ERAS PROTOCOLS AND 24 – 48 H DISCHARGE IN BARIATRIC SURGERY: 10 YEARS EXPERIENCE IN A CENTER OF EXCELLENCE IN THE ITALIAN SETTING

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ABSTRACT

Background: Enhanced Recovery After Surgery (ERAS) has shifted the paradigm of perioperative care. While its benefits are recognized, achieving consistent ultra-short hospital stays in complex bariatric populations remains a challenge. This study reports a decade-long evolution of an ERAS program, evaluating its safety and efficacy in facilitating discharge within 24–48 hours in a high-volume Italian Center of Excellence.

Objectives: The primary objective of this study was to critically evaluate the safety and clinical viability of an ERAS program in a bariatric population over a ten-year period. Specifically, we aimed to analyze whether a standardized multidisciplinary approach could consistently achieve early discharge—defined as 24 to 48 hours postoperatively—without increasing 30-day readmission rates or the incidence of major postoperative complications.

Methods: We conducted a comprehensive retrospective analysis of 986 consecutive bariatric procedures performed under a standardized ERAS protocol between June 2016 and February 2026. The cohort included primary and revisional cases (9.0%)—comprising Laparoscopic Sleeve Gastrectomy (n=469), Roux-en-Y Gastric Bypass (n=475), and One-Anastomosis Gastric Bypass (n=42), with 35 cases performed robotically. Key metrics analyzed were Length of Stay (LOS), 30-day readmission, and postoperative morbidity.

Results: The median operative time was 100 minutes for a population with a mean BMI of 43.1 kg/m2. The protocol demonstrated remarkable efficiency: 60.1% of patients were successfully discharged within 24 hours (POD 1), and 87.8% within 48 hours (POD 2). Despite the enhanced recovery and early discharge, safety was not compromised. Overall, complications occurred in 66 out of 986 patients (6.7%); notably, more than half of these (57.6%, n=38) were classified as minor complications (Clavien-Dindo I-II). Therefore, major complications (Clavien-Dindo III-IV) were reported in only 2.7% of the entire cohort. The 30-day readmission rate was 3.1%, and the mortality rate was 0.10%. The median LOS was established at 1 day.

Conclusions: Ten years of clinical experience confirm that ERAS protocols are safe and highly effective in bariatric surgery. By achieving a discharge rate of 87.8% within the first 48 hours without escalating readmission or complication rates, this institutional model provides a scalable blueprint for optimizing resource utilization and patient recovery across both primary and revisional bariatric surgery in the Italian setting.

INTRODUCTION

The global surge in obesity rates represents one of the most critical public health challenges of the modern era, creating a profound clinical and economic burden worldwide. Faced with the traditional limitations of conservative therapies, bariatric and metabolic surgery has definitively established itself as the gold standard intervention, offering substantial, long-lasting weight reduction and driving the clinical remission of severe, obesity-related metabolic and cardiopulmonary comorbidities. According to the 2022 joint guidelines issued by the American

Society for Metabolic and Bariatric Surgery (ASMBS) and the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO), the indications for surgical intervention have been expanded, recognizing metabolic surgery as an essential, high-impact treatment modality with demonstrated effects on long-term survival and quality of life. [1] While laparoscopic sleeve gastrectomy (SG) and Roux-en-Y gastric bypass (RYGB) continue to serve as the global benchmarks, laparoscopic one-anastomosis gastric bypass (OAGB) has rapidly transitioned from an emerging technique to an internationally validated, frontline standard surgical option. [2,3] Concurrently, high-volume bariatric centers are experiencing a substantial increase in revisional procedures due to inadequate weight loss, weight regain, gastroesophageal reflux disease, or long-term anatomical complications, thereby increasing the complexity of contemporary bariatric practice. [4]

This clinical landscape is being reshaped by rapid technological innovations. The integration of robotic surgical platforms provides surgeons with enhanced ergonomics, superior visualization, and unprecedented dexterity, effectively dismantling the technical barriers imposed by severe visceral adiposity and abdominal wall thickness. [5] Simultaneously, the incorporation of digital health applications and artificial intelligence (AI) into perioperative workflows is paving the way for predictive analytics and highly tailored patient management. [6] However, despite these intraoperative advancements, the inherently fragile physiological profile of patients with morbid obesity—frequently compounded by severe obstructive sleep apnea (OSA), restrictive lung disease, and cardiovascular strain—demands a comprehensive parallel evolution in perioperative care to minimize inherent surgical risks. [7]

In response to this need, the implementation of Enhanced Recovery After Surgery (ERAS) pathways—specifically adapted into Enhanced Recovery After Bariatric Surgery (ERABS) protocols—has revolutionized contemporary perioperative care. [8] Rather than relying on traditional surgical dogmas, ERABS employs a multimodal evidence-based framework engineered to attenuate the surgical stress response, protect organ function, and accelerate post-operative functional recovery. [8,9] This approach begins preoperatively with targeted nutritional optimization and respiratory prehabilitation. Intraoperatively, the protocol mandates goal-directed fluid therapy to prevent fluid overload—protecting tissue perfusion at anastomotic sites—and prioritizes opioid-sparing multimodal analgesia, leveraging regional nerve blocks and non-opioid medications to eliminate the risk of postoperative respiratory depression in vulnerable patients. [8]

Crucially, modern ERABS guidelines, updated by the ERAS Society, have systematically discarded outdated, recovery-delaying interventions. Current standards strongly advocate against the routine use of postoperative nasogastric tubes (NGT) and the prophylactic placement of intra-abdominal drains following bariatric surgery. [8,10] Accumulating evidence confirms that omitting routine drainage reduces postoperative pain and encourages immediate mobilization without masking signs of early complications, such as hemorrhage or staple-line leaks. [10,11] Similarly, avoiding routine nasogastric decompression directly minimizes pharyngeal trauma and pulmonary complications, facilitating immediate postoperative oral hydration and early restoration of gut motility. [8]

The cumulative clinical and economic outcomes of this standardized paradigm are compelling. Evidence from high-volume centers demonstrates that ERABS successfully reduces the length of hospital stay (LOS), postoperative morbidity, surgical site infections, and thromboembolic complications, without increasing 30-day readmission rates. [8,12,13] By reducing clinical variability, ERABS optimizes hospital resource utilization and lowers healthcare costs while enhancing patient satisfaction. [12,16] Nevertheless, implementing consistent ultra-short hospital stays (24 to 48 hours) within highly complex bariatric populations remains an active area of investigation.

