

Research Article

Perioperative Medicine: Investigating Preoperative and Postoperative Management, Including Reducing Complications in Diabetic and Obese Patients

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ARTICLE INFO

Article history:

02 Jul 2024 (Received)

12 Aug 2024 (Accepted)

19 Aug 2024 (Published Online)

Keywords:

Preoperative care, Post-operative care, Obesity, Diabetic, Perioperative medicine.

ABSTRACT

Perioperative medicine is crucial for optimizing outcomes for patients with comorbidities like diabetes and obesity. It involves a multidisciplinary approach to preoperative assessment, intraoperative management, and postoperative care to reduce complications and improve recovery. Diabetes and obesity increase the risk of perioperative complications, such as infections, cardiovascular events, and delayed wound healing. Perioperative medicine ensures personalized risk management, reducing problems and speeding up recovery. This comprehensive approach reduces hospital stays, enhances patient safety, and improves long-term health. This paper investigates preoperative and postoperative care for reducing complications in patients with diabetes and obesity, using interviews and symmetric analysis. Preoperative strategies focus on optimizing glycemic control, managing weight, and addressing risk factors through personalized care plans. Intraoperative techniques maintain hemodynamic stability, minimize insulin resistance, and use appropriate anaesthetic protocols. Postoperatively, vigilant monitoring of blood glucose levels, early mobilization, and nutritional support are pivotal for mitigating complications and enhancing recovery. Emerging research highlights the value of rehabilitation programs, tailored pharmacological interventions, and enhanced recovery pathways for high-risk populations. Advancements in minimally invasive surgical techniques and real-time monitoring technologies have shown promise in reducing adverse outcomes.

DOI: [10.1061/\(C5K\)JITMBH.1943-5533.0002519](https://doi.org/10.1061/(C5K)JITMBH.1943-5533.0002519) @ 2024 Periodic Reviews on Artificial Intelligence in Health Informatics (PRAIHI), C5K Research Publication

1. Introduction

The interdisciplinary care given to patients before, during, and following surgery is referred to as perioperative medicine. Its goal is to minimize problems and maximize results by using evidence-based practices (Jones et al., 2017). As surgical techniques get more intricate and patient demographics become more varied, this profession has grown in importance. Among these varied populations, people with diabetes and obesity constitute a particularly susceptible group, presenting specific difficulties because of their complex medical requirements and elevated risk profiles. Metabolic dysfunctions, cardiovascular risks, respiratory troubles,

wound healing concerns, and systemic inflammatory reactions are some of these challenges (Akabori et al., 2020; Lyons et al., 2021). Furthermore, obesity and diabetes frequently have a synergistic impact that increases surgical morbidity, necessitating very specialized care techniques.

The need to address these interrelated health concerns is further highlighted by the increased incidence of diabetes and obesity disorders worldwide, which are frequently linked to and made worse by contemporary lifestyle trends including sedentary behaviour, high-calorie meals, and genetic predispositions (Chen et al., 2019; Lyons et al., 2021). Numerous physiological alterations, such as increased adipose tissue deposition,

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Cite: Sheikh Ummey Salma Tonu, Sk Salauddin, Fatima tuz zahura, Dipta Sharma, Kishor Chandra das, Dr. Rajib Saha, Md. Imran Ali and Md Mesbah Uddin (2024). Perioperative medicine: investigating preoperative and postoperative management, including reducing complications in diabetic and obese patients. *Periodic Reviews on Artificial Intelligence in Health Informatics*, 1(1), pp. 20-27.

decreased pulmonary compliance, and altered hemodynamic responses, are linked to obesity. The pharmacokinetics of anaesthetic drugs, mechanical breathing, and airway control are all made more difficult by these alterations. Conversely, diabetes increases the risk of surgical site infections, delayed wound healing, and perioperative cardiovascular instability by impairing glucose control, immunological suppression, and vascular dysfunction (Chang et al., 2024).

