ORIGINAL ARTICLE

Implementation of Enhanced Recovery after Surgery at a General hospital in Zambia

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ABSTRACT

Background: Enhanced recovery after surgery (ERAS), with its aim of reducing operative stress and accelerating rehabilitation became a standard perioperative care in multiple surgical specialtiesin developed world. However, little is known about the implementation of the fast-track pathways in a low-resource environment. The objective of the study was to describe our experience and share lessons obtained in using ERAS protocol in general surgery patients.

Methods: In this descriptive study, all consecutive patients with no age restrictions undergoing elective and urgent abdominal surgery were assessed for inclusion in ERAS program. A retrospective analysis encompasses 98 patients aged two weeks to 87 years with male to female ratio of 2.3:1. Outcomes were functional recovery, postoperative complications, and length of hospital stay.

***Results*:** All elements of ERAS protocol including minimalincision length laparotomy and accelerated postoperative care were used; however, certain components were modified depending on the availability of the resources and patient's condition. Postoperative period complicated in17.4% of cases, seven patients (7.4%) died after urgent operations, and nomortality was recorded after elective procedures. Median length of stay was 4.0 days. Local and systemic septic complications, paralytic ileus and performing of the stomareversal procedure during the same hospital stay were reasons for delayed discharge.

Conclusion: This study indicates that employment of ERAS program for general surgery population at a second level hospital is feasible and safe. Further larger-scale studies are needed.

INTRODUCTION

Enhanced recovery after surgery (ERAS) is a multidisciplinary program designed to reduce surgical stress andimprove recovery of organ functionthrough perioperative optimisation of patient treatment.[1] Originally created for elective colorectal surgery, this protocol is well established now for many specialized surgical populations.[2-4]The program focuses on providing multimodal

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analgesia, goal-directed fluid therapy, minimally invasive techniques, thromboembolic prophylaxis, and early mobilisation.[5,6]The benefits, safety, and cost-effectiveness of fast-track pathways (FTP) were validated in multiple studies including randomised controlled trials.[7-9]However, in spite of its many successes, ERAS still has a number of issues and implementation of accelerated stay programs remains challenging.[1,10]The reasons are manifold including internal barriers (lack of awareness of current evidence-based literature, disagreement with current findings or belief that a particular hospital cannot support fast-track surgery protocols, etc.) and external barriers (insufficient number of support staff, lack of expertise in FTPs, and financial considerations).[2,11]This is particularly true for hospitals operating in low-resource environment having a reduced surgical workforce density and an urgent need to increase access to safe and timely surgical care.[12]The aims of research were to assess the feasibility of ERAS program for patients with elective and urgent abdominal conditions at our setting and share lessons learned in this process.

MATERIALS AND METHODS

#ERAS was systematically introduced for general surgery at Roan General Hospital in March 2021. This is a second level referral hospital in Zambia having a capacity of 164 beds and operating as the main medical centre in the area with the population of around 200,000 people. This observational study included patients operated until September 2022. Participants were identified through operative case logs, perioperative variables were obtained by retrospective review of medical records. All consecutive patients operated for elective and urgent abdominal conditions were assessed to enter the study, no age restrictions applied.

The study was conducted according to the ethical principles for medical research (Declaration of Helsinki).[13]Permission to conduct the study was sought from the Hospital Ethical Committee and confidentiality was maintained in the process of data collection. Informed consent was obtained from all individual participants included in the study.

Patient characteristics reported included age, sex, medical and social history, comorbidities. Fitness of patients to surgery was assessed using American Society of Anaesthesiologists Physical Status classification system (ASA score).[14]Patients were followed up by out-patient reviews during 30-days period after discharge.

