

Perioperative Optimization of Diabetic Patients: A Narrative Review

Riddhi Rana¹, Priyansh Patel¹, Tanmay Prasad¹ and Saumil H Shah^{2*}

¹GMERS Medical College, India

²Consultant Anesthesiologist at SDH hospital, India

*Corresponding Author

Saumil H shah, Consultant Anesthesiologist at SDH hospital, India.

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Abstract

Background

Diabetes mellitus is increasingly encountered in patients undergoing elective and emergency surgery. Perioperative dysglycemia is associated with surgical site infection, delayed wound healing, prolonged hospitalization, metabolic instability, and increased postoperative morbidity.

Objective

To review the current evidence and provide a clinically practical overview of perioperative optimization of adult patients with diabetes mellitus.

Methods

A narrative review was conducted using publicly available literature from peer-reviewed journals, reviews, clinical guidance documents, and perioperative diabetes management resources indexed in PubMed, PMC, and related academic sources.

Results

Successful perioperative optimization requires preoperative risk stratification, review of glycemic control, rational medication adjustment, avoidance of both hyperglycemia and hypoglycemia, intraoperative glucose surveillance, and timely postoperative resumption of therapy. Particular caution is required with insulin therapy, sodium-glucose cotransporter-2 inhibitors, and patients at risk of diabetic ketoacidosis or delayed gastric emptying.

Conclusion

Perioperative care of diabetic patients should be individualized, protocol-driven, and multidisciplinary. Updated knowledge of modern antidiabetic therapies and perioperative glucose targets is essential to improve surgical outcomes and patient safety.

Keywords: Diabetes Mellitus, Perioperative Care, Glycemic Control, Anesthesia, Surgery, Insulin, SGLT2 Inhibitors, Diabetic Ketoacidosis

1. Introduction

Diabetes mellitus has become one of the most common chronic illnesses encountered in surgical practice. With increasing prevalence of type 2 diabetes, rising obesity, aging populations, and wider access to surgical care, perioperative teams are now routinely required to manage patients with altered glucose metabolism. Diabetes is not simply a biochemical diagnosis in the perioperative setting; it represents a systemic disorder that can affect cardiovascular stability, renal function, autonomic

tone, wound healing, immune response, gastric emptying, and postoperative recovery.

The perioperative period poses unique challenges for diabetic patients. Fasting, interruption of regular medications, operative stress, inflammatory activation, fluid shifts, pain, and variable nutritional intake all contribute to glycemic instability. Hyperglycemia during this period has been associated with infection, delayed healing, osmotic diuresis, electrolyte

disturbances, and prolonged hospital stay, while hypoglycemia may go unrecognized under anesthesia and can be equally dangerous. Modern perioperative management therefore aims not at aggressive glucose normalization, but at **safe metabolic stability** through appropriate planning and individualized treatment. Current guidance also highlights newer clinical issues such as the perioperative implications of **SGLT2 inhibitors, GLP-1 receptor agonists, continuous glucose monitors, and insulin pumps**.

This narrative review summarizes the practical principles of perioperative optimization of adult patients with diabetes and is intended to support junior clinicians, anesthesiologists, surgeons, and perioperative physicians involved in routine clinical care.

2. Methods of Literature Search

This narrative review was based entirely on **publicly available, published literature** and did not involve patient recruitment, identifiable clinical records, or direct human participation. A focused literature search was performed using peer-reviewed sources indexed in **PubMed, PubMed Central (PMC)**, and guideline-oriented perioperative resources. Search terms included combinations of *diabetes mellitus, perioperative management, perioperative glycemic control, anesthesia and diabetes, SGLT2 inhibitors surgery, perioperative insulin management, and postoperative hyperglycemia*. Priority was given to recent review articles, consensus statements, perioperative guidance papers, and clinically relevant evidence addressing preoperative assessment, medication adjustment, glycemic targets, intraoperative monitoring, and postoperative care. Additional classic references were included where clinically foundational.