To address this evolving paradigm, this study critically evaluates the 10-year experience of a high-volume Italian Center of Excellence following the implementation of a standardized,

multidisciplinary ERAS protocol. The primary objective was to assess the safety, efficacy, and clinical feasibility of early discharge within 24–48 hours after bariatric surgery in a large consecutive cohort undergoing primary and revisional procedures performed via laparoscopic, robotic, and occasionally converted open approaches, with particular focus on length of stay, 30-day readmissions, and postoperative complications stratified according to the Clavien-Dindo classification.

MATERIALS AND METHODS

Study Design, Institutional Setting, and Ethical Framework

This study comprises a comprehensive, single-center retrospective analysis of a large, consecutive cohort of patients who underwent primary or revisional bariatric and metabolic surgery over the period from June 2016 to February 2026 at a high-volume Italian Center of Excellence. The study was conducted in strict accordance with the ethical principles of the Declaration of Helsinki and complied with national regulations regarding retrospective data analyses.

All enrolled candidates met the standardized eligibility criteria for metabolic surgery established by the Italian Society of Obesity Surgery (SICOB) and the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO).

Preoperative Optimization and Multidisciplinary Clinical Workflow

The preoperative phase was characterized by a mandatory, standardized multidisciplinary evaluation. During the initial surgical consultation, a dedicated bariatric surgeon provided a comprehensive explanation of every phase of the care pathway, highlighting the mandatory active participation required from the patient. Parallel, independent counseling sessions were systematically conducted by a staff dietitian and a psychologist. Tobacco cessation was strongly enforced for all active smokers, and a preoperative weight loss target of 5% to 10% was encouraged to reduce visceral adiposity and hepatomegaly. Active alcohol abuse constituted an absolute contraindication to scheduling surgery; this was quantified as a daily intake exceeding 3 standard drinks (equivalent to approximately 14 g of pure alcohol per drink) or a cumulative weekly consumption exceeding 7 drinks for female patients and 14 drinks for male patients.

Prior to hospital admission, patients and their relatives participated in a structured, interactive group counseling session with the full multidisciplinary bariatric team, which included the attending surgeons, anesthetists, dietitians, psychologists, and specialized nursing staff. This educational meeting focused on outlining the intraoperative course, detailing the early postoperative recovery milestones, defining follow-up adherence, and answering patient queries during a final question-and-answer forum.

The standardized preoperative diagnostic work-up for the entire cohort included:

- Complete hematochemical, metabolic, and coagulation profiles.
- Standard chest radiography and 12-lead electrocardiography.
- Upper abdominal ultrasonography, with specific focus on evaluating hepatic steatosis, cholelithiasis, and renal morphology.
- Routine esophagogastroduodenoscopy (EGD) performed under sedation, incorporating systematic random biopsies of the esophagogastric junction, gastric body, and antrum, alongside targeted biopsies of any macroscopically suspected mucosal lesions.
- Obstructive Sleep Apnea (OSA) screening using the STOP-BANG questionnaire, with mandatory nocturnal polysomnography for patients stratified as moderate-to-high risk.
- Advanced cardiopulmonary evaluations or secondary specialist assessments, which were requested on an individual, tailored basis depending on baseline comorbidities and clinical history.

Perioperative Care, Anesthetic Standardization, and Protocol Deviations
Patients were admitted to the surgical ward on the morning of the scheduled operation, maintaining fasting guidelines for solids (6 hours) and clear fluids (2 hours). All surgical procedures were performed by a consistent team of four board-certified, high-volume bariatric surgeons.

Upon transfer to the operating theatre, standardized preoxygenation was performed. Intravenous (IV) antibiotic prophylaxis was administered within 30–60 minutes prior to incision, utilizing either cefazolin (2 g) or clindamycin (600 mg) in cases of documented beta-lactam allergy. To prevent postoperative nausea and vomiting (PONV), a high-dose corticosteroid bolus (IV dexamethasone, 8 mg) was routinely delivered before induction. When performed, Total Intravenous Anesthesia (TIVA) was carried out via target-controlled infusions of propofol and remifentanil, while complete neuromuscular blockade was achieved with cisatracurium. Early in the study period, an opioid-sparing strategy was maintained; a single, restrictive intraoperative dose of morphine (4–5 mg IV) was administered approximately 30 to 60 minutes before the completion of the procedure. Later in the study period, an opioid-free protocol was preferred and applied to the majority of patients.

In compliance with the ERABS guidelines, several traditional, recovery-delaying surgical interventions were omitted. Prophylactic abdominal drains were systematically avoided. Placement was restricted solely to cases with intraoperative evidence of significant, uncorrectable hemostatic instability or an unsatisfactory primary intraoperative leak test. Nasogastric tubes (NGT) were routinely removed in the operating room immediately following the procedure. There was no routine use of indwelling transurethral urinary catheters in the entire study population.

