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IMPACT OF AN ENHANCED RECOVERY AFTER SURGERY PROTOCOL ON POSTOPERATIVE OUTCOMES FOLLOWING ELECTIVE GASTROINTESTINAL SURGERY: A COMPARATIVE STUDY

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ABSTRACT

Objective:

To analyze the postoperative complications and recovery outcomes for an enhanced recovery after surgery (ERAS) pathway in comparison to traditional perioperative care for adults undergoing elective gastrointestinal surgery

Material & Methods:

This was a prospective comparative study conducted in Department of General Surgery, Jinnah Postgraduate Medical Centre, Karachi. This study randomized a total of 120 patients, distributed equally between the two study groups. Grouping resulted in 60 patients per group. The main outcome of interest was postoperative complications of Clavien–Dindo Grade II or higher. These complications were analyzed for events that occurred in the first 30 days following surgery. The secondary outcomes were measured as length of stay, 30-day readmission, first flatus, first full meal, and the level of pain measured in the first 24 hours following surgery. The appropriate chi-square tests were utilized for the analysis of categorical outcomes. For continuous outcomes, independent samples t-tests were utilized.

Results:

Eight patients in the ERAS group had clinically relevant complications. In the conventional-care group, 23 patients had complications, which accounted for 38.3% of the group. The difference in complications between the two groups was significant, and a risk ratio of 0.35 (0.17–0.71) was calculated. The average length of stay following surgery was significantly shorter in the ERAS group, which stayed an average of 4.67 days, whereas the conventional-care group stayed an average of 8.45 days. Pain scores and times to first flatus and first full diet were also significantly better in the ERAS group. The 30-day readmission rate was also statistically not significant; however, the rate was lower for ERAS,

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which was 3.3%, compared to 8.3% in the conventional-care group, with a p-value of 0.243.
Conclusion:
Postoperative complications of a clinically relevant nature were significantly improved in the ERAS group compared to the conventional-care group. The ERAS pathway significantly improved the length of stay in the postoperative period and overall sped recovery for the remaining measured postoperative outcomes. Importantly, the ERAS group did not have an increase in 30-day readmissions compared to the conventional-care group.

INTRODUCTION

Surgical stress was the specific target of the development of ERAS. ERAS includes the following elements: longer pre-op education, shorter fasting, progressive feeding, progressive movement, and an opioid-sparing policy. These elements help support earlier feeding and postoperative mobilization and avoid unnecessary preoperative fasting. ERAS protocols developed for LMC countries incorporate as many practical elements as possible that can be used in the context of ordinary surgeries and do not require expensive, sophisticated technologies[1]. Cumulatively, meta-analytic evidence shows that ERAS tangibly decreases length of stay. Among 74 RCTs and 9,076 participants, ERAS shortened the length of stay by almost 2 days.[2]

The body of ERAS evidence for gastrointestinal surgery is growing. Two recent meta-analyses of colorectal surgery found that ERAS significantly shortened length of stay and decreased the rate of complications.[3,4] Similar positive results have been documented for minimally invasive gastrectomy procedures. Recovery improved with no increase in complications of the anastomosis or readmissions.[5,6] Pakistani evidence for ERAS is lacking; however, one study from 2021 noted a decrease in length of stay and a decreased rate of surgical site infections.[7,8]

There are significant surgical pressures in the tertiary hospitals in Pakistan. There is a large diversity across the country in patient population, available resources, and the types of cases being performed. This diversity adds significantly more value to the need for evidence generated locally. As such, this study aimed to compare ERAS to standard perioperative care in adults undergoing elective gastrointestinal surgery in one hospital in Pakistan. The primary outcomes of this study were length of stay and postoperative complications. The study incorporated the Clavien-Dindo classification of complications to maintain clinical relevance for both intervention study groups. The study evaluated the feasibility of the care pathway as a whole. It was hypothesized that ERAS would reduce complications and enhance recovery to a significant degree.

MATERIAL & METHODS

This was a prospective comparative study. It was conducted in the General Surgery Department at the Jinnah Postgraduate Medical Centre (JPMC), Karachi, Pakistan. JPMC is a tertiary hospital. The duration of this study was not reported in the available data. The total sample consisted of 120 adult participants. These participants were randomly divided into ERAS and Non-ERAS groups, with each group having a total of 60 participants, resulting in the formation of two groups of patients, each comprising 60 patients. For this sample, a two- proportion sample was estimated. The estimations were made based on 95% confidence and 80% power with a 10% attrition and non-compliance allowance.

