
Managing Hyperglycemia and Hypoglycemia Nursing Guidelines for Diabetic Patients

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Abstract:

Effective management of hyperglycemia and hypoglycemia is crucial in the care of diabetic patients to prevent acute complications and long-term health issues. For hyperglycemia, nurses should monitor blood glucose levels regularly, noting patterns that could indicate worsening glycemic control. Education on diet, the importance of medication adherence, and recognizing the symptoms of high blood sugar—such as increased thirst, frequent urination, and fatigue—are essential. In cases of significantly elevated glucose levels, nurses should follow protocols for administering insulin or other prescribed medications and ensure the patient is well-hydrated. Additionally, teaching patients to adjust their carbohydrate intake and exercise routines can be beneficial in managing their condition. Conversely, hypoglycemia requires immediate intervention to raise blood glucose levels swiftly. Nurses should recognize symptoms like sweating, shaking, confusion, and irritability, and be ready to respond effectively. Treatment typically involves administering fast-acting carbohydrates, such as glucose tablets or juice, followed by a more substantial snack or meal once the patient is stabilized. It is important to educate patients on their individualized hypoglycemia thresholds and provide guidance on carrying quick sources of glucose at all times. Continuous patient monitoring, coupled with patient education regarding lifestyle choices, will empower diabetic individuals to maintain their blood glucose levels within target ranges and reduce the risks associated with both hyperglycemia and hypoglycemia.

Keywords: Hyperglycemia, Hypoglycemia, Blood glucose monitoring, Insulin administration, Dietary education, Carbohydrate intake, Symptoms recognition, Fast-acting carbohydrates, Patient empowerment, Nursing protocols

Introduction:

Diabetes Mellitus, a chronic metabolic disorder characterized by elevated blood glucose levels, affects millions of individuals across the globe. According to the International Diabetes Federation, approximately 537 million adults (20–79 years) were living with diabetes in 2021, a figure expected to rise to 643 million by 2030. The implications of this widespread health issue extend beyond the individual, impacting healthcare systems, economies, and communities at large. The effective

management of diabetes is integral to mitigating its associated complications, particularly the extremes of hyperglycemia (high blood sugar) and hypoglycemia (low blood sugar). Both conditions pose significant risks to patient health and necessitate vigilant monitoring and intervention, underscoring the critical role of nursing professionals in the management of diabetic patients [1].

Hyperglycemia occurs when blood glucose levels exceed established thresholds, resulting from

inadequate insulin production or resistance to insulin. Its acute manifestations may include frequent urination, excessive thirst, fatigue, and blurred vision. Chronic hyperglycemia is a major contributor to long-term complications such as cardiovascular disease, neuropathy, nephropathy, and retinopathy, significantly affecting patients' quality of life. In contrast, hypoglycemia is characterized by abnormally low blood glucose levels, typically defined as below 70 mg/dL. It can lead to symptoms such as sweating, tremors, confusion, and in severe cases, loss of consciousness or seizures. Patients with diabetes, particularly those treated with insulin or certain oral medications, face an elevated risk of experiencing both conditions, sometimes even within short time frames. Thus, a thorough understanding of the management strategies for hyperglycemia and hypoglycemia is essential for nurses who play a frontline role in patient education, monitoring, and intervention [2].

Nurses are uniquely positioned to support diabetic patients through a holistic, patient-centered approach. The nursing process, which encompasses assessment, diagnosis, planning, implementation, and evaluation, provides a foundational framework for addressing the complex needs of individuals with diabetes. This research aims to illuminate the best practices and guidelines that nurses can adopt to manage hyperglycemia and hypoglycemia effectively. A collaborative approach that includes patient involvement is essential; patients must understand their condition, recognize symptoms, and take active roles in their care [3].

Educational intervention forms a cornerstone of effective diabetes management. Nurses are tasked with imparting knowledge about lifestyle modifications, including dietary management and physical activity, that can help regulate blood sugar levels. Moreover, understanding carbohydrate counting, portion control, and the importance of regular monitoring of blood glucose levels empowers patients in their self-management efforts. Effective communication strategies and tailored educational materials can enhance patient engagement, indicating that nurses must be adept at environment, cultural, and literacy awareness when educating patients [4].

