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ORIGINAL PAPER

Influence of checklist management model on postoperative complications and hospitalization time after metabolic and bariatric surgery

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Abstract

Introduction: Metabolic and bariatric surgery (MBS) is associated with various postoperative complications and extended hospital stays. Standardized management protocols may enhance patient outcomes.

Aim: This study aimed to evaluate the impact of a checklist-based management protocol on postoperative recovery, length of hospital stay (LOS) and complications in patients undergoing laparoscopic MBS.

Materials and methods: A retrospective analysis was conducted on 209 patients who underwent laparoscopic MBS from December 2021 to December 2022. Patients were divided into two groups based on the perioperative management protocol: the control group (n = 97) received standard care, while the observational group (n = 112) received checklist-based management after protocol implementation. Primary outcomes included LOS, time to first flatus, and time to first mobilization. Secondary outcomes included postoperative complications classified by Clavien-Dindo grade, postoperative nausea and vomiting (PONV), and analgesic consumption. Health literacy and self-efficacy were assessed using the Newest Vital Sign (NVS) and Self-Rated Abilities for Health Practices (SRAHP) scale.

Results: The observational group demonstrated shorter LOS (median 4.0 vs. 6.0 days, P <0.001), earlier first flatus, and earlier first mobilization compared to the control group. The total complication rate was lower in the observational group (4.46% vs. 16.49%, P = 0.004). The observational group also showed lower incidence of PONV and reduced analgesic consumption. There were no differences in NVS or SRAHP scores between groups before management ($P > 0.05$), but post-management, the observational group had higher scores ($P < 0.05$).

Conclusions: Checklist-based perioperative management was associated with improved postoperative recovery, reduced complications, and enhanced health literacy and self-efficacy in patients undergoing MBS.

Key words

checklist management protocol, metabolic and bariatric surgery, postoperative complications, length of hospital stay

Introduction

Obesity and its related metabolic diseases have become a major global public health problem, seriously threatening human health. Obesity is an important risk factor for multiple chronic diseases, including type 2 diabetes, cardiovascular disease, and non-alcoholic fatty liver disease [1]. The prevalence of obesity continues to increase dramatically worldwide, impeding progress in reducing cardiovascular disease incidence rates [2]. Metabolic and bariatric surgery (MBS) is widely recognized as the most effective and durable evidence-based treatment for obesity currently available [3]. However, patients undergoing MBS have high rates of postoperative complications, making effective perioperative management crucial for improving patient outcomes. Studies have found that obesity is associated with higher rates of infection, venous thromboembolism, and renal failure [4-6]. Current clinical management still faces challenges such as low standardization and delayed risk identification, urgently requiring the establishment of scientifically effective management models. Checklist management mode, as a systematic quality improvement tool, has been widely applied in clinical practice. The WHO Surgical Safety Checklist has demonstrated beneficial impacts on various patient and team outcomes [7]. Surgical checklists are associated with increased detection of potential safety hazards, decreased surgical complications, and improved communication among operating staff [8]. Implementation of the WHO Surgical Safety Checklist significantly reduces perioperative mortality and complication rates [9]. In bariatric surgery, pre- and intraoperative checklists are commonly used as safety tools to standardize care and identify high-risk patients [10]. However, current research on postoperative checklist management modes in MBS is relatively scarce, particularly regarding the application of checklist management in MBS, which remains a significant research gap. This study investigated the impact of a checklist management model on postoperative complications and hospital stay duration in 209 MBS patients. By establishing standardized postoperative protocols, we aimed to improve nursing quality, reduce complication rates, and develop an optimized perioperative care approach with comprehensive clinical value. The findings provide evidence-based support for establishing a scientific and standardized nursing system for MBS, demonstrating significant clinical applicability.

Materials and methods

Study design This retrospective cohort study was conducted at XX Hospital, a tertiary care center specializing in metabolic and bariatric surgery. The study analyzed consecutive patients who underwent MBS between December 2021 and December 2022. The institutional review board approved this study, and the requirement for informed consent was waived due to the retrospective nature of the study and the use of de-identified data.