Using a non-probability, purposive sampling, eligible participants were patients between the ages of 18 and 65, of either gender. All eligible patients were undergoing open, major, elective gastrointestinal surgery with anastomosis of either the stomach, small bowel, or large bowel. The participants were ASA I and II. Eligible patients were of both genders and were undertaking surgery with anastomosis of the stomach, small bowel, or large bowel. ASA III and above, unplanned GI surgery, pregnancy, diabetes (not controlled), renal failure, liver failure, patients on immunosuppressive therapy, patients with bleeding disorders, patients with cognitive

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impairment who are not able to take part in the study, and patients who are not consenting to take part in the study.

Baseline age, sex, BMI, comorbidity, ASA grade, type of operation, and duration of operation were entered on a structured proforma after an eligibility assessment. All operations were conducted by general surgeons of the same level of experience and under general anaesthesia. Preoperative counselling and carbohydrate loading, avoidance of prolonged fasting, opioid-sparing multimodal analgesia, goal-directed or rationalized fluid therapy, early removal of drains and catheters, early postoperative oral intake, and early postoperative mobilization were all part of the ERAS program. The conventional-care group received overnight fasting, a routine nasogastric tube and drain as per unit practice, the use of an opioid and intravenous fluid until bowel recovery, a stepwise regime of feeding as well as a stepwise regime of mobilization as directed by the treating surgeon.

The data were evaluated using IBM SPSS Statistics version 27. Continuous variables were expressed as mean±standard deviation, and categorical variables as frequency and percentage. Independent-samples t tests assessed the mean comparison of baseline data and outcomes, and Pearson chi-square tests assessed categorical variables. For some variables, risk ratios (RRs) and for some mean differences (MDs) with 95% confidence intervals (CIs) were provided. Complications and ERAS exposure were assessed in a multivariable binary logistic regression model after controlling for age, BMI, ASA grade, and type of surgery. Statistics were considered significant for two-tailed p values of ≤0.05. Due to the small sizes of the subgroups, results of the stratified analyses were considered exploratory. This study was approved by the Jinnah Postgraduate Medical Centre institutional ethics committee. Before enrollment, all participants provided written informed consent.

RESULTS

All participants had complete data available. For all 120 records, there were group assignments and information on what the groups actually did, and all stipulated outcomes for analysis were available. The design of each study group was, therefore, 60 cases. Age averaged 42.25±13.33 years and BMI 26.67±3.28 kg/m². There was no difference in age, sex, baseline BMI, comorbidities, operation type, ASA grade, or operation length between groups (Table I).

Table I. Baseline demographic and operative characteristics (n=120)

Characteristic	ERAS (n=60)	Conventional (n=60)	p value
Age, years	40.62±13.07	43.88±13.49	0.181
Male sex	30 (50.0)	24 (40.0)	0.271
BMI, kg/m²	27.05±3.27	26.29±3.27	0.205
Comorbidity			**0.377**
None	19 (31.7)	13 (21.7)	
Diabetes mellitus	17 (28.3)	15 (25.0)	
Hypertension	10 (16.7)	17 (28.3)	
Smoking	14 (23.3)	15 (25.0)	
Operation type			**0.533**
Gastric	22 (36.7)	19 (31.7)	

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Characteristic	ERAS (n=60)	Conventional (n=60)	p value
Small bowel	17 (28.3)	14 (23.3)	
Colorectal	21 (35.0)	27 (45.0)	
ASA physical status			**0.068**
I	34 (56.7)	24 (40.0)	
II	26 (43.3)	36 (60.0)	
Operative duration, min	162.40±41.84	159.10±41.94	0.667

ERAS patients experienced fewer complications. The 8 ERAS cases (13.3%) with primary outcome, overall, compared to 23, were (38.3%) conventional-care cases. This was an absolute risk reduction of 25.0 percentage points. This difference was clearly confirmed statistically (χ^2=9.79, p=0.002). The unadjusted risk ratio was 0.35 (95% CI 0.17-0.71) with four patients needing treatment to prevent one grade II or higher complication. The mean LOS was reduced by 3.78 days. Post-operative pain was also reduced following ERAS. The VAS result 24 hours after surgery was 2.30, and the p-value was <0.001. Together, these results demonstrated that there was increased recovery and fewer complications following ERAS without an extra significant early readmission rate (Table II).