Obesity and diabetes have become global epidemics, posing a twin public health emergency with significant surgical care ramifications. The World Health Organization (WHO) estimates that over 650 million individuals will be obese in 2022, with the prevalence of obesity having nearly quadrupled since 1975. Over 537 million people worldwide suffer from diabetes at the same time, and type 2 diabetes is closely associated with obesity (Rubino et al., 2020). These disorders frequently overlap, increasing the risk of complications after surgery and resulting in a complicated interaction of systemic and metabolic abnormalities. Numerous physiological changes are linked to obesity, such as decreased respiratory compliance, increased adipose tissue that makes surgery more difficult, and an increased risk of venous thromboembolism (VTE) (Lobo et al., 2020). Diabetes also puts patients at risk for immunological dysfunction, poor glycemic management, and microvascular and macrovascular problems, all of which can worsen surgical stress reactions (Martínez-Ortega et al., 2020). To maximize patient safety and results, careful perioperative planning is necessary due to the confluence of these factors (Kaye et al., 2022).

Obesity and diabetes have important systemic and physiological effects, especially during the perioperative phase. Under the strain of surgery and anaesthesia, patients' physiological fortitude is put to the test during the crucial perioperative period (Drayton et al., 2022). To reduce morbidity and mortality, effective treatment during this period necessitates careful preoperative assessment, careful intraoperative management, and attentive postoperative care. The main issues for diabetes patients include immune system dysfunction, poor glucose metabolism, and microvascular problems, all of which increase the likelihood of negative consequences (Martínez-Ortega et al., 2020). Similarly, because of their changed architecture and extra adipose tissue, obese individuals have higher inflammatory responses, lower respiratory reserves, higher risks of venous thromboembolism (VTE), and more technical challenges during surgery (Cheisson et al., 2018; Lobo et al., 2020).

Patients with diabetes and obesity routinely have worse rates of complications than non-obese, non-diabetic populations, even with improvements in surgical procedures, anaesthetic methods, and perioperative protocols (Crowley et al., 2023). Prolonged hospital stays, elevated readmission rates, heightened risk of

multi-organ malfunction, and substantial medical expenses are frequently among these problems. Therefore, using comprehensive, multidisciplinary solutions to meet the unique requirements of these high-risk individuals continues to be a top goal for contemporary perioperative medicine (Sarno et al., 2023). To reduce risks and enhance recovery and long-term health outcomes, key strategies include evidence-based postoperative procedures, customized preoperative optimization programs, and cutting-edge intraoperative technology (Crowley et al., 2023).

Perioperative medicine is essential for treating illnesses before, during, and following surgery to improve patient outcomes (Rubino et al., 2020). Customized risk management is guaranteed, which lowers problems and speeds up recovery. By using a comprehensive approach, hospital stays are shortened, patient safety is enhanced, and long-term health is improved. It bridges the gap between surgical treatments and the general well-being of patients by emphasizing holistic care (Chang et al., 2024). To comprehend the significance of perioperative medicine in the recovery journey for patients with special complications, this paper investigates preoperative and postoperative care for reducing complications in patients with diabetes and obesity.

2. Literature Review

Perioperative medicine is the future of anaesthesia, focusing on delivering the best possible pre-, intra-, and postoperative care for patients undergoing major surgery. This involves refining existing care pathways and developing new ones where current approaches are not fit for purpose. Anaesthetists face a choice between a narrow focus on high-quality anaesthesia administration or embracing the broader role of perioperative physicians, which includes non-operative care. This will help consolidate their position alongside their peers as a mature and respected medical speciality (Grocott & Pearse, 2012). New Perioperative Systems are a shift in surgical patient care, involving a multidisciplinary team providing integrated care from surgery decision to recovery. These systems are widely used in Australia, New Zealand, North America, and Europe. Benefits include increased surgical volume, shorter stays, fewer cancellations, reduced preoperative investigations, and lower risk of wound infection. The total cost per patient associated with a Perioperative System is 8-18%. Future developments may include health promotion activities before surgery to improve long-term patient outcomes. Despite these benefits, these systems are not fully developed in many jurisdictions (Lee et al., 2011).

Obesity is a growing global issue, necessitating optimal management for surgeons and anaesthetists. A review of perioperative strategies for obese patients found that comprehensive preoperative evaluation, experienced medical teams, appropriate equipment, careful anaesthetic management, and adequate ventilation

strategy can improve postoperative outcomes. Additional precautions are necessary for patients with severe obesity, metabolic syndrome, untreated or severe obstructive sleep apnea syndrome, obesity hypoventilation syndrome, patients receiving home ventilatory support or opioid therapy, and those undergoing open operations or long procedures (Carron et al., 2020). Before surgery, diabetic patients should assess their glycaemic control, including HbA1c and glucose levels, and adjust their treatments accordingly. Gastroparesis can cause stasis and aspiration of gastric content, while cardiac involvement can include silent myocardial ischemia, diabetic cardiomyopathy, and cardiac autonomic neuropathy. Chronic diabetic kidney disease can exacerbate acute renal failure risk. Antidiabetic therapy should be managed preoperatively, with non-insulin drugs administered the evening before the intervention, except for metformin. Insulin deficiency can lead to ketoacidosis (Cheisson et al., 2018).