Patient selection and group allocation A total of 209 patients undergoing MBS during the study period were included in this analysis. Patients were allocated into two groups based on the perioperative management protocol that was in effect at the time of their surgery: (1) Control group ($n = 97$): Patients who underwent surgery between December 2021 and June 2022, when standard perioperative care protocols were in place; (2) Observational group ($n = 112$): Patients who underwent surgery between July 2022 and December 2022, after the institutional implementation of a structured checklist-based management protocol.

Inclusion: (i) Body mass index (BMI) >27.5 kg/m² and fulfillment of Chinese Guidelines for Surgical Treatment of Obesity and Type 2 Diabetes (2019 Edition) [11,12]; (ii) age $\geq$ 18 years; (iii) primary bariatric/metabolic procedure performed laparoscopically; (iv) complete medical records available for analysis.

Exclusion: (i) severe cardiac disease or active malignancy; (ii) significant hepatic, renal, pulmonary, or cardiac dysfunction; (iii) transfer to another facility or incomplete follow-up; (iv) psychiatric illness or current sedative therapy that precluded reliable assessment; (v) revisional or emergency bariatric procedures or conversion to open surgery; (vi) incomplete medical records or missing key outcome data.

Perioperative management protocols

Control group Control-group participants received standard perioperative care that was routinely practiced at our institution prior to checklist protocol. After admission, baseline indicators were measured and they were briefed on disease origins, symptoms, treatment modalities, the planned operation, and surgical precautions. Instructions for preoperative fasting and fluid restriction were delivered one day prior to surgery. Hand-off to the operating-room team occurred three hours before the procedure. Postoperatively, patients were assisted with early mobilization, prescribed antibiotics and additional medications, and placed on individualized hydration regimens. Vital signs monitoring, pain management, and antiemetic therapy followed standard institutional protocols. Discharge education was provided on the day preceding departure, followed by monthly telephone follow-up.

Observational group Patients in the observational group received care under a newly implemented checklist-based management protocol. Its workflow unfolded as follows:

1. A multidisciplinary task-force—led by a senior bariatric head nurse and co-led by a dedicated metabolic surgeon—included five certified bariatric nurses, one clinical dietitian and one rehabilitation therapist. Within 24 h of admission, the team convened a bedside conference to review the patient's chart and operative plan, translate these into perioperative objectives, and allocate explicit responsibilities to every member.

2. Drawing from Guidelines for Perioperative Care in Bariatric Surgery [Enhanced Recovery After Surgery (ERAS) Society Recommendations], [13,14] and Clinical Practice Guidelines for the Perioperative Nutrition, Metabolic, and Nonsurgical Support of Patients Undergoing Bariatric Procedures,[15] we tailored perioperative goals to each patient and created a checklist whose items were individually assigned to team members, ensuring precise, efficient execution.

3. Checklist Structure and Implementation (see Table 1) —The checklist comprised standardized items organized into preoperative, intraoperative, and postoperative phases. The multidisciplinary team conducted formal reviews every 72 hours to examine adherence, identify gaps in the preceding care cycle, and implement refinements to the protocol.

Outcome measures

Demographic and clinical characteristics Demographic data was extracted from electronic medical records we extracted demographic data including sex, age, body weight, and BMI. Clinical information on comorbidities was collected, encompassing type 2 diabetes mellitus, hypertension, dyslipidemia, obstructive sleep apnea, fatty liver disease. Surgical characteristics were documented, including the type of bariatric procedure performed (laparoscopic sleeve gastrectomy or laparoscopic Roux-en-Y gastric bypass), American Society of Anesthesiologists (ASA) physical status classification, operative time measured from skin incision to closure, and estimated intraoperative blood loss recorded by the anesthesiology team.

Postoperative Complications Postoperative complications monitoring refers to the evaluation of all surgery-related adverse events occurring from the patient's return to the ward after surgery until discharge. All complications were classified according to the Clavien-Dindo grading system: Grade I (deviation from normal course without pharmacological treatment), Grade II (requiring pharmacological treatment), and Grade III (requiring surgical, endoscopic, or radiological intervention). The postoperative complication rate was counted using the patient-unit method (where each patient is counted only once regardless of multiple complications). Complication rate (%) = (Number of patients with complications / Total number of observed cases) × 100.

