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ORIGINAL CONTRIBUTIONS

Evaluation of Postoperative Care Protocol for Roux-en-Y Gastric Bypass Patients with Same-Day Discharge

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Abstract

Introduction Same-day discharge (SDD) after bariatric surgery is increasingly being performed and is safe with careful patient selection. However, detecting early complications during the first postoperative days can be challenging. We developed a postoperative care protocol for these patients and aimed to evaluate its effectiveness in detecting complications and monitoring patient recovery.

Methods A single-center retrospective observational study was conducted with patients with who underwent Roux-en-Y Gastric Bypass (RYGB) with successful SDD. The study evaluated the effectiveness of the safety net that included simple remote monitoring with a pulsoximeter and thermometer, a phone consultation on postoperative day (POD) 1, and a physical consultation on POD 2–4. Furthermore, an analysis was performed on various factors including pain scores, painkiller usage, and incidences of nausea and vomiting on POD 1.

Results In this study, 373 consecutive patients were included, of whom 19 (5.1%) were readmitted until POD 4. Among these, 12 patients (3.2%) reached out to the hospital themselves, while 7 (1.9%) were readmitted after phone or physical consultations. Ten of the readmitted patients had tachycardia. On POD 1, the mean numeric rating scale was 4 ± 2, and 96.6% of the patients used acetaminophen, 35.5% used naproxen, and 9.7% used oxynorm. Of the patients, 13.9% experienced nausea and 6.7% reported vomiting.

Conclusion A postoperative care protocol for SDD after RYGB, comprising simple remote monitoring along with a phone consultation on POD 1 and a physical checkup on POD 2–4, was effective in monitoring patient recovery and detecting all early complications.

Keywords Roux-en-Y gastric bypass · Same-day discharge · Postoperative care · Safety net · Monitoring

Introduction

The prevalence of obesity has surpassed one billion individuals worldwide and continues to rise [1]. Bariatric and metabolic surgery has been demonstrated to be effective and safe as a treatment for obesity, leading to an increase in the number of bariatric procedures performed [2, 3]. The COVID-19 pandemic and local staff shortages have increased the burden on hospital capacity globally, necessitating the development of innovative care pathways to address this high demand.

The development of enhanced recovery after bariatric surgery (ERABS) has led to guidelines regarding optimal perioperative care in bariatric and metabolic surgery. This includes a multimodal approach for analgesia and postoperative nausea and vomiting (PONV) and early mobilization after surgery [4]. One key benefit of implementing

Key Points
The safety net includes remote monitoring, a phone and physical consultation.
Early complications following SDD are effectively detected using the safety net.
We reported low use of NSAIDs and opioids among SDD patients.
The extent of the role of remote monitoring requires further investigation.

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ERABS protocols in bariatric and metabolic surgery is that it has been shown to effectively shorten the length of hospital stay, without increasing morbidity or compromising patient safety [5–8]. Expanding on the success of ERABS, a new and promising healthcare pathway has emerged that enables same-day discharge (SDD) following laparoscopic Roux-en-Y Gastric Bypass (RYGB). Same-day discharge involves discharging patients on the same day as their surgery, without requiring overnight hospitalization. An increasing amount of published data suggests that bariatric surgery with same-day discharge is a safe option, as long as the patients are carefully selected [9–18].

A key component of the SDD care pathway is the establishment of a safety net for patients after discharge, including monitoring for early detection of complications and hospital accessibility. Currently, there is a lack of knowledge and experience on the best approach for remote monitoring following bariatric surgery, and this uncertainty may cause hesitation among hospitals to adopt same-day discharge. While numerous modalities are available and ongoing innovations are being developed, there is no consensus on the optimal method for remote monitoring [12, 13, 19–22].

Same-day discharge after laparoscopic RYGB was implemented in 2020 in our hospital, and over 800 patients have been treated since implementation. We hypothesize that the postoperative care protocol that we have implemented, which includes a simple approach to remote monitoring in combination with two consultations, is adequate and can enhance the safety of same-day discharge following laparoscopic RYGB.