A multimodal, preemptive analgesic regimen was initiated intraoperatively, combining systemic non-opioid agents (IV paracetamol and non-steroidal anti-inflammatory drugs [NSAIDs]) with a specific local anesthetic strategy consisting of pre-incisional port-site infiltration and delayed intraperitoneal irrigation prior to trocar removal, utilizing levobupivacaine at concentrations of 3.75% (20 mL) and 1.875% (80 mL), respectively. Postoperatively, scheduled IV paracetamol (1 g) was administered every 6 to 8 hours before transitioning to the oral route upon the resumption of oral hydration. Secondary NSAIDs, specifically ketorolac (30 mg IV), were administered on a *pro re nata* (PRN) basis as rescue therapy to achieve comprehensive pain optimization, calibrated in accordance with objective patient-reported scores on the Visual Analogue Scale (VAS) and the Numerical Rating Scale (NRS). To establish proactive prophylaxis against common postoperative sequelae, antiemetic therapy consisting of ondansetron (8 mg IV) and gastroprotection utilizing a proton pump inhibitor (pantoprazole, 40 mg IV) were systematically delivered at the conclusion of the surgical procedure. These pharmacological interventions were maintained throughout the postoperative course via a standardized regimen consisting of oral pantoprazole (40 mg administered once daily) and rescue intravenous ondansetron (4 mg IV, prescribed PRN for persistent nausea or emesis).

Standardized Surgical Techniques
The study population underwent a total of 986 consecutive bariatric procedures. Within this cohort, primary procedures constituted 91.0 % (n=897) of the total surgical volume, while revisional surgery accounted for 9.0 % (n=89). The distribution of surgical procedures comprised Laparoscopic Sleeve Gastrectomy (SG, n=469), laparoscopic Roux-en-Y Gastric Bypass (RYGB, n=475), and laparoscopic One-Anastomosis Gastric Bypass (OAGB, n=42). Minimally invasive laparoscopy represented the standard approach, with a subset of 35 complex primary or revisional cases performed utilizing a multi-arm robotic surgical platform.

For RYGB, the procedure involved the creation of a vertically oriented, small-volume gastric pouch of approximately 50 mL. A transverse transection of the lesser curvature was performed using a 45 mm linear stapler at a measured distance of 7-8 cm distal to the gastroesophageal junction. The pouch was completed via two subsequent longitudinal linear stapler firings, calibrated over a 38F bougie. Reconstruction was performed via an antecolic, linear-stapled gastrojejunostomy, followed

by a linear-stapled jejunojejunostomy. The biliopancreatic limb was measured and fixed at 150 cm from the ligament of Treitz, while the alimentary limb was tailored to a standard length of 100 cm.

For SG, the procedure involved the sequential firing of multiple 60 mm linear staplers along the greater gastric curvature. Buttresses were used for the first and last firing. The devascularization and subsequent gastric transection commenced precisely 5 cm proximal to the pylorus, calibrated over a transoral 38F bougie to ensure a uniform, non-obstructed gastric sleeve.

For OAGB, the technique mandated the creation of a long, narrow, vertical gastric pouch calibrated over a 38F bougie. The dissection was initiated horizontally below the Crow's Foot (the anatomical junction of the gastric body and antrum) and extended vertically up to the angle of His. Gastrointestinal continuity was restored via an antecolic Billroth II type loop gastrojejunostomy, utilizing a 180 cm afferent jejunal loop measured from the ligament of Treitz. Common limb length was verified before performing the anastomosis.

For all configurations involving a gastrojejunal anastomosis (RYGB and OAGB), an intraoperative leak test via the intraluminal instillation of methylene blue was systematically performed to assess mechanical and structural sealing.

Postoperative Management and Accelerated Rehabilitation Workflow
Early functional rehabilitation and targeted respiratory care constituted the core components of the postoperative recovery phase. Within 1 to 2 hours following surgical completion, all stable patients were transitioned to an upright, sitting position inside the post-anesthesia care unit (PACU). Patients with a confirmed baseline diagnosis of obstructive sleep apnea (OSA) were immediately placed on standardized postoperative supplemental oxygen therapy and required to resume their specific, preoperatively prescribed continuous positive airway pressure (CPAP) regimens. Fluid balance optimization during the initial 12 postoperative hours was maintained through a restrictive fluid stewardship protocol, consisting of intravenous maintenance crystalloids titrated at a rate of 0.5–1.0 mL/kg/h to avoid fluid overload.

Progressive physical mobilization and oral rehydration targets were initiated on the day of the operative procedure. Patients were actively prompted by the nursing staff to ambulate outside of their beds and were allowed frequent sips of clear fluids. On the morning of the first postoperative day (POD 1), following a formal clinical clearance and nutritional status review by the institutional bariatric staff dietitian, a specialized soft-texture dietary regimen was introduced. This foundational diet incorporated high-protein, easily digestible elements, including clear broths, mashed potatoes, cereal creams, plain yogurt, fruit purees, homogenized vegetables, and pureed meats (infant-grade baby food formula). To mitigate the baseline risk of respiratory atelectasis, diaphragmatic splinting, and hypoxemia, all patients received volume-oriented incentive spirometry devices accompanied by mandatory, structured respiratory physiotherapy exercises performed at regular intervals during hospitalization. In parallel, customized glycemic control protocols, featuring standardized capillary blood glucose monitoring and correction scales, were enforced for all patients with documented pre-existing diabetes mellitus.

Routine postoperative laboratory evaluations and hematochemical panels were omitted for patients exhibiting an uneventful recovery pattern, provided that physiological trends remained stable and within normal homeostatic thresholds. Normal clinical status was defined by the simultaneous absence of pyrexia and tachycardia, characterized objectively as a core body temperature below 38 °C and a resting heart rate below 120 beats per minute (bpm).

Discharge Criteria and Study Endpoints
A rigorous protocol assessed readiness for hospital discharge. Patients were deemed eligible for safe transition to home care upon simultaneously fulfilling the following criteria:

- Optimal pain control managed successfully via exclusive oral analgesia, defined as an NRS score of < 4 calibrated during scheduled oral paracetamol administration (1 g, three times daily).
- Complete functional independence and self-mobilization, defined as the ability to ambulate unassisted along the surgical ward corridor.
- Satisfactory tolerance and adequate caloric-fluid volume intake of both oral liquids and the prescribed soft dietary steps without abdominal distress or nausea.
- Absence of clinical, systemic, or localized signs suggesting infectious complications or surgical site issues.

