
16. Emergencies in Diabetes

All persons involved in the care of persons with diabetes need to be able to determine when hospitalization is warranted. General hospital admission guidelines for diabetes are summarized in **Table 16-1**. When counseling patients about hypoglycemia and hyperglycemia, emphasize that the best treatment is prevention: be proactive by recognizing the signs early, be prepared to treat, treat appropriately, and seek prompt attention when needed. It is always better to err on the side of safety.

Hyperglycemia

Outpatient Management

Milder forms of hyperglycemia can often be treated in the outpatient setting. Testing for ketones (blood or urinary) is recommended in the following settings:

- When the blood glucose level is more than 250 mg/dL for two tests in a row
- During illness or infection
- After trauma or stressors
- When symptoms compatible with ketoacidosis, such as nausea, vomiting, or abdominal pain, are present

Persons with more pronounced insulin deficiency (see Table 17-2) are at highest risk of developing ketoacidosis. If a patient with small ketonuria (2+) experiences no altered level of consciousness, can monitor his or her blood sugars (every 1–2 hours for rapid analogues or 2–3 hours for regular insulin), administer insulin appropriately, and ingest fluids without difficulty, he or she can often be treated at home by following predetermined sick day rules. Even a patient with moderate ketonuria (3+) can often be treated at home with direct guidance from the diabetes care team.

The ability to absorb subcutaneous insulin is related to the level of hydration. If dehydration

progresses at a rate that cannot be easily managed by oral intake, intravenous fluids will be required, regardless of the results of ketone testing, and intravenous insulin should also be considered. In the setting of large ketonuria (4+), more intensive monitoring is required, and hospitalization is encouraged, even if the patient reports feeling well.

Inpatient Management

The subtleties of hospital management of hyperglycemic emergencies are beyond the scope of this text and are reviewed elsewhere (see *Suggested Readings*). In general, the initial treatment plan for hyperglycemic emergencies includes stabilizing hemodynamic values, replenishing volume, administering insulin, correcting electrolyte abnormalities, and searching for precipitating causes. Intravenous insulin infusion is usually the preferred method of insulin delivery in an emergency because dehydration may be severe (decreasing subcutaneous absorption). Rapid titration of insulin may be required.

After the metabolic abnormalities have been corrected and the patient is ready to be transferred to subcutaneous administration of insulin (usually when the patient starts eating), intravenous and subcutaneous insulin administration need to be overlapped to avoid rebound ketoacidosis. Give short-acting or rapid-acting insulins 1 to 2 hours or intermediate or long-acting insulins 2 to 3 hours before terminating the insulin infusion to ensure adequate overlap.

What do I need to tell patients about hyperglycemia?

- Review when to test for ketones.
- Ensure that patients have in their home sufficient ketone-testing supplies, which can usually be purchased without a prescription. (The

Table 16-1. Hospital Admission Guidelines for Diabetes

<p>Life-threatening acute metabolic complications of diabetes</p> <p>Diabetic ketoacidosis: Plasma glucose >250 mg/dL with arterial pH <7.30, serum bicarbonate <15 meq/L, and moderate ketonuria and/or ketonemia</p> <p>Hyperglycemic hyperosmolar state: Impaired mental status, usually with plasma glucose >600 mg/dL and elevated serum osmolality (>320 mosm/kg)</p> <p>Hypoglycemia with neuroglycopenia:</p> <ul style="list-style-type: none"> • Blood glucose <50 mg/dL without rapid recovery of sensorium with treatment; <i>or</i> • Coma, seizures, or altered behavior due to documented or suspected hypoglycemia; <i>or</i> • Hypoglycemia has been treated but a responsible adult cannot observe the patient for the ensuing 12 hours; <i>or</i> • Expected prolonged hypoglycemia from medication such as sulfonylurea or long-acting insulin. <p>Newly diagnosed diabetes in children and adolescents*</p> <p>Substantial and chronic poor metabolic control that necessitates close monitoring of the patient to determine the etiology of the control problem, with subsequent modification of therapy:</p> <ul style="list-style-type: none"> • Hyperglycemia with volume depletion • Persistent refractory hyperglycemia associated with metabolic deterioration • Recurrent fasting hyperglycemia (>300 mg/dL) or A1C >2 times normal • Frequent swings between hypoglycemia <50 mg/dL and hyperglycemia >300 mg/dL • Recurrent diabetic ketoacidosis without precipitating infection or trauma • Repeated absence from work or school due to psychosocial problems causing poor metabolic control that cannot be managed as an outpatient <p>Severe conditions related or unrelated to diabetes that significantly affect metabolic control or are complicated by diabetes</p> <p>Uncontrolled or newly discovered insulin-requiring diabetes during pregnancy</p> <p>Institution of insulin-pump therapy or other intensive insulin regimens†</p>

