Perioperative Management of Glucagon-like Peptide-1 Receptor Agonists and Sodium-Glucose Co-transporter 2 Inhibitors

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KEYWORDS

• GLP-1 receptor agonist • SGLT 2 inhibitor • Diabetes mellitus • Gastric emptying • Aspiration • Euglycemic DKA

KEY POINTS

- There is an increasing number of patients taking glucagon-like peptide-1 receptor agonists (GLP-1 Ras) and sodium-glucose co-transporter 2 (SGLT 2) inhibitors who are presenting for elective surgeries. Risk-stratification depends on patients' presenting symptoms and the specific pharmacokinetics and dosing schedule of their medications.
- GLP-1 RAs can increase the risk of gastric aspiration but can be continued perioperatively on asymptomatic patients on stable doses. Standard fasting guidelines should be followed and point-of-care ultrasound utilized when there is uncertainty of a full stomach.
- SGLT 2 inhibitors can increase the risk of euglycemic diabetic ketoacidosis and should be held 2 to 3 days preceding elective surgery.

BACKGROUND

According to the National Statistics Report, in 2021, 38.4 million people in the United States (11.6%) had diabetes mellitus (DM). The total cost of diagnosed diabetes in the United States in 2022 was $412.9 billion.[1] Worldwide, in 2022, 830 million people were living with diabetes.[2] Globally, in 2024, diabetes had an estimated cost of $1.015

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Abbreviations	
ADA	American Diabetes Association
ASA	American Society of Anesthesiologists
CI	confidence interval
DM	diabetes mellitus
DPP-4	dipeptidyl peptidase-4
eDKA	euglycemic diabetic ketoacidosis
GLP-1	glucagon-like peptide-1
GLP-1 RA	glucagon-like peptide-1 receptor agonist

trillion.[3] The obesity epidemic has worsened worldwide. In the past 30 years, the prevalence of obesity has seen an increase of 47.1% for children and 27.5% in the adult population.[4] According to the Joint Economic Committee, obesity-related expenses will cost the federal government in the United States $4.1 trillion from 2024 to 2033.[5] Among the drugs used to treat both DM and obesity are the glucagon-like peptide-1 receptor agonists (GLP-1 RAs) and the sodium-glucose co-transporter 2 (SGLT2) inhibitors.

HISTORY

Many GLP-1 receptor agonists initially developed for diabetes management have since been approved for weight loss. Exenatid (Byetta, 2005) was the first GLP-1 RA approved for diabetes and liraglutide (Saxenda, 2014) was the first approved for weight loss. GLP-1 RAs commonly encountered in practice include semaglutide, FDA-approved as Ozempic in 2017 for diabetes, and as Wegovy in 2021 for weight loss. Similarly, tirzepatide was initially FDA-approved as Mounjaro in 2022 for diabetes, then later as Zepbound in 2023 for weight loss.

Glucagon-Like Peptide-1 Receptor Agonists

Introduction

Glucagon-like peptide-1 receptor agonist pharmacology. Glucagon-like peptide-1 (GLP-1) is an endogenous incretin hormone secreted by enteroendocrine L-cells in the gut after food ingestion and is degraded by dipeptidyl peptidase-4 (DPP-4), resulting in a short half-life. It increases secretion of insulin by pancreatic β-cells and suppresses the release of glucagon by a-cells, which decreases blood glucose (**Table 1**).[6,7] It regulates appetite peripherally by slowing gastric emptying, and centrally via secretion from the brain stem solitary tract nucleus.[6,8]

GLP-1 RAs are agonists of GLP-1. Biochemically, GLP-1 RAs are formulated as either analogs of human GLP-1 (semaglutide, liraglutide, and dulaglutide) or exendin-based compounds (exenatide and lixisenatide) (**Table 2**).[9] Exendin homologs of

Table 1
GLP-1 RA location of action and physiological effects

Organ	Physiological Effects
Pancreas	Increase insulin secretion Decrease glucagon release
Brain	Increase satiety and suppress appetite (contributes to weight loss)
Gastrointestinal tract	Decrease glucagon secretion Slow gastric emptying