Table II. Postoperative outcomes by perioperative pathway

Outcome	ERAS (n=60)	Conventional (n=60)	Effect (95% CI)	p value
Grade II+ complication	8 (13.3)	23 (38.3)	RR 0.35 (0.17 to 0.71)	0.002
Hospital stay, days	4.67±1.08	8.45±1.73	MD -3.78 (-4.30 to -3.27)	<0.001
Time to first flatus, h	29.82±6.93	55.35±10.08	MD -25.53 (-28.63 to -22.44)	<0.001
Time to oral diet, h	28.13±4.93	71.78±14.12	MD -43.65 (-47.43 to -39.87)	<0.001
VAS pain at 24 h	3.53±1.13	5.83±1.44	MD -2.30 (-2.76 to -1.84)	<0.001
Readmission within 30 days	2 (3.3)	5 (8.3)	RR 0.40 (0.08 to 1.97)	0.243

Overall, there were eight ERAS patients experiencing the development of postoperative complications. There were no reported cases of ileus or chest infection, only five surgical site infections and three anastomosis leaks. There were 5 surgical site infections in conventional patients during follow-up post-operation. Seven patients who were treated with conventional treatment suffered from anastomotic leakage. Of those, eight developed ileus, and three patients developed chest infection within the time post-operative observations of the group of patients were documented. Grade III (moderate) or IV (severe) classification was given for those events with higher severity grades. They affected 4/60 (6.7%) and 17/60 (28.3%) respectively in ERAS and conventional-care groups (Table III).

Table III. Severity and type of postoperative complications

Complication profile	ERAS (n=60)	Conventional (n=60)
Clavien-Dindo severity		
Grade II	4 (6.7)	6 (10.0)
Grade III	1 (1.7)	8 (13.3)
Grade IV	3 (5.0)	9 (15.0)
Type of complication		
Surgical-site infection	5 (8.3)	5 (8.3)
Anastomotic leak	3 (5.0)	7 (11.7)
Ileus	0	8 (13.3)
Chest infection	0	3 (5.0)

Adjusted analyses showed fewer grade II-and-higher complications. ERAS showed lower adjusted odds after accounting for age, BMI, ASA grade, and operation type. The adjusted odds ratio was 0.28 (95% CI 0.11-0.71; p=0.007). None independently affected outcomes of interest (Table IV).

Table IV. Multivariable logistic regression for grade II-or-higher complications

Predictor	Adjusted OR	95% CI	p value
ERAS vs conventional care	0.28	0.11 to 0.71	0.007
Age, per year	1.01	0.97 to 1.04	0.684
BMI, per kg/m^2	0.97	0.85 to 1.11	0.672
ASA II vs I	1.70	0.68 to 4.23	0.256
Small bowel vs gastric	0.90	0.28 to 2.91	0.863
Colorectal vs gastric	1.08	0.40 to 2.95	0.880

DISCUSSION

This study found a clinically and statistically significant relationship between ERAS care and improved early recovery for patients undergoing elective gastrointestinal surgery. ERAS care, on average, is associated with 25% fewer grade II-or-higher complications, reduced length of stay by almost 4 days, and a quicker recovery of bowel function and oral intake, as well as reduced pain in the first 24 hours after surgery. The lack of a significant increase in readmissions indicates that a decreasing length of stay was not due to discharging patients early. Adjusting for age, BMI, ASA grade, and the type of operation, this study obtained qualitatively similar estimates for the primary outcome, supporting an effect beyond measured case-mix differences.