2.1. Preoperative Assessment and Optimization

Perioperative optimization begins well before the day of surgery. A diabetic patient should not be viewed only in terms of a fasting blood sugar value; instead, the clinician should understand the **type of diabetes**, baseline control, treatment regimen, history of hypoglycemia, frequency of glucose fluctuations, and presence of diabetes-related complications.

A structured preoperative evaluation should include:

- duration and type of diabetes
- current medications, including insulin formulations and newer antidiabetic agents
- most recent glycemic markers, especially **HbA1c**
- presence of microvascular and macrovascular complications
- renal function and cardiovascular status
- autonomic dysfunction, neuropathy, and gastroparesis
- anticipated duration of fasting and type of surgery

HbA1c remains a useful indicator of longer-term control, particularly in elective surgery. Although elevated HbA1c may suggest increased perioperative risk, it should not be used as the sole determinant to cancel surgery. Rather, it should trigger a broader assessment of infection risk, wound healing concerns, and

the need for optimization before elective procedures. A patient with severe hyperglycemia, ketonemia, active infection, or metabolic decompensation requires stabilization before proceeding unless surgery is emergent.

Patients with diabetes are also more likely to have coexisting **ischemic heart disease, hypertension, chronic kidney disease, and autonomic neuropathy**, all of which may influence anesthetic planning. Autonomic dysfunction may contribute to labile blood pressure, silent ischemia, resting tachycardia, and delayed gastric emptying. Thus, perioperative diabetic optimization is not purely endocrine management—it is risk reduction across multiple organ systems.

2.2. Perioperative Glycemic Targets

One of the major shifts in modern perioperative care has been the move away from “tight control” toward **moderate and safe glucose targets**. Earlier approaches often emphasized near-normal glycemia; however, this increased the risk of hypoglycemia, especially in fasting or anesthetized patients. Current perioperative guidance generally favors maintaining glucose in a **reasonable, practical target range**, often around **140–180 mg/dL** for many hospitalized adults, while avoiding marked excursions at either end.

The ideal target may vary according to:

- type of surgery
- insulin dependence
- severity of illness
- ambulatory vs inpatient setting
- nutritional status
- risk of hypoglycemia

In day-care or ambulatory surgery, the emphasis is often on **safe same-day recovery** rather than aggressive inpatient-style correction. In major surgery, ICU admission, or prolonged fasting, closer monitoring and more structured insulin-based management are usually needed.

2.3. Management of Antidiabetic Medications

One of the most critical components of perioperative optimization is **appropriate adjustment of diabetes medications**. Medication errors in the perioperative period are common and can result in hypoglycemia, severe hyperglycemia, ketosis, or delayed recovery.

2.3.1. Oral Antidiabetic Agents

Sulfonylureas are generally withheld on the day of surgery due to the risk of fasting-related hypoglycemia.

Metformin is commonly managed more cautiously in the presence of renal dysfunction, hemodynamic instability, or expected contrast exposure. In many patients undergoing minor procedures, practices vary, but risk assessment remains essential.

2.3.2. SGLT2 Inhibitors

Among newer agents, **SGLT2 inhibitors** deserve particular attention. These drugs are now widely used not only for type 2 diabetes but also for heart failure and renal protection. Their perioperative importance lies in the risk of **euglycemic diabetic ketoacidosis (euDKA)**, which may occur despite only mild or moderate glucose elevation. This can be especially dangerous because the diagnosis may be delayed if clinicians focus solely on blood sugar values. Current recommendations support **withholding SGLT2 inhibitors before elective surgery** and maintaining a high index of suspicion for ketosis in the perioperative period.

2.3.3. GLP-1 Receptor Agonists

GLP-1 receptor agonists are increasingly used in diabetic and obese patients. Their perioperative relevance is linked to **delayed gastric emptying**, nausea, and possible aspiration risk in selected patients. Management should be individualized according to the drug used, dosing frequency, symptoms, and the nature of surgery.

2.3.4. Insulin

Insulin-treated patients require **individualized planning**, not blanket discontinuation.