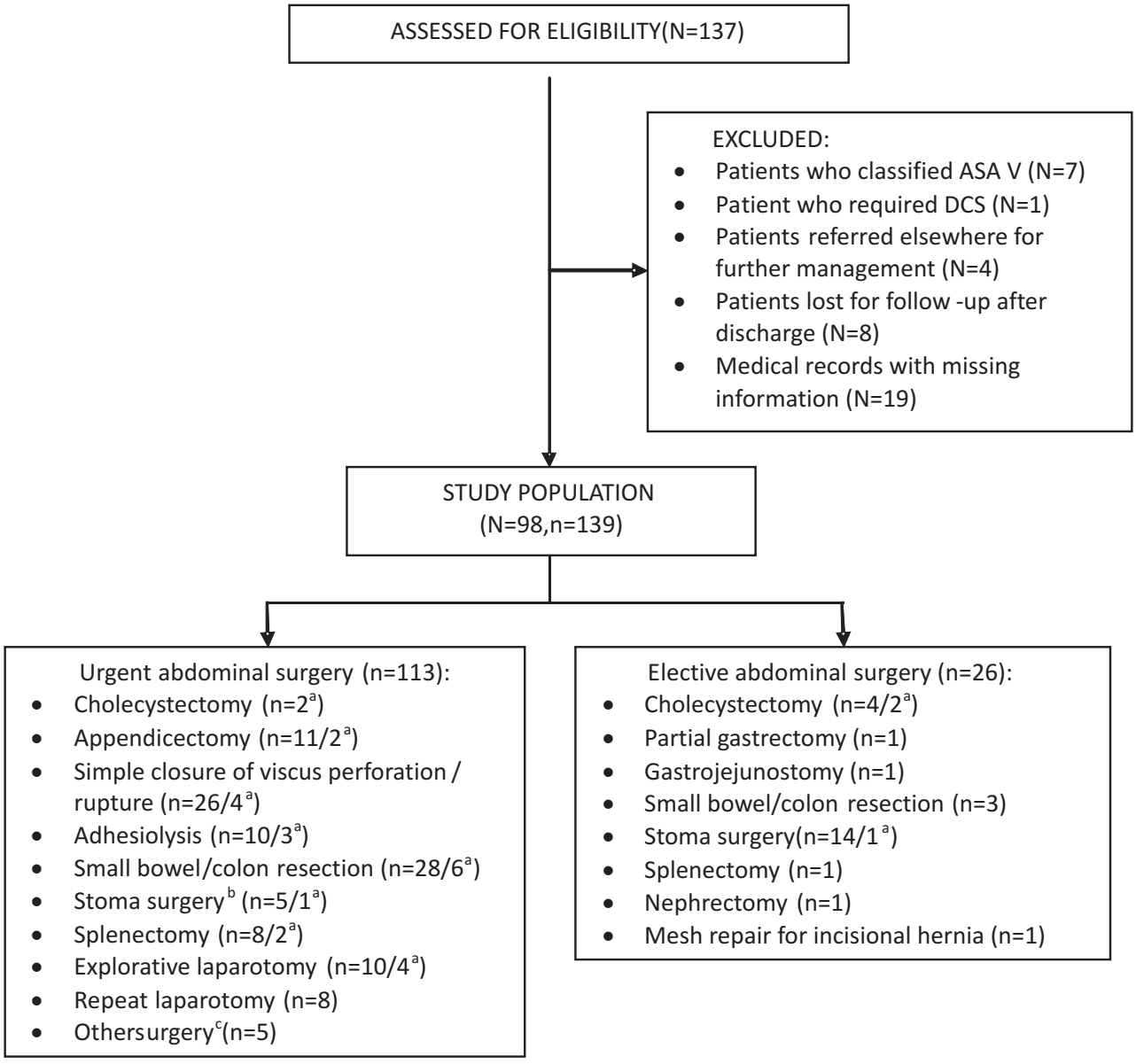
In the study participants, corresponding components of ERAS were used in accordance with interdisciplinary consensus review[5] starting from preoperative assessment and including final recommendations to the patients at the time of discharge from clinical care (Table 1). Preoperative management of patients depended on their clinical needs. Evaluation of patients scheduled for an elective procedure comprised of revealing and correcting coexistent medical morbidity, while management of patients admitted as an urgent case focused on immediate optimisation of their conditions. The plan for the intervention was discussed in details with anaesthesiologist and we sought consensus in every case. When indicated, local anaesthesia was given by infiltration of subcutaneous tissues and muscles of anterior abdominal wall at the site of incision with lignocaine 0.5% 200-250 mg.

