

What dose of insulin should be ordered preoperatively?

In patients with diabetes undergoing inpatient or outpatient surgery, appropriate glycemic management is important in reducing morbidity and mortality; hyperglycemia and hypoglycemia are associated with poor outcomes including death.^{1,2} In terms of preoperative management, Table 1 summarizes guideline recommendations and consensus statements regarding appropriate preoperative insulin treatment in patients with diabetes.

Table 1: Guidelines/consensus statements regarding preoperative insulin in patients with diabetes.

Guideline/consensus statement	Recommendations
AACE/ADA consensus statement on inpatient glycemic control (2009) ¹	<ul style="list-style-type: none"> Does not address preoperative insulin management
ADA guidelines on diabetes care in the hospital (2018) ²	<ul style="list-style-type: none"> On the day of surgery/procedure, give half of NPH dose or 60-80% of the dose of long-acting analog or pump basal insulin Recommends withholding metformin and other oral hypoglycemic agents on the morning of surgery/procedure Monitor BG every 4-6h and provide short-acting insulin as needed Notes that the perioperative target BG ranges from 80 – 180 mg/dL; once insulin is initiated, the target BG is 140 – 180 mg/dL in most patients (some patients may benefit from a lower BG goal of 110 – 140 mg/dL) Following surgery, ADA recommends use of basal and nutritional insulins in patients with good nutritional intake who are not critically ill
NHS/UK guideline for perioperative management (2012) ³	<ul style="list-style-type: none"> Although focused on perioperative management, NHS does address preoperative management Recommends the following on the morning of surgery: <ul style="list-style-type: none"> <u>Once daily insulin [long-acting]</u>: no change in morning administration of once daily insulin; check BG upon admission <u>Twice-daily insulin</u>: halve the morning dose; check BG upon admission; leave evening meal dose unchanged <u>Short-acting insulin</u>: hold the morning and lunchtime doses <ul style="list-style-type: none"> Notes that mealtime insulin may be resumed when a patient resumes a normal diet <u>Metformin</u>: withhold morning dose in fasting patients with renal impairment; may administer morning dose in patients without renal impairment <u>Acarbose</u>: withhold morning dose in fasting patients <u>Sulfonylureas</u>: withhold morning dose <u>DPP-IV inhibitors, GLP-1 analogs</u>: withhold on day of surgery <u>Pioglitazone</u>: take as normal

Guideline/consensus statement	Recommendations
	<ul style="list-style-type: none"> • Recommends optimization of glycemic control preoperatively • Recommends a target perioperative BG range of 106 – 180 mg/dL (6 – 10 mmol/L)
<p>SAMBA consensus statement on BG in ambulatory surgery (2009)⁴</p>	<ul style="list-style-type: none"> • Notes insufficient evidence for preoperative management using insulin; should consider patient’s preoperative glycemic control, safety concerns (e.g., risk for hypoglycemia), maintenance of glycemic control, timing of surgery, and resumption of meals • For insulin, recommends the following on the day of surgery: <ul style="list-style-type: none"> • <u>Long-acting insulins</u>: 75-100% of morning dose (reduce nighttime dose if history of morning/nocturnal hypoglycemia; may administer morning dose of basal insulin upon arrival for ambulatory surgery) • <u>Intermediate-acting insulins</u>: 50-75% of morning dose (see long-acting insulins for additional comments) • <u>Fixed-combination insulins</u>: 50-75% of morning dose of intermediate-acting insulin (use NPH insulin if patient is using lispro-protamine [only available in combination]) • <u>Short- and rapid-acting insulins</u>: hold the dose • <u>Insulin pumps</u>: no change but recommends using “sick day” or “sleep” basal rates • Metformin: discontinue 24-48h prior to surgery in patients with renal dysfunction who may receive IV contrast • Other oral antidiabetic agents and non-insulin injectables: withhold on the day of surgery • Notes insufficient data regarding recommended preoperative fasting BG or HbA1c levels for which ambulatory surgery should be postponed • Recommends that patients may resume their preoperative antidiabetic treatment once a normal diet is resumed following surgery
<p>STS guideline on BG management in cardiac surgery (2009)⁵</p>	<ul style="list-style-type: none"> • Recommends the following on the day of surgery: <ul style="list-style-type: none"> • <u>For admitted patients</u>: scheduled insulin therapy (e.g., combination of long-acting/short-acting SC insulin or an infusion insulin protocol) should be administered • <u>For patients admitted on the day of surgery</u>: basal insulin (e.g., glargine, detemir, or NPH) should be continued; nutritional insulin (e.g., lispro, aspart, glulisine, or regular) should not be administered; consider reducing the NPH dose by one-half or one-third <ul style="list-style-type: none"> • Administer IV continuous infusion insulin or SC basal + rapid-acting insulin for patients with persistent hyperglycemia (BG>180 mg/dL for >12h prior to surgery)

Guideline/consensus statement	Recommendations
	<ul style="list-style-type: none"> • Re-start typical insulin regimen once patient resumes a normal diet following surgery • Oral hypoglycemic and non-insulin diabetes agents: hold for 24h prior to surgery; restart metformin once stable renal function has been documented and a normal diet has been resumed; other oral agents may also be resumed upon return to a normal diet • Regarding BG, states that it is reasonable for preoperative BG to be ≤ 180 mg/dL

AACE=American Association of Clinical Endocrinologists, ADA=American Diabetes Association, BG=blood glucose, DPP-IV=dipeptidyl peptidase-IV, GLP-1=glucagon-like peptide-1, h=hours, IV=intravenous, NHS=National Health Service, SAMBA=Society for Ambulatory Anesthesia, SC=subcutaneous, STS=Society of Thoracic Surgeons, UK=United Kingdom.

Conclusion

Treatment guidelines and consensus statements are not consistent in terms of insulin dosage recommendations in the preoperative setting.¹⁻⁵ For long-acting or basal insulins, 2 recommend continuing the same dose, while 2 others recommend dosage adjustment; however, for short-acting insulins, non-insulin injectables, and most oral antidiabetic agents, all guidelines/consensus statements recommend holding the dose. In addition to these recommendations, it is important to consider patient-specific factors such as type of diabetes, preoperative glycemic control, patient morbidity, and type/length of surgery.⁶ Finally, different healthcare settings may have their own insulin dosage algorithms in place based on the type of institution (e.g., inpatient, ambulatory) and the surgery that is being performed.

References

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