The primary and secondary clinical endpoints tracked within this investigation included the overall rate and severity of acute postoperative complications, quantified and classified according to the validated Clavien-Dindo grading system, total LOS recorded in days, and the incidence of unplanned 30-day hospital readmissions.

Statistical Analysis

All statistical analyses were executed using GraphPad Software (GraphPad Software Inc., Boston, MA, USA). Descriptive statistics were utilized to summarize baseline data; continuous variables were expressed as means accompanied by their corresponding standard deviations (SD), whereas categorical and ordinal variables were presented as absolute frequencies (counts) and relative percentages. Differences among categorical variables and proportions were analyzed using Fisher's exact test or the chi-squared (χ^2) test where appropriate. Continuous variables displaying normal distribution characteristics were evaluated using the independent Student's *t*-test. For all analytical measurements, a two-tailed *p*-value of less than 0.05 ($p < 0.05$) was established as the formal threshold for determining statistical significance.

RESULTS

Baseline Demographics and Cohort Characteristics

Between June 2016 and February 2026, a consecutive series of 986 patients underwent bariatric and metabolic surgery for morbid obesity at the Department of Surgery of San Giovanni Hospital, Gorizia. The baseline demographic, anthropometric and clinical features of the study population are summarized in Table 1. Within this definitive cohort, primary bariatric procedures constituted 91.0% (n=897) of the total surgical volume, whereas secondary or revisional surgery (redo procedures following previous gastric banding or other primary bariatric interventions) accounted for the remaining 9.0% (n=89).

The overall distribution of the surgical techniques comprised: SG 47.6% (469/986), RYGB 48.2% (475/986), and OAGB 4.3% (42/986).

Table 1. Baseline demographic, anthropometric and clinical profile of the study population (N=986)

Characteristic	n or value	% of total cohort
Cohort size	986	100.0
Age, years	47 ± 11.0*	—
BMI, kg/m²	43.1 ± 6.1*	—
Female	734	74.4
Male	252	25.6
Diabetes Mellitus	359	36.4
Dyslipidemia	433	43.9
Arterial hypertension	416	42.2
Obstructive sleep apnea syndrome (OSAS)	297	30.1
Arthropathy	176	17.8
Other comorbidities**	588	59.6
Ketogenic diet before surgery	102	10.3

** Mean ± SD*

***Other comorbidities include GERD, peptic ulcer disease, coagulation disorders, thyroid dysfunction, neurological disorders, cardiovascular diseases, and other medical conditions. Comorbidity categories are not mutually exclusive.*

Stratification by operative platform revealed that 98.9% of the SG procedures (464/469) were executed via standard laparoscopy, while 1.1% (5/469) required a robot-assisted approach. In the RYGB subgroup, 94.9% (451/475) were completed laparoscopically and 5.1% (24/475) were performed utilizing the robotic platform. Lastly, within the OAGB subgroup, 85.7% (36/42) were laparoscopic and 14.3% (6/42) were robot-assisted. Across all surgical techniques, the cumulative volume of robot-assisted cases amounted to 35 procedures.

The mean baseline Body Mass Index (BMI) of the enrolled cohort was 43.1±6.1 kg/m^2, and the mean age at the time of the operative procedure was 47±11.0 years.

Intraoperative Metrics and Concomitant Procedures

The overall cohort exhibited a median operative time of 100 minutes (range, 45–360 minutes). All surgical interventions were successfully initiated via minimally invasive approaches. Open laparotomic conversion was required in only 0.2% (n=2) of cases, necessitated by the intraoperative finding of dense, extensive intraperitoneal adhesions secondary to major prior abdominal surgeries. Concomitant cholecystectomy for documented symptomatic cholelithiasis was simultaneously performed in 8.0% (n=79) of the study population. The technical distribution of these concurrent cholecystectomies included 7.6% (n=6) during OAGB, 81.0% (n=64) during RYGB, and 11.4% (n=9) during SG. Table 2 summarizes the key perioperative findings and short-term clinical outcomes of the entire cohort.

Table 2. Key Perioperative Findings and Outcomes

Characteristic	n or value	% of total cohort
Study period	June 2016 – February 2026	
Total procedures	986	100
Primary surgery	897	91.0
Revisional surgery	89	9.0
Sleeve Gastrectomy (SG)	469	47.6
Roux-en-Y Gastric Bypass (RYGB)	475	48.2
One-Anastomosis Gastric Bypass (OAGB)	42	4.3
Laparoscopic procedures	951	96.5
Robotic-assisted cases	35	3.6
Conversion to open surgery	2	0.2
Concomitant cholecystectomy	79	8.0
Median operative time, min	100 (range: 45–360)	
Intra-abdominal drain placement	149	15.1
Drain trend (chi-squared for linear trend)	$\chi^2 = 43.61$; $p < 0.0001$	
Postoperative ICU surveillance	26	2.6
Median LOS, days	1 (range: 1–50)	
Mean LOS, days	1.8 ± 2.5*	
Discharged on POD 1 (within 24h)	593	60.1
Discharged on POD 2 (within 48h)	273	27.7
Discharged within 48h	866	87.8
Hospital stay >48 h	120	12.2
Early postoperative complications**	66	6.7
Minor complications (Clavien-Dindo I–II)	38	3.9
Major complications (Clavien-Dindo III–IV)	27	2.7
Postoperative mortality (Clavien-Dindo V)	1	0.10
30-day readmissions	31	3.1
Readmissions discharged within 48h	24/31	77.4***

** Mean ± SD*

*** defined as ≤30-day after surgery*

*** of the 30-day readmissions

Protocol Adherence: Intra-abdominal Drainage

In alignment with the progressive implementation and maturation of the ERABS pathway, the placement of prophylactic intra-abdominal drainage was restricted. Overall, a surgical drain was left in place postoperatively in 15.1% (n=149) of the total patient population.

