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ORIGINAL ARTICLE

Implementation of the ERAS program in gastric surgery: a nationwide survey in Italy

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Abstract

Enhanced recovery after surgery (ERAS) programs have been developed by combining several evidence-based techniques for perioperative care, with the intention of reducing the stress response and organ dysfunction, thus allowing improved clinical results. ERAS programs have been widely adopted for colorectal surgery; however, their adoption for upper gastrointestinal surgery has been challenging even though good results have been reported in the literature. Our intent was to investigate the adoption of ERAS programs for resective gastric surgery in Italy. A survey was conducted among 20 departments of surgery belonging to the Italian Group for Research on Gastric Cancer (GC). Analysis of our survey showed that several evidence-based practices and many items of the ERAS guidelines for gastric surgery are not implemented in real practice in Italian centers dedicated to GC. This situation may be related to the hesitation of surgeons to introduce radical changes to the traditional postoperative management after gastrectomy. A multidisciplinary approach to the perioperative care of these patients is not routinely applied in many Italian centers. A strict collaboration of all clinicians involved in the perioperative care of patients undergoing gastrectomy for GC is key for the future implementation of ERAS in gastric surgery in our departments.

Keywords Enhanced recovery after surgery · Gastrectomy · Gastric cancer

Introduction

The worldwide incidence of gastric cancer (GC) has declined over the last decades, but it still remains one of the most common and lethal cancers [1, 2]. Surgery is the mainstay of treatment for localized disease [3]. Radical gastrectomy is a delicate operation with a postoperative 30-day mortality rate between 1 and 5% and a morbidity rate ranging from 10 to 40% [4, 5].

To improve the results of surgery, particular attention has been dedicated to improving perioperative care. Enhanced recovery after surgery (ERAS) programs have been developed by combining several evidence-based techniques for perioperative care with the intention of reducing the stress response and organ dysfunction [6]. Implementation of ERAS programs is intended to shorten the time required for full recovery and reduce postoperative complications associated with an excessive response to surgical stress without increasing postoperative morbidity.

Attention to perioperative care may have a major influence on morbidity after gastrectomy, and comprehensive pathways such as ERAS standardized protocols may be effective in improving the clinical course with subsequent economic benefits on health care systems [7]. ERAS protocols for perioperative care have proven valuable in reducing complications after surgery, improving overall outcomes, and shortening the length of stay, thus also saving resources [6]. A significant reduction in the postoperative length of stay after both open and laparoscopic gastrectomy, a reduction in the cost of surgery with similar morbidity and mortality, and a possible advantage in survival have been reported in several cases after application of an ERAS program for the care of patients undergoing radical gastrectomy [8–10]. Notwithstanding these results, it has been more difficult to apply ERAS programs to gastric surgery in clinical practice compared to what happened for colorectal surgery, mainly due to the need to introduce radical changes to the traditional postoperative management after gastrectomy.

Collaborators are listed in Acknowledgements.

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Therefore, we were interested in determining the present rate of implementation of ERAS protocols for elective gastric resection for malignancy in Italy. To this end, we prepared and distributed a specific survey on this topic. This work reports the results of the survey.

Methods

This survey was conducted and proposed to several departments of surgery belonging to the Italian Group for Research on Gastric Cancer (GIRCG). These centers specialize in the treatment and management of patients with GC. The survey was composed of a two-part questionnaire that was sent to participating centers: the first part of the questionnaire included questions regarding general information about the department and the respective annual volume of resective GC surgery; the second part specifically concerned the implementation of ERAS protocols in the management of patients undergoing GC surgery (Supplementary Table 1). The questionnaire was designed in electronic format and sent by email to the heads of the selected surgery units. The survey was conducted between February and March 2021.

Results

Twenty centers (mostly located in northern Italy) from 9 Italian regions completed and returned the questionnaires. In total, 684 gastrectomies were reportedly performed in 2020. Table 1 reports the annual volume of gastric resective surgery among the centers. Only 1 center (5%) performed more than 100 gastrectomies, 4 (20%) centers performed between 50 and 99 resections, 7 (35%) centers between 25 and 49, and 8 (40%) centers performed less than 25. At the time of the questionnaire, a structured protocol for the management of patients undergoing GC surgery was present in 13 (65%) surgical departments. Among these 13 centers, only 5 (38,5%) declared that the ERAS items of this protocol were shared by surgeons, anesthesiologists, and nurses; in the remaining cases (61.5%), the definition and application of the items composing the ERAS protocol were either at complete discretion of the single healthcare professional or not included in the perioperative routine. In 15 of the 20 centers (75%), each professional figure was independently responsible for application of the various items without a shared structured protocol.