In selective group of the patients, we practiced a mini-laparotomy surgical approach (MLS)to abdominal cavity (Figure). Mini-laparotomy was defined as a skin incision of less than or equal to 12 cm in length performed by using traditional surgical techniques and instruments. We considered small-incision laparotomy in clinical situations when preoperatively we were able to establish the diagnosis and locus of intra-abdominal pathology. A decision to use mini-laparotomy was taken after critical assessment of possible risks and expected benefits for every particular patient. We did not attempt small incisions in obese patients with body mass index of above 28, in cases of generalised peritonitis, abdominal malignancy and forrepeat laparotomy procedures.

Table 1. Application of ERAS program in our hospital

ERAS item	Comments
Pre-admission risk stratification	ASA Physical Status Classification used
Optimization of pre-existing health conditions	Medical optimization performed pre-operatively. Routine preoperative HIV testing. No routine bowel preparation for elective colonic surgery.
Antimicrobial prophylaxis and skin preparation	Single-dose antibiotic given at induction. Chlorhexidine–alcohol-based skin preparation. No routine skin shaving, no adhesive incise sheets available.
Preoperative fasting and carbohydrate loading	All patients fasted before the procedure. No carbohydrate loading preoperatively.
Pre-anaesthetic medication	Long-acting anxiolytic and opioids avoided.
Anaesthetic Protocol	Individualized depending on the ASA grade. Short-acting anesthetic agents.
Preventing intraoperative hypothermia	Blankets used to cover the patient before procedure started. Ambient temperature in theatre is regulated by air-conditioner.
Surgical access (minimally invasive surgery including laparoscopic/robotic approaches)	Small incision laparotomy used when possible. Laparoscopic technique still not available.
Intraoperative fluid and electrolyte therapy	IV fluid therapy monitored using haemodynamic parameters and urine output. Balanced crystalloid solutions used as routine. Colloid solutions and inotropes considered in haemodynamically unstable patients.
Drainage of the peritoneal cavity and pelvis	Abdominal drains placed in cases belonging to the contaminated/dirty surgical wound classes; [15]removed when output =100 ml/day. No drains used to prevent or detect anastomotic leakage.
Post-operative analgesia	NSAIDs alone or in combination with opioids used. Spinal/epidural analgesia not used postoperatively.
Nasogastric intubation	Nasogastric tubes removed on POD1-2 when =300 ml/day.
Urinary drainage postoperatively	Urinary catheter removed in conscious and haemodynamically stable patients
Postoperative fluid management	Balanced crystalloid solutions were preferred. Monitoring of IV fluids aimed to achieve state of zero fluid balance as possible.
Thromboprophylaxis	Unfractionated heparin/LMWH started 8-12 hourly on POD1 and continued till patient discharge.
Early mobilization	Used in all patients; physiotherapy started on POD1
Post-operative nutritional care	Clear liquids as tolerated after surgery. Softdiet commenced as soon as possible.
Discharge criteria	Afebrile, without tachycardia. Tolerance of meals without nausea or vomiting. Passage of stool. Adequately controlled pain. Patient ambulating independently. Adequate support at home.
Post discharge follow-up	Reviews in surgical clinic during 30 days after discharge

ASA, American Society for Anaesthesiologists; HIV, Human Immunodeficiency Virus; NSAIDs, Non-Steroidal Anti-Inflammatory Drugs; OT, Operating Theatre; POD, post-operative day(s); LMWH, low molecular weight heparin