Chronological trend analysis demonstrated a statistically significant decline in prophylactic intra-abdominal drain utilization over time following the programmatic introduction and maturation of the institutional ERABS framework (Chi-squared test for linear trend: $\chi^2 = 43.61$; $p < 0.0001$). Specifically, 15 drainages were placed in 2016 (46.9% of the annual surgical volume), followed by

30 in 2017 (31.3%), 29 in 2018 (26.9%), 16 in 2019 (14.8%), 5 in 2020 (5.9%), 4 in 2021 (5.0%), 8 in 2022 (7.7%), 9 in 2023 (6.8%), 20 in 2024 (15.9%), 12 in 2025 (11.4%), and only 1 drainage during the initial two months of 2026 (11.1%). The annual distribution of drainage cases is presented in Table 3. Anatomically, surgical drains were distributed across 43 cases within the SG cohort (9.2% of all SGs), 98 cases within the RYGB cohort (20.6% of all RYGBs), and 8 cases within the OAGB cohort (19.0% of all OAGBs). Notably, a transient increase in drain placement was observed in 2024 (n=20; 15.9%), a year in which revisional cases accounted for 13 of 126 procedures (10.3%). This relative concentration of complex redo procedures during 2024 likely contributed to the observed deviation from the prevailing downward trajectory in drain utilization. As such, the overall pattern is most accurately characterized as a significant long-term decline rather than a monotonic year-by-year reduction, with the 2024 inflection point reflecting the inherently higher technical complexity and associated risk profile of the revisional surgical subgroup.

Table 3. Annual Distribution of Procedures, Redo Cases, Drain Placement Rate, Mean LOS and LOS change vs 2016 (2016–2026)

Year	Total Cases (n)	Redo Cases	Drains Placed	Mean LOS (days)	LOS Change vs 2016
2016	32	2 (6.3%)	15 (46.9%)	5.0 ± 8.9	—
2017	96	9 (9.4%)	30 (31.3%)	2.2 ± 1.3	↓ 56%
2018	108	14 (13.0%)	29 (26.9%)	1.7 ± 1.3	↓ 66%
2019	108	9 (8.3%)	16 (14.8%)	1.9 ± 2.4	↓ 62%
2020	85	4 (4.7%)	5 (5.9%)	1.9 ± 3.0	↓ 62%
2021	80	3 (3.8%)	4 (5.0%)	1.5 ± 1.8	↓ 70%
2022	104	13 (12.5%)	8 (7.7%)	1.4 ± 0.8	↓ 72%
2023	133	14 (10.5%)	9 (6.8%)	1.5 ± 1.4	↓ 70%
2024	126	13 (10.3%)	20 (15.9%)	1.8 ± 2.7	↓ 64%
2025	105	7 (6.7%)	12 (11.4%)	1.5 ± 1.1	↓ 70%
2026 (Jan–Feb)	9	1 (11.1%)	1 (11.1%)	1.0 ± 0	↓ 80%
Overall	986	89 (9.0%)	149 (15.1%)	1.8 ± 2.5 (Median: 1)	—

Table 4. Distribution of Surgical Approach, Drain Placement, and Early Discharge by Bariatric Technique

	SG (n=469)	RYGB (n=475)	OAGB (n=42)
Primary procedures	98.7% (463)	90.1% (428)	14.3% (6)
Laparoscopic approach	98.9% (464)	94.9% (451)	85.7% (36)
Robotic approach	1.1% (5)	5.1% (24)	14.3% (6)
Concomitant cholecystectomy	1.9% (9)	13.5% (64)	14.3% (6)
Intra-abdominal drain placement	9.2% (43)	20.6% (98)	19.0% (8)
Discharge on POD 1	61.2% (287)	57.9% (275)	73.8% (31)
Discharge on POD 2	27.9% (131)	28.2% (134)	19.1% (8)
Discharge within 48h	89.1% (418)	86.1% (409)	92.9% (39)

Postoperative Monitoring

All patients were admitted to a post-anesthesia care unit (PACU) after surgery to be monitored for 2 to 4 hours. Postoperative intensive care unit (ICU) surveillance was required in 2.6% of the total cohort (n=26).

Readmissions and Early Outcomes

Within the subset of patients requiring postoperative ICU surveillance, only three patients required 30-day hospital readmission following index discharge; these individuals had initially been discharged on postoperative days 1, 2, and 4, respectively, before developing the clinical sequelae that prompted their return.

When examining the entire study population, the 30-day readmission cohort encompassed 31 cases (3.1%). Of these readmitted patients, 77.4% (24/31) had originally been discharged within 48 hours of the index procedure, including 17 on postoperative day 1 and 7 on postoperative day 2. Within the readmitted subgroup, 83.9% (26/31) presented with an underlying early complication, which was evenly distributed between minor (Clavien–Dindo grades I–II, n=13) and severe (Clavien–Dindo grades III–IV, n=13) adverse events. The remaining 5 readmissions were therefore not associated with a documented early complication classified within these categories.

From a holistic perspective, early 30-day postoperative complications occurred in 66 patients (6.7%) across the entire cohort. Among these, 38 experienced minor adverse events (Clavien–Dindo grades I–II), presenting predominantly as self-limiting hemorrhage, transient pyrexia of unknown origin, or minor respiratory tract infections. Conversely, 28 patients developed severe complications (Clavien–Dindo grades III–V)—including major hemorrhage, staple-line or anastomotic leaks, and deep intra-abdominal collections—requiring invasive endoscopic, radiological, or surgical reintervention. This severe-complication count includes the single postoperative death (grade V): one patient with multiple, severe pre-existing comorbidities died following a protracted hospital stay, yielding an overall perioperative mortality rate of 0.10%.