Furthermore, the management of insulin therapy, a prevalent treatment modality for diabetes, demands

rigorous attention from nursing professionals. Dosage adjustment based on blood glucose monitoring results is crucial for preventing the extremes of hyperglycemia and hypoglycemia. Nurses must be well-versed in the mechanisms of action of various diabetic medications, their potential side effects, and the intricate balance of dietary intake and physical activity that influences insulin efficacy. Regular training and up-to-date knowledge are necessary to ensure that nurses remain competent in the evolving landscape of diabetes management [5].

In recognition of the multifaceted nature of diabetes, interdisciplinary collaboration is vital. Health professionals from diverse backgrounds must work together to create comprehensive care plans that address the biological, psychological, and social determinants of health affecting diabetic patients. Nurses often serve as coordinators of this care, bridging gaps between patients and other healthcare providers, and ensuring that therapies are tailored to individual needs [6].

Understanding Hyperglycemia: Causes and Consequences:

Hyperglycemia, commonly referred to as high blood sugar, is a condition characterized by an excess of glucose in the bloodstream. It is typically defined as a blood glucose level greater than 130 mg/dL (7.2 mmol/L) when fasting or greater than 180 mg/dL (10 mmol/L) two hours after eating. While often associated with diabetes, hyperglycemia can affect individuals without diabetes as well. Understanding the various causes and consequences of hyperglycemia is crucial for effective management and prevention of its related complications [7].

Causes of Hyperglycemia

Hyperglycemia can arise from various factors, which can broadly be categorized into physiological, psychological, and lifestyle-related causes [7].

1. Diabetes Mellitus:

The most common cause of hyperglycemia is diabetes mellitus, which encompasses both Type 1 and Type 2 diabetes. In Type 1 diabetes, the pancreas produces little to no insulin due to autoimmune destruction of insulin-producing beta cells. In Type 2 diabetes, the body develops insulin resistance, and the pancreas cannot produce enough

insulin to overcome this resistance. Both conditions ultimately lead to elevated blood glucose levels [7].

2. Stress Responses:

Physiological stress, whether from illness, surgery, or emotional distress, can lead to elevated blood glucose levels. The body's "fight or flight" response releases stress hormones such as cortisol and adrenaline, which can prompt the liver to release more glucose into the bloodstream. This can result in temporary hyperglycemia even in individuals without an underlying glucose regulation disorder [8].

3. Medications:

Certain medications can induce hyperglycemia as a side effect. For instance, corticosteroids, commonly used to reduce inflammation, can significantly raise blood sugar levels. Other medications, such as thiazide diuretics and certain antipsychotics, may also contribute to hyperglycemic episodes [8].

4. Dietary Factors:

The consumption of high-glycemic index foods—such as white bread, sugary snacks, and processed carbohydrates—can result in rapid spikes in blood glucose levels. Portion sizes and frequency of meals also play a critical role; overeating can overwhelm the body's insulin response, leading to hyperglycemia [9].

5. Lack of Physical Activity:

Regular physical activity helps regulate blood glucose levels by promoting the uptake of glucose by muscle cells. Sedentary lifestyles contribute to insulin resistance, resulting in elevated blood sugar levels. Lack of exercise also decreases the body's ability to manage sudden surges in glucose from dietary sources [9].

6. Hormonal Imbalances:

Endocrine disorders, such as Cushing's syndrome, which results in excess cortisol production, or pheochromocytoma, a tumor that causes adrenal glands to secrete excess catecholamines, can lead to hyperglycemia. These hormonal imbalances can interfere with the body's ability to utilize glucose effectively [9].

Consequences of Hyperglycemia

Failing to manage hyperglycemia properly can lead to both short-term and long-term consequences.

1. Acute Complications:

One of the immediate risks of uncontrolled hyperglycemia is the development of diabetic ketoacidosis (DKA), especially in Type 1 diabetes. DKA occurs when the body begins to break down fat for energy instead of glucose, producing ketones that accumulate in the blood. Symptoms include nausea, vomiting, abdominal pain, fruity-smelling breath, and can ultimately lead to coma or death if not promptly treated.

