CE

Postoperative Management of Hypoglycemia

Christine R. Wallace

Individuals with Type 1 and Type 2 diabetes who are managed with insulin are at risk for developing hypoglycemia, a significant consequence of insulin therapy. Symptoms of hypoglycemia develop rapidly and the condition can be life threatening. It is imperative that the inpatient team, including the orthopaedic nurse, is able to recognize the signs and symptoms, respond appropriately, and prevent hypoglycemia. It is equally important to provide the patient with education to prevent, identify, and self-manage hypoglycemia at home. A case study example is included that addresses an elderly patient with Type 2 diabetes who had a total hip arthroplasty and developed hypoglycemia postoperatively while on an orthopaedic unit. Assessment, treatment, prevention, and patient self-management education of hypoglycemia are reviewed.

Mr. D is a 75-year-old man admitted via ambulance to the emergency department after a fall on the ice, leaving the grocery store. A witness attempted to ask Mr. D whether he needed assistance; however, Mr. D was confused. The witness immediately called 911. When emergency medical services arrived, Mr. D was unable to be aroused. Per ambulance report, Mr. D's blood glucose level was 30 mg/dl on the scene and he received 1 amp of D50 intravenous en route. His medical history includes a 15-year history of Type 2 diabetes mellitus complicated by peripheral neuropathy, hypertension, hyperlipidemia, and renal insufficiency. When Mr. D arouses, he complains of severe pain in his left hip and an x-ray reveals an unstable left hip fracture.

In addition to the medical history, the nursing assessment reveals that Mr. D experiences two episodes of hypoglycemia per week with symptoms of lightheadedness and difficulty concentrating. He admits to hypoglycemia unawareness. The last time his insulin regimen was adjusted was 2 years ago. His social history indicates that he is widowed and lives alone. His daughter lives 10 minutes away and they see each other twice a week when he visits his daughter's home to eat dinner with his son-in-law and three grandchildren. The focus of this article is hypoglycemia in a postoperative orthopaedic patient with Type 2 diabetes. Treatment protocols and hypoglycemia-prevention strategies will be presented. Critical self-management practices will be described.

Traditionally hypoglycemia has been associated with Type 1 diabetes. However, it has become a major concern in the management of Type 2 diabetes as an increasing number of individuals with Type 2 diabetes are being prescribed insulin to manage their glucose level and glucose targets have been tightened (Campbell & Braithwaite, 2004). The clinical practice recommendations from the American Diabetes Association (ADA, 2012) recommend a glycemic goal for many nonpregnant adults as a hemoglobin A_{1C} no higher than 7% equivalent to an estimated average glucose of 154 mg/dl. However, a less-intense hemoglobin A_{1C} goal such as less than 8% may be appropriate for individuals with a history of severe hypoglycemia (ADA, 2012). The recent intensification of glycemic control and attainment of lower blood glucose level is associated with a significantly increased risk of developing hypoglycemia (Pearson, 2008).

The most dangerous side effect of diabetes treatment is hypoglycemia (Plodkowski & Edelman, 2001). It is becoming increasingly clear that the frequency of hypoglycemic events in individuals with Type 2 diabetes has been underestimated, partly because of limited symptom recognition in the elderly population (Fisher, 2010). Approximately 90% of individuals with diabetes who receive insulin have experienced a hypoglycemic episode (Briscoe & Davis, 2006). Predictors for hypoglycemia in a person with Type 2 diabetes are treatment with insulin, a history of previous hypoglycemia, and duration of insulin treatment. Application of the ADA's evidence-based clinical practice recommendations to the care of the patient with diabetes enables the orthopaedic nurses to provide high-quality care.

Presentation of Hypoglycemia

Mr. D undergoes a left total hip arthroplasty and arrives on the orthopaedic unit postoperatively. It is postoperative

Christine R. Wallace, MSN, RN, PCCN-CMC, Advanced Practice Nurse, University Hospitals Seidman Cancer Center, Cleveland, Ohio.

The author has disclosed that she has no financial interests to any commercial company related to this educational activity.