Table 2
GLP-1 RA generic name, trade name, half-life, dosing, administration route, approved indications

Generic Name	Trade Name	Half-Life	Dosing	Admin Route	Approved Indications
Semaglutide	Ozempic	7 d	Weekly	SC Injection	DM 2
	Rybelsus	7 d	Daily	PO	DM 2
	Wegovy	7 d	Weekly	SC Injection	Weight loss
Dulaglutide	Trulicity	5 d	Weekly	SC Injection	DM 2
Liraglutide	Victoza	13 h	Daily	SC Injection	DM 2
	Saxenda	13 h	Daily	SC Injection	Weight loss
Exenatide (ER)	Bydureon	96 h	Weekly	SC Injection	DM 2
Immediate release (IR)	Byetta	2.4 h	Twice daily	SC Injection	DM 2
Tirzepatide	Mounjaro	5 d	Weekly	SC Injection	DM 2 Weight loss
	Zepbound	5 d	Weekly	SC Injection	OSA

Abbreviations: Admin, administration; ER, extended release; IR, immediate release; OSA, obstructive sleep apnea; PO, oral; SC, subcutaneous; Wt mgmt, weight management.

GLP-1s resist proteolytic degradation by DPP-4 resulting in a longer half-life.[10,11] By their duration of action, GLP-1 RAs can be either short-acting (lixisenatide and exenatide immediate release) or long-acting (liraglutide, semaglutide, dulaglutide, and exenatide extended-release). Of note, lixisenatide is no longer available in the United States.

Indications. All GLP-1 RAs are FDA approved to improve glycemic control in patients with DM II as an adjuvant to diet and exercise. They are not for treatment of DM I. Long-acting GLP-1 RAs are approved for the treatment of obesity, regardless of whether the patient has DM or not.[12]

The American Diabetes Association recommends the use of GLP-1 RAs for patients with DM 2 who have not met glycemic targets with oral agents alone, and as first-line for those who cannot tolerate oral agents such as metformin due to renal function.[13] GLP-1 RAs can also be used for insulin-dependent diabetes for improved glycemic control.[14]

In patients with concomitant DM, GLP-1 receptor agonists have demonstrated other benefits including cardiovascular and renal protection. Studies have shown reduced hospitalizations for heart failure, improved progression of renal disease, and a 28% lower incidence of major cardiac events in a 7 year cohort follow-up study.[15,16] Their use has expanded to obesity treatment, promoting 10% to 15% weight loss through increased satiety and reduced hunger.[17–19] Semaglutide currently appears to be the most effective GLP-1 RA for weight loss.[20–22]

Discussion

Clinical implications of glucagon-like peptide-1 receptor agonists

The benefits of GLP-1 RAs extend beyond glycemic control. Studies such as the LEADER (liraglutide) and SUSTAIN-6 (semaglutide) trials in patients with DM have demonstrated reductions in cardiovascular events and sustained weight loss, positioning these drugs at the forefront of metabolic disease management.[20,23,24]

However, their mechanism of action, which includes delayed gastric emptying and modulation of appetite, may present unintended perioperative risks.

Gastrointestinal side effects of glucagon-like peptide-1 agonists

The most commonly cited concern with GLP1 RAs is delayed gastric emptying through slowing gastric motility through augmentation of pyloric tone and inhibition of peristalsis.[25–27] Assessment of residual gastric contents has been performed using elective upper endoscopy and point-of-care gastric ultrasound.[28] Several large studies have demonstrated increased gastric residuals despite adherence to standard fasting protocols. A retrospective study of elective upper endoscopies found that semaglutide use was significantly associated with higher residual gastric contents, and increased contents correlated with the presence of pre-operative gastrointestinal symptoms such as nausea, vomiting, and bloating.[27] In a separate matched pair case–control endoscopy study involving 205 pairs with diabetes fasting greater than 12 hours, the proportion of gastric residue was significantly higher in the GLP-1 RA treatment group than control (5.4% vs 0.49% respectively, P=.004), although no clinical adverse events were reported.[29] A large multicenter retrospective study similarly found the incidence of "poor preparation" suggestive of gastric residue being significantly increased in patients taking a GLP-1 RA (5.6%) versus control (2.0%) (P<.001) receiving upper endoscopies.[30] The presence of diabetes and GLP-1 RA use were independent risk factors for gastric residue with significantly increased risk (OR 2.1 P<.001; 95% confidence interval [CI] 1.698–2.677) seen in GLP-1 RA use and (OR 2.0, P < .001, 95%CI 1.827–2.353) concomitant diabetes.[30]