For patients on **basal insulin**, a modified dose is usually continued to prevent severe hyperglycemia and ketosis, especially in **type 1 diabetes**, where omission of insulin can be dangerous.

Prandial or rapid-acting insulin is typically adjusted or withheld while fasting and resumed when nutritional intake is re-established.

This distinction is crucial: a fasting diabetic patient may not need meal-time insulin, but they may still require **background insulin support** to maintain metabolic stability. This is particularly important in insulin-dependent patients and those at risk of ketosis.

2.4. Intraoperative Management

Intraoperative diabetic management should focus on **glucose surveillance, hemodynamic stability, fluid balance, and avoidance of metabolic extremes**. The intensity of monitoring depends on the patient's diabetic profile, type of surgery, duration of procedure, insulin use, and baseline control.

In short ambulatory cases, intermittent glucose monitoring may be sufficient. In major procedures, long operations, or unstable patients, **more frequent testing** is necessary. Glucose should ideally be checked at induction and periodically thereafter, with the frequency adjusted according to insulin exposure and physiologic stress.

2.4.1. Insulin Strategy

For stable patients undergoing short procedures, **subcutaneous correctional insulin** may be adequate. However, in patients with:

- prolonged surgery
- severe hyperglycemia
- critical illness

- type 1 diabetes
- significant metabolic instability

an **intravenous insulin infusion** may provide safer and more predictable control.

The choice of fluid also matters. Excess dextrose without insulin may worsen hyperglycemia, while prolonged fasting without metabolic support may increase catabolism and ketosis. The goal is not simply to "treat sugar," but to maintain overall metabolic homeostasis.

2.5. Postoperative Management

The postoperative period is often the most unstable phase for diabetic patients. Surgical stress, pain, infection, nausea, steroids, reduced mobility, and inconsistent oral intake can all worsen glucose control. At the same time, improvement in intake or relief of physiological stress may suddenly change insulin requirements. Therefore, postoperative management should be **active and dynamic**, not merely a return to the home prescription.

Frequent glucose reassessment is particularly important in:

- insulin-treated patients
- major abdominal or vascular surgery
- septic or critically ill patients
- patients receiving steroids
- those with delayed oral intake

Antidiabetic medications should be resumed **thoughtfully**, not automatically. Oral agents should be restarted only when the patient is hemodynamically stable, renal function is acceptable, and oral intake is reliable. Insulin regimens should be tailored to current intake and metabolic state rather than copied directly from the preoperative routine.

Clinicians must remain alert for **postoperative DKA**, including **euglycemic DKA** in patients previously using SGLT2 inhibitors. Unexplained nausea, abdominal pain, tachypnea, malaise, or acidosis should prompt early ketone testing and metabolic evaluation.

2.6. Multidisciplinary and Practical Considerations

Perioperative diabetic optimization works best when it is **team-based**. Surgeons, anesthesiologists, physicians, nursing staff, and where available, endocrinology or diabetes teams should coordinate management rather than act in isolation. Good outcomes often depend less on a single glucose number and more on:

- clear communication
- standardized institutional protocols
- correct medication withholding
- early identification of risk
- timely transition back to nutrition and maintenance therapy

This is particularly relevant in high-turnover settings such as emergency surgery units, day-care operating rooms, and

government hospitals, where perioperative diabetic patients are common but formal endocrine input may not always be immediately available.

3. Conclusion

Perioperative optimization of diabetic patients is a clinically important and increasingly relevant aspect of modern surgical care. Safe management requires more than checking a random glucose level on the morning of surgery. It demands thoughtful preoperative evaluation, awareness of drug-specific risks, rational glycemic targets, intraoperative vigilance, and structured postoperative transition.

In the current era, perioperative clinicians must be especially aware of **SGLT2 inhibitor-associated ketoacidosis**, **GLP-1-related gastric emptying concerns**, and the continued importance of preserving **basal insulin** in insulin-dependent patients. A patient-centered, individualized, and protocol-based approach remains the most effective strategy to reduce perioperative morbidity and improve surgical outcomes [1-15].

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