DOI: 10.1097/NOR.0b013e31827424df

Table 1. Signs and Symptoms of Hypoglycemia

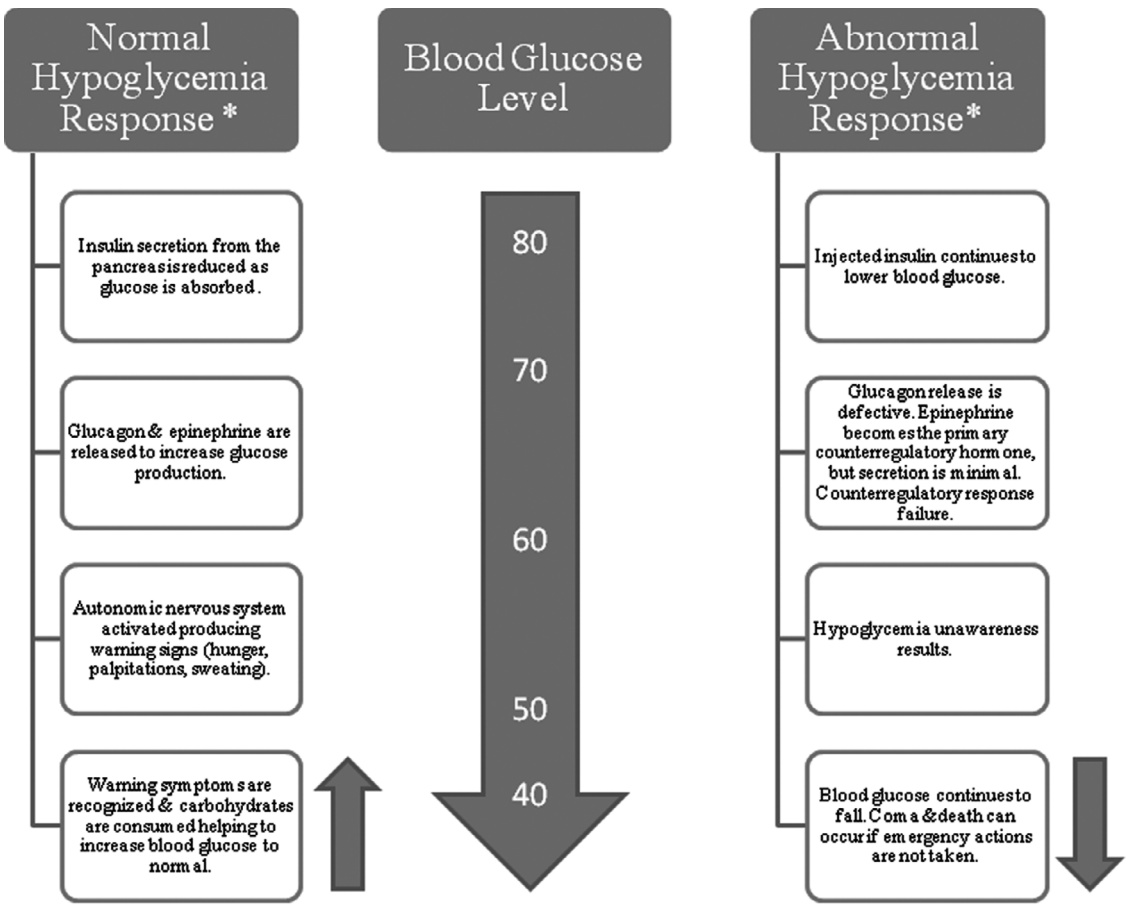
Neurogenic (ANS) (Early Response to Falling Glucose Levels)	Neuroglycopenic (Brain Neuronal Glucose Deprivation)
Shakiness	Abnormal mentation
Anxiety	Irritability
Nervousness	Confusion
Palpitations	Difficulty speaking
Sweating	Ataxia
Dry mouth	Paresthesias
Pallor	Headache
Pupil dilation	Stupor
Increased heart rate	Seizures
Increased systolic blood pressure	Coma
Hunger	Death (if untreated)
Diaphoresis	

Note. ANS = autonomic nervous system. "Hypoglycemia in Type 1 and Type 2 Diabetes: Physiology, Pathophysiology, and Management," by V. J. Briscoe and S. N. Davis, 2006, *Clinical Diabetes, 24*(3), pp. 115–121.