Compared with upper endoscopy studies, gastric ultrasound is more accessible for point-of-care assessment pre-operatively. A prospective study assessing 124 participants undergoing elective procedures with gastric ultrasound found that patients on GLP-1 RAs, even those who held the medication for more than a week, had a greater incidence of residual gastric contents quantified as greater than 1.5 mL/kg (prevalence ratio, 2.92; 95% CI, 1.67–5.08).[31] There was no association between duration of discontinuation and GLP-1 RA type within this study. Other smaller prospective studies have corroborated increased residual contents in patients on GLP-1 RA following an overnight fast and 2 hours after clear liquids (risk ratio [RR], 3.50; 95% CI, 1.26–9.65; P=.02).[32] Considerable variation in gastric emptying has been observed with short-acting GLP-1 RAs, which do not remain pharmacologically effective over 24 hours. Long-acting GLP-1 RAs are more closely associated with delayed gastric emptying effects but may exhibit tachyphylaxis after months of maintenance. A prospective trial of liraglutide showed heterogeneous effects at 16 weeks, with some patients having persistent gastric emptying delays, others showing initial delays followed by tachyphylaxis, and some showing no significant change.[33] Patients with additional risk factors, such as diabetic autonomic neuropathy, opioid use, or altered GI anatomy may present increased risk for gastroparesis. Holding long-acting medications for several weeks for return of gastric motility may be impractical or harmful to glycemic control.[32]

Perhaps due to increased vigilance, overt regurgitation and aspiration events associated with GLP-1 RAs at induction have been limited and typically described in case reports. These cases involved patients who had followed standard fasting guidelines but had taken their weekly-dosed GLP-1 RA within the week prior to their procedure.[34–36] Currently, data remain conflicting regarding whether there is an increased risk of aspiration events in patients taking GLP-1 RAs.[37] One of the largest studies suggested an increased risk of aspiration pneumonia for patients on GLP-1 RA undergoing endoscopies (hazard ratio, 1.33; 95% CI, 1.02–1.74), with the highest risk in

procedures with propofol sedation likely due to impairment of airway reflexes.[38] A separate meta-analysis of nine largely retrospective studies found that while patients using GLP-1 RA agonists presented with increased residual gastric contents, there was not strong evidence to suggest increased aspiration risk.[39] Several studies of patients undergoing upper endoscopies found increased risk of retained gastric contents, but only an estimated 0.2% of cases resulting in evident pulmonary aspiration.[40] Evidence on the effects of GLP-1 RA agonists on pulmonary aspiration is weak and largely biased toward retrospective studies on patients receiving endoscopies. Aspiration risk should still be carefully weighed even with adherence to fasting protocols. Risks are highest during early treatment phases, dose escalation, or in patients with comorbid gastrointestional motility impairments.[32,33]

Challenges in the ambulatory setting

The ambulatory surgical environment presents significant challenges for safely managing patients on GLP-1 RAs. Patient compliance with pre-operative instructions to hold GLP-1 medications is difficult, particularly when communication is fragmented between prescribers, surgical, and anesthesia teams. This has anecdotally led to an increasing number of day-of-surgery cancellations, which may carry substantial patient dissatisfaction, delays in patient care, financial implications for surgical centers due to lost operating room time, and resource allocation inefficiencies. There are limited data on elective surgery cancellation rates associated with GLP-1 RAs, though large-scale studies of diagnostic EGDs have cited increase in same-day cancellation rates from 4% to up to 13%, and up to 5% rates in procedures aborted early due to gastric residue.[41]