Recovery outcomes (1) LOS was defined as the total number of calendar days from the date of surgery to the date of discharge, calculated as discharge date minus surgery date.

(2) Time to first flatus was defined as the interval in hours from the completion of surgery (skin closure) to the first documented passage of gas per rectum as reported by the patient and recorded by nursing staff.

(3) Time to first mobilization was defined as the time in hours from the completion of surgery to the first instance of independent ambulation, documented as the patient walking without physical assistance for a minimum distance of 10 meters as observed and recorded by the bedside nurse.

(4) Postoperative nausea and vomiting (PONV) were defined as the occurrence of nausea, vomiting, or retching within 48 hours following surgery, as documented in nursing records or

requiring administration of rescue antiemetics beyond routine prophylaxis. PONV incidence was recorded as a binary outcome (present or absent).

(5) Analgesic consumption was quantified as the total amount of opioid medications administered from the end of surgery until 48 hours postoperatively. All opioid medications were converted to oral morphine milligram equivalents (MME) using standard conversion factors: intravenous morphine (× 3), oral oxycodone (× 1.5), intravenous fentanyl (× 0.1 per microgram), and tramadol (× 0.1). Non-opioid analgesics (paracetamol, NSAIDs) were not included in the MME calculation but were administered as part of multimodal analgesia protocols in both groups.

Health literacy and self-efficacy outcomes Health literacy was assessed using the Newest Vital Sign (NVS), a six-question health literacy assessment tool based on reading a nutrition label. The instructions for scoring the NVS categorize patients into three groups, depending on the total number of questions answered correctly. Scores of 0–1 indicate a high likelihood of limited health literacy; scores of 2–3 indicate the possibility of limited health literacy; and scores of 4–6 indicate adequate health literacy [16]. Health-related self-efficacy was assessed using the Self-Rated Abilities for Health Practices (SRAHP) scale [17]. This 28-item instrument evaluates four key dimensions: nutrition, physical activity, stress management, and health responsibility. Each item is scored on a 5-point Likert scale (1 = 'not at all confident' to 5 = 'completely confident'), with total scores ranging from 28 to 140. Higher scores indicate greater self-efficacy in health practices [14]. The NVS and SRAHP dimensions have demonstrated excellent reliability and validity in medical populations, with Cronbach's α = 0.80 (for health literacy) and 0.74 (for SRAHP dimensions).

Statistical Analysis All figures were compiled in Excel and processed using SPSS 22.0. Normality of the data was assessed using the Shapiro-Wilk test. Continuous variables are expressed as the mean (standard deviation, SD) for normally distributed data or as the median with interquartile ranges (IQR) for non-normally distributed data. Categorical variables are presented as frequencies and percentages. Between-group comparisons for continuous variables were conducted using the independent t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data. Within-group comparisons of pre- and post-management scores were performed using the paired t-test for normally distributed data and the Wilcoxon signed-rank test for non-normally distributed data. For categorical outcomes, comparisons were made using the chi-square (χ^2) test or Fisher's exact test. A two-tailed *P* value of <0.05 was considered statistically significant for all analyses.

Results

Study population characteristics The baseline characteristics of the two groups are presented in Table 2. No statistically significant differences were observed between the control group and observational group in demographic variables (age, sex, body weight, BMI), comorbidities (type 2 diabetes mellitus, hypertension, dyslipidemia, obstructive sleep apnea, fatty liver disease, family history of diabetes), or surgical characteristics (procedure type, ASA classification, operative time, estimated blood loss), indicating comparable baseline status between the two groups.