ASSESSED FOR ELIGIBILITY(N=137)
EXCLUDED:
Patients who classified ASA V (N=7)
Patient who required DCS (N=1)
Patients referred elsewhere for further management (N=4)
Patients lost for follow -up after discharge (N=8)
Medical records with missing information (N=19)
STUDY POPULATION (N=98,n=139)
Urgent abdominal surgery (n=113):
Cholecystectomy (n=2[a])
Appendicectomy (n=11/2[a])
Simple closure of viscus perforation / rupture (n=26/4[a])
Adhesiolysis (n=10/3[a])
Small bowel/colon resection (n=28/6[a])
Stoma surgery[b] (n=5/1[a])
Splenectomy (n=8/2[a])
Explorative laparotomy (n=10/4[a])
Repeat laparotomy (n=8)
Othersurgery[c](n=5)
Elective abdominal surgery (n=26):
Cholecystectomy (n=4/2[a])
Partial gastrectomy (n=1)
Gastrojejunostomy (n=1)
Small bowel/colon resection (n=3)
Stoma surgery(n=14/1[a])
Splenectomy (n=1)
Nephrectomy (n=1)
Mesh repair for incisional hernia (n=1)

Figure

Table 2. Sociodemographic and clinical variables

Variables	Number (%)
Gender: Male	68 (69.4)
Female	30 (30.6)
Age: years, median; IQR	32; 22–48
Admissions: Elective	22 (20)
Urgent	88 (80)
Aetiology:	
Intestinal obstruction	33 (31.7)
Perforation peritonitis	19 (18.3)
Abdominal trauma	18 (17.3)
Acute appendicitis	11 (10.6)
Acute pancreatitis	6 (5.8)
Gastrointestinal tumour[a]	6 (5.8)
Acute/chronic cholecystitis	5 (4.8)
Other[b]	6 (5.8)
Co-morbidities:	
Hypertension	4
Acquired Immunodeficiency Syndrome	4
Chronic Obstructive Pulmonary Disease	2
Pulmonary Tuberculosis	2
Diabetes Mellitus	1
ASA grade: I	36 (32.7)
II	33 (30.0)
III	15 (13.6)
IV	26 (23.6)
MLS: Elective	3 (12)
Urgent	24 (21)
Multiple surgery[c]	15 (15.3)
Length of stay, days, median; IQR	4.0; 3–7
Postoperative morbidity:	
Surgical site infection (C-D I, III)	8
Paralytic ileus (C-D I)	3
Dermatitis around the stoma (C-D I)	1
fistula (C-D II)	3
Postoperative wound dehiscence (C-D III)	3
Anastomotic leakage (C-D III)	2
Ongoing peritonitis (C-D III)	1
Total	21 (17.4)
Postoperative mortality:	
After elective surgery	0
After urgent surgery	7 (7.4)
Total	7 (5.8)

IQR, interquartile range; MLS, mini-laparotomy surgical approach, C-D, Clavien-Dindo grade

Except those caused intestinal obstruction

[b] **Included splenomegaly, hydronephrosis, pelvic inflammatory disease,** post-operative peritonitis

[c] 1 patient had 4 operations, 3 patients had 3 operations and 11 patients had 2 operations as separate cases, these 15 patients therefore represent 35 operations

After the operation, patients were managed at Intensive Care Unit or surgical ward depending on their clinical condition. Thromboembolic prophylaxis included early mobilisation and administration of unfractionated or low-molecular weight heparin starting from 6-12 hours postoperatively. We mobilise the patients with the help of specially trained hospital staff. Mobilisation started on postoperative day(POD) 1 with in-bed exercises and chest physiotherapy, and continued thereafter with encouraging ambulation as tolerated.