Beyond aspiration, symptoms such as nausea, vomiting, and bloating may contribute to intravascular volume depletion, perioperative hypotension, and exacerbate electrolyte abnormalities, thereby interfering with post-operative recovery. Meta-analysis of 14 studies on patients receiving elective surgeries demonstrated an increased rate of preprocedural gastrointestinal symptoms but no difference in post-operative nausea and vomiting, post-operative inotropic support, or 30-day mortality. Aspiration events in patients receiving elective surgery remain largely in case reports.[42] While this suggests that patients on GLP-1RAs do not fare significantly differently in the post-operative phase following elective surgery, there is limited evidence fully investigating the impact of GLP-1 RA use on same-day ambulatory anesthesia, patient dissatisfaction, cancellation rates, and financial implications.

Lastly, the growing use of custom-compounded GLP-1 RAs presents additional challenges in the perioperative setting. Patients may seek out non-traditionally sourced GLP-1 RAs, which may not show up in the medical record, as a cost-effective alternative or due to shortages of FDA-approved drugs, often with variable medical oversight. These formulations may have unpredictable pharmacokinetics and dosing reliability, further complicating risk assessments.

Risk reduction strategies

Effective perioperative management of patients taking GLP-1 RAs requires a structured, multidisciplinary approach rooted in current available evidence. Early guidelines were conservative and recommended routine holding of GLP-1 RAs, but prolonged holds risk unpredictable patient response. Awaiting return of gastric motility may be impractical. The American Society of Anesthesiologists (ASA) previously recommended holding daily GLP-1 RAs on the day of surgery and weekly formulations for at least 7 days prior to procedures involving sedation or general anesthesia, regardless of whether they are prescribed for diabetes or weight loss.[43] These early guidelines

were subject to debate with evidence cited for rebound weight gain and dysglycemia in addition to the indeterminate findings of aspiration risk in endoscopy studies above.[44] The European Society of Anaesthesiology and Intensive Care advises pausing once-weekly GLP1 RAs at least 1 week prior to elective procedures, but advises holding GLP1 RAs up to 2 weeks when used for obesity, particularly in high-risk patients or in the presence of gastrointestinal symptoms.[45] These recommendations are based on the growing recognition that delayed gastric emptying induced by GLP-1 therapy can persist even during standard pre-operative fasting and increase the risk of aspiration under anesthesia.[46,47]

In addition to medication management, pre-operative assessment should include a focused evaluation of glycemic status, especially in patients with diabetes, as withholding GLP1 RAs can cause hyperglycemia. Adjustments to insulin or other antihyperglycemic therapies may be necessary to maintain metabolic stability. For patients with unclear medication history or in urgent cases where GLP-1 therapy cannot be discontinued, point-of-care gastric ultrasound is increasingly recommended by both ASA and ESA as a tool to assess residual gastric content and inform anesthetic planning. Gastric ultrasound offers a real-time, individualized risk stratification strategy (**Fig. 1**) though the technique relies on equipment availability and operator familiarity. The diagnostic performance of the technique has relatively high sensitivity and specificity, with a metanalysis reporting a sensitivity of 95% (95% CI, 84%–99%) and specificity of 88% (95% CI, 72%–95%).[48,49]

Regarding extended fasting before surgery, some expert consensus statements now suggest extending fasting protocols to include a 24 h clear-liquid diet prior to surgery for patients at higher risk of gastroparesis, particularly those on high-dose or recently escalated GLP-1 therapy.[45,50] While these recommendations often arise from expert consensus rather than primary literature, this approach may mitigate aspiration risk when medication cannot be withheld for the full recommended interval. Prokinetic agents such as intravenous metoclopramide and erythromycin have been under consideration, though previously only erythromycin has been shown to counteract