Another acute complication is hyperglycemic hyperosmolar state (HHS), more common in Type 2 diabetes. This condition can occur in response to prolonged severe hyperglycemia, leading to extreme dehydration, altered mental status, and increased risk of seizures. HHS requires immediate medical attention, similar to DKA [10].

2. Chronic Complications:

Long-term hyperglycemia primarily impacts the body's vasculature. Chronic elevated blood glucose levels can cause damage to blood vessels, leading to microvascular and macrovascular complications. Microvascular complications include retinopathy (damage to the retina leading to vision problems), nephropathy (kidney damage), and neuropathy (nerve damage, often leading to pain, tingling, or loss of sensation). These complications can significantly reduce the quality of life and lead to necessary medical interventions, such as dialysis for kidney failure.

Macrovascular complications involve larger blood vessels and are associated with an increased risk of cardiovascular diseases. Individuals with chronically elevated blood glucose levels face a greater risk of heart attack, stroke, and peripheral arterial disease due to atherosclerosis [10].

3. Impaired Immune Function:

Chronic hyperglycemia can also suppress the immune system, making individuals more susceptible to infections. High glucose environments can promote the growth of certain pathogens, and diabetic patients frequently experience skin infections, urinary tract infections, and foot ulcers, which can escalate if not treated appropriately [11].

4. Psychological Impact:

Living with hyperglycemia and diabetes can impose a psychological burden. Anxiety about managing

blood sugar levels, dealing with dietary restrictions, and the fear of complications can lead to mental health challenges such as depression or diabetes distress. These psychological factors can create a vicious cycle, where the emotional stress further exacerbates metabolic control, leading to even higher blood glucose levels [11].

Identifying Symptoms and Risks of Hypoglycemia:

Hypoglycemia, commonly referred to as low blood sugar, is a critical condition resulting from an insufficient concentration of glucose in the bloodstream. Glucose is a primary energy source for the body, particularly for the brain, and maintaining optimal blood glucose levels is paramount for overall health. Hypoglycemia poses significant risks, especially for individuals with diabetes who may be managing their glucose levels through insulin or other medications.

To understand hypoglycemia, it is essential to establish a clear definition. Hypoglycemia occurs when blood glucose levels drop below 70 mg/dL (milligrams per deciliter), though this threshold can vary slightly based on individual factors and circumstances. Several factors can precipitate hypoglycemia, including excessive insulin administration, prolonged fasting, vigorous physical activity, or consuming alcohol without accompanying food. While hypoglycemia is most commonly associated with diabetes management, it can also occur in individuals without diabetes due to hormonal disorders, liver disease, medications, or infections [12].

Symptoms of Hypoglycemia

The symptoms of hypoglycemia can be categorized into mild, moderate, and severe manifestations, depending on the severity of the blood sugar drop.

Mild Symptoms

In the early stages, individuals may experience a variety of mild symptoms that serve as warning signs that glucose levels are falling. These can include:

- **Sweating:** Profuse perspiration is a common early indicator of hypoglycemia as the body attempts to compensate for low sugar levels.

- **Shakiness:** Tremors or shaking are often felt as the body reacts to the inadequate glucose supply.
- **Hunger:** An intense feeling of hunger usually accompanies low blood sugar levels as the body signals the need for food intake.
- **Nervousness or Anxiety:** Many individuals report feelings of anxiety or restlessness stemming from the body's stress response to low glucose [13].

Moderate Symptoms

If blood sugar continues to decline and is not addressed, the individual may begin to experience more pronounced symptoms, such as:

- **Confusion or Difficulty Concentrating:** The brain, being highly reliant on glucose, may begin to show signs of dysfunction with continued low sugar levels, making it difficult to focus or think clearly.
- **Dizziness or Lightheadedness:** Insufficient glucose levels can impair balance and coordination, leading to dizziness or a faint feeling.
- **Palpitations:** The heart may race as the body releases adrenaline in response to low blood sugar levels [14].