Recovery Outcomes Postoperative recovery indicators are presented in Table 3. The observational group demonstrated shorter LOS compared to the control group (P <0.001). Time to first flatus was markedly reduced in the observational group compared to the control group (P <0.001). Similarly, time to first mobilization was shorter in the observational group versus the control group (P <0.001), indicating enhanced early postoperative recovery with the checklist-based protocol. The incidence of PONV was lower in the observational group compared to the control group (21.43% vs 39.18%, P = 0.005). Additionally, postoperative analgesic consumption was reduced in the observational group [median 10.0 vs 18.0 mg morphine equivalent, P <0.001].

Postoperative complications The incidence and distribution of postoperative complications are presented in Table 4. The total complication rate (Grade I–IIIb) was 16.49% in the control group and 4.46% in the observational group (P = 0.004), while Grade II–IIIb complication rates were 9.28% and 1.79%, respectively (P = 0.016). Grade I complications (seroma and transient fever) occurred in 7 control patients (7.22%) and 3 observational patients (2.68%) (P = 0.118). Grade II complications requiring pharmacological treatment occurred in 4 control patients (4.12%) and 2 observational patients (1.79%) (P = 0.415), including wound infection, thromboembolism, and conservatively managed bowel obstruction. Grade IIIb complications requiring surgical intervention under general anesthesia occurred in 5 control patients (5.15%) and none in the observational group (P = 0.019), including intra-abdominal hemorrhage (3 vs. 0), anastomotic leak (1 vs. 0), and surgically treated bowel obstruction (1 vs. 0).

Health literacy and health practice self-efficacy The effects of the management on health literacy and health practice self-efficacy are shown in Table 5. At baseline, no differences were observed between the two groups in NVS scores or any dimensions of SRAHP subscales (all P >0.05). Following the management, both groups demonstrated improvements in all measured outcomes compared to baseline values (all P <0.05). However, the observational group achieved higher scores than the control group across all measures. NVS scores increased to a median of 4.0 in the observational group compared to 3.0 in the control group (P <0.001). For SRAHP subscales, the observational group showed superior improvements in psychological comfort, physical activity, nutrition, and health responsibility compared to the control group (all P<0.001).

Discussion

MBS is an effective treatment for obesity and related metabolic diseases. In recent years, with the continuous development and improvement in the number of MBS surgeries performed, perioperative nursing management has received increasing attention. Choosing a perioperative management model with higher quality helps consolidate the clinical treatment effects and provides patients with more comfortable and efficient perioperative care [18]. To further improve the quality of clinical management, setting specific nursing goals offers guidance for clinical management development, standardizes nursing workflows, and promotes early postoperative rehabilitation [19]. Recent expert consensus has also emphasized that a multidisciplinary approach with standardized protocols is essential for ensuring safer care for patients with severe obesity [20].

This study revealed a lower incidence of complications in the observational group compared with the control group (*P* <0.05). This suggests that implementing a checklist management mode can effectively reduce postoperative complications and adverse events during clinical perioperative nursing, which aligns with earlier research [21]. According to Hilary Pinnock et al., checklist management is characterized by logic, systematization, and standardization [22,23]. By outlining perioperative nursing tasks, it helps prevent omissions in nursing procedures and ensures the achievement of various nursing objectives. Clinically, for patients undergoing MBS, checklist management specifies the nursing processes and content at different postoperative stages. Detailed nursing arrangements and accountability at various postoperative intervals ensure the proper implementation of nursing tasks and reduce the risk of complications. Complications such as hemorrhage and anastomotic leak are primarily technique-dependent; however, the checklist may exert indirect effects through preoperative optimization, intraoperative safety verification, and early postoperative surveillance that enables prompt detection before minor issues progress to severe complications. The observed reduction in Grade IIIb complications (5.15% vs. 0%) should be interpreted with caution given the small sample size. Similar findings have been reported in other newly established bariatric programs, where Grade IIIb complications decreased from 7.69% to 0.97% over three years through careful planning and protocol adherence [24]. A nationwide survey also demonstrated that standardized care protocols were associated with improved compliance and outcomes in bariatric surgery [25].

