .Nevertheless, both ERAS and non-ERAS protocols resulted in comparable outcomes for 30-day mortality, the requirement for re-admission, and the necessity for re-operation.(10).

In 2018, Mohsina et al demonstrated that 49 individuals received conventional therapy, while 50 individuals were allocated to the ERAS category. Subjects in the ERAS category showed notably faster restoration of normal function in terms of the time it took for them to have their first stool (2.25 ± 0.20), first flatus (1.47 ± 0.18), first fluid diet (2.72 ± 0.38), and solid

diet (3.70 ± 0.44). The length of hospitalization (LOH) was considerably reduced in the ERAS category, with a mean difference of 4.41 ± 0.64 days. In addition, there was a significant decrease in postoperative complications, such as superficial SSI (relative risk [RR] 0.35), postoperative nausea and vomiting, and pulmonary difficulties (RR 0.24) in the ERAS category compared to the standard care category, while the rates of leaks were similar (1 out of 50 in the ERAS category vs. 2 out of 49 in the standard care category).).(11)In 2017, Moydien et al demonstrated that the ERAS category exhibited significantly reduced durations for solid meal beginning, urine catheter removal, and nasogastric tube removal compared to the non-ERAS category. Nevertheless, there was no notable disparity in the duration from admission to laparotomy between the two categories. The complication rates, evaluated using the Clavien-Dindo classification, showed no significant difference between the two categories. However, the ERAS category showed a considerably lower duration of hospitalization in comparison to the non-ERAS category..(12)

The limitations are

- Single centre study
- Incomplete follow-up
- Non availability of comparison group
- Selection bias- excluding subjects with specific comorbidities or those who are hemodynamically unstable.

5. CONCLUSION

All the subjects had Patient, Family Education and Shared Decision, early imaging, anti-microbial prophylaxis, preoperative pain medication, nasogastric intubation, open surgical access, goal directed fluid therapy, warm IV fluids, non-opioid analgesia, received Ondansetron 4 mg iv as PONV, Post- Operative Analgesia, Thromboprophylaxis, Net Zero Fluid And Electrolyte Balance, Glycaemic Control and Sham Feeding. Among the subjects, 27 (90%) had qSOFA score 1 and 3 (10%) had qSOFA score 2. Among the subjects, 29 (96.67%) had score 0 and 1 (3.33%) had score 1.5 as Modified Wells Score for Venous Thrombo-embolism. Among the subjects, 6 (20%) received FFP Transfusion and remaining 24 (80%) received no anti thrombotic medication. Among the subjects, 15 (50%) had Pre-Operative Glucose Correction. Among the subjects, 14 (46.67%) had Spinal, 11 (36.67%) had General/ Epidural and 5 (16.67%) had General anaesthesia. Among the subjects, 11 (36.67%) had Drains in Peritoneal / Pelvic Cavity. 3 (10.34%) subjects received nutritional care post-surgery on Day 0, 21 (72.41%) on Day 1, 4 (13.79%) on Day 2 and 1 (3.45%) on Day 3. The mean duration of nutritional care post-surgery was 1.1 (± 0.61) days ranged from 0 to 3 days.28 (96.55%) subjects started mobilization post-surgery on Day 0 and 1 (3.45%) on Day 1.

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