The primary outcomes were: functional recovery, intra- and postoperative complications according to Clavien-Dindo (C-D) classification[16]andhospital length of stay(LOS). Functional recovery was assessed by a resumption of oral intake, return of bowel function, and sufficient mobilisation. Morbidity was defined as per operations when they represent a separate case; a patient could undergo several procedures, both urgent and elective (Table 2) at different stages of surgical management with intervals ranging from seven days to eleven months. For example, reversal of the stoma considered as a different case from the index procedure even if these two operations performed during the same hospital admission (as it was done in three of our patients). In cases of re-operations performed in the immediate postoperative period, complication rates have been adjusted so that they only can be attributed as a result to the last of a patient's operations. The similar calculation demonstrated by Timan et al.[17] in a study on emergency surgery from Sweden and suggested in a review report on the global surgery metrics[18] in order to avoid distortion of morbidity data. Postoperative mortality was categorised according to the Safe Surgery Saves Lives initiative of WHO's Patient Safety Programme[19] as death following surgery and before discharge from hospital or within 30 days of surgery, whichever is sooner, expressed as percentage. LOS was counted from the day of surgery until the day of discharge. The discharge criteria were clearly outlined and standardised (Table 1); the pillars for the decision-making included the optimal pain control, appropriate bowel

function and adequate care support at home. If any of these factors seemed questionable, the patients remained in the hospital until the safe discharge is guaranteed. Readmission were documented from the day of discharge until 30 days postoperatively.

We used descriptive statistics to report data obtained. Due to skew distribution of the variables, continuous parameters were expressed as median and ranges. Categorical data were presented as absolute figures and percentages.

RESULTS

A total of 98 patients aged two weeks to eighty-seven years with male to female ratio 2.3:1met the inclusion criteria. Demographics and clinical variables of the population are presented in Table 2. As our patients were generally young, medical comorbidities were uncommon (N=9, 9.2%). Because of this, 63% of patients were classified as ASA scores I-II. However, one third of emergency admissions were in complicated conditions of sepsis or/and shock. As a result, a noticeable proportion of the participants were classified as ASA score IV (Table 2).

Operations performed are depicted in the Figure. As a surgical approach, small-incision laparotomy with the median length of 10.5 cm (range 6-12 cm) was used in 27 operations performed in 26patients. Incisions used were midline (upper n=9, median n=6, and lower n=6), oblique in right (n=3) and left (n=1) hypochondrium, in right (n=1) and left (n=1) iliac fossae. In four cases, MLS was converted to a standard laparotomy incision due to technical difficulties in intraabdominal assessment and manipulation.

We did not encounter any life-threatening intra operative events, and eight of the patients required blood transfusion during and/or immediately after the procedure. Post-operative complications occurred in 21 patients (17.4%) (Table 2), and most of them (N=17) were recognized during the stay in the hospital. Four patients were re-admitted with complications developed within 30 days after discharge: post-operative wound infection (N=1), high-output colostomy (N=1), both managed medically, and adhesive intestinal obstruction (N=2) which required laparotomy and adhesiolysis in one patient and responded to conservative treatment in the other. Seven patients died after surgery, all deaths occurred after urgent procedures. The causes of in-hospital death recorded were as follows: anastomotic leakage with ongoing peritonitis, sepsis and multiple organ failure (N=1), septic shock without leakage (N=2),non-correctable hypotension and respiratory failure in medically compromised patients (N=2), acute renal failure (N=1). One patientdied on day 4 after uncomplicated adhesiolysis procedure performed for intestinal obstruction, and the cause of death remains unknown, as autopsy was not performed. LOS for survived patients ranged from 1 to 47 days, with median of 4.0 days.

The reasons for prolonged stay in the hospital were: septic complications of the post-operative wound and abdominal cavity, paralytic ileus and performing of the stoma reversal procedure during the same admission.

DISCUSSION

The study describes our experience in employing ERAS methodology at a second level surgical hospital. Among the different steps of the implementation process described, [20] we were particularly interested in two principal aspects, namely 1) fidelity, which shows how the innovation corresponds to the originally designedprotocol, and 2) adaptation, which refers to modifications made to the initialprogram during performance. In other words, we aimed to investigate whether it is possible to reproduce the original protocol of ERAS for general surgery population managed in a resource-scarce setting, and if we could prioritize certain items of the FTP and omit the others with the hope for the better outcome in a particular case.