day 2 and Mr. D is progressing as expected. His capillary blood glucose level at 8 a.m. is 210 mg/dl. When Mr. D's breakfast arrives, you administer four units of lispro subcutaneously per his supplemental dose (insulin ordered to correct high blood glucose), in addition to four units of lispro for his prandial dose (insulin ordered to be given at meal time). Before Mr. D finishes his breakfast, transport arrives and whisks him off to physical therapy without notifying you. A short time later, physical therapy calls the unit and tells you that Mr. D is sweaty and anxious. You suspect a hypoglycemic episode and rush to the physical therapy department. Upon your arrival, you assess that Mr. D is pale, diaphoretic, and confused. You obtain a capillary blood glucose level, which is 42 mg/dl. See Table 1 for the signs and symptoms of hypoglycemia and Figure 1 for the physiologica l response to hypoglycemia.

Physiological Response to Hypoglycemia

Let us first examine the cause of Mr. D's signs and symptoms. The brain depends on a continual supply of glucose and is vulnerable to glucose deprivation. Because of its inability to synthesize or store its main source of energy, the brain is one of the first organs to be affected by lower blood glucose levels. Once the plasma glucose level falls below the physiological threshold of approximately 70 mg/dl, sequences of counterregulatory responses are activated (Briscoe & Davis, 2006).



*The blood glucose level that activates these responses differentiate among individuals.
Adapted from: Tkacs, N.C. (2002). Hypoglycemia unawareness. *AJN, 102*(2), 34-40

Figure 1. Critical elements for physiological response to hypoglycemia.

Different counterregulatory mechanisms are activated at certain threshold levels of blood glucose.

The key normal counterregulatory response is decreased endogenous insulin secretion, followed by an increased secretion of glucagon and epinephrine. Both hormones increase blood glucose levels mostly by activating glucose from the liver. In people with diabetes who take insulin, all three counterregulatory mechanisms become compromised and eventually nonfunctional over time (Pearson, 2008). The level of glucose that produces signs and symptoms differs greatly among individuals and differs from one episode to another (Tkacs, 2002). For example, people with poorly controlled diabetes are likely to experience hypoglycemia symptoms at higher blood glucose levels because their body is accustomed to higher blood glucose levels. In contrast, people under tight control of their blood glucose level are more likely to experience symptoms at a lower blood glucose level (Pearson, 2008). In Mr. D's case, his diabetes is well controlled, and his laboratory results revealed that his hemoglobin A_{1C} was 7% upon admission.

Signs and Symptoms of Hypoglycemia

Signs and symptoms of hypoglycemia are divided into two categories: neurogenic (or autonomic) and neuroglycopenic. Neurogenic symptoms are caused by the early falling of the blood glucose level and help individuals recognize that they are having a hypoglycemic episode. These symptoms are activated by the autonomic nervous system and are mediated in part by the release of epinephrine (Briscoe & Davis, 2006).

The orthopaedic nurses' skills are vital in discerning the neurogenic (moderate symptoms) that can prevent a progression to neuroglycopenic (severe symptoms). Neuroglycopenic symptoms are caused from the brain's neuronal glucose deprivation. These can progress to seizures, coma, and even death (Briscoe & Davis, 2006). There is a medullary phase of hypoglycemia that occurs with a blood glucose level of approximately 10 mg/dl, which is characterized by deep coma, pupillary dilatation, shallow breathing, bradycardia, and hypotonicity. Fortunately, most individuals with diabetes never suffer such severe hypoglycemia (Tomky, 2005).

Another classification of hypoglycemia symptoms is mild-to-moderate and severe. Mild-to-moderate hypoglycemia is characterized by symptoms such as sweating, trembling, difficulty concentrating, lightheadedness, and lack of coordination (Anthony, 2008). The individual is able to self-treat mild-to-moderate hypoglycemia by ingesting carbohydrates. The term *mild-to-moderate* refers to the ability to self-treat and does not reflect the severity of the symptoms. Severe hypoglycemia is characterized by an inability to self-treat because of mental confusion, lethargy, or unconsciousness. Characteristically, this is represented by a blood glucose level of less than approximately 50 mg/dl. When the individual is unable to self-treat, the nurse must provide treatment to raise the blood glucose level out of the dangerously low range (ADA, 2012).