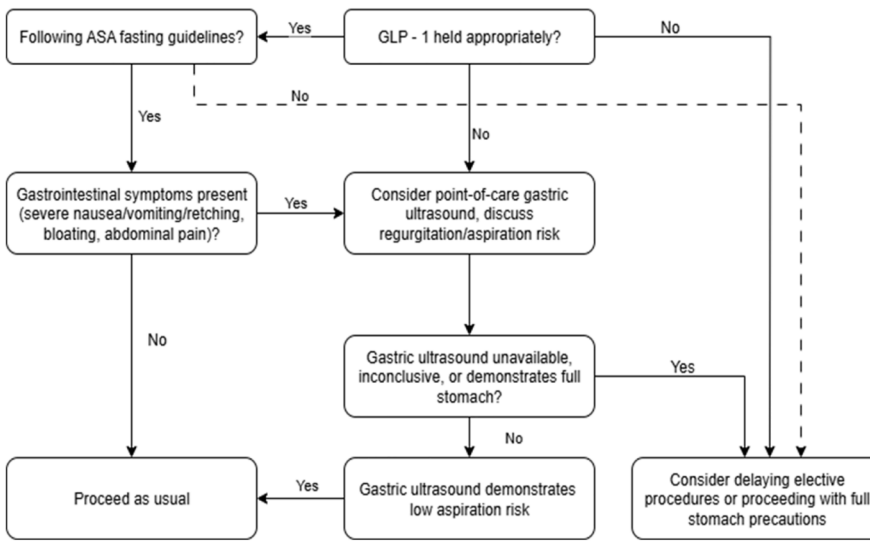

Fig. 1. Management of patients on GLP-1 RAs having elective procedures. GLP-1 RA, glucagon-like peptide-1 receptor agonist.

the delayed gastric emptying. The administration of additional medication is accompanied by side effects including attenuating the hypoglycemic effect of the GLP1-RA.[51] Current society guidance does not suggest routine administration of prokinetic medications at this time.

Sodium-Glucose Co-transporter 2 Inhibitors

Introduction

The first patients with mutations in the genes for the SGLT2 were described in 1927. Termed familial glucosuria, these patients had renal losses of glucose of up to 150 g per day and rarely experienced severe co-morbidities due to their condition.[52] This observation contributed to the discovery that inhibition of SGLT2 could be a potential target for the treatment of DM.

Pharmacology

SGLT2 inhibitors function by preventing the reuptake of glucose in the proximal tubule resulting in increased glucose excretion.[53] In DM, patients typically experience glucose hyperfiltration due to increased expression of SGLT2, reducing plasma glucose, increasing caloric excretion, and improving weight loss.[54,55] Increased glucose reuptake in diabetes results in concomitant increased sodium resorption. By reducing the amount of sodium reaching the distal tubule, SGLT2 inhibition leads to afferent arteriolar dilation, increased intraglomerular pressure, and increased glomerular filtration rate. SGLT2 inhibition increases natriuresis and reduces circulating volume and blood pressure.[53]

SGLT2 inhibitors are readily absorbed by the gastrointestinal tract and are typically dosed daily.[56] This is in large part due to high protein binding and half-lives ranging from 10 to 17 hours (**Table 3**).[57]

Since their FDA approval in 2013, the number of prescriptions of SGLT2 inhibitors has increased steadily.[60] 11.9% of patients with type 2 DM in 2019 were taking SGLT 2 inhibitors, up from 3.8% in 2015.[61] With this number likely to increase, anesthesiologists must be prepared for perioperative management of SGLT2 inhibitors. In patients with type 2 diabetes, SGLT2 inhibitors have been shown to reduce mortality due to cardiovascular causes and hospitalizations for heart failure, even in the absence of diabetes.[62,63] Empagliflozin was shown to reduce progression of chronic kidney disease and provide cardiorenal benefits for up to 12 months after its discontinuation.[64]

SGLT2 inhibitors are generally well tolerated and carry minimal risk with outpatient long term use. Hypoglycemia is rare, likely due to the action of SGLT1, which

Table 3
Half-lives and starting oral doses of common SGLT2 inhibitors

SGLT2 Inhibitor	Half-Life [hours]	Starting Oral Dose [per day]
Canagliflozin	10–13	100 mg
Dapagliflozin	13	10 mg
Empagliflozin	13	10 mg
Ertugliflozin	11–17	5 mg