The study demonstrated that the recovery outcomes in the observational group was superior to that of the control group. The observational group also experienced shorter LOS, earlier time to first flatus, and earlier first ambulation compared to the control group (P <0.05). These results align with those of Zhang et al [26], who reported that average LOS and flatus in the ERAS group was shorter than in the control group. The results showed that the application of the checklist management model can enhance postoperative rehabilitation efficiency and promote rapid recovery after surgery. For example, Guo et al [27]. stated that the metabolism following MBS can be effectively managed through a checklist management model, which allows for dynamic monitoring of metabolic reactions. The perioperative nursing care for patients focuses on key aspects by using a comprehensive checklist. The implementation of this nursing approach assists case managers and full-time doctors in completing their respective management tasks and facilitates clinical perioperative nursing supervision. The lower incidence of PONV and reduced analgesic consumption observed in the observational group may reflect the benefits of protocolized antiemetic prophylaxis and early mobilization. Additionally, the observational group scored significantly higher than the control group on both health-knowledge tests and SRAHP. This suggests that checklist-driven management not only expands patients' information reserves, but—more importantly—translates "knowledge" into observable and sustainable "behavior": patients became more willing to monitor blood glucose, adhere to dietary prescriptions, and mobilize early out of bed, thereby markedly enhancing self-efficacy. Preoperative sessions focused on surgical procedures and risk disclosure, day-of-surgery education emphasized anesthesia cooperation and early-mobilization rehearsal, and postoperative training centered on pain assessment, nutritional intake, and complication recognition. This staged information delivery may help patients construct a coherent knowledge-skill framework, thereby improving health literacy and self-efficacy [28].

This study has several limitations that warrant consideration. As a single-center investigation, the findings may reflect institution-specific practices and patient characteristics, potentially limiting generalizability to other healthcare settings with different resources or patient populations. The relatively modest sample size, although adequate for detecting the observed differences in complication rates, may have constrained the ability to perform subgroup analyses by procedure type or to identify associations with less common adverse events. The absence of long-term follow-up prevents evaluation of whether the benefits of checklist management persist beyond the immediate postoperative period or influence outcomes such as weight loss maintenance and metabolic disease control at one year or beyond. Additionally, while the checklist encompassed multiple perioperative domains, granular analyses to determine which specific checklist components contributed most substantially to improved outcomes were not conducted. Future investigations employing multicenter designs with larger cohorts would strengthen the evidence base and enhance external validity. Extended follow-up studies are needed to assess the durability of improvements in patient self-efficacy and clinical outcomes. Exploring the relative impact of individual checklist elements through component analysis or factorial designs could inform more targeted and resource-efficient quality improvement strategies in bariatric surgery programs.

Conclusions

This study suggests that checklist-based perioperative management is associated with shorter LOS, earlier functional recovery, reduced postoperative complications, and improved health literacy and self-efficacy among patients undergoing metabolic and bariatric surgery. Prospective multicenter trials with larger sample sizes are needed to confirm these observations and assess the long-term durability of these benefits.

Article information

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Conflict of interest The authors have no conflicts of interest to declare.

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References

1 Pipek LZ, Moraes WAF, Nobetani RM, et al. Surgery is associated with better long-term outcomes than pharmacological treatment for obesity: a systematic review and meta-analysis. Sci Rep. 2024; 14: 9521.

2 Laddu D, Neeland IJ, Carnethon M, et al. Implementation of obesity science into clinical practice: a scientific statement from the american heart association. Circulation. 2024; 150: e7-e19.

3 Eisenberg D, Shikora SA, Aarts E, et al. 2022 American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO): indications for metabolic and bariatric surgery. Surg Obes Relat Dis. 2022; 18: 1345-1356.

4 Madsen HJ, Gillette RA, Colborn KL, et al. The association between obesity and postoperative outcomes in a broad surgical population: a 7-year American College of Surgeons National Surgical Quality Improvement analysis. Surgery. 2023; 173: 1213-1219.

5 Adindu E, Singh D, Geck M, et al. The impact of obesity on postoperative and perioperative outcomes in lumbar spine surgery: a systematic review and meta-analysis. Spine J. 2025; 25: 1081-1095.

