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Insulin Adjustments in Special Situations from Primary Care

Type 2 diabetes mellitus (T2DM) is a chronic and progressive disease characterized by insulin resistance and decreased insulin secretion, which over time usually requires insulin therapy to maintain adequate glycemic control. Many patients with T2DM will need insulin therapy either temporarily or permanently, even when oral antidiabetic drugs are used correctly, because blood glucose targets are not always achieved. In these cases, insulin therapy consists of administering insulin to maintain blood glucose within therapeutic ranges and to prevent chronic complications (1, 6).

It is essential that primary care physicians understand and manage these insulinization strategies, adapting treatment to the clinical situation and preferences of each patient. Insulinization in people with T2DM is mainly based on the use of basal insulin, whose goal is to control fasting glucose without causing nocturnal hypoglycemia. It may be complemented with premixed insulins or rapid-acting analogs when postprandial glucose spikes need to be controlled (1, 3, 4, 5). In patients with elevated HbA1c (≥ 9%) or with already optimized basal insulin doses but persistent high postprandial glucose, combinations of basal insulin with premixed insulin administered two or three times daily, depending on the meal pattern, may be used (1, 3, 4, 5). It is essential that primary care physicians are familiar with and manage these insulinization strategies, adapting treatment to each patient's clinical situation and preferences (1, 3, 5, 6).

AIR TRAVEL

When a patient with type 1 diabetes mellitus (T1DM) or T2DM treated with insulin travels by plane, it is crucial to plan insulin adjustments according to the duration and direction of the flight due to time zone changes and meal schedules (4, 6, 7, 8). Rapid-acting insulin can be adapted relatively easily because of its short action; on long trips it may be administered every 6 hours, adjusting the dose to in-flight meals (7, 8).

Flights westward: the day is prolonged, and the patient may require an extra dose of rapid insulin to cover the additional waking hours and meals (7, 8). Flights eastward: the day is shortened, meals occur earlier, and it is often necessary to reduce or omit a rapid insulin dose to avoid hypoglycemia (7, 8). With basal insulin: For short trips (fewer than 5 time zones or less than 3 days), it is recommended to maintain the usual schedule according to the time in the country of origin and adjust only rapid-acting boluses (6, 7, 8). For long trips (≥ 5 time zones and >3 days), a practical rule is to adjust approximately 4% of the basal dose per time zone crossed — increasing when traveling west and decreasing when traveling east (5). In patients using ultra-long-acting insulins such as degludec, the need for adjustments may be lower and should be individualized (1, 5, 7).

RAMADAN

During Ramadan, many Muslim patients eat only two meals per day: Iftar (at sunset) and Suhoor (before dawn). This requires reorganizing both diet and diabetes treatment (5, 9). Before making recommendations, patient risk should be classified. Very high or high risk includes those with recent severe hypoglycemia, severe hyperglycemia, ketoacidosis episodes, advanced complications, complex insulin or sulfonylurea regimens, intense physical labor, pregnancy, dialysis, and advanced age. In these groups, fasting is discouraged and religious alternatives and individualized support should be offered (5, 9).

Patients with T2DM without major complications and HbA1c < 8%, treated with diet and oral agents, are usually considered moderate or low risk and may fast with proper education (5, 9). Medication adjustments: Metformin: usually maintained, redistributed according to iftar and suhoor; extended-release formulation recommended at iftar (5, 9). Sulfonylureas: may require dose reduction or change, especially at suhoor, to reduce nocturnal hypoglycemia risk (5, 9). GLP-1 receptor agonists, DPP-4 inhibitors, SGLT2 inhibitors: mainly adjusted in timing (usually at iftar). With SGLT2 inhibitors, ensure good hydration and avoid starting therapy just before Ramadan (5, 9).

Insulin adjustments: Basal insulin once daily: reduce by ~20% and administer at iftar (6, 7, 8). Basal insulin twice daily: morning dose moved to iftar; evening dose reduced to 50% and given at suhoor (5, 9). Premixed insulin twice daily: usual dose at iftar; half dose at suhoor (5, 9). Premixed insulin three times daily: lunch dose usually omitted (5, 9). Rapid analogs: morning dose moved to iftar; lunch dose omitted; suhoor dose reduced by 50% (5, 9).

CORTICOSTEROID THERAPY

Corticosteroids are a common cause of hyperglycemia and may destabilize known diabetes or trigger de novo hyperglycemia. The glucose elevation pattern depends on the steroid's half-life and dosing schedule. Short-acting steroids (e.g., morning prednisone): hyperglycemia mainly during the day. Long-acting or multiple-dose steroids (e.g., dexamethasone): hyperglycemia may persist most of the day (6, 9).