Perioperative hyperglycemia is a risk factor for injury, an extended hospital stay, and mortality, regardless of the cause of known diabetes, undiagnosed diabetes, or stress hyperglycemia. Perioperative hyperglycemia is becoming more and more shown to be a modifiable risk factor, and many of the measures needed to enhance surgical outcomes must be implemented before the actual surgical admission. For these interventions to guarantee that treatment is integrated across the patient-centered care pathway, the multidisciplinary team must collaborate and communicate at every stage of the patient experience (Levy & Dhatariya, 2019). Obesity is disproportionately higher in women due to biological and social factors, including pregnancy and lactation demands and poor access to healthy foods. Obesity-related physiological changes increase risks of infertility, malignancy, sleep-disordered breathing, cardiovascular disease, diabetes, and thromboembolism. Obese women face increased peri-operative morbidity and mortality, necessitating comprehensive evaluation and targeted comorbidity optimization by a multidisciplinary team. Weight loss, lifestyle management, and comorbidity optimization are crucial for reducing obesity-related risks (Tan & Habib, 2021).

The increasing number of bariatric surgeries for type 1 or type 2 diabetes patients presents challenges for clinicians in selecting therapies that reach glycemic targets without adverse effects. This review evaluates data supporting the best diabetes management strategies in patients undergoing bariatric surgery. Although few clinical trials have evaluated the safety and effectiveness of glucose-lowering therapies, remission of diabetes or reduced medications is an established benefit. Adverse events, such as diabetic ketoacidosis, have been reported in patients with both types of diabetes (Mulla et al., 2019). Bariatric surgery is the most effective long-term therapy for managing severe obesity in adults, as recommended by guidelines. However, it can cause new clinical problems and

requires special knowledge and skills from clinicians. The recommendations summarize basic notions needed for first-level medical care, including nutrition, comorbidity management, pregnancy, psychological issues, and weight regain prevention. Clinical practical recommendations are included, and referral to a bariatric multidisciplinary center, preferably the one performing the original procedure, is recommended for more complex clinical situations (Busetto et al., 2017).

Hyperglycemia is a common symptom of critical and surgical illnesses, resulting from metabolic and hormonal changes due to injury and stress. The prevalence of hyperglycemia in hospitals is unknown, but studies show it can range from 32 to 60% in community hospitals and 80% of patients after cardiac surgery. Hyperglycemia and diabetes are associated with increased length of stay, hospital complications, resource utilization, and mortality. Correcting hyperglycemia can reduce complications in critically ill and general surgery patients (Duggan et al., 2016). A study aimed to identify independent risk factors for poor 30-day perioperative outcomes in morbidly obese patients undergoing elective posterior lumbar fusion (PLF). Results showed that morbidly obese patients had a higher perioperative complication rate, with the most common complications being prolonged hospitalization, blood transfusion, readmission, wound complications, and reoperation. Factors for these complications included age ≥ 65 years, super obesity, chronic steroid use, poor functional status, long length of fusion, and extended operative time (Ranson et al., 2018).

Metabolic surgery is a unique therapeutic method for managing type II diabetes in obese patients, as traditional pharmacological and behavioural therapies often fail. Patients must adhere to strict nutritional and diabetes management protocols, and the pharmacological regimen upon discharge differs from the preoperative one. As time elapses, diabetes control becomes tenuous due to weight regain and beta cell failure, necessitating intensification of therapy. Pharmacotherapy from the preoperative to postoperative phase is labile and complex, so discussing pharmacology options during the preoperative, perioperative, and postoperative periods helps guide clinician-driven care (Kheniser & Kashyap, 2018). Postoperative pulmonary complications (PPCs) are a significant factor in poor patient outcomes, affecting between 2.0% and 5.6% of the general surgical population and 20-70% of upper abdominal and thoracic surgeries. To reduce PPCs, a detailed preoperative risk evaluation is crucial. This review examines preoperative risk assessment, pulmonary tests, intraoperative and procedure-associated risk factors, and perioperative strategies. Nearly 25% of postoperative deaths in the first week after surgery are associated with PPCs. This information helps clinical anesthesiologists recognize potential risks and create appropriate perioperative plans for patients (Chandler et al., 2020).