6 Koskinas KC, Van Craenenbroeck EM, Antoniades C, et al. Obesity and cardiovascular disease: an ESC clinical consensus statement. Eur Heart J. 2024; 45: 4063-4098.

7 Wæhle HV, Haugen AS, Wiig S, et al. How does the WHO Surgical Safety Checklist fit with existing perioperative risk management strategies? An ethnographic study across surgical specialties. BMC Health Services Research. 2020; 20.

8 Borchard A, Schwappach DL, Barbir A, et al. A systematic review of the effectiveness, compliance, and critical factors for implementation of safety checklists in surgery. Ann Surg. 2012; 256: 925-933.

9 Chhabra A, Singh A, Kuka PS, et al. Role of perioperative surgical safety checklist in reducing morbidity and mortality among patients: an observational study. Niger J Surg. 2019; 25: 192-197.

10 Hart JWH, Takken R, Hogewoning CRC, et al. Markers for major complications at day-one postoperative in fast-track metabolic surgery: updated metabolic checklist. Obes Surg. 2023; 33: 3008-3016.

11 Zeng Q, Li N, Pan XF, et al. Clinical management and treatment of obesity in China. Lancet Diabetes Endocrinol. 2021; 9: 393-405.

12 Du Y, Zhang J, Chen G, et al. Formulation and interpretation of the Chinese Guidelines for Surgical Treatment of Obesity and Type 2 Diabetes Mellitus. Biosci Trends. 2021; 15: 299-304.

13 Thorell A, MacCormick AD, Awad S, et al. Guidelines for perioperative care in bariatric surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations. World J Surg. 2016; 40: 2065-2083.

14 Stuifbergen AK, Rogers S. Health promotion: an essential component of rehabilitation for persons with chronic disabling conditions. ANS Adv Nurs Sci. 1997; 19: 1-20.

15 Mechanick JI, Apovian C, Brethauer S, et al. Clinical practice guidelines for the perioperative nutrition, metabolic, and nonsurgical support of patients undergoing bariatric procedures - 2019 update: cosponsored by American Association of Clinical Endocrinologists/American College of Endocrinology, The Obesity Society, American Society for Metabolic & Bariatric Surgery, Obesity Medicine Association, and American Society of Anesthesiologists. Surg Obes Relat Dis. 2020; 16: 175-247.

16 Yim CK, Shumate L, Barnett SH, et al. Health literacy assessment and patient satisfaction in surgical practice. Ann Med Surg (Lond). 2018; 35: 25-28.

17 Becker H, Stuifbergen AK, Sands D. Development of a scale to measure barriers to health promotion activities among persons with disabilities. Am J Health Promot. 1991; 5: 449-454.

18 Rajabi MR, Rezaei M, Abdollahi A, et al. Long-term systemic effects of metabolic bariatric surgery: a multidisciplinary perspective. Heliyon. 2024; 10: e34339.

19 Nelson G, Bakkum-Gamez J, Kalogera E, et al. Guidelines for perioperative care in gynecologic/oncology: enhanced Recovery After Surgery (ERAS) Society recommendations-2019 update. Int J Gynecol Cancer. 2019; 29: 651-668.

20 Major P, Orłowski M, Małczak P, et al. Polish Expert Consensus on Metabolic and Bariatric Surgery: 2025 update. Wideochir Inne Tech Maloinwazyjne. 2025; 20: 125-143.

21 Abbott TEF, Ahmad T, Phull MK, et al. The surgical safety checklist and patient outcomes after surgery: a prospective observational cohort study, systematic review and meta-analysis. Br J Anaesth. 2018; 120: 146-155.

22 Pinnock H, Epiphaniou E, Pearce G, et al. Implementing supported self-management for asthma: a systematic review and suggested hierarchy of evidence of implementation studies. BMC Med. 2015; 13: 127.

23 Li X, Qin W, Jiang H, et al. Spatial equity and factors that influence the distribution of elderly care institutions in China. Int J Health Geogr. 2025; 24: 2.