Methods

A retrospective observational study was performed in a high-volume bariatric center in the Netherlands. All patients undergoing laparoscopic Roux-en-Y gastric bypass with successful same-day discharge and a registered phone consultation on POD 1 were included. For this study, the local Medical Ethics Committee waived the need to obtain informed consent.

Same-day Discharge Protocol

The study population consisted of patients with same-day discharge after primary laparoscopic RYGB. Patients had to meet the criteria for bariatric surgery according to the International Federation for the surgery of obesity and metabolic disorders (IFSO) [23]. The protocol for SDD has been previously published [17]. To summarize, strict selection criteria had to be met in order to be discharged on the same day of the surgery, as presented in Table 1. These criteria aimed to exclude patients at high risk of complications, such as those with cardiovascular diseases, those taking anticoagulants, or those with a body mass index (BMI) greater than 50 kg/m^2. In addition, it was required that an informal caregiver be present during the first 24 h after surgery, and the maximum travel time to the hospital was set at 45 min. The SDD in our study was based on the ERABS concept, which emphasizes early mobilization, optimizing pain management by using multimodal analgesia, and standardized oral medication

Table 1 Selection and discharge criteria

Preoperative selection criteria for intended SDD
- BMI 35–50 kg/m^2
- Age 18–65 years
- No cardiovascular disease (i.e., history of myocardial infarction, heart rhythm disorder), poorly controlled diabetes mellitus or use of insulin, and coagulation abnormalities or use of anticoagulants
- No severe pulmonary disease or OSA with AHI > 15 without the use of CPAP
- No history of major abdominal surgery, including laparotomy
- Approval of intended SDD by both surgeon and anesthesiologist
- Ability to understand and use the remote medical devices
- Residing within a maximum of 45-min travel time to the hospital
- An informal caregiver is available for the first 24 h following hospital discharge
Postoperative criteria for approval of SDD
- No abnormalities or complications during the surgical procedure
- No anesthetic abnormalities or complications
- No severe pain (NRS > 4 with analgesics) or clinically important PONV[a]
- Minimum oral intake of 200 ml of fluids postoperatively
- Normal vital signs after 6 h of observation[b]
- Maximum decrease in hemoglobin-level postoperative of 1.0 mmol/L
- Approval of bariatric surgeon and patient for discharge

[a]Clinically important PONV is defined as: a continuous feeling of nausea with vomiting more than once [24]

[b]Divergent vital signs defined as: tachycardia > 100 bpm, temperature > 38 °C, oxygen saturation < 95% [25]

BMI, body mass index; *CPAP*, continuous positive airway pressure; *NRS*, numeric rating scale; *OSA*, obstructive sleep apnea; *PONV*, postoperative nausea and vomiting; *SDD*, same-day discharge

postoperatively [4, 5, 26]. Upon discharge, patients were prescribed acetaminophen 1000 mg four times daily, naproxen 500 mg twice daily (maximum of 3 days), and if necessary, rescue medication oxynorm 5 mg with a maximum of four times daily (maximum of 3 days). To prevent postoperative nausea and vomiting (PONV), all patients received antiemetics (dexamethasone and granisetron) during and after surgery. The patients were discharged only after ensuring the absence of complications, including stable hemoglobin levels and normal vital signs, and obtaining agreement from both the surgeon and patient regarding the discharge plan.

Postoperative Care Protocol

Upon discharge, patients and their informal caregiver (e.g., partner, family member, friend) were provided with an information sheet detailing symptoms that require emergency consultation and the hospital's 24-h emergency telephone numbers. Additionally, all patients were given a Nonin Onyx Vantage 9590 pulse oximeter and a Covidien Genius 2 tympanic thermometer. Patients were instructed to record their pain, heart rate, oxygen saturation, and body temperature three times daily on the information sheet to detect early complications for 48 h. Patients were advised to contact the hospital for severe pain (numeric rating scale, NRS > 4), hematemesis, rectal blood loss, divergent vital signs, or any further concerns. Divergent vital signs were defined as tachycardia > 100 bpm, temperature > 38 °C, or oxygen saturation < 95% [25].