Severe Symptoms

Severe hypoglycemia is a medical emergency and is characterized by more alarming symptoms, including:

- **Loss of Consciousness:** If glucose levels fall to critically low levels, an individual may lose consciousness or experience seizures.
- **Seizures:** Hypoglycemia can provoke seizures due to significant disruption to brain function.
- **Coma:** In extreme cases, ongoing hypoglycemia can lead to a coma, necessitating immediate medical intervention [15].

Recognizing these symptoms is vital since timely action can prevent severe outcomes and long-term neurological damage.

Risks Associated with Hypoglycemia

Hypoglycemia carries considerable risks, particularly in vulnerable populations such as those with diabetes. These risks can manifest both in short-term and long-term complications.

Short-term Risks

Short-term risks primarily pertain to the immediate physiological dangers of hypoglycemia. For instance, severe hypoglycemia can lead to confusion and impaired decision-making, which can pose risks during daily activities, such as driving or operating machinery. In extreme cases, losing consciousness or having a seizure can lead to accidents with potentially fatal consequences.

Moreover, frequent episodes of hypoglycemia can contribute to a phenomenon known as hypoglycemia unawareness. This is a condition where the body fails to recognize the early warning signs of low blood sugar due to repeated instances of hypoglycemia. Consequently, individuals may not respond appropriately, leading to more severe episodes [16].

Long-term Risks

Long-term consequences of hypoglycemia can be significant, particularly for people with diabetes. Repeated instances of low blood sugar can impair the body's ability to respond to future hypoglycemic events. Individuals may experience a decrease in cognitive function over time and may also face increased anxiety or fear of subsequent episodes, which can affect their overall quality of life.

Additionally, chronic hypoglycemia can lead to detrimental effects on the cardiovascular system. While the specific mechanisms are still being studied, there is evidence to suggest that recurring low blood sugar episodes may increase the risk of cardiovascular disease in affected individuals [17].

Management and Prevention of Hypoglycemia

Managing and preventing hypoglycemia entails several strategies. It is crucial for individuals with diabetes, or those at risk, to regularly monitor their blood glucose levels, particularly during periods of

medication adjustment, increased physical activity, or dietary changes. Maintaining a consistent eating schedule and consuming carbohydrates before engaging in exercise can help stabilize blood sugar levels [18].

Education is also essential. Individuals need to recognize the symptoms of hypoglycemia and have a clear plan of action in place, including carrying a quick source of glucose, such as glucose tablets, fruit juice, or candies, to manage mild hypoglycemic episodes effectively. Furthermore, teaching family and friends how to recognize symptoms and provide assistance can be life-saving, especially during severe episodes.

In cases where a person is at risk of severe hypoglycemia, healthcare providers may recommend using continuous glucose monitors (CGMs) that provide real-time updates on blood glucose levels, allowing for timely preventative action [18].

Blood Glucose Monitoring Techniques:

Blood glucose monitoring is a critical component in the management of diabetes, a condition that affects millions of people worldwide. Understanding how to effectively monitor blood glucose levels can significantly improve both short- and long-term health outcomes for individuals with diabetes.

Blood glucose, or blood sugar, is the main type of sugar found in the blood and is the body's primary source of energy. The human body meticulously regulates blood glucose levels through a complex interplay of hormones, primarily insulin and glucagon. For those with diabetes, this regulation is impaired, leading to either high blood sugar (hyperglycemia) or low blood sugar (hypoglycemia). This dysregulation necessitates ongoing monitoring to prevent complications that can arise from sustained abnormal glucose levels, including nerve damage, kidney failure, and cardiovascular disease [19].

Traditional Monitoring Techniques

1. Self-Monitoring of Blood Glucose (SMBG):

Self-monitoring of blood glucose is one of the most common methods used by individuals with diabetes. This technique involves the use of a blood glucose meter,

a portable device that measures blood sugar levels. The process typically requires a finger prick to obtain a drop of blood, which is then placed on a test strip inserted into the meter. SMBG allows for real-time data, enabling patients to make informed decisions about diet, exercise, and medication.