Table 2 reports the answers concerning the preoperative item of the ERAS protocol. All respondents answered that they performed a preoperative nutritional risk assessment with different tools, mainly using the nutritional risk score [11]. A dietary assessment was routinely considered in 4 (20%) centers; it was performed only in case of diagnosis of malnutrition in 15 (75%) centers and never in 1 center (5%). Routine preoperative administration of immunonutrition and carbohydrate-rich drinks were applied in only six centers (30%), whereas in seven centers, these nutritional interventions were considered only selectively [Fig. 1]. Surprisingly, regarding preoperative fasting, solid food was allowed until 6 h before surgery in four centers (20%), whereas liquids were allowed until 2 h before surgery in only three of these centers (15%).

The intraoperative items are addressed in Table 3. The attitude of different centers in respect to specific intraoperative surgical items was very dishomogeneous: in 60% of centers, a nasogastric tube was inserted either in all

Table 1 Annual volume of gastric resective surgery among centers

Gastrectomies per year	Number of centers (%)
< 25	8 (40)
25–49	7 (35)
50–99	4 (20)
> 100	1 (5)

Table 2 Preoperative items

Nutritional risk assessment	20 (100)	
NRS	6 (30)	
MUST	2 (10)	
MNA	2 (10)	
NRI	1 (5)	
Other	9 (45)	
Dietary evaluation		
Always	4 (20)	
Only if malnutrition	15 (75)	
Never	1 (5)	
Preoperative fasting (hours)		
	solids	liquids
2		3 (15)
6	4 (20)	9 (40)
8	7 (35)	6 (25)
12	7 (35)	2 (10)
From midnight	1 (5)	
24	1 (5)	
In patients without outlet obstruction or diabetes		
Immunonutrition		
Yes	6 (30)	
Sometimes	7 (35)	
No	7 (35)	
Administration of carbohydrate-rich drink before surgery		
Yes	6 (30)	
Sometimes	2 (10)	
No	12 (60)	

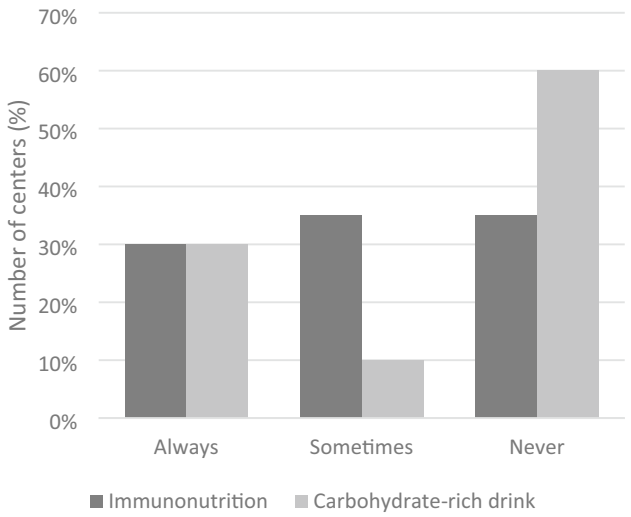

Fig. 1 Administration of carbohydrate-rich drink before surgery and immunonutrition

gastric resections (50%) or selectively based on the type of resection (15%), and abdominal drainage was considered routine in 75% of centers [Fig. 2]. A jejunostomy or naso-jejunal feeding tube was considered in cases of malnourished patients in 50% of centers, with 30% using it routinely in cases of total gastrectomy. Minimally invasive surgery was routinely considered for gastric resection for cancer by four centers (20%), whereas 30% of the centers included in this survey never or occasionally considered it [Fig. 3]. Among other intraoperative items in 25% of centers, placement of a central venous catheter and epidural analgesia were considered a routine. Measures to maintain intraoperative normothermia were used by all participants. The policy for intraoperative fluid administration was dictated by goal-directed fluid management by six (30%) respondents. In the other cases, fluid administration was restrictive in 20% of centers and guided by diuresis and central venous pressure in 30% of centers.

Answers to questions regarding postoperative items are reported in Table 4. In most centers, early mobilization is generally considered in 80% of centers, but early postoperative nutrition on postoperative day 1 (POD 1) in distal gastrectomy is routine in only one center (5%), with 25% of centers still initiating a postoperative diet on POD 4. This attitude is more pronounced after total gastrectomy where in 70% of centers, an oral diet is resumed after POD 4 (20%) or POD 5 (50%) [Fig. 4]. Again, postoperative immunonutrition was used only in malnourished patients in 45% of centers with 40% never using it.

