

Management of Diabetes Medications for Patients Undergoing Ambulatory Surgery

Mary Ann Vann, MD

KEYWORDS

- Ambulatory anesthesia • Ambulatory surgery • Diabetes mellitus
- Perioperative hyperglycemia • Perioperative insulin

KEY POINTS

- Perioperative hyperglycemia is typically due to the neuroendocrine stress response and the discontinuation of insulin and other antihyperglycemic medications.
- Blood glucose (BG) should be maintained in a patient's usual range because acute variations may be harmful.
- Hypoglycemia treatments should be readily available for fasting patients.
- For type 1 diabetic patients, basal insulins should be administered at or near customary doses.
- For type 2 diabetic patients, oral medications may be withheld on the day of surgery until meals resume; intermediate-acting or sole peakless insulin regimens usually require modification.

PREOPERATIVE INQUIRIES

Patients should be questioned about duration and type of diabetes, compliance with medications, level of glycemic control, and frequency of self-monitoring of BG (SMBG). Their understanding of and skill in managing their treatment regimen must be evaluated prior to altering medications preoperatively. Practitioners should ascertain the incidence and frequency of hypoglycemia, the BG at which symptoms occur, and the presence of hypoglycemia unawareness.

Medications for Type 2 Diabetes Mellitus

Among diabetics, 72% take oral hypoglycemic drugs,¹ with metformin the first-line oral hypoglycemic. Patients with renal insufficiency may develop lactic acidosis, and metformin is often held prior to radiologic procedures requiring contrast. Insulin secretagogue

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Department of Anesthesia, Critical Care and Pain Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, 330 Brookline Avenue, Boston, MA 02215, USA

E-mail address: mvann@bidmc.harvard.edu

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drugs, such as sulfonylureas (eg, glinides) and meglitinides may cause perioperative hypoglycemia. **Table 1** provides additional information on hypoglycemic drugs.

Insulin

Although only 5% to 10% of all diabetics have type 1 diabetes mellitus, 26% take insulin (**Table 2**).¹ The preferred regimen of physiologic insulin dosing (also called basal bolus) mimics endogenous insulin production by providing basal, prandial or nutritional, and correction doses.² Continuous subcutaneous insulin infusions via an insulin pump or long-acting peakless insulin analogs are used for basal dosing. Basal insulin comprises approximately 50% of a patient's total daily dose (TDD) of insulin, which covers basal metabolic needs and should not cause hypoglycemia.³ Patients administer variable boluses of rapid-acting nutritional insulin to match the carbohydrate content of meals. The final element of a physiologic insulin regimen is correction of elevated BG.

Peakless insulin alone or intermediate-acting or premixed insulins are alternative regimens used mostly by type 2 diabetes mellitus patients. For these patients, insulin supplements oral medications and endogenous insulin production but may cause hypoglycemia while fasting. Type 2 diabetes mellitus patients are insulin resistant and usually require higher insulin doses for the same level of BG control.⁴ Administration of premixed or fixed combinations of intermediate- and short- or rapid-acting insulins poses a challenge perioperatively, because each should be dosed independently. Components of premixed NPH insulin and regular insulin are available, but for Humalog (Lilly, Indianapolis, IN, USA) Mix, intermediate-acting lispro protamine is not offered alone and NPH insulin must be substituted. Split dosing for most patients should occur at an ambulatory facility.

Insulin Pumps

More than 20% of type 1 diabetes mellitus patients in the United States use insulin pumps.^{5,6} The pump delivers multiple basal infusion rates of a rapid-acting insulin analog (RAIA), lispro, aspart, or glulisine, which matches diurnal rhythms and activity and also provides adjustable nutritional and correction insulin boluses. The lowest basal rate should be used perioperatively, although some authors advocate reducing this rate by 10% to 20% to prevent hypoglycemia.⁶ Basal insulin is vital for metabolic functions, and replacement insulin must be administered if the pump is discontinued. An insulin-deficient patient's BG rises 45 mg/dL per hour if basal insulin is withheld.⁷

HYPOGLYCEMIA

Hypoglycemia is a common occurrence in type 1 and advanced type 2 diabetic patients. Elderly patients are at increased risk due to fewer symptoms and diminished counter-regulatory responses.^{8,9} The alert value for hypoglycemia, BG less than 70, allows for a response prior to symptoms in well-controlled patients.¹⁰ Severe hypoglycemia, BG less than 40 or cognitive impairment, typically requires assistance to correct. Thresholds for hypoglycemic symptoms are dynamic and are reduced by frequent low BG and elevated by poor glycemic control.

There are 2 levels of symptoms during hypoglycemia. Sympathoadrenal activation with mild hypoglycemia produces neurogenic symptoms, such as sweating, palpitations, hunger, and tremor. At lower BG, neuroglycopenic symptoms of fatigue, confusion, visual changes, and seizures occur.^{3,11} Hypoglycemia unawareness or hypoglycemia-associated autonomic failure minimizes or eliminates a patient's neurogenic symptoms, so neuroglycopenic symptoms are the only response to low BG. This unawareness can be diminished by elevating BG targets.

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