On the first day after surgery, the operating surgeon called each patient using a standardized questionnaire to assess pain score (NRS), painkiller use, nausea/vomiting, mobilization, and vital signs. During the phone consultation, any patient questions were addressed, mobilization was encouraged, and complications signs were reiterated. The standardized questionnaire was recorded in the patient's electronic file. Patients whose phone consultation was not registered were excluded from this study. On POD 2 to 4, depending on which day of the week the surgery was performed, a specialized bariatric nurse conducted a physical consultation at the outpatient clinic using a standardized consult format.

Outcomes

The outcomes of this study included the presence of early complications, classified according to the Clavien-Dindo classification system [27], as well as the part of the postoperative care protocol in which they were detected. This analysis included suspected complications identified during consultations and the number of patients who contacted the hospital before their scheduled phone or physical consultation. In addition, the study evaluated pain scores, analgesic use, the incidence of nausea and vomiting, vital signs, and degree of mobilization.

Statistical Analysis

All data were analyzed using SPSS version 22.0 for Windows (SPSS Inc., Chicago, IL, USA). Patient characteristics were presented as mean ± standard deviation (SD), median (interquartile range), and categorical data as counts and percentages. The normality of the variables was assessed through visual inspection of histograms and Q-Q plots. Missing data were not imputed.

Results

There were 373 consecutive patients included in this study, who underwent surgery between November 2021 and December 2022. The mean age was 38 ± 11 years, and the mean preoperative BMI was 41 ± 4 kg/m^2. The majority of participants were female (83.4%). Table 2 presents the baseline characteristics of the participants.

During the follow-up period (up to and including the physical consultation on postoperative days 2 to 4), a total of 19 patients (5.1%) were readmitted to the hospital due to a complication, either after initiating contact themselves or after the scheduled consultations. This sequence of events is presented in Fig. 1. Before the phone consultation, nine patients contacted the hospital, out of whom five were readmitted (1.3%). Four of them had hematemesis, while the fifth patient had an intra-abdominal hematoma. All five patients were managed conservatively and discharged within a few days (Clavien-Dindo grade 1 or 2). The other four patients who contacted

Table 2 Baseline characteristics

Age at surgery, years (mean, SD)	38 ± 11
Female (*n*, %)	311 (83.4)
Weight, kg (mean, SD)	118 ± 16
BMI, kg/m^2 (mean, SD)	41 ± 4
ASA classification (*n*, %)	
2	102 (27.3)
3	271 (72.7)
AHI (median, IQR)	6.7 (2.8–15.9)
Use of CPAP (*n*, %)	107 (28.7)
Associated medical problems (*n*, %)	
Hypertension	43 (11.5)
NIDDM	18 (4.8)
Dyslipidemia	19 (5.1)
Operation time, minutes (mean, SD)	44 ± 11
Duration of hospital admission, hh:mm (mean, SD)	10:15 ± 00:55
Perioperative complications (*n*, %)	0
Mortality (*n*, %)	0

AHI, apnea-hypopnea index; *ASA*, American Society of Anesthesiologists; *BMI*, body mass index; *CPAP*, continuous positive airway pressure; *IQR*, interquartile range; *NIDDM*, non-insulin-dependent diabetes mellitus; *SD*, standard deviation

the hospital prior to the consultation were examined in the emergency department (ED) and found to have no complications. They were not readmitted. Consequently, the phone consultation was canceled for these nine individuals. Out of the remaining study population consisting of 364 patients, the vast majority, 353 patients (94.6%), showed no signs of complications during the phone consultation. Three patients did not initially respond, but upon follow-up consultation on POD 2 to 4, they were also found to have no complications. Subsequent to the phone consultation, seven patients were referred to the ED for a physical examination. Three of them were readmitted (0.8%). The first had hematemesis and was treated conservatively and discharged after one night of hospitalization (Clavien-Dindo grade 1). The second patient had an early anastomotic leakage and was reoperated (Clavien-Dindo grade 3b). The third patient had intra-abdominal bleeding, which was managed with surgical diathermy (Clavien-Dindo grade 3b).