Adapted from Patel K, Nair A. A literature review of the therapeutic perspectives of sodium-glucose cotransporter-2 inhibitor-induced euglycemic diabetic ketoacidosis. *Cureus* 2022;14(9):e29652; and American Diabetes Association Professional Practice Committee. Pharmacologic approaches to glycemic treatment: standards of medical care in diabetes—2022. *Diabetes Care* 2022;45(Suppl 1):S125–S143.[58,59]

reabsorbs glucose in the proximal tubule.[55,65] Additional improvements in insulin sensitivity and gluconeogenesis compensate to maintain glucose homeostasis. As a result, SGLT2 inhibitors can safely be used in patients with a wide range of glycemic control. However, increased urinary excretion of glucose can create a favorable medium for bacterial or fungal growth, thus possibly increasing risk of urinary tract infection, seen rarely with dapagliflozin.[66,67]

DISCUSSION

Clinical Implications

SGLT2 inhibitors exert their glucose-lowering effect primarily through promotion of glucosuria, resulting in an osmotic diuresis and a concomitant shift in energy metabolism toward enhanced lipolysis and ketone utilization.[68] Although these mechanisms are therapeutically advantageous in the outpatient management of diabetes, they confer risks in the peri-operative period.

Concurrently, it is important to recognize the growing body of evidence from large-scale randomized trials and meta-analyses demonstrating the consistent cardiometabolic benefits of SGLT2 inhibitors.[69,70] These findings highlight the transformative impact of these agents on long-term patient outcomes and emphasize their increasing role in contemporary clinical practice. These competing considerations underscore the necessity for integrated, multidisciplinary peri-operative pathways that incorporate both chronic disease outcomes and acute surgical safety.

Peri-operative Risks

Euglycemic diabetic ketoacidosis

eDKA is a distinct clinical entity characterized by the triad of high-anion-gap metabolic acidosis, increased circulating ketones (most notably β-hydroxybutyrate), and blood glucose concentrations that are either normal or only modestly elevated, typically less than 250 mg/dL. Its development is driven by SGLT2-mediated glucosuria and reduced insulin secretion, which, together with an elevated glucagon-to-insulin ratio, enhance lipolysis and ketogenesis. When superimposed upon peri-operative stressors, including fasting, counter-regulatory hormone surges, and reductions or omissions in exogenous insulin therapy, ketone production is markedly amplified.[70] The clinical presentation is nonspecific, encompassing nausea, vomiting, abdominal discomfort, malaise, and tachypnea. Yet these features may be obscured by peri-operative analgesia and sedation.[71–73]

Although absolute incidence is low, relative risk is appreciable. Observational series and systematic reviews estimate rates of approximately 0.17% in elective procedures, with elevations to approximately 1.1% in emergent settings.[43,74] Several risk factors predispose patients for the development of eDKA including insulin dependent diabetes, prolonged fasting, and ketogenesis. In the presence of pre-existing insulin resistance and prolonged fasting, cells may be unable to absorb adequate glucose at plasma concentrations kept low by SGLT2 inhibitor-mediated increased glucose excretion. The resulting shift toward intracellular anaerobic metabolism results in lactic acidosis.[75] Case reports and institutional audits further illustrate that eDKA may arise across a broad spectrum of surgical procedures, including outpatient contexts where early recognition is particularly challenging. Current observational series, case reports, and audits document eDKA across a wide range of surgical procedures, but the available data do not consistently stratify incidence by anesthesia type or surgical site. While some reports suggest higher vigilance may be warranted in major or prolonged procedures, no definitive comparative rates

have been established in these subgroups.[76] Morbidity is significant when diagnosis is delayed, with many cases necessitating ICU admission.[77–80]

Management follows standard principles of DKA therapy but requires adaptation to the euglycemic context, including continuous intravenous insulin infusion to suppress ketogenesis paired with concomitant glucose administration to mitigate hypoglycemia. Patients should receive aggressive crystalloid resuscitation and vigilant electrolyte repletion. Serial monitoring of β-hydroxybutyrate provides useful diagnostic and therapeutic guidance.[77] Importantly, a low diagnostic threshold for arterial blood gas analysis and ketone assessment in the setting of unexplained acidosis is clinically recommended.