Reduced complication rates are in line with the evidence being reported internationally. Sauro et al.[1] performed a meta-analysis across several randomized ERAS trials and found a pooled complication RR of 0.71. Similar findings of reduced morbidity with enhanced recovery pathways were also reported in several meta-

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analyses of colorectal surgery.[3,4] Although the present RR of 0.35 is larger, the wide confidence interval and the single-centre, small sample size mean it should be viewed as a relatively weak finding. That said, similar benefits were reported in Pakistani cohorts, with Soomro et al.[7] reporting reduced infection and length of stay, and Amjad et al.[9] reporting a reduction in complications, in a 400-patient prospective Pakistani cohort. A 2024 study on a colorectal pathway from Peshawar also reported faster recovery and shorter stays.[10]

The length of stay reduction of 3.78 days is more than the pooled estimate of 1.88 days across all surgical specialties.[1] But is comparable to reductions seen when traditional recovery pathways include prolonged fasting, routine drainage, and delayed patient mobilization. International evidence on ERAS across colorectal, gastrectomy, and emergency abdomen surgery shows reduced length of stay.[3,5,6] Local levidence supports significant resource savings, with a Pakistani cohort reporting mean lengths of stay of 3.52 versus 6.29 days,[9] and the Peshawar colorectal pathway also reaching a similar conclusion.[10] In the public sector, resource-limited context, a savings of almost four inpatient bed days per case may significantly improve surgical throughput and patient access, even though a formal cost savings was not conducted.

Earlier first flatus and oral intake offer explanatory support for the length-of-stay finding. ERAS-centered colorectal studies identify recovery of gastrointestinal function as a key pathway outcome especially in older adults. [14,15] Modern evidence of randomized gastrectomy studies shows accelerated recovery of bowel function.[16] Component-level synthesis argues that early oral feeding reduces length of stay and time to first flatus without an increased risk of anastomotic leak.[17] Heterogeneity of the evidence for early mobilization does not preclude its biological and operational plausibility.[18]

The lower 24-hour pain score supports the opioid-sparing approximation of ERAS. The pathway should be viewed as a coordinated package, rather than focusing on the individual intervention. Preoperative carbohydrate loading is a safe substitution for prolonged fasting,[19] and may be particularly relevant from an economic perspective in low- and middle-income countries in the gastrointestinal cancer population.[20] Prevention of postoperative ileus,[21] the modern ERAS guidelines,[2,22] and early protein-based diets,[23] support the incorporation of feeding, mobilization, analgesia, and education of the patient, as opposed to the selection of isolated components.

Readmission in the ERAS group was 3.3%, and 8.3% in the Control group, but the study was underpowered to evaluate this outcome with such a low incidence. The wide RR confidence interval includes both benefit and no effect. This is consistent with large meta-analyses showing that ERAS reduces length of stay without a significant increase in readmission and mortality.[1,4,6] This should be considered reassuring, but not conclusive, and post-discharge contact and the criteria for discharge should remain unchanged.

Implementation is likely to determine whether these outcomes can be reproduced. In a recent survey, 86% of respondents acknowledged that they were familiar with ERAS. However, only 50% stated that they implemented the systems, with inclusion of staff, workspace, and time among the cited limitations.[11] Qualitative studies from Pakistan suggest the need for continuous ownership and multidisciplinary presence, along with the development of local, bespoke solutions.[8] ERAS is an example of the many systems that, when implemented, improve adherence to protocols, reduce complications, and shorten the hospital stay.[12] However, factors related to the patient and the complexity of the perioperative process adversely affect the level of adherence.[13] Active delineation of compliance with ERAS components is warranted, particularly in light of the fact that mobilization, removal of continuous IV fluids, and removal of urinary catheters, among others, have been cited as barriers to ERAS.[24] Evidence from unplanned emergent colorectal surgeries indicates that with great care, flexible ERAS pathways may be adapted for elective surgeries.[25]However, this should be taken with caution, as indicated by the current study cohort

This study has several limitations. The study was limited to a single public surgical department, with small sample sizes and non-randomized sampling, leading to limited generalizability. Residual

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confounding was partially limited by regression. This study grouped together ERAS gastric, small bowel, and colorectal surgeries, and as a result, sub-analyses lacked power. The surgical staff was not blind to the procedures. Element-level ERAS compliance was not measured, and there was a lack of longer-term follow-up. The author limited patient follow-up to 30 days with no measurement of patient-reported recovery, cost, or post-surgery morbidities. The author describes a comparative study and a Lottery Allocation; completion of regulatory and design control listings for the study, as well as trial registration, are warranted before the author pushes for publication.