After the phone consultation on POD 1, an additional seven patients (1.9%) independently contacted the hospital before their scheduled physical consultation on POD 2 to 4. These patients were all readmitted. Four patients had rectal blood loss and needed pharmacological treatment, such as tranaxamic acid or blood transfusion (Clavien-Dindo grade 2). The other three patients had anastomotic leakage and required radiological or surgical intervention (Clavien-Dindo grade 3a, 3b, and 4a). All other (not currently admitted) patients in the cohort received their physical follow-up consultation on POD 2 to 4. Four patients (1.1%) were identified with suspected complications during the checkup and required redirection to the ED, where they were readmitted for conservative treatment (Clavien-Dindo grade 1–2).

On the morning of POD 1, the mean temperature was 36.9 ± 0.6 °C, the mean heart rate was 78 ± 13 beats per minute, and the mean oxygen saturation was 97 ± 1%. Ten of the earlier mentioned patients were identified with suspected complications due to divergent vital signs, all presenting with tachycardia. One patient was referred to the emergency department before the phone consultation, three during it, and three before the physical consultation. The remaining three presented tachycardia during the physical consultation. There were no patients with suspected complications related to temperature or oxygen saturation.

After analyzing the other details of the phone consultation as presented in Table 3, the average pain score is found to be NRS 4 ± 2. Nearly all patients (96.6%) reported using acetaminophen as their primary painkiller. Additionally, 114 patients (35.5%) reported using naproxen as a secondary pain medication, while 31 patients (9.7%) required the use of oxynorm. Out of the 44 patients (13.9%) who reported nausea during the consultation, 25 patients (7.9%) also reported vomiting. Most cases of vomiting involved small amounts of mucus, while two patients were referred to the ED due to vomiting fresh blood. Regarding patient mobilization, at the time of the phone consultation, 45.7% of patients had already walked outside their homes.

Discussion

Our postoperative care protocol consists of several components, including comprehensive patient education, the presence of an informal caregiver, a maximum travel time of