24 Sroczyński P, Jędras K, Dobkowski G, et al. Outcomes of a newly established bariatric program in a hospital without an intensive care unit: a retrospective analysis of safety and effectiveness. Wideochir Inne Tech Maloinwazyjne. 2025; 20: 279-284.

25 Świerz MJ, Majdak K, Budzyński A, et al. Adoption of the Polish bariatric and metabolic surgery care standards: a nationwide survey. Wideochir Inne Tech Maloinwazyjne. 2024; 19: 442-453.

26 Zhang Q, Sun Q, Li J, et al. The impact of ERAS and multidisciplinary teams on perioperative management in colorectal cancer. Pain Ther. 2025; 14: 201-215.

27 Guo Y, Hao RX, Duan HX, et al. Application of chain body temperature management checklist in robotic surgery for urology: a randomised controlled trial. BMC Surg. 2025; 25: 101.

28 Eisele A, Schagg D, Krämer LV, et al. Behaviour change techniques applied in interventions to enhance physical activity adherence in patients with chronic musculoskeletal conditions: A systematic review and meta-analysis. Patient Educ Couns. 2019; 102: 25-36.

Table 1 Checklist-Based Perioperative Management Protocol for MBS Patients

Phase	Domain	Checklist Items	Responsible Personnel
Preoperative	Patient Preparation	Complete admission and provide education manual[a]	Case manager
		Document preoperative examination results	
	Clinical Assessment	Complete laboratory tests and communicate surgical plan	Metabolic surgeon & case manager
		Provide education on procedure and obtain informed consent[a]	

	Optimization	Nutritional preparation: 6-hour fasting, carbohydrate drink 2 hours preoperatively	Case manager
		Psychological counseling and family support[a]	
Intraoperative	Safety & monitoring	Verify patient identity, surgical site, and prophylactic antibiotics	Surgical team & OR nurse
		Monitor vital signs at 15-minute intervals	
		Ensure hemodynamic stability before ward transfer	
Postoperative	POD 0	Administer antibiotics, antiemetics, and multimodal analgesia	Metabolic surgeon & case manager

		Respiratory care: airway management and oxygen monitoring	
		Early mobilization: sitting within 4-6 hours, ambulation ≥3 times	
		Monitor for complications (bleeding, leak, respiratory distress)	
	POD 1-3	Continue medications and advance oral intake	Metabolic surgeon & case manager
		Progressive ambulation 4-6 times daily	
		VTE prophylaxis and wound inspection;	

		Health literacy and self-efficacy education[a]	
	POD 4-5 (Discharge)	Perform contrast study if indicated	Metabolic Surgeon & Case Manager
		Discharge education: diet, activity, medications, warning signs[a]	
Post-discharge	Follow-up	Weekly telephone/WeChat follow-up (first month)[a]	Case manager
		Monthly follow-up thereafter; enroll in support group[a]	

Each completed task was marked with "✓"; for any items left undone, a detailed explanation was required and documented.

a Indicates checklist items directly addressing patient education

Abbreviations: POD, postoperative day

Table 2 Demographics and clinical characteristics

Characteristic	Control group (n = 97)	Observational group (n = 112)	*P* value
Age (years)	36.45 (8.72)	37.23 (9.14)	0.530
Sex, n (%)			0.650
Male	42 (43.30)	52 (46.43)	
Female	55 (56.70)	60 (53.57)	
BMI (kg/m²)	38.67 (5.43)	39.12 (5.78)	0.564
Comorbidities, n (%)			
T2DM	31 (31.96)	38 (33.93)	0.762
Hypertension	45 (46.39)	54 (48.21)	0.792
Dyslipidemia	38 (39.18)	41 (36.61)	0.702
Obstructive sleep apnea	22 (22.68)	28 (25.00)	0.699
Fatty liver disease	56 (57.73)	67 (59.82)	0.759
Surgical procedure, n (%)			0.680
Laparoscopic sleeve gastrectomy	73 (75.26)	87 (77.68)	
Laparoscopic Roux-en-Y gastric bypass	24 (24.74)	25 (22.32)	
ASA classification, n (%)			0.890
ASA I~II	58 (59.79)	65 (58.04)	