Other risks and peri-operative considerations

In addition to eDKA, SGLT2 inhibitors introduce a spectrum of other peri-operative risks, including hypotension and low urinary filtration. Electrolyte disturbances, particularly sodium, potassium, and bicarbonate imbalances, can exert clinically meaningful effects on anesthetic management. SGLT2 inhibitors promote urinary sodium loss, which can lead to volume depletion and compensatory hyperaldosteronism, occasionally resulting in hypokalemia. Additionally, bicarbonate loss may contribute to a non-anion gap metabolic acidosis, especially when compounded by perioperative fasting and surgical stress.[81,82] Furthermore, concomitant use with insulin, diuretics, or ACE inhibitors/ARBs may potentiate these electrolyte derangements.[56,60,83] Other minor complications include genitourinary and fungal infections, hypoglycemia with other oral anti-hyperglycemics, and very rarely Fournier's gangrene.[77,78,84–86] Collectively, these considerations emphasize that peri-operative risk assessment must extend beyond ketoacidosis alone.

Challenges in the ambulatory setting

Ambulatory surgical contexts introduce unique challenges due to rapid discharge timelines and limited post-operative surveillance. While short fasting intervals may reduce the biochemical risk of eDKA, these settings increase the likelihood of delayed recognition of metabolic complications if they do occur. Institutional variability in perioperative recommendations further contributes to inconsistent practices, underscoring the need for standardized and evidence-based protocols.[87,88] Some institutions recommend discontinuing SGLT2 inhibitors in these patients before surgery, while others advise continuation, citing potential risks associated with discontinuation. This inconsistency reflects the absence of a unified protocol across health care settings.[89]

Risk Reduction Strategies

Preoperative considerations

Most guidelines advise withholding SGLT2 inhibitors for at least 3 days prior to surgery, with ertugliflozin requiring 4 days due to its longer half-life (**Fig. 2**). However, institutional protocols vary, and clinical practices often differ from guideline recommendations.[88,89] In patients deemed high risk, such as those with tenuous glycemic control, limited oral intake, or undergoing procedures of high metabolic stress, baseline evaluation of ketones and acid–base status may be prudent.[90]

Intraoperative measures

Meticulous fluid management is essential to offset both osmotic and surgical fluid losses, though it depends on procedure type and duration. Glucose should be monitored frequently, and unexplained acidosis, such as that arising from prolonged fasting, surgical stress, perioperative insulin adjustments, or volume depletion, should prompt