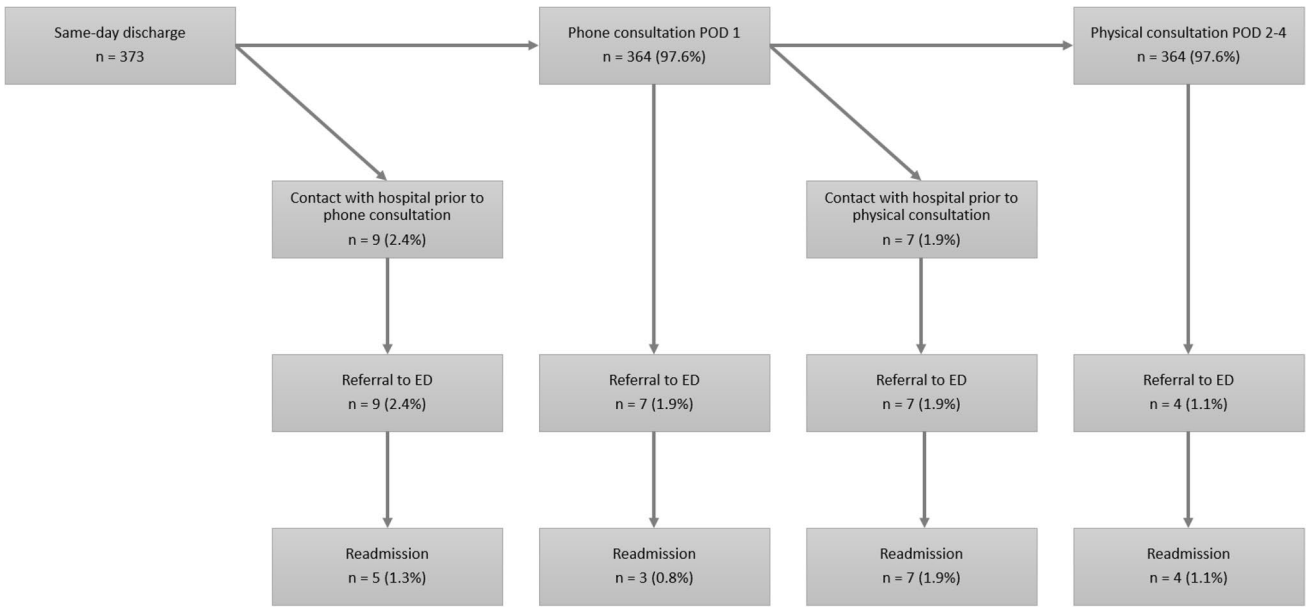

Fig. 1 Flowchart of postoperative events. ED, emergency department; POD, postoperative day

Table 3 Outcomes

Consultation outcomes	
Phone consultation (*n*, %)	364 (97.6)
No complaints	353 (94.6)
Suspected complication (referral to ED)	7 (1.9)
No answer	3 (0.8)
Physical consultation (*n*, %)	364 (97.6)
No complaints	360 (96.5)
Suspected complication (referral to ED)	4 (1.1)
No show	0
Phone consultation analysis	
NRS score (mean, SD)	4 ± 2
Use of painkillers (*n*, %)	366 (98.1)
Acetaminophen	311 (96.6)
Naproxen	114 (35.5)
Oxynorm	31 (9.7)
Nauseous (*n*, %)	44 (13.9)
Vomiting (*n*, %)	25 (6.7)
Mucus	11 (2.9)
Fresh blood	2 (0.5)
Old blood	2 (0.5)
Oral intake	3 (0.8)
Other/not specified	7 (1.9)
Vital signs (mean, SD)	
Temperature	36.9 ± 0.6
Heart rate	78 ± 13
Oxygen saturation	97 ± 1
Mobilization (*n*, %)	
Indoor	165 (54.3)
Outdoor	139 (45.7)

ED, emergency department; *NRS*, numeric rating scale; *SD*, standard deviation

45 min to the hospital, 24/7 hospital accessibility, remote monitoring with a simple pulse oximeter and thermometer, a phone consultation on postoperative day 1 by the surgeon, and a physical consultation on postoperative days 2–4 with a specialized bariatric nurse. The objective of this study was to evaluate the efficacy of this safety net, which captured all 19 patients (5.1%) who were readmitted in the first days after surgery. Our data indicates that the strength of the safety net lies in the combination of all these elements. Initially, we believed that remote monitoring was the most critical component when implementing same-day discharge after RYGB. However, our data reveals that only 10 out of the 19 readmitted patients had divergent vital signs, which questions the extent of the role of remote monitoring. In addition, we did not observe any divergent signs in oxygen saturation or temperature. Nevertheless, due to the small sample size, it is challenging to draw definitive conclusions on the role of remote monitoring.

Out of the 19 readmitted patients, 12 contacted the hospital on their initiative. This suggests that patients were well-informed and had a low threshold for seeking medical attention. The present data do not provide sufficient evidence to determine if patients with signs of complications waited for the surgeon's phone call or if they would have contacted the hospital earlier if they were not expecting a call. It is plausible that some patients may not have recognized the symptoms, rendering the phone consultation a crucial component for the early detection of complications. However, the findings from this study suggest that the information provided to patients was sufficient, as evidenced by their ability to contact the hospital when necessary. This is in line with the results of the study by Sada et al., which suggest that patients are often the ones to detect complications as they recognize abnormal recovery patterns and seek medical attention [28]. Furthermore, the study by Kummerow Broman et al. supports this finding, as they reported no increased rate of missed complications when telemedicine visits were utilized [29]. Moreover, the study by Nijland et al. did not find that home monitoring led to earlier detection of postoperative complications [20]. It is currently a prevailing idea that responsibility in healthcare is increasingly placed on patients. The present study suggests that patients are capable of taking on this responsibility, provided that they are adequately informed. In addition, it could be considered that in the future, it may not be necessary for the surgeon to make phone calls to patients. For example, a surgical resident or nurse practitioner could perform a phone consultation and, in case of any doubt or signs of complications, seek the advice of the surgeon. This could potentially further increase the efficiency and cost-effectiveness of the SDD pathway.