Table 3 Intraoperative items

Prophylactic antibiotics *n*° of centers (%)	
UST	12 (60)
ST	6 (30)
Until or beyond POD 1	2 (10)
CVC	
Non-routine	15 (75)
Routine	5 (25)
Epidural analgesia	
Always	5 (25)
If open surgery	10 (50)
Sometimes	4 (20)
Never	1 (5)
Maintaining intraoperative normothermia	20 (100)
Fluid management	
GDFT	6 (30)
Restrictive	4 (20)
CVP and diuresis	6 (30)
Other	4 (20)
Nasogastric tube insertion	
Never	5 (25)
Only for total gastrectomy	3 (15)
Only for distal gastrectomy	3 (15)
Always	9 (45)
Abdominal drainage	
No insertion	1 (5)
Selective insertion	4 (20)
Routine insertion	15 (75)
Jejunostomy or naso-jejunal feeding tube	
Always	1 (5)
Only for total gastrectomy	6 (30)
Only if malnutrition	10 (50)
Never	3 (15)
Minimally invasive surgery	
Routine	4 (20)
Only for distal gastrectomies	6 (30)
Only for early stages	3 (15)
Occasionally	4 (20)
Never	3 (15)

Discussion

ERAS programs have demonstrated safety and efficacy in the perioperative care of many patients undergoing resective surgery for gastrointestinal cancers [6]. ERAS programs have also been applied to the care of patients undergoing gastrectomy for GC with good results, as reported by several retrospective [9, 12] and prospective [13, 14] series and by several reviews and meta-analyses [7, 8, 15, 16]. These studies have demonstrated that the application of ERAS programs in this setting may reduce hospital stay, costs, and

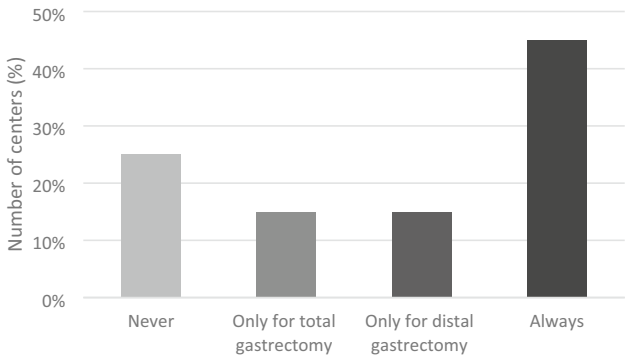

Fig. 2 Postoperative nasogastric tube insertion

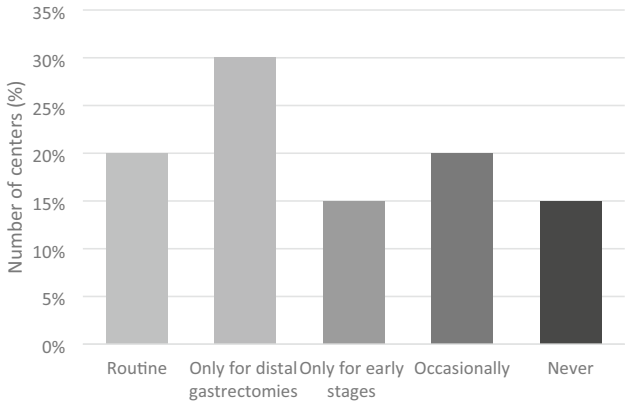

Fig.3 Minimally invasive surgery

surgical stress response, without increasing postoperative morbidity [8]. Patients treated according to ERAS principles can expect faster recovery and fewer complications and may live longer; health systems can expect reduced cost of care [6]. A higher rate of hospital readmission has been reported in several of these experiences [8] even if only considering patients aged over 75 years [17].

However, other studies have reported how, despite the demonstrated advantages of the applications of ERAS protocol for gastrectomy, their actual applications in daily practice is lower than expected [18, 19]. It is interesting to note that most studies in the literature on the efficacy of a structured ERAS protocol in gastric resective surgery come from the East [20].

In 2019, a nationwide survey in Korea demonstrated that at that time, only 50% of centers performing gastric resective surgery for cancers were applying an ERAS protocol [21]. This situation may be related to the hesitation of surgeons to introduce radical changes to the traditional postoperative management after gastrectomy, mainly due to concerns regarding the problems of tubes (nasogastric tube and drains) and of nutrition.

