

The **American Diabetic Association** provides the following ungraded recommendations for insulin use in various inpatient clinical situations:

- Overall recommendations:
 - Total insulin requirement per day can be based on prior known insulin doses or calculated as 0.6 units/kg per day.
 - In general, basal insulin requirement is 40% to 50% of the total daily insulin requirement.
 - Prandial/nutritional or correction/supplemental requirement per dose is usually about 10% to 20% of the total daily insulin requirement.
 - Type 1 diabetics always must be continued on insulin.
 - The 3 components of subcutaneous insulin therapy are: (1) scheduled insulin for basal insulin requirements; (2) scheduled insulin for prandial and/or nutritional requirements; and (3) correction/supplemental insulin; various insulin types can be used to meet patient-specific needs.
 - The organization includes the following insulins types for use in their recommendations: long-acting insulin (ie, insulin glargine or insulin zinc extended), intermediate-acting insulin (ie, insulin isophane or insulin zinc), insulin regular, and rapid-acting insulin (ie, insulin aspart or insulin lispro).

- Patients who are eating meals:
 - For basal insulin, use an intermediate-acting insulin (twice daily or at bedtime), long-acting insulin (at bedtime or in the morning), or IV insulin infusion; insulin glargine is given daily, usually at bedtime. Continuous subcutaneous insulin infusion is another option.
 - For prandial/nutritional insulin, use insulin regular or a rapid-acting insulin before meals (either breakfast/dinner or breakfast/lunch/dinner).
 - For correction/supplemental insulin, use insulin regular or a rapid-acting insulin before meals and optionally at bedtime; however, bedtime doses should be minimized or avoided due to risk of nocturnal hypoglycemia.
 - A biphasic insulin of 70/30 or 75/25 formulation (before breakfast and dinner) may be used instead of the above to meet both basal and prandial insulin requirements.
 - Give Insulin regular 30 to 45 minutes before meals
 - Give rapid-acting insulin 0 to 15 minutes before meals.
 - IV insulin infusion is indicated in severely decompensated type 1 diabetics (even those without DKA) and in hyperglycemic hyperosmolar type 2 diabetics.

- Patients who are not eating:
 - For basal insulin, use IV insulin infusion, an intermediate-acting (twice daily or at bedtime), or long-acting insulin (at bedtime or in the morning).
 - Prandial/nutritional insulin is not given.
 - For correction/supplemental insulin, use insulin regular (every 4 to 6 hours) or a short-acting insulin (every 4 hours).
 - Consider that noninsulin-dependent patients may have lowered or no basal insulin requirement when not eating. Thus for type 2 diabetics, the organization states that one safe initial strategy is to assume that endogenous insulin may be adequate when not eating and to treat only with correction doses until insulin needs become clear by monitoring.

- Perioperative/periprocedural patients who will eat after surgery/procedure:

- For basal insulin, use previous insulin requirement as a guide; give an intermediate-acting insulin at half to two thirds of the usual morning dose, or if using insulin glargine, continue to give its usual dose on the night before surgery/procedure.
 - Until the patient resumes eating, provide correction/supplemental insulin with insulin regular (every 4 to 6 hours) or a rapid-acting insulin (every 4 hours).
 - When the patient resumes eating, restart previous doses of pre-meal insulin regular or rapid-acting insulin for prandial/nutritional insulin coverage.
 - To ensure optimum glycemic control on the morning of the surgery/procedure, the patient's routine dose of insulin and/or oral agent is given the night prior. If in the morning the blood glucose exceeds 180 mg/dL (10 mmol/L), a correction/supplemental insulin dose can be given.
 - To minimize the duration of no oral intake and decrease hypoglycemic risk, diabetics should be scheduled to have the surgery/procedure early in the morning.
- Perioperative/periprocedural patients who will not eat afterwards (eg, major surgery):
 - For basal insulin, use IV insulin infusion, insulin regular (every 4-6 hours), a rapid-acting insulin (every 4 hours), an intermediate-acting insulin (give half of usual morning dose), or insulin glargine (give usual daily dose).
 - Prandial/nutritional insulin is not given.
 - Until the patient resumes eating, provide correction/supplemental insulin with insulin regular (every 4-6 hours) or a rapid-acting insulin (every 4 hours).
 - IV insulin infusion is recommended if the patient is expected to remain in nothing by mouth status for a prolonged period.
 - Perioperative IV insulin infusion may be started at 0.02 units/kg per hour.
- ICU patients who are clinically unstable and/or on nothing by mouth status:
 - For basal insulin, use IV insulin infusion, insulin regular (every 4-6 hours), or a rapid-acting insulin (every 4 hours).
 - Prandial/nutritional insulin is not given if the patient is on nothing by mouth status.
 - For correction/supplemental insulin, use insulin regular (every 4-6 hours) or a rapid-acting insulin (every 4 hours).
 - IV insulin infusion is the treatment of choice in critically ill diabetics in the ICU, as evidenced by outcome studies in surgical and coronary care ICUs.
- ICU patients who are eating:
 - For basal insulin, continue patient's usual intermediate-acting insulin or long-acting insulin.
 - For prandial/nutritional insulin, use insulin regular or a rapid-acting insulin before meals and at bedtime.
 - For correction/supplemental insulin, use insulin regular (every 4-6 hours) or a rapid-acting insulin (every 4 hours).
- Patients on continuous enteral feedings:
 - If feeding is for 24 hours, use intermediate-acting insulin (twice daily) or long-acting insulin (at bedtime or in the morning) for basal insulin.
 - If feeding is during daytime only, use intermediate-acting insulin in the morning for basal insulin.
 - For prandial/nutritional insulin, use insulin regular (every 4-6 hours) or a rapid-acting insulin (every 4 hours) if feeding is for 24 hours; however, if on daytime only feeds, give