This study's remarkable and encouraging finding was the infrequent utilization of non-steroidal anti-inflammatory drugs (NSAIDs) and opioids. Specifically, on the first day following the surgery, only one-third of the patients used naproxen, and a mere 9.7% of the patients made use of oxynorm. Prolonged usage of NSAIDs may impede anastomotic healing [30]; therefore, their limited usage in this study is promising. Additionally, there is a growing trend toward minimizing the use of opioids in postoperative pain management [8, 31]. A multimodal analgesia approach has been shown to effectively reduce pain scores without increasing the incidence of complications [32–34]. For instance, the combination of acetaminophen and NSAIDs is effective in postoperative pain [35]. In our SDD protocol, we implemented strategies to reduce opioid consumption, including perioperative wound infiltration with bupivacaine, low-dose perioperative opioid administration, and avoidance of postoperative opioids. We also managed patient expectations by providing preoperative education on the expected pain level and the benefits of

early mobilization in reducing postoperative pain associated with surgical gas. We believe this education is crucial, as this knowledge can motivate them to actively participate in their recovery process.

The implementation of enhanced recovery after bariatric surgery is crucial before initiating same-day discharge following RYGB. Before implementation in our hospital, patients were already discharged in the early morning of POD 1, resulting in a hospital stay of less than 24 h. During morning rounds, patients' well-being and vital signs were assessed. In our current practice with same-day discharge, the process is quite similar, except that we conduct the assessment and monitoring of patients' well-being and vital signs via phone consultation. Consequently, the transition to SDD was relatively straightforward for us. However, not all hospitals may be equipped for this change, and successful implementation of ERABS is a critical prerequisite.

The primary limitation of this study is the small sample size, which is a common challenge when studying the safety of bariatric surgery, due to the low complication rates. Therefore, while our safety net approach incorporating multiple elements at different time points was effective in capturing all readmitted patients, our sample size is too small to draw definitive conclusions about the individual elements of the postoperative care protocol. Another important limitation of this study is the retrospective design and the use of non-validated questionnaires. A prospective and multicenter study with validated questionnaires would provide more robust data. Furthermore, it should be noted that the objective of this study was not to compare simple remote monitoring to continuous home monitoring but rather to evaluate the effectiveness of our same-day discharge protocol. Further studies are needed to determine the optimal remote monitoring modality, where patients using various types of remote monitoring are compared, as there is currently no consensus on this matter [12, 13, 19–22]. Finally, patient satisfaction was not assessed in this study. This could include patients' experience with measuring their vital signs, the perception of the phone consultation, and how patients experienced the burden of responsibility for monitoring themselves for potential complications.

Conclusion

This study demonstrated that implementing a safety net, comprising simple remote monitoring along with a phone consultation on POD 1 and a physical checkup on POD 2 to 4, was effective in monitoring patient recovery and detecting early complications for same-day discharge after RYGB. The safety net successfully captured all patients with complications. The findings of this study provide insights that could inform healthcare providers' decision-making regarding same-day discharge after bariatric surgery as a safe alternative to overnight hospitalization.

Data Availability The data supporting the findings of this study are available upon request from the corresponding author.

Declarations

Ethical Approval and Informed Consent The study has been performed in accordance with the Declaration of Helsinki, originally adopted in 1964 and its later amendments or comparable ethical standards. The local Medical Ethics Committee waived the need to obtain informed consent for this study.

Conflict of Interest The authors declare no competing interests.

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