The cohort exhibited a median LOS of 1 day (range 1–50) and an overall mean LOS of 1.8 ± 2.5 days. This represents a reduction of more than 50% compared to the historical institutional baseline prior to the adoption of the ERAS pathway. Chronological stratification of the data revealed a progressive and significant decline in hospitalization duration over the 10-year study period, which was achieved without compromising patient safety or increasing readmission rates. Specifically, the mean LOS evolved from an initial 5.0 ± 8.9 days in 2016 to 2.2 ± 1.3 days in 2017, 1.7 ± 1.3 days in 2018, 1.9 ± 2.4 days in 2019, 1.9 ± 3.0 days in 2020, 1.5 ± 1.8 days in 2021, 1.4 ± 0.8 days in 2022, 1.5 ± 1.4 days in 2023, 1.8 ± 2.7 days in 2024, 1.5 ± 1.1 days in 2025, and reached an optimal 1.0 ± 0 days during the initial two months of 2026 ($p < 0.05$).

Regarding the timeline of patient discharge, 593 (60.1%) individuals were safely transferred home by the first postoperative day, followed by an additional 273 (27.7%) on the second postoperative day. Collectively, 866 of 986 patients (87.8%) were discharged within 48 hours of the index procedure. When analyzed by specific procedural configuration, successful ultra-short discharge within 24 hours of surgery was accomplished in 61.2% (287/469) of patients undergoing sleeve gastrectomy (SG), 57.9% (275/475) of those undergoing Roux-en-Y gastric bypass (RYGB), and 73.8% (31/42) of the one-anastomosis gastric bypass (OAGB) cohort. Discharge on the second postoperative day was recorded in 27.9% (131/469), 28.2% (134/475), and 19.1% (8/42) of the SG, RYGB, and OAGB subgroups, respectively. Prolonged hospitalization was predominantly driven by suboptimal pain control via the oral route, insufficient oral fluid intake, persistent nausea, or non-clinical logistical and social factors, such as geographical distance or a lack of domestic support. Crucially, the entire cohort of uncomplicated patients—defined by an uneventful clinical course—remained entirely opioid-free, requiring exclusively oral paracetamol for postoperative pain management both on the surgical ward and following discharge.

DISCUSSION

This study presents one of the largest single-center longitudinal analyses of the clinical implementation of a standardized ERABS protocol in bariatric surgery, encompassing 986 consecutive procedures over a 10-year period. The primary findings corroborate and extend the existing evidence base: the systematic adoption of ERABS in a high-volume Italian Center of Excellence was associated with a progressive, statistically significant reduction in mean length of hospital stay—from 5.0 ± 8.9 days in 2016 to 1.0 ± 0 days by the final study period, with an overall median LOS of 1 day—without a concomitant increase in 30-day readmission rates or overall postoperative morbidity. These results reinforce the shift from traditional, resource-intensive perioperative care toward evidence-based, patient-centered accelerated recovery pathways in bariatric surgery, consistent with current ERAS Society guidelines for the bariatric setting. [8,14]

ERABS Implementation and Length of Hospital Stay

The progressive and significant decline in LOS observed across the study period is consistent with the broader international experience. A systematic review and meta-analysis by Zhou et al. comprising 17 studies and over 8,000 patients demonstrated that ERABS implementation was associated with a significant reduction in LOS without any increase in complication rates or readmissions, and was additionally associated with a significant reduction in PONV—a leading driver of unplanned readmissions in bariatric populations. [15] More recently, a large single-

institution study demonstrated that the adoption of an ERAS protocol in bariatric surgery was independently associated with a 28% reduction in LOS (incidence rate ratio 0.72; $p < 0.001$), a reduction in median cost of approximately $2,230, and a 52% lower odds of 30-day unplanned readmission (OR 0.48; $p < 0.001$)—findings that are in close concordance with our institutional experience. [16] The earliest reports from high-volume bariatric centers, such as the Humanitas Research Hospital (Milan), similarly documented a reduction in LOS from 4.7 to 2.1 days following ERABS implementation, with a readmission rate of 0.9% and an early complication rate of 3.5% in a cohort of 2,400 consecutive patients, which aligns with our observed 30-day readmission rate of 3.1% and overall early complication rate of 6.7%. [17]

Crucially, ERAS protocol adherence appears to exert a dose-dependent effect on outcomes. A propensity-matched analysis demonstrated that full protocol compliance was associated with an 83% reduction in odds of postoperative complications and a 31% reduction in LOS compared to pre-ERAS care, with even partial adherence yielding a 54% reduction in complication odds. [18] These findings support the institutional commitment to protocol fidelity observed in the present cohort, where the progressive maturation of the ERABS pathway—evidenced most clearly by the chronological reduction in prophylactic drainage utilization—directly correlated with improvements in perioperative outcomes. Early systematic reviews on ERABS, including those by Lemanu et al. and Ahmed et al., consistently reported significant reductions in LOS without any increase in morbidity or 30-day readmission, thereby establishing the evidence base upon which the institutional protocol described herein was progressively refined. [12]

Safety of Ultra-Short Hospitalization and Same-Day Discharge

The finding that 60.1% of patients were safely discharged on postoperative day 1 and an additional 27.7% by day 2—collectively representing 87.8% of the cohort achieving discharge within 48 hours—places this institutional experience at the forefront of international reporting on accelerated discharge in bariatric surgery. The feasibility and safety of same-day or 24-hour discharge following bariatric procedures have been increasingly investigated. A systematic review and meta-analysis by Vanetta et al. evaluated outcomes of same-day discharge (SDD) following both sleeve gastrectomy and Roux-en-Y gastric bypass, concluding that SDD was associated with comparable complication and readmission rates to overnight hospitalization when guided by rigorous institutional protocols and appropriate patient selection criteria. [19] A contemporaneous review synthesizing literature from 2016 to 2024 confirmed that same-day discharge sleeve gastrectomy demonstrates complication and readmission rates equivalent to inpatient care under strict protocols and patient selection, while noting that large-scale database studies occasionally identify slight increases in emergency department visits and complications during periods of rapid and less-selective adoption. Similar trends are seen with same-day Roux-en-Y gastric bypass (SD-RYGB). [20]

A propensity score-matched analysis using the Dutch national bariatric registry specifically evaluated same-day discharge gastric bypass against overnight hospitalization and provided further evidence for the safety of this model in carefully selected populations, demonstrating no increased risk of short-term severe complications, reoperations, or mortality. [21] More recently, a retrospective cohort study of 457 same-day discharge bariatric cases—encompassing primary and revisional procedures as well as concomitant operations performed at a free-standing ambulatory center—demonstrated that outpatient bariatric surgery was associated with promising short-term safety outcomes. [22] The present cohort, which achieved a 30-day readmission rate of 3.1% and an overall early complication rate of 6.7% in the context of an 87.8% ultra-short discharge rate, appears favorably comparable to these international benchmarks, thereby providing robust institutional validation for the safety of this accelerated discharge model across a heterogeneous bariatric population including both primary and revisional procedures performed via laparoscopic, robotic, and converted (n=2) approaches.