It is well-known that components of the ERAS pathway positively affect all elements of preoperative investigation, decision-making

process, intraoperative management and postoperative care.[5,6] Some alterations to perioperative management standards are minimal or not to be changed like, for example, antibiotic-orthromboprophylaxis,[7] and this alleviates the implementation of the FTP into everyday clinical practice. Other changes require more determined attempts, for instance, reducing pre-operative fasting, early postoperative nutrition and restricted use of drains,[21] and need to be encouraged and controlled. Due to fast development of the medical science, industry and operative technique in the recent decades, mini-invasive procedures became an integral part of surgical practice.[22,23] These novel techniques include not only, and should not be limited by, laparoscopic and robotic procedures.[24] At our hospital, we practice MLS in elective and urgent abdominal surgery. Naturally, employment of mini-laparotomyrequires sufficient level of surgical competence and this technique has its contraindications, disadvantages and challenges.[25] However, this component of ERAS should not be eliminated in resource-constrained environment, in absence of modern mini-invasive surgical equipment.[26,27] Clinical benefits of minimal approach for the patients have already described in the literature.[11,25] What is particularly important from the patient's perspective, mini-invasive procedures make a vital contribution to positive effects of ERAS program[1,28] and our humble experience confirms this.

With this in mind, there is a risk that mini-invasive procedures can be considered as the solely decisive factor in improving morbidity in surgery bypassing other elements of the ERAS protocol.[7,24,27] It is therefore crucial to realize that clinical success of accelerated stay program depends first of all on the quality of multidisciplinary collaboration between patient and allcare providers involved,[10] and different components of the FTP are in factequally valuable for faster return to baseline physiological function. According to Malik et al.,[4] the applied perioperative management interventions can have a synergic effect on shortening the recovery time. Similarly, Wijk with colleagues[2] in an international multicentre study of more than 2000 patients made a conclusion that it is the combination of all the different elements of ERAS protocol that makes an effective regimenin improved outcomes after surgeryes in which ERAS protocols are used, individua. On the other hand, because of the variety of disciplinlity of the patient, their clinical condition and the type of procedure being performed should also be factors in whether FTP is utilized. Some researchers[1,29] do not recommend use of enhanced recovery protocolin emergent abdominal procedures for obstruction, perforation and ischaemia. Similarly, others,[21,30] while acknowledging the benefits of accelerated stay program, mentioned certain clinical issues in emergency surgery that are not easily amenable to ERAS principles. Indeed, in patients presented in acute surgical condition, preoperative counselling and education, called otherwise prehabilitation,[31] is usually limited or impossible because of lack of time. Besides, use of FTP in emergency setting may face some challenges postoperatively. Patients undergoing major abdominal procedures may require a period of prolonged ventilation and circulation supports which would limit early mobilisation, early removal of drains and tubes and early enteral nutrition. It was opposed by Hajibandeh et al.[8] and Sethi et al.[32] indicating that most components of ERAS pathways can be applicable and appropriate in acute general surgery population. Likewise, in a review article, Bugada and co-authors[28] suggested that as emergency operations carry a mortality rate at least ten times higher than many similar elective procedures, fast-track surgery strategies may be of even greater advantage in such kind of setting. In our study, we offered ERAS components to both elective and urgent surgical population. Prevalence of urgent procedures over elective surgery (3.7:1) reflects the real-life situation with surgery in Zambia and is consistent with data from other research done in sub-Saharan Africa.[33] In elective surgical patients, commonly reported limitations for use of FTP include immobility, alcohol dependence, poorly

controlled psychiatric disorders, lack of social support, and inability to follow-up for postoperative visits or complications.[11] Certainly, the multimodality of the ERAS pathway can limit its complete incorporation into routine practice, and despite its many benefits, ERAS still has a number of issues that need addressing in the future.