ASA III	39 (40.21)	47 (41.96)	
Operative time (min)	118.3 (24.7)	115.6 (23.2)	0.416
Estimated blood loss (mL)	30 (20–50)	30 (20–45)	0.601
Abbreviations: ASA, American Society of Anesthesiologists physical status classification; BMI, Body mass index; T2DM, Type 2 diabetes mellitus			

Table 3 Postoperative recovery outcomes

Outcome	Control group (n = 97)	Observational group (n = 112)	*P* value
LOS, days	6.0 (5.0–7.0)	4.0 (4.0–5.0)	<0.001[a]
Time to first flatus, hours	48.32 (12.64)	36.76 (10.23)	<0.001[b]
Time to first mobilization, hours	18.50 (6.29)	12.58 (4.68)	<0.001[b]
Postoperative nausea and vomiting, n (%)	38 (39.18)	24 (21.43)	0.005[c]
Analgesic consumption (morphine equivalent, mg)	18.0 (12.0–26.0)	10.0 (6.0–16.0)	<0.001[a]

a Mann-Whitney U test was used for non-normally distributed continuous variables.

b Independent t-test was used for normally distributed continuous variables.

c Chi-square test was used for categorical variables.

Abbreviations: LOS, length of hospital stays

Table 4 Postoperative complications classified by Clavien-Dindo Grade, n (%)				
Clavien-Dindo Grade	Complication	Control Group (n = 97)	Observational Group (n = 112)	*P* value
Grade I	Seroma	4 (4.12)	2 (1.79)	0.415 [a]
	Transient fever	3 (3.09)	1 (0.89)	0.334 [a]
	Subtotal	7 (7.22)	3 (2.68)	0.118 [a]
Grade II	Wound infection	1 (1.03)	0 (0.00)	0.464 [a]
	Thromboembolism	2 (2.06)	1 (0.89)	0.596 [a]
	Bowel obstruction (conservative)	1 (1.03)	1 (0.89)	1.000 [a]
	Subtotal	4 (4.12)	2 (1.79)	0.415 [a]
Grade IIIb	Intra-abdominal hemorrhage	3 (3.09)	0 (0.00)	0.097 [a]

	Anastomotic leak	1 (1.03)	0 (0.00)	0.464[a]
	Bowel obstruction (surgical)	1 (1.03)	0 (0.00)	0.464[a]
	Subtotal	5 (5.15)	0 (0.00)	0.019[a]
Total (Grade I–IIIb)	–	16 (16.49)	5 (4.46)	0.004
Total (Grade II–IIIb)	–	9 (9.28)	2 (1.79)	0.016
Data are presented as n (%) **a** indicates using Fisher's exact test				

Table 5 Health literacy and self-efficacy before and after management				
Variables	Time point	Control group (n = 97)	Observational group (n = 112)	*P* value[a]
NVS	Before	2.0 (1.0-3.0)	2.0 (1.0-3.0)	0.798
	After	3.0 (2.0-4.0)[b]	4.0 (4.0-6.0)[b]	<0.001
SRAHP subscales				
Psychological comfort	Before	18.67 (3.42)	19.23 (3.67)	0.258
	After	21.34 (2.89)[b]	23.89 (2.34)[b]	<0.001

Sports	Before	19.45 (4.21)	20.12 (4.45)	0.267
	After	23.12 (3.67)[b]	26.45 (3.12)[b]	<0.001
Nutrition	Before	11.23 (2.45)	11.67 (2.67)	0.219
	After	13.67 (2.12)[b]	15.34 (1.89)[b]	<0.001
Health responsibility	Before	20.34 (3.78)	21.02 (3.94)	0.206
	After	24.12 (3.23)[b]	26.78 (2.87)[b]	<0.001

a Between-group comparisons were performed using independent t-test (normally distributed) or Mann-Whitney U test (non-normally distributed)

b Indicates $P < 0.05$ compared to before intervention within the same group

Note: NVS, Newest Vital Sign; SRAHP, Self-Rated Abilities for Health Practices.