Perioperative medicine is a critical field that offers comprehensive pre-, intra-, and postoperative care for patients undergoing major surgery. The Perioperative System, a shift in surgical patient care, involves a multidisciplinary team providing integrated care from surgery decision to recovery. It manages risks such as diabetes, hyperglycemia, and metabolic surgery, ensuring optimal care and reduced complications. Following this information from the above research papers and understanding the role that perioperative medicine plays in the healing process for patients who have unique difficulties, this research paper examines preoperative and postoperative treatment for lowering complications in patients who have diabetes and obesity.

3. Methodology

A survey was done in several hospitals in Dhaka, Bangladesh where a total of 150 patients with obesity and diabetics were interviewed to learn about their healing journey and any complications associated with their specific disease. 21 interviews were rejected due to their discomfortability and mild reactions in meditation due to their disease. Table 1 shows details about the patients and sources. Table 1 Represent data table.

Table 1. Data table.

Patients details	No of patients
Patient with obesity	39
Patient with diabetics	47
Patients with both	43
Total	129

After interviews, the details were accumulated and compared with several renowned journals for further information. A total of 20 journal articles were studied for a complete study. Table 2 is the summary of journals studied for conclusion. Table 2 shows the journal number and name.

Table 2. Journal number and name.

Journal name	No of Journals
ACNM (Annals of Clinical Nutrition and Metabolism)	2
BJA Education	2
Elsevier	7
PMC (Pubmed Central)	5
Springer Nature	4
Total	20

The research methodology follows in Fig. 1.

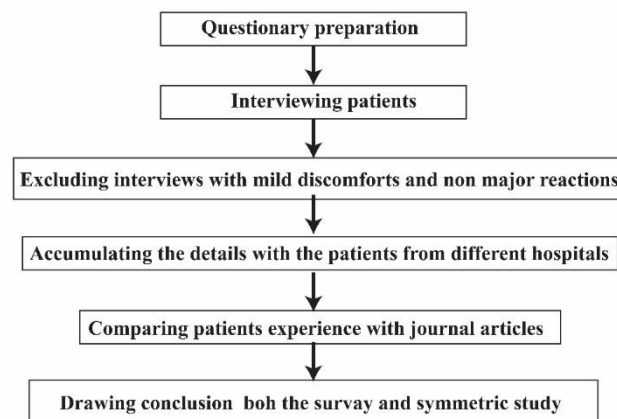


Fig. 1. Research methodology.

4. Results and Discussion

The analysis along with the interview for investigating preoperative and postoperative management, including reducing complications in diabetic and obese patients are combined for better results. Most of the patients interviewed in the survey were suffering either from diabetes or both diabetes and obesity. Fig. 2 shows how much the patient's disease influences this research.

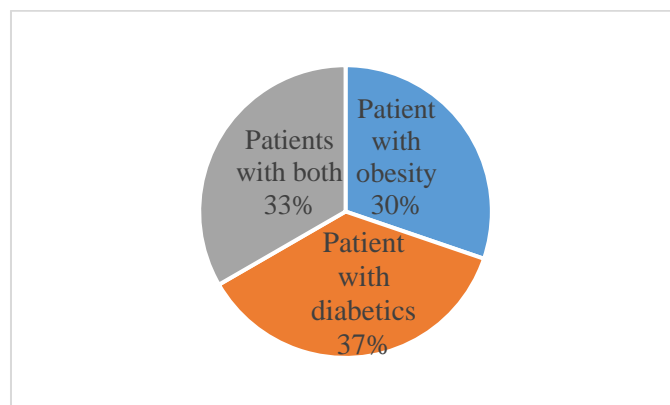


Fig. 2. Influence of disease in result and conclusion.

The interview and symmetric analysis of perioperative medicine have concluded in several points.

4.1. Perioperative Care Phases

The three main phases of the perioperative period, which includes the full surgical experience, each have distinct objectives and activities:

- Preoperative phase: A comprehensive evaluation of the patient, including a medical history, physical examination, and laboratory tests, is part of the surgical phase. Comorbidities such as diabetes and obesity are addressed, preoperative education regarding the procedure, expected results, and postoperative care is given, and the patient's informed consent is obtained before transfer to the operating room.