Table 4 Postoperative items

Use of opioids n° of centers (%)	
Never	3 (15)
Sometimes	16 (80)
Always	1 (5)
Patient mobilization	
Within POD 1	16 (80)
After POD 1	2 (10)
When possible	2 (10)
Respiratory physiotherapy	
Routine, with physiotherapist	3 (15)
Routine, surgeon advices	8 (40)
Selective	9 (45)
Stop infusions	
POD 3–4	13 (65)
After	7 (35)
What instrumental check before the removal of the nasogastric tube?	
None	12 (60)
X-ray with gastrografin	7 (35)
Other	1 (5)
Other	1 (5)
Postoperative diet initiation (distal gastrectomy)	
POD 1	1 (5)
POD 2	6 (30)
POD 3	7 (35)
POD ≥ 4	5 (25)
Upon gas passage	1 (5)
Postoperative diet initiation (total gastrectomy)	
POD 1	1 (5)
POD 2	2 (10)
POD 3	2 (10)
POD 4	4 (20)
POD ≥ 5	10 (50)
Upon gas passage	1 (5)
Postoperative immunonutrition	
Never	8 (40)
Only if malnutrition	9 (45)
Always	1 (5)
Other	1 (5)

Therefore, we were interested in analyzing the adoption of the ERAS protocol for gastrectomy among surgical centers in Italy, where the incidence of GC is lower than that in Korea but still remains an important disease in the departments of general and digestive surgery. Gastric resective surgery for cancer in Italy has no centralization [22]. Data from 2019 demonstrated that 5.824 operations for GC were performed in 534 centers. Among them, 249 centers (46.6%) performed less than five resections/year; 27.4% had a volume of at least 20 resections/year [23]. We envision that

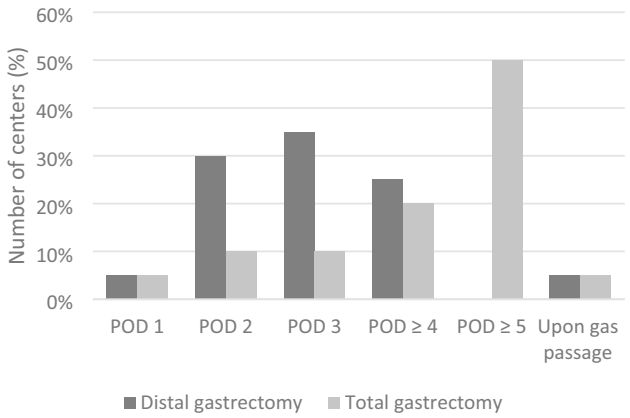

Fig. 4 Postoperative diet initiation

application of the ERAS protocol for gastric resections could be more diffuse among centers with a minimal volume of 20 cases/year, and selected centers affiliated with the GIRCG took part in this survey, considering their possible interest in this subject.

Generally speaking, a specific interest in the perioperative care of these patients was evident since, at the time of the survey, 65% of centers had a structured protocol for the management of patients undergoing GC surgery. However in most of these centers, application of the perioperative protocol was not shared by all of the professionals included in the pathway, and the definition and application of the items of the ERAS protocol were either at the complete discretion of a single healthcare professional or not included in the perioperative routine. This means that only a few centers, at the time of the survey, were effectively sharing the protocol with audits among the various professionals involved. Implementation of ERAS, as reported by others, should be systematic and involve a multidisciplinary team [6, 24]. Multidisciplinary work, patient partnership, evidence-based interventions, and audit are essential elements for the implementation of ERAS programs; these audits should include monitoring and reviews of outcomes during multidisciplinary meetings. Therefore, in many Italian centers, the application of ERAS programs at the time of the survey should be considered with caution.

We should, however, consider that beyond improving the results of surgery for GC, the application of ERAS programs has been more effective when patients were operated on laparoscopically [16]. In Italy, most resections are performed for locally advanced cancers, mainly after perioperative chemotherapy; in these cases, laparoscopic surgery is still not considered a routine approach as per guidelines [25]. This aspect may in part explain the reluctancy of surgeons to apply the ERAS protocol to their gastrectomies. Thirty percent of the centers included in this survey never or occasionally considered laparoscopic surgery for their resections.