Adapted from: American Diabetes Association. Hospital admission guidelines for diabetes. *Diabetes Care*. 2004;27 Suppl 1:S103.

*Children and adolescents with newly diagnosed diabetes without severe metabolic decompensation can frequently be treated in the outpatient setting if adequate educational resources and social supports are available.

†With adequate education and supervision, intensive insulin regimens and insulin-pump therapy can be safely instituted or modified in the outpatient setting.

exception to this rule is the patient with type 2 diabetes who is at very low risk for developing ketoacidosis.)

- Tell patients to drink sugar-free liquids when hyperglycemic to prevent dehydration and help lower blood glucose levels.
- Help patients be prepared for emergencies. Provide information about sick day care (see *Sick Day Recommendations* in Chapter 2), ways to handle hyperglycemia before it occurs, and when to contact the diabetes care team about hyperglycemia (e.g., number of episodes per week, number of severe episodes).

Hypoglycemia

Because the glycemic threshold for epinephrine and glucagon production is 65 to 70 mg/dL, hypoglycemia is frequently defined as a plasma glucose level of less than 70 mg/dL. Mild hypoglycemia without significant neurologic

symptoms can generally be treated by the patient. In general, 15 g of glucose or carbohydrates will increase blood glucose 25 to 50 mg/dL. Adding protein to the acute treatment neither affects the glycemic response nor prevents subsequent hypoglycemia; adding fat may retard the absorption of glucose and actually delay the response.

One approach to avoiding “overshoot hyperglycemia” is for patients to take 15 g of carbohydrates (preferably glucose), test their blood sugar in 15 minutes, and, if necessary, take another 15 g of carbohydrates. Depending on the insulin regimen, an additional snack may be needed if they will not be eating their next meal for another 30 to 60 minutes. Examples of 15 g of carbohydrates include the foods listed below.

- 3–4 oz juice
- 4 oz regular soda
- 3 tsp jelly
- 2 tbsp (or a small box of) raisins

- 3 to 5 glucose tablets (buccal preparations are also available that allow for more rapid absorption)
- 2 tsp sugar
- 8 oz milk

If hypoglycemia is severe and the patient cannot safely ingest food because of neurologic symptoms of hypoglycemia (dizziness, weakness, loss of consciousness), another person can administer 1 mg of glucagon subcutaneously or intramuscularly to transiently increase blood glucose enough to facilitate further treatment. Remember that the effects of glucagon only last 15 to 30 minutes, so additional treatment with a snack is required. Because glucagon administration requires the assistance of others, family members or those who live with a person at risk for hypoglycemia should have appropriate training in its use. If the patient does not respond to glucagon within 15 minutes, emergency assistance is needed.

If the hypoglycemia is caused by an excess of sulfonylurea or long-acting insulin, hospitalization will likely be required because of the long half-lives of these agents. Dextrose infusion may be required to maintain normoglycemia. Rapid changes in cardiac, renal, or hepatic status may drastically alter the half-life of medications used to treat diabetes and should be evaluated as potential contributing factors.