Mr. D is confused and experiencing severe hypoglycemia; he is unable to self-treat and, therefore, is relying on your assistance. You respond quickly and follow your hospital's hypoglycemia protocol. Mr. D is lethargic and at risk for aspiration; therefore, the hospital's protocol requires you to administer 0.5 amp of D50, notify the physician, and document the event. When you recheck his blood glucose 15 minutes later, it is 90 mg/dl and he is alert. Your success in responding to Mr. D's hypoglycemia depends on how well you know your hospital's protocol. The following is a review of the importance of an evidence-based hypoglycemia protocol and the ADA's 2012 clinical practice recommendations for treating hypoglycemia.

Treatment Using a Hypoglycemia Protocol

An evidence-based hypoglycemia protocol is a well-recognized approach in providing high-quality patient care. The hypoglycemia protocol includes evidence on treatment and monitoring of hypoglycemia. Knowledge and adherence to the hypoglycemia protocol are imperative to avoid recurrent hypoglycemia or hyperglycemia The ADA's (2012) evidence-based clinical practice recommendations for hypoglycemia management should be adopted and implemented in each hospital system. The use of a hypoglycemia protocol optimizes the abilities of the orthopaedic nurse to treat hypoglycemia and contributes to the reduction of errors. The ADA's standards rely on an initial assessment of the patient's mental status. See Table 2

Table 2. American Diabetes Association's 2012 Recommendations for Treatment of Hypoglycemia

If the patient's blood glucose level is *less than 70 mg/dl* and the individual is *conscious*:
Administer 15–20 g of carbohydrates (see Table 3 for carbohydrate sources)
Wait 15 minutes
Recheck blood glucose
If less than 70 mg/dl, repeat 15–20 g of carbohydrates
May repeat this sequence up to three times
Recheck the blood glucose level 1 hour after the blood glucose reaches 70 mg/dl
Once the blood glucose level reaches 70 mg/dl, the individual should consume a meal or snack to prevent recurrence of hypoglycemia
If the patient demonstrates a *diminished level of consciousness* but is able to swallow without risk of aspiration:
Administer instant glucose (15 g) in between the patient's cheek and gum
Turn the patient to his or her side to reduce risk of aspiration
If the patient is *unconscious, unable to swallow, or NPO* and has IV access:
Administer 25 mg (0.5 amp) of 50% dextrose IV (D50).
If IV access is *not available*:
Administer 1 mg of glucagon subcutaneously or intramuscularly

Note. IV = intravenous; NPO = nothing by mouth. Nursing treatment protocols may require a physician's order to implement depending on the state in which you practice. "Standards of Medical Care in Diabetes," by American Diabetes Association, 2012, *Diabetes Care, 35*(Suppl. 1), pp. S11–S63.

Table 3. Carbohydrate Sources: Approximately 15 g

Source	Quantity
Fruit Juice	4 ounces
Regular non-Cola soda	4 ounces
Skim milk	8 ounces
Glucose tablets	3–4 tablets
Oral glucose gelatin	1 single use tube
15 g of carbohydrates can increase the blood glucose 50 mg/dl.	
Apple juice is preferred for individuals with renal insufficiency.	

Note. "Hypoglycemia in Hospitalized Adults," by M. Anthony, 2008, *MEDSURG Nursing, 17*(1), pp. 31–40.

for treatment of hypoglycemia and Table 3 for carbohydrate sources.

Assessment

When a patient experiences a hypoglycemic episode, assessment at the bedside must include the patient's level of consciousness, respiratory and circulatory status, glucose level, intravenous access, time and amount of last insulin dose, and the time of the most recent intake of food and the amount (Tomky, 2005). Documentation of assessment, interventions, and patient response in the medical record is crucial. The documentation is an important part of the reassessment of insulin treatment. A comprehensive diabetes assessment recommended by the ADA (2012) clinical practice recommendations includes the assessment of hypoglycemia episodes, awareness, frequency, type of symptoms, and cause in the medical history.