However, ERAS programs have also proven to be effective after open surgery with a reduction of postoperative infections [10] and acceleration of patients' postoperative recovery [8, 26]. The applications of ERAS programs, in patients treated with open surgery, can improve patients' recovery and reduce hospital costs without increasing readmission or the need for postdischarge care [25]. Several items in the ERAS programs encompass nutritional problems [27]. Management of the metabolic stress response to surgery is a crucial feature of ERAS protocols; malnutrition and frailty significantly contribute to postoperative morbidity, and nutritional status is a critical factor for recovery after gastrectomy. The prevalence of malnutrition in patients with gastroesophageal cancers [28] is higher than 20%. Therefore, it is usually considered adequate that all patients scheduled for resective gastric surgery require a nutritional risk assessment, and if needed, a preoperative nutritional treatment [29]. In this respect, our survey showed that all participants underwent a preoperative nutritional risk assessment even if a dietary assessment was performed in most centers only in the case of diagnosis of malnutrition. Notwithstanding this, a preoperative long fasting is still considered routine in many centers, probably as a reflection of the absence of a multidisciplinary approach to this problem.

The efficacy of preoperative immune modulating nutrition in reducing postoperative infections has been evaluated by several studies. Although the benefits of immunonutrition in this domain have been reported, [30] no conclusive data are available. More data are available on the benefits of preoperative carbohydrate load, which mitigates the negative effects of overnight fasting [31] and reduces postoperative insulin resistance, with a positive effect on muscle function. A reduction in postoperative stay has been reported for preoperative carbohydrate load in major abdominal surgery [32]. Immunonutrition and carbohydrate-rich drinks are used selectively in most Italian centers with both being routinely used as suggested in the European guidelines [27] in only six centers (30%) [Fig. 1].

Regarding the use of a nasogastric tube after resective surgery, there are ERAS experiences [33], randomized studies [34], systematic reviews [35], and meta-analyses [36] proving that nasogastric decompression is unnecessary after gastrectomy [Fig. 2]. Still, at the time of the survey, a nasogastric tube was inserted in 60% of the participating centers either in all gastric resections (50%) or selectively based on the type of resection (15%); both attitudes were in contrast with the recommendations of the ERAS Society [27]. The use of an abdominal drainage after gastrectomy was considered routine in most centers at the time of the survey. In the same period, a multicenter prospective randomized trial was developed among the GIRCG centers for

patients undergoing gastrectomy for GC [37]. This item will, therefore, be implemented in the various centers based on the results of this trial.

Another very important item in the ERAS protocol is the implementation of early postoperative enteral nutrition, which seems to be effective in accelerating postoperative recovery [38]. Traditional postoperative fasting was still considered routine in most centers at the time of the survey, with 25% of centers initiating a postoperative diet on POD 4 after subtotal gastrectomy and 70% of centers resuming an oral diet on POD 4 (20%) or POD 5 (50%) [Fig. 4]. Postoperative fasting proved ineffective in reducing postoperative complications after elective gastrointestinal surgery, as demonstrated by several randomized studies and meta-analyses [39, 40]. Effectively in our survey, particular attention toward malnutrition and early postoperative enteral feeding was demonstrated by the routine use of a jejunostomy or a naso-jejunal feeding tube in the case of malnourished patients in 50% of centers, with 30% using it routinely in the case of total gastrectomy. The analysis of the results of our survey showed that several evidence-based practices and many items of the ERAS guidelines for gastric surgery were not implemented in real practice in Italian centers with a particular interest in GC surgery at the time of the survey. This is in contrast with another experience within the GIRCG, which demonstrated that there is a significant association between adherence to the ERAS protocol and postoperative outcomes [19].

This analysis was done during the SARS-COV2 pandemic infection, a period when elective surgery was limited in numbers and faced a "disrupted" routine. According to published experiences, during the COVID period, adherence to a structured ERAS protocol has been non-homogeneous, even if the data from the literature are few and discordant [41–44].

The fact that our analysis was performed during this pandemic period did not influence our results since the aim of our research was to establish the existence of specific ERAS programs for oncologic gastric surgery in Italian centers with a particular interest in this aspect and not the results of the application of ERAS protocols.

Conclusions

Our survey showed that the application of ERAS programs in Italian centers with a particular interest in GC is occasional;many important items of the ERAS guidelines are not followed even in the presence of evidence-based data supporting them. One of the main problems in the application of these programs is probably the difficulty in applying a multidisciplinary approach to both defining and evaluating the clinical pathway for these patients. Acceptance of the protocol, registration of patients' data, and periodical audits aimed at discussing the results obtained are the key to success in the application of ERAS philosophy.

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Declarations

Conflict of interest The authors have no conflicts of interest to declare about the present study.

Ethical approval All procedures performed were in accordance with the ethical standards of the institutional and national research committee and with 1964 Helsinki Declaration.

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