- ii. Intraoperative phase: The patient's entrance into the operating room marks the start of the surgical process, and their transfer to the post-anesthesia care unit marks its conclusion. Anesthesia administration, surgical technique, continuous physiological state, and vital sign monitoring are important components.
- iii. Postoperative phase: In the post-anaesthetic care phase, patients are monitored for problems, their pain is managed, their mobility is supported, wound care is ensured, and they are educated for at-home care. Follow-up for long-term results and a gradual return to regular activities are also part of it.

4.2. Role of Perioperative Medicine

An interdisciplinary approach, perioperative medicine integrates several specializations to deliver coordinated treatment. Enhancing patient fitness, managing medical comorbidities, and predicting consequences with risk-scoring systems are its objectives. In addition to lowering hospital stays, complications, and medical expenses, good perioperative care can also increase patient satisfaction. Collaboration between surgeons, anesthesiologists, endocrinologists, dietitians, physical therapists, and nursing staff is essential due to the complexity of perioperative treatment in patients with diabetes and obesity. By enabling more accurate and individualized management techniques, technological innovations such as artificial intelligence-driven risk assessment tools and continuous glucose monitoring devices are revolutionizing perioperative care. Perioperative medicine's primary functions and facets include:

- **Preoperative Assessment:** The process involves assessing the patient's medical history, physical condition, and comorbidities, conducting necessary investigations, identifying potential complications, optimizing medical conditions, and discussing anaesthesia options, pain management, and potential complications with the patient.
- **Patient Health Optimization:** Administering medications and interventions to improve patient outcomes, such as managing blood pressure and glucose levels, and advising on lifestyle modifications like smoking cessation, can also improve surgical outcomes.
- **Intraoperative Care:** Along with working with the surgical and anesthesiology teams to reduce problems, the person is in charge of monitoring vital signs, managing medical comorbidities during operation, and modifying medication.
- **Postoperative Management:** The role involves monitoring patients post-surgery for complications, managing recovery from anaesthesia, addressing medical issues, and coordinating rehabilitation or

post-acute care needs, depending on the surgery's complexity and the patient's health.

- **Multidisciplinary Collaboration:** Establishing a thorough care plan in conjunction with medical professionals for every patient, guaranteeing both psychological and physical readiness for surgery to promote a better recovery.
- **Risk Stratification:** Making educated judgments on the kind and timing of surgery requires the use of clinical tools and standards to evaluate and stratify patient risk levels and obtain the patient's informed permission by going over the possible dangers and advantages.

4.3. Perioperative Management for Diabetic Patients

Diabetes has a substantial influence on surgical results because of the risks associated with infection, poor wound healing, and hyperglycemia (Polderman et al., 2024). Strategies for preoperative management that work well include:

- **Glycemic Control:** It's important to maintain ideal blood glucose levels. This entails regular observation and proper insulin administration on the day of surgery.
- **Evaluation of Medication:** checking that diabetic drugs are appropriate for the surgical setting. Depending on the operation type and the patient's health, adjustments can be required.
- **Comorbidity Management:** For safe surgical planning, it is crucial to assess related disorders such as cardiovascular disease or renal impairment.

While aiming for proper glucose regulation, organizations advise avoiding hypoglycemia. Regular blood glucose monitoring both before and during surgery is one strategy (Polderman et al., 2024).

- Effective management of hyperglycemia requires the use of short-acting insulin.
- Examining intravenous insulin infusion for patients in severe conditions or undergoing intricate procedures.

Significant perioperative hazards are also associated with diabetes (Na & Park, 2021). Patients with diabetes are vulnerable to:

- **Postoperative Infections:** Diabetes-related compromised immune responses are linked to increased infection rates.
- **Cardiac Complications:** After surgery, poor glycemic management may raise the risk of myocardial infarction and other cardiovascular problems.

- **Metabolic Derangements:** It's critical to maintain euglycemia during the perioperative phase since hyperglycemia might result in serious side effects such as acute renal failure and extended intensive care unit stays.

Optimizing glycemic control before surgery, making sure blood glucose levels are closely monitored throughout the procedure, and returning the patient to their routine after the procedure are all examples of effective management techniques.