Prevention

Prevention of hypoglycemia is preferable to treatment, and prevention is the best intervention. It is important for the orthopaedic nurse to be attentive to situations that contribute to hypoglycemia in the hospital. Situations that precipitate hypoglycemia may include inappropriate ordering of insulin or antidiabetic oral agents, inadequate blood glucose monitoring at the bedside, lack of recognition of symptoms, and treatment that does not adhere to the hypoglycemia protocol. The orthopaedic nurse and the inpatient team can prevent or reduce hypoglycemic events by recognizing predisposing conditions and triggering events.

Predisposing Conditions

It is crucial to identify predisposing conditions that place the individual at a higher risk for hypoglycemia and to adjust the insulin regimen as appropriate. (See Table 4 for a list of conditions that predisposes the individual for the occurrence of hypoglycemia.) Mr. D's predisposing conditions for a hypoglycemic episode include renal insufficiency, age, long history of diabetes, and possible hypoglycemia unawareness.

Table 4. Predisposing Conditions for Occurrence of Hypoglycemia

Renal insufficiency
Malnutrition
Liver disease
Sepsis
Shock
Pregnancy
Malignant lesion
Hyperkalemia
Total parenteral nutrition
Burns
Dementia
Congestive heart failure
Stroke
Hypoglycemia unawareness
Defective counterregulation
Alcoholism
Old age
Drug interactions
Polypharmacy
Tapering of glucocorticoid steroids
Adrenal or pituitary insufficiency

Note. "Hospital Hypoglycemia: Not Only Treatment But Also Prevention," by S. S. Braithwaite, M. M. Buie, C. L. Thompson, D. F. Bladwin, M. D. Oertel, B. A. Robertson, and H. P. Mehrotra, 2004, *Endocrine Practice, 10*(2), pp. 89–99.

Renal Insufficiency

In individuals with diabetes, it is important to determine their glomerular filtration rate (GFR) to assess drug dosing that may contribute to hypoglycemia (Goldstein, 2009). Mr. D has a documented history of renal insufficiency and per laboratory results, a GFR of 55 ml/min. Reduced kidney function impairs elimination of insulin, thus prolonging the effects. The kidneys help generate new glucose from amino acids, which is termed gluconeogenesis. In kidney disease, gluconeogenesis is impaired. Hypoglycemia in an individual with kidney disease may occur because of decreased gluconeogenesis or excessive insulin action. A decrease in insulin requirements may occur because of changes in insulin clearance or insulin metabolism (Gerich, Woerle, & Stunvoll, 2001). The American Academy of Clinical Endocrinologist recommended to lower insulin doses (0.3 units/kg of body weight/day) in patients with kidney disease that have a GFR less than 60 ml/min (Moghissi et al., 2009).

Age

Mr. D is a 75-year-old man and it is important to appreciate the age-specific manifestations of hypoglycemia symptoms. Neural and hormonal responses to hypoglycemia decline with age, and symptoms in older adults

may be neuroglyopenic rather than neurogenic. Specifically, the secretion of glucagon, epinephrine, and growth hormone in response to hypoglycemia diminishes significantly after the age of 65 years, reducing neurogenic warning symptoms in older adults (Goldstein, 2009).

With older age may come a longer history of diabetes. Mr. D has a 15-year history of diabetes. Many individuals with a long history of Type 2 diabetes lose the glucagon counterregulation mechanism and depend entirely on the epinephrine response. Over time, individuals with diabetes have a delayed or decreased epinephrine response and may not have symptoms even when their blood glucose is very low (Anthony, 2008).

Hypoglycemia Unawareness

Nursing assessment upon admission revealed that Mr. D had been having frequent hypoglycemic episodes at home. Repeated episodes of hypoglycemia produce accommodation or autonomic desensitization, resulting in low blood glucose that is difficult to recognize and increases the risk for subsequent hypoglycemia, falls, and injuries, as occurred in Mr. D's situation. Many older patients with chronic hypoglycemia have few, if any, symptoms with blood glucose levels as low as 45 mg/dl (Goldstein, 2009). This is termed hypoglycemia unawareness and is defined as the patient's inability to perceive or recognize the usual warning symptoms of hypoglycemia. Avoidance of hypoglycemia for several weeks may help improve hypoglycemia unawareness (Fowler, 2008).