Of the 31 readmitted patients (3.1%), 83.9% presented with an underlying early complication, and the distribution between minor (Clavien-Dindo I–II) and severe (Clavien-Dindo III–IV) adverse events was equal. Importantly, this finding does not suggest that ultra-short discharge precipitated

these complications; rather, it reflects the expected postoperative morbidity profile of a complex, high-risk surgical population, in which early complications manifest independently of the duration of initial hospitalization. This interpretation is further supported by the observation that prolonged in-hospital stays were driven by pain control failure, persistent PONV, insufficient oral tolerance, and non-clinical logistical factors—all modifiable variables—rather than occult surgical complications that remained undetected at discharge.

Prophylactic Drainage Abandonment: Temporal Evolution and Safety
One of the most clinically significant findings of this longitudinal analysis is the progressive, statistically significant decline in prophylactic intra-abdominal drain placement over the 10-year study period (chi-squared test for linear trend: $\chi^2 = 43.61$; $p < 0.0001$), reflecting the progressive implementation and maturation of ERABS principles at the institutional level. The overall drain placement rate of 15.1%—representing a near-complete elimination of routine drainage by the latter years of the study—aligns with current ERAS Society recommendations, which strongly advise against prophylactic drainage following bariatric surgery. [8] These recommendations are supported by robust evidence demonstrating that prophylactic drains neither reliably detect early complications such as anastomotic leaks or hemorrhage nor reduce their severity when they occur, while being independently associated with increased postoperative pain, restricted early mobilization, and prolonged hospitalization. [10,11] The broader gastrointestinal surgery evidence base consistently affirms that drain omission is safe in elective procedures when intraoperative hemostasis is satisfactory and leak testing is negative [11]—conditions systematically fulfilled in the present cohort via routine intraoperative methylene blue leak testing across all anastomotic configurations.

Opioid-Free Analgesia as a Cornerstone of Accelerated Recovery
A clinically significant finding of the present study is the progressive institutional evolution toward a fully opioid-free postoperative analgesia protocol, culminating in the observation that all uncomplicated patients were managed exclusively with oral paracetamol—without any opioid requirement—both on the ward and following discharge. This achievement is particularly significant given the unique physiological vulnerability of the morbidly obese patient to opioid-induced respiratory depression, hypoxemia, and PONV, all of which are recognized inhibitors of early mobilization and barriers to timely discharge. [7,8]

The progressive institutional shift from an opioid-sparing strategy (single restricted intraoperative morphine dose) to a fully opioid-free protocol mirrors the trajectory reported in the international literature. A prospective randomized controlled trial by Dagher et al. (2025), enrolling 58 obese patients undergoing bariatric surgery, demonstrated that an OFA regimen incorporating the combination of lidocaine, ketamine, magnesium sulfate, dexmedetomidine, and dexamethasone was associated with a statistically significant reduction in postoperative morphine consumption compared to traditional Opioid-Based Anesthesia (OBA) (median 8 mg vs. 19 mg; $p < 0.001$), with morphine requirements reaching zero beyond the 24th postoperative hour in the OFA group. Pain scores assessed by visual analogue scale (VAS) at rest, during movement, and during coughing were significantly lower in the OFA group across the 48-hour postoperative period, while hemodynamic stability was fully preserved, with no significant intergroup differences in episodes of hypotension, bradycardia, or vasopressor requirements. Notably, patient satisfaction at 48 hours was significantly higher in the OFA group, with 65% of patients reporting a global satisfaction score of ≥ 8/10 compared to 28% in the OBA group ($p = 0.003$). [23]

The analgesic strategy employed in the present cohort—combining preemptive local anesthetic infiltration (levobupivacaine port-site infiltration and delayed intraperitoneal irrigation), systemic non-opioid agents (intravenous paracetamol and NSAIDs), and targeted pharmacological PONV prophylaxis (dexamethasone and ondansetron)—is consistent with the multimodal framework advocated by current ERABS guidelines. [8] A meta-analysis of randomized controlled studies by Hung et al. specifically evaluating the impact of OFA in bariatric surgery demonstrated that OFA was associated with improved postoperative pain outcomes in the immediate postoperative period and at 24 hours, as well as a significant reduction in PONV incidence, without, however, producing

a significant reduction in total opioid consumption at 24 hours postoperatively — a finding that underscores the importance of complementary multimodal analgesic strategies within the ERABS framework. [24] The clinical significance of achieving a completely opioid-free postoperative course in the uncomplicated cohort extends beyond analgesic outcomes *per se*: it facilitates earlier resumption of oral intake, earlier mobilization, and a reduced need for rescue antiemetics—all of which are direct enablers of the ultra-short discharge rates achieved in this series.