Persons with frequent hypoglycemia often develop hypoglycemia unawareness and may not have the typical adrenergic symptoms of diaphoresis, shakiness, palpitations, nervousness, hunger, or headache. Neuroglycopenic symptoms, including irritability, difficulty concentrating, blurred vision, confusion, recall difficulty, personality changes, or seizures, may develop at lower blood sugar levels. A counter-regulatory hormone response and symptoms may return after preventing low levels for two weeks.

What do I need to tell my patients about hypoglycemia?

- Review the symptoms of hypoglycemia. Point out that they will not experience all of these symptoms but that they will generally have the same symptoms whenever they are hypoglycemic.
- Teach the “rule of 15s”: Treat with 15 g of carbohydrates, wait 15 minutes, and treat with another 15 g of carbohydrates if the blood glucose level is still too low.
- Caution patients not to overtreat a hypoglycemic episode.
- Remind patients to always wear identification for diabetes and to test their blood glucose before driving a car or engaging in exercise. The general recommendation is that the blood glucose level should be >100 mg/dL prior to exercise or driving.
- Teach patients to keep glucose tablets or another form of treatment with them at all times and to be sure to keep a form of glucose in the car, purse, briefcase, pocket, gym bag, desk drawer, and night stand.
- Make sure that patients at risk for hypoglycemia have a current prescription for glucagon and that someone around them knows how to administer it.
- Provide information about when to contact providers about hypoglycemia (e.g., number of episodes per week, number of severe episodes).
- Teach patients with hypoglycemia unawareness to recognize neuroglycopenic symptoms early. These patients should have higher targets to avoid hypoglycemia until adrenergic symptoms return.

© 2007 American College of Physicians, Inc. (ACP)

ACP reserves all rights not specifically granted by this license. Any modifications to license must be made by an authorized officer of ACP in writing. Requests for modifications may be sent to MKSAP® Permissions, ACP, 190 N. Independence Mall West, Philadelphia, PA 19106-1572.

Recipient of this publication is granted a nonexclusive, revocable, and transferable license to copy a particular chapter, form, patient education sheet, chart, or directory item from this publication for distribution to a medical associate, patient with diabetes, or family member of a patient with diabetes for educational purposes only. ACP may revoke or modify this license at anytime without notice to the recipient.

Recipient may not copy the entire publication, make derivative works, collective works, or compilations from this publication. Recipient may not copy or distribute any part of this publication for consideration. Recipient may not distribute any material from this publication via electronic transmission such as email, FTP, or HTTP. Recipient may not display any contents of this publication on any type of web page. This license terminates immediately if recipient fails to conform with any provision in this license agreement.

ISBN: 978-1-930513-91-4

Printed in the United States of America.

For information on this program in the United States or Canada, call 800-523-1546, extension 2600. Professionals from all other countries should call 215-351-2600 or send an email to custserv@acponline.org.

Educational Disclaimer

The editors and publisher of *ACP Diabetes Care Guide: A Team-Based Practice Manual and Self-Assessment Program* recognize that the development of new material offers many opportunities for error. Despite our best efforts, some errors may persist in print. Drug dosage schedules are, we believe, accurate and in accordance with current standards. Readers are advised, however, to ensure that the recommended dosages in this program concur with the information provided in the product information material. This is especially important in cases of new, infrequently used, or highly toxic drugs. Application of the information in the Guide in a professional situation remains the professional responsibility of the practitioner.

The primary purpose of the *ACP Diabetes Care Guide: A Team-Based Practice Manual and Self-Assessment Program* is educational. Information presented, as well as publications, technologies, products, and/or services discussed, is intended to inform subscribers about the knowledge, techniques, and experiences of the contributors. A diversity of professional opinion exists, and the views of the contributors are their own and not those of the ACP. Inclusion of any material in the Guide does not constitute endorsement or recommendation by the ACP. The ACP does not warrant the safety, reliability, accuracy, completeness or usefulness of and disclaims any and all liability for damages and claims that may result from the use of information, publications, technologies, products, and/or services discussed in this program.