Regular SMBG is usually recommended multiple times a day, especially for those on insulin. Despite its widespread use, SMBG does have some drawbacks, including discomfort from finger pricks and the need for frequent testing, which may lead to monitoring fatigue among users [20].

2. Laboratory Testing:

In addition to self-monitoring, healthcare providers often recommend laboratory blood tests to assess overall glycemic control. The most notable of these is the Hemoglobin A1c (HbA1c) test, which measures the average blood glucose levels over the preceding two to three months. The HbA1c test provides a broader view of blood glucose management than daily monitoring, helping to identify trends over time.

Laboratory tests, however, require visits to healthcare facilities and are not as responsive to immediate changes in dietary intake or physical activity [20].

Advanced Blood Glucose Monitoring Techniques

As technology has advanced, so too have the techniques for monitoring blood glucose levels. These innovations aim to improve convenience, accuracy, and comprehensive tracking of glucose levels.

1. Continuous Glucose Monitoring (CGM):

Continuous glucose monitoring systems have gained significant traction in recent years. A CGM system typically includes a small sensor placed under the skin, which measures glucose levels in interstitial fluid. This sensor transmits data to a device or smartphone app, providing real-time glucose readings every few minutes. CGMs not only offer continuous data but

also feature alarms that alert users to dangerously high or low levels of glucose, thus facilitating proactive management.

CGMs also enable users to see trends over time, allowing for better adjustments in insulin or dietary intake. While CGMs provide a wealth of information, they can be expensive and may not be covered by all insurance providers [21].

2. Flash Glucose Monitoring:

A variation of CGM, flash glucose monitoring involves a similar sensor that users can scan with a reader or smartphone app. Unlike traditional CGMs that provide continuous data, flash systems require users to initiate scans to obtain their glucose readings. This technique retains many benefits of CGMs, including trend data and the ability to track glucose levels with relative ease.

Flash glucose monitoring systems appeal to those who prefer less frequent calibration compared to traditional CGMs while still offering flexibility in testing [22].

3. Non-Invasive Monitoring:

The pursuit of non-invasive monitoring methods has garnered significant interest within the field of diabetes management. Various technologies, including infrared spectroscopy and bioimpedance analysis, have been explored but remain largely experimental. Non-invasive approaches seek to eliminate the need for finger pricks altogether, which could drastically improve the quality of life for those living with diabetes.

As of now, non-invasive methods are not yet fully developed and lack the accuracy and reliability of traditional or continuous methods. However, ongoing research in this area holds promise for the future [22].

The Role of Digital Health and Mobile Applications

The rise of digital health technologies and mobile applications has transformed the landscape of diabetes management. Many of these apps are designed to integrate with glucose monitoring devices, offering users comprehensive platforms to

track their blood sugar levels, medication intake, dietary choices, and physical activity. These applications often come equipped with analytics that help users visualize their data trend and identify patterns correlating with fluctuations in glucose levels.

Additionally, telehealth services have enhanced communication between patients and healthcare providers, allowing for virtual consultations and timely adjustments to diabetes management plans based on monitoring data. As technology continues to evolve, the integration of artificial intelligence and machine learning algorithms promises even more personalized management strategies, utilizing data from various sources to recommend interventions tailored to individual needs [23].

Nursing Protocols for Managing Hyperglycemia:

Hyperglycemia, a condition characterized by elevated blood glucose levels, presents a significant challenge within the healthcare sector. It is a critical issue not only for patients diagnosed with diabetes but also for those experiencing incidental hyperglycemia in the context of acute illness, stress, or medications. Hyperglycemia can have serious implications, including increased risk for infections, poor wound healing, and potentially life-threatening complications such as diabetic ketoacidosis and hyperglycemic hyperosmolar state. The role of nurses in managing hyperglycemia is crucial, encompassing comprehensive assessments, timely interventions, patient education, and collaboration with interdisciplinary teams to ensure optimal patient outcomes.

Before delving into the protocols, it is crucial to understand the underlying causes of hyperglycemia. Hyperglycemia can arise from various factors, including insufficient insulin production, increased insulin resistance, excessive glucose production by the liver, and inadequate glucose uptake in peripheral tissues. In non-diabetic patients, hyperglycemia can occur due to stress responses, medications like corticosteroids, and various acute illnesses. This condition is often categorized as mild (blood glucose between 140-180 mg/dL), moderate (180-250 mg/dL), and severe (above 250 mg/dL), with specific protocols adjusting accordingly based on severity [24].