CONCLUSION

In this comparative study, ERAS resulted in shorter hospitalizations, earlier GI recovery, lower early post-operative pain, fewer complications, and no significant increase in 30-day readmissions. This study suggests that ERAS be adopted for elective GI surgery in resource-limited, tertiary hospitals.

REFERENCES

Sauro KM, Smith C, Ibadin S, Thomas A, Ganshorn H, Bakunda L, et al. Enhanced recovery after surgery guidelines and hospital length of stay, readmission, complications, and mortality: a meta-analysis of randomized clinical trials. JAMA Netw Open. 2024;7(6):e2417310. doi: https://doi.org/10.1001/jamanetworkopen.2024.17310

Oodit R, Biccard BM, Panieri E, Alvarez AO, Sioson MRS, Maswime S, et al. Guidelines for perioperative care in elective abdominal and pelvic surgery at primary and secondary hospitals in low-middle-income countries: ERAS Society recommendation. World J Surg. 2022;46(8):1826-1843. doi: https://doi.org/10.1007/s00268-022-06587-w

Zhang W, Wang F, Qi S, Liu Z, Zhao S, Zhang N, et al. An evaluation of the effectiveness and safety of the ERAS program for patients undergoing colorectal surgery: a meta-analysis of randomized controlled trials. Wideochir Inne Tech Maloinwazyjne. 2023;18(4):565-577. doi: https://doi.org/10.5114/wiitm.2023.131426

Li N, Liu Y, Chen H, Sun Y. Efficacy and safety of the ERAS pathway in minimally invasive colorectal cancer surgery: a systematic review and meta-analysis. J Laparoendosc Adv Surg Tech A. 2023;33(2):177-187. doi: https://doi.org/10.1089/lap.2022.0349

Jin H, Song S, Lu T, Ma S, Wang Y, Fu L, et al. The application of ERAS in minimally invasive gastrectomy for gastric cancer: a meta-analysis of randomized controlled trials. Expert Rev Gastroenterol Hepatol. 2022;16(11-12):1089-1100. doi: https://doi.org/10.1080/17474124.2022.2145944

McKechnie T, Tessier L, Archer V, Park L, Cohen D, Levac B, et al. ERAS protocols following emergency intra-abdominal surgery: a systematic review and meta-analysis. Eur J Trauma Emerg Surg. 2024;50(3):679-704. doi: https://doi.org/10.1007/s00068-023-02387-6

Soomro FH, Razzaq A, Qaisar R, Ansar M, Kazmi T. Enhanced recovery after surgery: are benefits demonstrated in international studies replicable in Pakistan? Cureus. 2021;13(11):e19624. doi: https://doi.org/10.7759/cureus.19624

Ahmad H, Arnaert A, Shedio W, Tanoli O, Deckelbaum D, Pasha T. Enhanced recovery after surgery in Pakistan: a qualitative descriptive analysis of current practices and future directions. BMC Health Serv Res. 2024;24(1):1634. doi: https://doi.org/10.1186/s12913-024-11569-w

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

Amjad T, Malana MA, Khan MSN, Hasan SA, Fahad S, Haider M. Optimizing surgical outcomes: the role of ERAS protocols in improving recovery and reducing hospital stays in Pakistan. Cureus. 2025;17(1):e76713. doi: https://doi.org/10.7759/cureus.76713

Naseer S, Gul A, Shah SA, Khan S, Nayab MU, Khan FA, et al. Impact of ERAS protocols on postoperative recovery and hospital stay in colorectal surgery. Biol Clin Sci Res J. 2024;2024(1):1102. doi: https://doi.org/10.54112/bcsrj.v2024i1.1102

Ahmad H, Shehdio W, Tanoli O, Deckelbaum D, Pasha T. Knowledge, implementation, and perception of ERAS amongst surgeons in Pakistan: a survey analysis. Cureus. 2023;15(9):e46030. doi: https://doi.org/10.7759/cureus.46030

Hartman A, Leonard D, Trefois C, Remue C, Bachmann R, Abbes Orabi N, et al. Good compliance to enhanced recovery program improves outcome after colorectal surgery. Surg Endosc. 2021;35(8):4214-4221. doi: https://doi.org/10.1007/s00464-020-07903-y