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IT IS ESSENTIAL THAT PRIMARY CARE PHYSICIANS UNDERSTAND AND MANAGE THESE INSULINIZATION STRATEGIES, ADAPTING TREATMENT TO THE CLINICAL SITUATION AND PREFERENCES OF EACH PATIENT

» Mild cases (< 200 mg/dL) may be managed by adjusting oral agents such as glinides or DPP-4 inhibitors. However, many patients require insulin, especially with high glucose levels, prolonged steroid use, or hospitalization. Basal insulin alone or combined with correction boluses may be used, adjusting daily based on capillary glucose, especially pre-dinner levels. When steroids are reduced or stopped, insulin doses should be decreased by approximately 20–30% to prevent hypoglycemia (6, 9).

SURGERY

The perioperative period in patients with diabetes carries increased risk of infection, impaired wound healing, and cardiovascular complications, requiring specific glycemic control planning. Surgical stress increases counterregulatory hormones and raises glucose levels, while fasting limits usual intake and some drugs. Target glucose range: generally 80–180 mg/dL, adjusted according to surgery type and clinical situation (3, 6).

In the preoperative phase, it is usually recommended to discontinue metformin the day before surgery and other oral antidiabetic drugs on the day of the procedure. Patients who use insulin once daily typically reduce their nighttime dose by approximately 25%. Those who administer insulin twice daily receive, on the morning of surgery, 80% of the usual dose if it is long-acting basal insulin or 50% if it is intermediate-acting insulin, omitting rapid-acting boluses from the start of fasting. During surgery and in the immediate postoperative period, glucose is monitored with frequent measurements (every 4–6 hours or even hourly in critically ill patients). Subcutaneous rapid-acting insulin or continuous intravenous infusion may be used, especially in major or cardiac surgeries. Once oral intake is tolerated again, the usual insulin and antidiabetic regimen is progressively reintroduced and adjusted according to clinical progression (3, 6).

FEVER

Fever and infections are common situations that can cause stress hyperglycemia, and many patients are unaware that they should adjust their insulin treatment in these cases (6). The inflammatory response and stress hormones increase blood glucose levels, and certain treatments, such as corticosteroids, may raise them even further (6, 7). The target for glycemic control in patients with fever is usually between 140–180 mg/dL, avoiding both sustained hyperglycemia and hypoglycemia, especially in severely ill patients (6). »

» In non-hospitalized patients, most oral antidiabetic drugs can be continued, although the risk of hypoglycemia with certain sulfonylureas should be assessed and safer alternatives considered (6, 7). In older adults, it is recommended to increase the frequency of glucose monitoring, as decompensations may present with atypical symptoms and go unnoticed (6). There is no single standard insulin dose adjustment during fever; doses should be adapted according to capillary glucose readings. Basal insulin should not be discontinued, and the regimen should be reassessed if vomiting, diarrhea, or reduced intake occurs (6, 9).

COLONOSCOPY

Colonoscopy is a widely used procedure for evaluating digestive symptoms and for colorectal cancer screening. Its preparation presents specific challenges in patients with diabetes due to dietary changes and fear of hypoglycemia. Traditionally, a low-residue diet has been recommended for several days beforehand and, in some cases, a full day of clear liquids. However, recent evidence supports simpler regimens with one or a few days of a low-residue diet, which improve tolerance and reduce the risk of hypoglycemia. During preparation, capillary blood glucose should be measured every 4 hours, and both insulin and oral antidiabetic drugs should be adjusted accordingly (6, 10).

During low-residue diet days, basal insulin is usually reduced to approximately 50–80% of the usual dose, and rapid-acting insulin is suspended or significantly reduced if intake is limited to carbohydrate-free liquids. SGLT2 inhibitors are recommended to be discontinued 2–3 days beforehand, while sulfonylureas and metformin are usually stopped 24 hours before the procedure, especially if prolonged fasting or risk of dehydration is expected. GLP-1 receptor agonists are suspended only on the day of the procedure, and DPP-4 inhibitors may be continued until the same day (6, 10).

On the day before the procedure, practical guidelines recommend that clear liquids contain small amounts of carbohydrates (approximately 15 g every 2 hours and 30–45 g at lunch and dinner) to prevent hypoglycemia, providing specific examples to the patient. On the day of the colonoscopy, insulin adjustments depend on whether the procedure is scheduled in the morning or afternoon. In general, the basal dose is reduced (for example, to 50% in the morning), and the remaining doses are postponed until after the procedure. Rapid-acting insulins and oral antidiabetic drugs are omitted until the patient can resume normal eating.

Additionally, patients are advised to bring their glucose monitoring equipment, insulin, and, if possible, prepared food to safely resume their usual regimen as soon as appropriate (6, 10). D

CONCLUSIONS

1. Insulin therapy in T2DM requires specific adjustments in special situations.
2. Risk classification and individualized treatment are fundamental.
3. Structured therapeutic education empowers patients to safely self-adjust insulin doses.

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