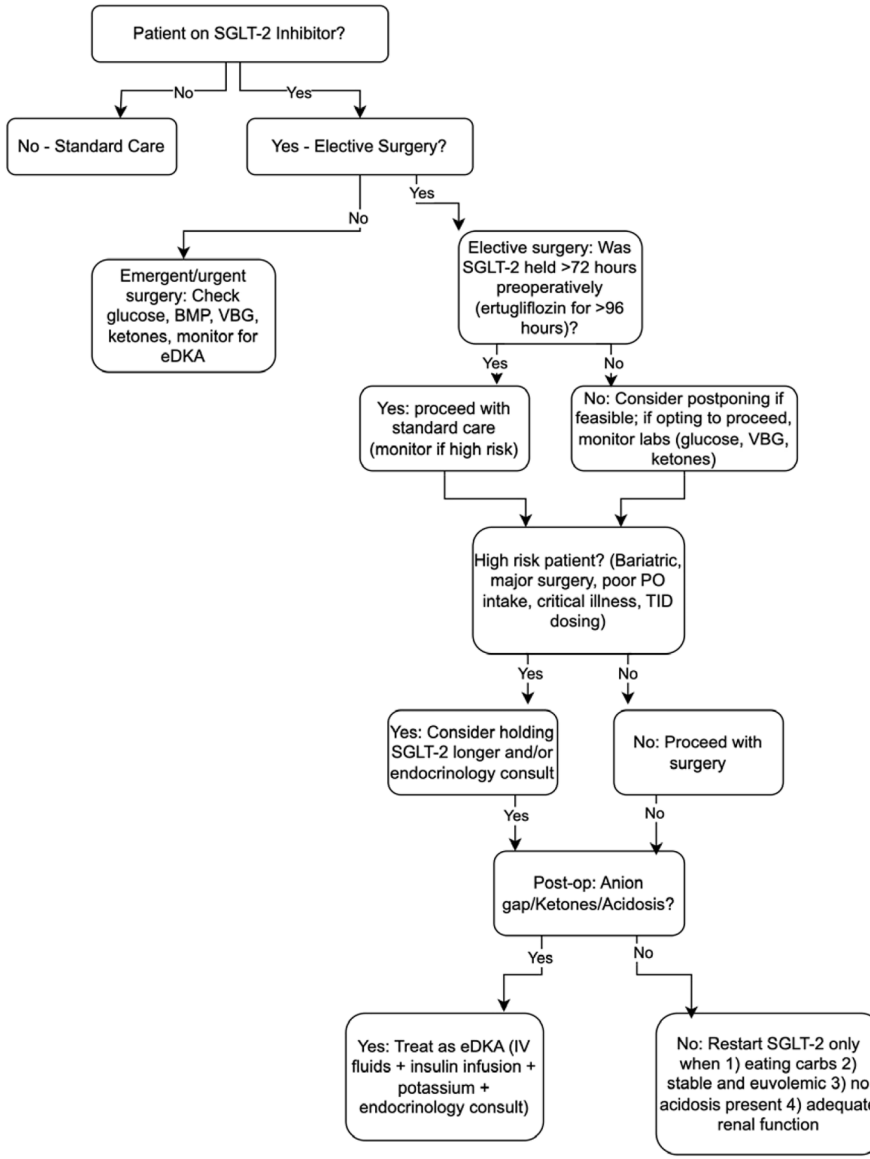

Fig. 2. Algorithm for peri-operative management of patients on SGLT2 inhibitors. SGLT-2, sodium-glucose co-transporter 2.

early investigation with arterial blood gases and ketone testing. Concurrent administration of additional nephrotoxic or diuretic agents should be avoided to mitigate cumulative renal and hemodynamic stress.[73,80]

Postoperative monitoring and therapy re-initiation

Postoperative surveillance should extend beyond PACU, particularly in the ambulatory setting (see **Fig. 2**). Patients should receive explicit education regarding the signs and symptoms of eDKA and hypoglycemia. Re-initiation of therapy should be deferred

until oral intake is adequate, and the patient demonstrates clinical stability and adequate hydration. Laboratory evaluation may be considered selectively for patients with intraoperative complications, prolonged fasting, or other risk factors mentioned. Multidisciplinary input from anesthesia, endocrinology and surgical teams is recommended in such higher-risk cases.[78,87]

CLINICS CARE POINTS

- Patients taking GLP-1 RAs should be asked how long they have taken the medication, the time of the last dose, and if they have any gastrointestinal symptoms suggestive of an increased risk of aspiration under anesthesia.
- Expert consensus statements recommend holding the GLP-1 RA for a week prior to elective procedures and suggest placing patients who are at a higher risk of gastroparesis and aspiration on a 24-hour clear-liquid diet prior to surgery.
- For patients with unclear medication history and fasting status who might be at risk aspiration, consider rescheduling elective procedures, utilizing gastric ultrasound if available, or employing rapid sequence induction.
- Due to the risk of developing euglycemic ketoacidosis, patients taking SGLT2 inhibitors should hold the medication for 3 days prior to surgery (4 if taking ertugliflozin).
- If patients did not hold the SGLT2 inhibitor for the recommended period of time, both baseline evaluation of ketones and acid-base status and postoperative monitoring for the development of euglycemic ketoacidosis are advised.

DISCLOSURES

The authors have nothing to disclose.

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