4.4. Perioperative Management for Obese Patients

Due to elevated risks, including challenging airway management, prolonged recovery periods, and a greater incidence of surgical complications, obesity makes perioperative care more challenging (Bamgbade et al., 2007). Important tactics for treating obese people consist of:

- **Weight Optimization:** Prior to surgery, it might be beneficial to promote weight loss. Exercise regimens and dietary changes may be part of this.
- **Anesthetic Considerations:** Adapting anaesthetic methods to possible obesity-related difficulties, such as problems with airway control.
- **Postoperative Monitoring:** In this population, it is essential to closely monitor for complications such as respiratory distress or thromboembolic events.

Reducing complications in people with diabetes and obesity requires effective postoperative care (Lang et al., 2017). Some strategies are:

- **Tracking Blood Sugar Levels:** After surgery, blood sugar levels should be closely monitored to avoid problems like infections or delayed recovery.
- **Multidisciplinary Follow-Up:** Including physiotherapists, endocrinologists, and nutritionists during the recuperation stage guarantees all-encompassing treatment catered to each patient's need.
- **Patient education:** Giving patients precise advice about dietary modifications, medication adjustments, and warning signals of possible problems encourages them to take an active role in their healing.

The risk of problems following surgery is considerably increased by obesity (Drayton et al., 2022). Research shows that people who have a body mass index (BMI) of 30 kg/m² or over are more likely to suffer from issues like:

- **Urinary Tract Infections:** Fat Patients are more likely to get these infections.
- **Death Rates:** Compared to non-obese individuals (1.2%), morbidly obese patients (BMI ≥ 35 kg/m²) had a greater death rate (2.2%).

These risks are further increased by the existence of other comorbidities, such as diabetes and hypertension. Longer hospital admissions, pulmonary difficulties, and an increased risk of cardiac events are all associated with patients with metabolic syndrome, which encompasses obesity, diabetes, and hypertension.

4.5. Future of Perioperative Medicine

Future perioperative medicine initiatives must concentrate on the following areas as the prevalence of diabetes and obesity rises worldwide:

- **Preoperative Optimization:** Complications can be considerably decreased by improved preoperative evaluations that give priority to weight management and glycemic control.
- **Tailored Anesthetic Techniques:** To reduce hazards related to drug metabolism and airway management, anesthesia techniques may need to be modified based on BMI and concomitant diseases.
- **Multidisciplinary Approaches:** For complete treatment catered to the particular requirements of patients with diabetes and obesity, cooperation between surgeons, anesthesiologists, endocrinologists, and nutritionists is crucial.

To improve patient safety and outcomes during the perioperative phase, further research and clinical practice adaption are necessary to address the complications related to obesity and diabetes in surgical settings.

5. Conclusion

Obesity and diabetes are common health conditions that significantly impact surgical outcomes. Obesity can lead to complications like cardiovascular strain and obstructive sleep apnea, while diabetes increases the risk of poor wound healing and infection due to impaired glycemic control. These conditions require specialized perioperative strategies to ensure patient safety and optimize recovery. Perioperative medicine is a crucial field that integrates various specializations to deliver coordinated treatment aimed at enhancing patient fitness, managing medical comorbidities, and predicting outcomes through risk-scoring systems. Effective perioperative care can reduce hospital stays, complications, and healthcare costs while improving patient satisfaction. Collaboration among healthcare professionals, including surgeons, anesthesiologists, endocrinologists, dietitians, physical therapists, and nursing staff, is essential due to the complexities

involved in managing diabetic and obese patients. Perioperative medicine focuses on the comprehensive management of patients before, during, and after surgery, especially for those with chronic conditions like diabetes and obesity. Preoperative management includes risk assessments, glycemic control, weight optimization, and patient education. Intraoperative care includes specialized anaesthesia, glucose and hemodynamic monitoring, and appropriate equipment. Postoperatively, continuous glucose monitoring, tailored insulin therapy, thromboprophylaxis, multimodal pain management, and meticulous wound care are critical. A multidisciplinary approach is essential to optimize outcomes and enhance recovery for diabetic and obese patients. Future directions in perioperative medicine include personalized medicine, wearable technology integration, and research into innovative surgical techniques and pharmacological agents. Expanding multidisciplinary collaborations and implementing robust data-driven protocols will be critical in addressing the evolving needs of this population.

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