Revisional Surgery Within an ERABS Framework

Revisional bariatric surgery accounted for 9.0% of the study population (n=89 of 986 total procedures)—a proportion consistent with contemporary epidemiological trends reflecting the growing clinical demand for redo procedures driven by inadequate weight loss, weight regain, or long-term anatomical complications following primary interventions. [4] The annual distribution of revisional cases ranged from 2 cases in 2016 to a peak of 14 cases in both 2018 and 2023, with a total of 89 redo procedures performed across the study period. Notably, 2024 recorded 13 revisional procedures out of 126 total cases (10.3%), which, in conjunction with a higher absolute volume of complex primary cases, contextualizes the transient increase in prophylactic drain placement observed that year. This growing subset of bariatric practice is inherently more technically demanding than primary surgery, involving altered anatomy, dense adhesions, and significantly heightened procedural risk. A large retrospective cohort analysis of 10,589 patients from the MBSAQIP database confirmed that revisional procedures for inadequate weight loss/persistent obesity were independently associated with a 49% higher odds of serious complications compared to primary bariatric surgery (OR 1.49; 95% CI 1.36–1.64; $p < 0.001$), underscoring the procedural risk differential. [25] Similarly, a focused analysis of 4,412 revisional procedures performed for gastroesophageal reflux disease documented a major complication rate (defined as Clavien-Dindo ≥ III) of 11.9% and a 30-day mortality of 0.23%—figures substantially exceeding those typically encountered in primary procedures. [26] The capacity to safely achieve ultra-short discharge in a mixed cohort including revisional cases—without stratifying or excluding this higher-complexity subgroup from accelerated recovery pathways—represents a clinically meaningful demonstration of the robustness and adaptability of the institutional ERABS protocol.

Role of the Robotic Surgical Platform

The selective integration of robotic-assisted surgery in 35 cases (3.6% of the total cohort), predominantly for complex primary and revisional procedures, reflects an evidence-based utilization strategy rather than broad-based platform adoption. A systematic review and meta-analysis by Leang et al. demonstrated no significant difference in key perioperative outcome measures—including complication rate, anastomotic leak, anastomotic stricture, surgical site infection, hospital readmission, length of stay, conversion rate, and mortality—between robotic and laparoscopic gastric bypass, although robotic surgery was associated with a slightly higher 30-day reoperation rate (4.4% vs. 3.4%; OR 1.31; $p = 0.027$). The authors noted that the mechanical advantages of the robotic platform are likely to translate into clinically meaningful benefit in more technically demanding cases, particularly revisional gastric bypass—precisely the indication profile for which robotic assistance was employed in the present series. [27] This interpretation is further reinforced by a large MBSAQIP database analysis of over 40,000 revisional bariatric cases, which demonstrated that robotic revisional RYGB was associated with significantly lower overall morbidity (4.8% vs. 6.2%; $p < 0.001$), lower blood transfusion rates (1.0% vs. 1.5%; $p < 0.05$), significantly fewer superficial surgical site infections (0.4% vs. 1.2%; $p < 0.001$), and shorter LOS (1.76 vs. 1.87 days; $p < 0.001$) compared to laparoscopic revisional RYGB—establishing a compelling evidence base for selective robotic deployment in revisional bypass surgery. [28] The institutional experience described herein, in which robotic assistance was reserved for the most technically challenging cases, is thus aligned with the emerging consensus favoring indication-driven robotic deployment rather than universal platform adoption. [5]

Multidisciplinary Preoperative Optimization: The Foundation of ERABS Success

The clinical outcomes reported in this series cannot be divorced from the rigorous, structured preoperative optimization pathway that preceded every surgical intervention. The mandatory

multidisciplinary evaluation—encompassing dietary counseling, psychological assessment, OSA screening with selective nocturnal polysomnography, comprehensive endoscopic and histological upper gastrointestinal assessment, and structured interactive group educational sessions involving the full perioperative team—constitutes the foundational substrate upon which the accelerated postoperative recovery pathway operates. Current ERAS Society guidelines for bariatric surgery emphasize preoperative optimization as a non-negotiable prerequisite for the safe implementation of accelerated discharge protocols, with particular attention to respiratory prehabilitation, nutritional conditioning, and OSA management. [8] Obstructive sleep apnea represents a particularly significant perioperative risk factor in the bariatric population, and its systematic preoperative diagnosis and immediate postoperative CPAP reinstitution—as consistently observed in the present cohort—directly mitigates the principal respiratory risk inherent to the early postoperative period, thereby enabling earlier safe discharge without exposing vulnerable patients to unmonitored nocturnal hypoventilation. [7]

LIMITATIONS

This study carries the intrinsic limitations of a retrospective, single-center design, which precludes the establishment of definitive causal relationships and limits the external generalizability of the findings to other institutional settings and patient populations. The absence of a concurrent or historical comparator group managed without an ERABS protocol represents a constraint on the direct attribution of outcome improvements to specific protocol elements. Furthermore, the lack of systematic long-term follow-up data beyond the 30-day perioperative window precludes the evaluation of medium- and long-term outcomes, including weight loss trajectory, metabolic remission rates, and late revisional surgery requirements. Quality-of-life outcomes and patient-reported experience measures were also not systematically captured within the current analysis. Future prospective, multicenter studies with standardized protocol fidelity metrics, patient-reported outcomes, and comprehensive long-term follow-up are warranted to further consolidate and validate the findings reported herein.

CONCLUSIONS

The present 10-year institutional experience demonstrates that a standardized, multidisciplinary ERABS protocol can be safely and effectively implemented across a diverse, high-complexity bariatric population—encompassing primary and revisional procedures performed via laparoscopic and robotic approaches—with progressive improvements in LOS and preservation of excellent perioperative safety profiles. The progressive abandonment of prophylactic drainage, the systematic transition toward opioid-free analgesia, and the achievement of ultra-short discharge within 48 hours in 87.8% of patients without a corresponding increase in 30-day readmissions or morbidity collectively support the clinical and institutional framework described herein. These findings provide a robust evidence base for the adoption of similar ERABS-based accelerated care models in high-volume bariatric centers of excellence.

DECLARATIONS

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: The authors declare that they have no competing financial or non-financial interests that could inappropriately influence or bias the content, methodology, or conclusions of this work.

Ethical Approval

All procedures performed in studies involving human participants were conducted in strict accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This retrospective study was formally approved by the institutional review board of the participating center.

Informed Consent
Informed consent was obtained from all individual participants included in the study prior to surgical intervention, ensuring full comprehension of data utilization for institutional clinical research.

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