Assessment Protocols

The initial step in managing hyperglycemia is a thorough assessment. Nurses should implement the following assessment protocols:

1. **Patient History:** Obtain a detailed history of the patient's medical background, focusing on diabetes management, medication adherence, dietary habits, and physical activity levels. A comprehensive understanding of the patient's previous glucose management allows for tailored interventions.
2. **Physical Examination:** Assess the patient for signs and symptoms of hyperglycemia, such as polyuria, polydipsia, fatigue, blurred vision, and skin changes. Additionally, consider checking for any complications resulting from chronic hyperglycemia, such as neuropathy or retinopathy.
3. **Blood Glucose Monitoring:** Regular monitoring of blood glucose levels is paramount. Nurses should educate patients on the use of glucometers and the importance of frequent monitoring, particularly in patients with known diabetes. Continuous glucose monitoring devices may also be utilized for real-time data on blood sugar fluctuations.
4. **Laboratory Tests:** Request appropriate laboratory tests, including HbA1c, electrolytes, renal function tests, and ketone levels, especially if diabetic ketoacidosis (DKA) is suspected [25].

Interventional Protocols

Once an assessment has been made, the next step involves implementing appropriate interventional protocols, which may include:

1. **Insulin Therapy:** Administering insulin is often the cornerstone of hyperglycemia management. Nurses should be adept in calculating dosages based on the patient's needs. Continuous intravenous (IV) insulin infusion may be warranted in critically ill patients or those with severe metabolic derangements [26].

2. **Administration of Oral Medications:** For patients with type 2 diabetes, oral hypoglycemic agents such as Metformin, Sulfonylureas, or DPP-4 inhibitors may be prescribed. Nurses play an important role in monitoring the effects and side effects of these medications.
3. **Dietary Management:** Collaborate with dietitians to create individualized meal plans that emphasize low glycemic index foods. Nurses should educate patients about carbohydrate counting and adjusting food intake based on glucose levels [26].
4. **Hydration:** Monitoring and maintaining hydration is essential. Nurses should ensure patients receive adequate fluids to prevent dehydration, especially when patients experience polyuria. Electrolyte monitoring is also crucial to prevent imbalances.
5. **Exercise:** Encourage physical activity as appropriate. Exercise can significantly lower blood glucose levels; thus, nurses should devise safe exercise plans based on the patient's condition [27].
6. **Patient Education:** Educating patients about the causes and consequences of hyperglycemia is vital. Topics should include recognizing signs and symptoms, understanding the importance of medication adherence, and developing an individualized management plan. Nurses should also inform patients about factors that may prompt hyperglycemia such as illness, stress, and dietary indiscretions [27].

Team Collaboration

Effective management of hyperglycemia involves multidisciplinary teamwork. Nurses should maintain open lines of communication with physicians, endocrinologists, dietitians, and pharmacists to ensure comprehensive care. Participation in interdisciplinary rounds can help ensure that care plans are updated based on real-time assessments and patient feedback.

Follow-up is critical to determine the effectiveness of the implemented interventions. Regular

monitoring of blood glucose levels, assessment of HbA1c, and evaluating the presence of complications are necessary components of ongoing care. Collaboration with the healthcare team for adjusting treatment protocols based on changing patient conditions is also crucial [28].

Immediate Interventions for Hypoglycemic Episodes:

Hypoglycemia, commonly referred to as low blood sugar, is a potentially serious condition characterized by abnormally low levels of glucose in the bloodstream. It occurs when the blood glucose falls below the normal range, typically considered to be less than 70 mg/dL. For individuals with diabetes who are on insulin or oral hypoglycemic agents, hypoglycemia can be a frequent complication, necessitating prompt and effective interventions to prevent severe health outcomes. Understanding the immediate interventions for managing hypoglycemic episodes is critical for both patients and caregivers [29].