Triggering Events

A study by Braithwaite et al. (2004) on prevention of hypoglycemia in the hospital explained that 45% of hypoglycemic events were caused by a decrease in intake of calories. This was the largest single cause of hypoglycemia identified in the study. The causes of decreased intake included nausea, vomiting, anorexia, lethargy, nothing-by-mouth status, interruption of meals by transport, and nondelivery of meal trays. In Mr. D's case, the interruption of his breakfast by transport after receiving his insulin was the triggering event of his hypoglycemic episode.

If nutrition ceases to be provided, nutritional insulin coverage should be interrupted. If nutritional coverage of insulin was not interrupted, the prevention of hypoglycemia is warranted. This consists of recognizing this as a triggering event and increasing the intensity of blood glucose monitoring for the duration of the nutritional coverage of insulin. Campbell and Braithwaite (2004) suggest a hospital protocol for triggering events and the inpatient team's response to the triggering events.

Diabetes Self-Management Education

As a part of Mr. D's overall discharge plan, he needs to be prepared to self-manage his diabetes and prevent further hypoglycemic episodes at the time of transition from the orthopaedic unit. Hypoglycemia prevention and management are a diabetes survival skill that all patients receiving sulfonylureas and/or insulin need to master. The ADA (2012) recommends that diabetes self-management education (DSME) should address psychosocial issues, because emotional well-being is associated with positive diabetes outcomes. Ongoing DSME and diabetes self-management support help people cope and maintain effective self-management throughout a lifetime of diabetes as they are faced with new challenges. The overall objectives of DSME and diabetes self-management support are to support informed decision-making, self-care behaviors, problem-solving, and active collaboration with the healthcare team to improve clinical outcomes, health status, and quality of life (ADA, 2012).

Current best practice for DSME is a skills-based approach that focuses on helping people with diabetes make informed self-management choices. Patient-centered care is respectful of and responsive to the individual's preferences, needs, and values to ensure that the individual's values guide all decision-making. When treatment goals are not met, as in Mr. D's case, rethinking the treatment regimen may include assessment of barriers such as income, health literacy, distress, depression, and competing demands including family dynamics (ADA, 2012). See Table 5 for the ADA's (2012) clinical practice recommendations for areas of knowledge to be addressed prior to discharge.

It is important for the orthopaedic nurse to assist the newly diagnosed individuals with diabetes to develop their "survival skills" and to reinforce knowledge of the survival skills with those with a history of diabetes. In the hospital, "survival skills" are typically for individuals with no or little knowledge regarding their diabetes self-management. The topics of blood glucose monitoring, how and when to take their medication, management of hypoglycemia, and when to contact their physician are essential in the short term for safe patient discharge (Clement et al., 2004).

A crucial inpatient goal of DSME is a team approach among healthcare professionals coordinating the care

Table 5. Areas of Knowledge to Be Addressed Prior to Hospital Discharge

Identification of healthcare provider who will provide diabetes care after discharge
Level of understanding related to blood glucose monitoring and goals
Definition, recognition, treatment, and prevention of hypoglycemia
Information on consistent eating patterns
When and how to take to blood glucose lowering medication and administration
Sick-day management
Proper use and disposal of syringes

Note. "Standards of Medical Care in Diabetes," by American Diabetes Association, 2012, *Diabetes Care, 35*(Suppl. 1), pp. S11–S63; "Hypoglycemia in Type 1 and Type 2 Diabetes: Physiology, Pathophysiology, and Management," V. J. Briscoe and S. N. Davis, 2006, *Clinical Diabetes, 24*(3), pp. 115–121.

in the hospital and postdischarge. Collaboration among the physician, nurse, diabetes nurse educator, registered dietician, social worker, and case manager is essential in providing continuity of care and a safe discharge. Registered dieticians should be consulted for medical nutrition therapy and patient education. Social workers and case managers are needed to assist with discharge planning including assessing for the affordability and need of medications, supplies, and possible home healthcare at discharge. Individuals with diabetes in need of home healthcare referrals can include people newly diagnosed, new to insulin, elderly, and those for whom there are self-management concerns (Clement et al., 2004). Mr. D's discharge plan will include a home healthcare nurse to facilitate a safe transition to home.