One of the valid concerns while using the FTP is patients' safety after enforced early discharge.[29]Advantagesof accelerated stay program should be carefully weighed against the risk of missing postoperative complications. This is especially true in a setting where transport is difficult and local nursing staff might be not sufficiently qualified. It is well known that early hospital discharge without sufficient recovery and lack of competent support can increase both patient and family anxiety, and may lead to readmission.[11]In our work, despite the priority was given to early discharge of the patients, we allowed them to go home only when they are considered to be safe with strict recommendations given timing and the process of follow-up. We had four readmissions because of developed postoperative complications, and interestingly enough, rehospitalisation of two of these patients actually followed prolonged stay in the hospital when they were chosen to be observed for a few days more after the procedure. Thus, late discharge cannot guarantee uneventful postoperative recovery in patients who underwent abdominal surgery. By contrast, among the patients discharged early, incidence of complications requiring readmission was low (2/61, 3.3%).The similar phenomenon is reported by Delaney et al.[22]suggesting that it is not the early discharge in itself that prevents the complication, rather late complications are likely to be developed in patients who are not doing well postoperatively in one or another way. It seems that selection of appropriate candidates for early discharge requires substantial surgical expertise in addition to the use of standardised discharge criteria.

Acknowledging unique physiological and psychological characteristics of paediatric patients, we include seventeen operated children into the study. Review of the literature shows that ERAS interventions in paediatrics contribute to improved outcome for patients and positively impact parent's satisfaction with the surgical process,[3]and we anticipated clinical benefits for the children from inclusion into the program. We understand that standard FTP principles applicable to the adult patients may not be completely translatable to paediatric population. For example, no clear recommendations were found on use of perioperative pharmacological thromboprophylaxis in children, so we focused on early mobilisation and restricted use of drains and tubes. At the same time, other components of ERAS program may have exceptional weight in this population, and we applied them correspondently. It concerns, for instance, providing parents with full and timely information about the management process as well as reducing preoperative fasting time and early resumption of postoperative feeding.[3]

Despite this is our preliminary experience with FTP in abdominal surgery and the study design was not intended to demonstrate efficiency of ERAS protocolinthis setting, obtained figures for LOS and morbidity/mortality appear to be comparable with the literature findings.[8,17,18]We saw that implementation of accelerated stay program for our patients was associated with sufficiently low rate of complications and readmissions and provided benefits for the patients and for the hospital likely enabling efficient management of resources. By contrast to some studies published,[9,21,29] but in accordance with others,[7]we offered elements of ERAS program to patients having ASA scores III and IV on preoperative assessment. We rationalised inclusion of these critical patients by the following. First, flexible employment of fast-track surgery components can give the critically ill patient an additional chance to recover. For example, use of mini-laparotomy with local anaesthesia and conscious IV sedation allowed us to avoid intraoperative complications and achieve uneventful recovery in three of our high-risk patients

who were deemed to be poor candidates for a general anaesthetic. Second, proportion of patients presented with severe systemic disease including sepsis and shock is quite high among the urgent admissions (in our study it was 29.6%) and eliminating these patients from the study may distort the real results of the surgery. Nonetheless, we have to admit that we eliminated cases with ASA score V as these moribund patients routinely need postoperative intensive care and application of FTP elements in them can be difficult or even impossible. Third, apart from ASA score V, we did not see in our patients a strong association between the Physical Status score and postoperative mortality, as four out of eight deceased patients were scored I and II, while mortality among the ASA score IV sub-cohort was as low as 12% (3/23). We acknowledge, however, that our study is too weak to make assumptions about correlation relationship. On note, Horvath et al.[14] in a review article on evolution of ASA Classification System indicated that "ASA Physical Status is not intended and should not be used as predictor of operative risk, certainly not in individual patients", and we see a clear rationale behind this conclusion. In our opinion, challenges with predicting post-operative morbidity could serve as an additional argument in favour of wider application of the ERAS program components to the management of high-risk patients.