Galarza-Prado AM, Zorrilla-Vaca A, Healy R, Ripolles J, Abad-Motos A, Nozal-Mateo B, et al. Patient characteristics influencing adherence to enhanced recovery protocols for colorectal surgery: a multicentric prospective study. J Gastrointest Surg. 2022;26(4):911-916. doi: https://doi.org/10.1007/s11605-021-05234-4

Hamel JF, Sabbagh C, Alves A, Regimbeau JM, Vignaud T, Venara A. Comparison of treatment to improve gastrointestinal functions after colorectal surgery within enhanced recovery programmes: a systematic review and meta-analysis. Sci Rep. 2021;11(1):7423. doi: https://doi.org/10.1038/s41598-021-86699-w

Thillainadesan J, Yumol MF, Suen M, Hilmer S, Naganathan V. ERAS in older adults undergoing colorectal surgery: a systematic review and meta-analysis of randomized controlled trials. Dis Colon Rectum. 2021;64(8):1020-1028. doi: https://doi.org/10.1097/DCR.0000000000002128

Liu W, He L, Yin C, Gong G. Enhanced recovery after gastrectomy: updated meta-analysis of 27 randomized trials (2018-2025). BMC Surg. 2025;26(1):26. doi: https://doi.org/10.1186/s12893-025-03399-2

Deng H, Li B, Qin X. Early versus delayed oral feeding after upper gastrointestinal surgery: a systematic review and meta-analysis of randomized controlled trials. Cancer Cell Int. 2022;22(1):167. doi: https://doi.org/10.1186/s12935-022-02586-y

Willner A, Teske C, Hackert T, Welsch T. Effects of early postoperative mobilization following gastrointestinal surgery: systematic review and meta-analysis. BJS Open. 2023;7(5):zrad102. doi: https://doi.org/10.1093/bjsopen/zrad102

Ricci C, Ingaldi C, Alberici L, Serbassi F, Pagano N, De Raffele E, et al. Preoperative carbohydrate loading before elective abdominal surgery: a systematic review and network meta-analysis of phase II/III randomized controlled trials. Clin Nutr. 2022;41(2):313-320. doi: https://doi.org/10.1016/j.clnu.2021.12.016

Knight SR, Qureshi AU, Drake TM, Lapitan MCM, Maimbo M, Yenli E, et al. Preoperative oral nutrition supplementation and outcomes in patients undergoing gastrointestinal cancer surgery in low- and middle-income countries: a systematic review and meta-analysis. Sci Rep. 2022;12(1):12456. doi: https://doi.org/10.1038/s41598-022-16460-4

Chaouch MA, Daghmouri MA, Lahdheri A, Hussain MI, Nasri S, Gouader A, et al. How to prevent postoperative ileus in colorectal surgery? A systematic review. Ann Med Surg (Lond). 2023;85(9):4501-4508. doi: https://doi.org/10.1097/MS9.0000000000001099

Joliat GR, Kobayashi K, Hasegawa K, Thomson JE, Padbury R, Scott M, et al. Guidelines for perioperative care for liver surgery: ERAS Society recommendations 2022. World J Surg. 2023;47(1):11-34. doi: https://doi.org/10.1007/s00268-022-06732-5

Pu H, Heighes PT, Simpson F, Wang Y, Liang Z, Wischmeyer P, et al. Early oral protein-containing diets following elective lower gastrointestinal tract surgery in adults: a meta-analysis of randomized clinical trials. Perioper Med (Lond). 2021;10(1):10. doi: https://doi.org/10.1186/s13741-021-00179-3

Vignali A, Elmore U, Guarneri G, De Ruvo V, Parise P, Rosati R. ERAS in colon and rectal surgery: identification of predictive variables of failure in a monocentric series including 733 patients. Updates Surg. 2021;73(1):111-121. doi: https://doi.org/10.1007/s13304-020-00848-w

Ahmed A, Khalid S, Sharif G, Ahmed HH, Khattak IA, Memon SK. Efficacy of ERAS protocols in emergency colorectal surgery: a meta-analytical comparison with conventional care. Cureus. 2024;16(10):e71630. doi: https://doi.org/10.7759/cureus.71630