Conclusion

The goal of diabetes therapy is to normalize the glucose levels without lowering it excessively. Hypoglycemia can be frightening for the patient, family, and even the healthcare professional. Symptoms can develop rapidly, and the condition can be life threatening. Once you understand how to identify and treat the signs and symptoms of hypoglycemia, you can respond calmly and with confidence. The threat of hypoglycemia requires the orthopaedic nurse to be prepared in assessing, treating, and preventing hypoglycemia on the basis of the clinical practice recommendations.

The use of evidence-based practice is recognized as the best approach to provide high-quality care. The ADA (2012) evidence-based clinical practice recommendations strongly advise hospital-wide protocols for the treatment of hypoglycemia. The ADA (2012) urges the need for policies and protocols that focus on prevention of hypoglycemia through identifying the predisposing conditions and triggering events throughout the patient's hospitalization.

Acknowledgments

Special thanks to Mary Beth Modic, MSN, RN, CNS, CDE, clinical nurse specialist in diabetes at the Cleveland Clinic in Cleveland, OH, and Carol Sedlak, PhD, RN, CNS, ONC, CNE, FAAN, professor and director, MSN Nurse Educator Program at Kent State University in Kent, OH, for their encouragement, guidance, and excellent advice during the writing of this article.

References

American Diabetes Association. (2012) Standards of medical care in diabetes. *Diabetes Care*, *35*(Suppl. 1), S11–S63. Retrieved from http://care.diabetesjournals.org/content/35/Supplement_1/S11.full.pdf+html

Anthony, M. (2008). Hypoglycemia in hospitalized adults. *Medsurg Nursing*, *17*(1), 31–40.

Braithwaite, S. S., Buie, M. M., Thompson, C. L., Bladwin, D. F., Oertel M. D., Robertson B. A., & Mehrotra H. P. (2004). Hospital hypoglycemia: Not only treatment but also prevention. *Endocrine Practice*, *10*(2), 89–99.

Briscoe, V. J., & Davis, S. N. (2006). Hypoglycemia in Type 1 and Type 2 diabetes: Physiology, pathophysiology, and management. *Clinical Diabetes*, *24*(3), 115–121.

Campbell, K. B., & Braithwaite, S. S. (2004). Hospital management of hyperglycemia. *Clinical Diabetes*, *22*(2), 81–88.

Clement, S., Braithwaite, S. S., Magee, M. F., Ahmann, A., Smith, E. P., Schaferm, R. G., & Hirsh, I. B. (2004). Management of diabetes and hyperglycemia in the hospitals. *Diabetes Care*, *27*(2), 553–591.

Fisher, M. (2010). Hypoglycaemia in patients with Type 2 diabetes: Minimising the risk. *The British Journal of Diabetes and Vascular Disease*, *10*(1), 35–41.

Fowler, M. J. (2008). Hypoglycemia. *Clinical Diabetes*, *26*(4), 170–173.

Gerich, J. E., Woerle, H. J., & Stunvoll, M. (2001). Renal glucogensis: Its importance in human glucose homeostasis. *Diabetes Care*, *24*(2), 382–391.

Goldstein, P. C. (2009). Assessment and treatment of hypoglycemia in elders: Cautions and recommendations. *Medsurg Nursing 18*(4), 215–241.

Moghissi, E. S., Korytkowski, M. T., DiNardo, M., Einhorn, D., Hellman, R., Hirsh, I. B., & Umpierrez, G. E. (2009). American Academy of Clinical Endocrinologist and American Diabetes Association consensus statement on inpatient glycemic control. *Endocrine Practice*, *15*(4), 1–16.

Pearson, T. (2008). Glucagon as a treatment of severe hypoglycemia. *The Diabetes Educator*, *34*(1), 128–134.

Plodkowski, R. A., & Edelman, S. V. (2001). Pre-surgical evaluation of diabetic patients. *Clinical Diabetes*, *19*(2), 92–95.

Tkacs, N. C. (2002). Hypoglycemia unawareness. *American Journal of Nursing*, *102*(2), 34–40.

Tomky, D. (2005). Detection, prevention, and treatment of hypoglycemia in the hospital. *Diabetes Spectrum*, *18*(1), 39–44.