

Hypoglycemia in Diabetes

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KEYWORDS

• Hypoglycemia • Diabetes • Hypoglycemia unawareness • Patient education

KEY POINTS

- Hypoglycemia is a limiting factor in achieving glucose control in patients with diabetes.
- Hypoglycemia is the result of increased insulin levels or decreased counterregulation in patients with diabetes.
- Recurrent hypoglycemia can cause autonomic failure and increased risk of hypoglycemia unawareness.
- Patient education and prevention strategies should be implemented between the patient and provider to recognize, manage, and prevent hypoglycemia.

INTRODUCTION

Hypoglycemia is a major limiting factor in achieving glycemic control in patients with diabetes. The American Diabetes Association recommends an HgA1C goal of less than 7% in most patients, and the American Association of Clinical Endocrinologists recommends an HgA1C less than 6.5%, if achievable without significant hypoglycemia.^{1,2} Landmark studies, such as the Diabetes Control and Complications Trial and the United Kingdom Prospective Diabetes Trial have clearly shown that tight glycemic control can prevent or delay the development of microvascular complications, such as retinopathy, nephropathy, and neuropathy, in type 1 and type 2 diabetes, but with aggressive glycemic targets comes an increase of hypoglycemia risk.³ Higher glycemic targets may be more appropriate in patients with recurring hypoglycemia, limited life span, or multiple comorbidities, and goals should be individualized per patient.² Balancing strict glucose control to prevent microvascular and avoidance of hypoglycemia can become a challenge for both providers and patients.

Hypoglycemia incidence in diabetes is often underestimated and underreported, especially mild or asymptomatic episodes. Hypoglycemia occurs more often in patients with type 1 diabetes, with an estimated 1 to 2 symptomatic episodes per week, and 1 episode of severe hypoglycemia per year.⁴ The incidence of

Disclosure Statement: The author has nothing to disclose.

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Nurs Clin N Am ■ (2017) ■-■

<http://dx.doi.org/10.1016/j.cnur.2017.07.006>

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hypoglycemia in type 2 diabetes is much lower than in patients with type 1 diabetes, but patients with longstanding type 2 diabetes on insulin therapy have comparable hypoglycemia rates to patients with type 1 diabetes.⁵ Repeated hypoglycemia can impair the body's defenses against hypoglycemia, leading to recurrent and more severe episodes, and can be fatal. Hypoglycemia has been reported to cause 4% to 10% of deaths in patients with type 1 diabetes.⁶

Hypoglycemia can cause short term and long term problems. Symptoms of hypoglycemia are unpleasant, and can disrupt daily functions. If hypoglycemia occurs while driving, motor vehicle accidents can occur, causing injury to the patient and others. Hypoglycemia can decrease work performance, interfering with daily job requirements. It can cause falls, leading to injury. If severe enough, it can cause seizures and death.⁴ Repeated hypoglycemia can cause loss of counterregulatory protective effects and hypoglycemia unawareness. Patients with recurrent hypoglycemia report higher fear of hypoglycemia leading to missed medication doses. Overtreatment of hypoglycemia, leading to overall worsening of glycemic control.⁷

Hypoglycemia has cardiovascular effects. Physiologically, it can increase cardiac contractility, cause electrocardiogram changes, and increase the workload of the heart.^{4,8} Severe hypoglycemia has been associated with prolonging the QT interval. Death from hypoglycemia is thought to be caused by cardiac arrhythmias. The Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial, which studied effects of intensive versus standard glucose control on cardiovascular events, was stopped prematurely due to increased mortality in the patients treated intensively. Hypoglycemia was significantly higher in the intensively treated group.⁹

Additionally, hypoglycemia can lead to increased emergency room admissions and health care costs^{10,11} The Centers for Disease Control and Prevention estimated the amount of emergency room visits secondary to hypoglycemia in patients with diabetes to average 300,000 visits per year between 2006 and 2009.¹²

It is important for health care providers to understand this often-overlooked complication of diabetes management, to know which medications cause hypoglycemia, recognize which patients are at risk, and implement strategies to prevent future episodes of hypoglycemia to ensure the safety of patients. Patient education is key in the prevention and avoidance of hypoglycemia.

HYPOGLYCEMIA: DEFINITION

Hypoglycemia is defined as any glucose value low enough to harm a patient. Although no definite glucose value has been assigned to define hypoglycemia, as patients with diabetes may have differing symptoms at various glucose levels, a glucose value less than 70 mg/dL should alert a patient or provider of possible impending hypoglycemia.⁶ The American Diabetes Association Workgroup on Hypoglycemia defines hypoglycemia in the following ways:

1. Severe hypoglycemia: an episode requiring third-party assistance for treatment of hypoglycemia, either with administration of carbohydrate, glucagon, or other forms of glucose.
2. Documented symptomatic hypoglycemia: an episode in which the patient experiences symptoms of hypoglycemia, and glucose measured at the time of symptoms is less than 70 mg/dL.
3. Asymptomatic hypoglycemia: an episode of glucose less than 70 mg/dL without any symptoms of hypoglycemia.
4. Probable symptomatic hypoglycemia: an episode of symptoms indicating hypoglycemia, but without documentation of glucose less than 70 mg/dL.

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