Taking these observations into account, an answer to our research question is yes, ERAS pathway is a right choice of perioperative management employed at a peripheral hospital. Implementation of elements of ERAS program is in line with both recommendations of the Lancet Commission and Global Surgery Foundation to improve access to safe and affordable surgical and anaesthetic care in low- and middle-incomecountries (LMIC)[34] and Zambia's first National Surgical, Obstetric, and Anaesthesia Strategic Plan.[12]At the time of our study, ERAS society (www.erassociety.org) produced targeted guidelines for hospitals in LMIC,[35]and we became particularly encouraged to intensify our efforts to refine protocol of perioperative care in accordance with new recommendations. We see the incorporation of FTP into routine surgical practice in low-resource environment as an incredible opportunity to standardise care, improve outcomes, save lives and reduce healthcare costs. Our study tells us that patient-centred individual approach with flexible application of ERAS components could increase chances for faster recovery in every particular patient. Therefore, implementation of ERAS protocols into clinical practice of hospitals operating in resource-scarce setting like ours would be mandated. In this respect, we agree with Fawcett et al.[11] that' ERAS does not make bad surgery good, but it does make good surgery optimal'.

LIMITATIONS

There are some limitations to this study that warrant mentioning. This was a retrospective record review and some data have inevitably been missed. Lack of a control arm and patient randomisation to participate in the protocol reduced the internal validity of the study and therefore no causal inferences were made from the data obtained. The research was based on a database from a single centre and after application of exclusion criteria not all patients operated in our hospital entered the study. There is a risk that some patients – potential participants – may not survive the transfer to our hospital, or be admitted in a critical condition with ASA score V and consequently excluded from the study. At the same time, we transferred four of our patients in complicated conditions to a higher referral institution. As a result, morbidity/mortalityfigures may be underreported. Additionally, the data obtained did not allow us to assess the compliance rate of the patients and surgical teams to FTP, so there is a possibility of variation in the implementation. There search was designed and controlled by a single investigator (without blinding) and this could lead to subjective assessments of the data. Clearly defined exclusion criteria and objective outcome measures, detailed description of the demographics, intervention and

processing of the data aimed to reduce the selection and observer biases.

Among advantages of the study, this work represents a provincial initiative to change surgical care according to the principles of evidence-based medicine aiming to improve patient outcomes. As our hospital is peripheral, the sample investigated can be considered as being representative of the wider, predominantly rural, population of the country. This is a clinical study, so our results are close to those obtained in routine surgical practice and they might be considered as being sufficiently relevant. Besides, in-depth knowledge of the question and familiarity with clinical aspects of the cases enrolled by a well-motivated author of the manuscript could reinforce adherence to the treatment regimen and enhance the external validity of the study. Employing a short inclusion period (of 18 months in our study), according to Kooistra et al.,[36] can minimise changes over time in interventions reducing risk of chronology bias. In general, selecting a descriptive, "how-we-do-it", design for the research, we focused on practical aspects of the ERAS program implementation and gained a valuable experience during this work. We hope that our findings could be of some interest for medical society. We also expect that this paper could be found useful to define areas for future larger-scale clinical trials and experimental studies.

CONCLUSIONS

Patients undergoing abdominal surgery in a resource-scarce setting constitute a serious challenge, as most of them admitted in emergent and/or complicated condition. In our institution, the introduction of ERAS program was associated with a change in the management of surgical patients towards an increased use of fast-track surgery pathway. Preliminary outcomes are promising, but further studies with a higher level of evidence are needed to verify the data presented and to develop recommendations for surgeons working in smaller hospitals.

What is already known on this topic?

- ERASis a multimodal approach to the perioperative management of patients designed to improve the overall quality of care
- The program includes interventions that focus on anaesthesia, goal-directed fluid therapy, minimally invasive techniques, thromboembolic prophylaxis, nutrition, and early postoperative mobilisation

What this study adds

- Employment of ERAS protocol for general surgery population at second level hospital is feasible and safe
- Incorporation of FTP into routine surgical practice in low-resource environment could standardise care, has the potential to improve outcomes and reduce healthcare costs

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Competing interests

The author declares that he has no competing interests.

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