this insulin during feeds only. Note that these doses are regularly scheduled for all continuous feed patients, whether on 24-hour or daytime-only schedule.

- For correction/supplemental insulin, use insulin regular (every 4-6 hours) or a rapid-acting insulin (every 4 hours).
 - Fasting hyperglycemia can be treated with low-dose intermediate-acting insulin given at bedtime.
 - If feeding becomes interrupted, check fingerstick blood glucose more frequently.
 - To avoid hypoglycemia in case of interrupted feeding, basal insulin dose is generally dosed at 40% or less of the total daily insulin requirement in order to keep glucose at the high end of target range with basal insulin.
- Patients on bolus enteral feedings:
 - If bolus is over 24 hours, use intermediate-acting insulin (twice daily) or long-acting insulin (at bedtime or in the morning) for basal insulin.
 - If bolus is during daytime only, use intermediate-acting insulin in the morning for basal insulin.
 - For prandial/nutritional insulin, use insulin regular (every 4-6 hours) or insulin a rapid-acting (every 4 hours) if feeding is for 24 hours; however, if on daytime bolus feeds only, give this insulin only during bolus delivery periods.
 - For correction/supplemental insulin, use insulin regular (every 4-6 hours) or a rapid-acting insulin (every 4 hours).
 - Fasting hyperglycemia can be treated with low-dose intermediate-acting insulin given at bedtime.
 - To minimize post-bolus glucose fluctuations, give insulin regular 30 to 45 minutes prior to the feed or 0 to 15 minutes prior for a rapid-acting insulin.
 - To achieve the post-bolus target blood glucose of < 180 mg/dL (10 mmol/L), perform fingerstick blood glucose checks 1 hour after a rapid-acting insulin and 2 hours after insulin regular and determine any change in dosing.
 - Patients on TPN:
 - For both basal and nutritional insulin, insulin regular is added to the TPN bag directly.
 - For correction/supplemental insulin, use insulin regular (every 4-6 hours).
 - As a dose finding strategy, consider using a separate IV insulin drip for 24 hours to determine the daily insulin requirement and then add two thirds of the total dose to the next TPN bag. Alternatively, two thirds of the total subcutaneous insulin requirement from the prior day may be added to the TPN bag as insulin regular until total daily dose is found.
 - However, caution is warranted if subcutaneous insulin is used with TPN; blood glucose levels may fluctuate widely due to insulin's peaks and troughs that do not match caloric delivery rates.
 - Patients transitioning to oral intake:
 - For basal insulin, use intermediate-acting insulin (twice daily) or long-acting insulin (at bedtime or in the morning).
 - For prandial/nutritional insulin, use insulin regular or a rapid-acting insulin before meals.
 - For correction/supplemental insulin, use insulin regular or a rapid-acting insulin before meals and optionally at bedtime.
 - To minimize postprandial glucose fluctuations, give insulin regular 30 to 45 minutes prior to the meal or 0 to 15 minutes prior for a rapid-acting insulin; postprandial blood glucose target is < 180 mg/dL (10 mmol/L).

- Perform fingerstick blood glucose checks 1 hour after a rapid-acting insulin and 2 hours after insulin regular and determine any change in the prandial insulin dose.
- Patients on high-dose glucocorticoids:
 - For basal insulin, use IV insulin infusion, intermediate-acting insulin (twice daily), or long-acting insulin (at bedtime or in the morning).
 - For prandial/nutritional insulin, use insulin regular or a rapid-acting insulin before meals (either breakfast/dinner or breakfast/lunch/dinner) if the patient is eating; however, if the patient is on nothing by mouth status, then use insulin regular or a rapid-acting insulin every 4 to 6 hours.
 - For correction/supplemental insulin, use insulin regular or a rapid-acting insulin before meals and at bedtime if eating or every 4 to 6 hours if on nothing by mouth status.
 - High-dose glucocorticoids increase insulin requirements, the magnitude of which is difficult to predict.
 - Insulin is the recommended treatment of choice in glucocorticoid-induced hyperglycemia. IV insulin infusion may be appropriate since glycemic control may be achieved rapidly and safely, especially if steroid dose tapering requires insulin titration.
 - Once-daily glucocorticoids may cause postprandial hyperglycemia and glycemic peak 8 to 12 hours after the dose, requiring insulin dose adjustments accordingly. Every-other-day glucocorticoid dosing requires that insulin also be given every other day.