Causes of Hypoglycemia

Before delving into the immediate interventions, it is essential to recognize the underlying causes of hypoglycemia. Several factors can contribute to low blood sugar levels, especially in diabetic patients. These include:

1. **Excessive Insulin or Medications:** Overadministering insulin or diabetes medications can lead to hypoglycemia.
2. **Inadequate Food Intake:** Skipping meals or consuming insufficient carbohydrates relative to insulin dosages can precipitate low blood sugar.
3. **Increased Physical Activity:** Exercise can enhance glucose uptake by muscles, leading to hypoglycemia if glucose levels are not adequately replenished.
4. **Alcohol Consumption:** Alcohol can inhibit gluconeogenesis—the liver's process of producing glucose—especially when consumed on an empty stomach.
5. **Stress and Illness:** While stress can lead to increased blood sugar levels, certain conditions and infections may disrupt

normal glucose metabolism and result in hypoglycemia [30].

Having established the causes, it becomes imperative to understand how to manage hypoglycemic episodes effectively.

Recognizing Hypoglycemic Symptoms

The presentation of hypoglycemia can vary between individuals, but common symptoms include:

- Sweating
- Trembling
- Palpitations
- Hunger
- Dizziness
- Confusion
- Irritability
- Weakness

In severe cases, hypoglycemia can lead to loss of consciousness, seizures, or even coma. Consequently, recognizing the symptoms early is crucial in administering timely interventions [31].

Immediate Interventions

The management of hypoglycemic episodes can be divided into two categories: mild to moderate hypoglycemia where the individual is conscious and able to swallow, and severe hypoglycemia where the individual is unconscious or unresponsive.

1. Mild to Moderate Hypoglycemia

For individuals experiencing mild to moderate hypoglycemia, immediate treatment involves the consumption of fast-acting carbohydrates. The general recommendation is to consume approximately 15 grams of rapidly absorbable carbohydrates, which can include:

- **Glucose Tablets:** These are specifically designed for quick absorption and are highly effective.
- **Fruit Juice:** About half a cup (4 ounces) of orange or apple juice.
- **Sugary Beverages:** Regular (non-diet) soda, consuming about half a can.

- **Candy:** Hard candies or gummy candies, with guidance to ensure they contain sugar.

After the initial intake, it is important to recheck blood glucose levels after 15 minutes. If symptoms persist or blood sugar is still below 70 mg/dL, the individual should take another 15 grams of carbohydrates. Once glucose levels normalize, it is advisable to consume a small snack containing protein and complex carbohydrates, such as peanut butter on whole-grain bread, to sustain glucose levels and prevent recurrence [32].

2. Severe Hypoglycemia

Severe hypoglycemia is a medical emergency and requires intervention, especially if the individual is unable to consume food or drink. In such cases, the following options are available:

- **Glucagon Injection:** Glucagon is a hormone that raises blood glucose levels by promoting glycogen breakdown in the liver. It can be administered as an injection by anyone aware of the person's condition (family members, friends, or caregivers). A typical dose is 1 mg, and it can be administered intramuscularly or subcutaneously.
- **Emergency Medical Services:** If glucagon is not available or the individual does not respond within 15 minutes, calling for emergency medical services is imperative. Emergency responders can provide intravenous dextrose (50% dextrose solution) to rapidly increase blood sugar levels [33].

Preventative Education and Management

Apart from understanding immediate interventions, it is crucial for individuals with diabetes and their supporters to be educated about the nature of hypoglycemia, its symptoms, and its management strategies. This includes:

- **Regular Monitoring:** Frequent blood glucose monitoring can help individuals and caregivers catch low blood sugar levels before they become severe.
- **Personalized Management Plans:** Working with healthcare providers to establish individualized diabetes

management plans, including adjusting medication dosages and meal planning, can greatly reduce the risk of hypoglycemic episodes.

- **Patient Education:** Diabetic education programs that teach patients how to recognize symptoms, the importance of carrying fast-acting sugars, and how to administer glucagon can empower individuals to manage their conditions effectively [34].

Patient Education and Self-Management Strategies:

Managing blood glucose levels is critical for individuals with diabetes, as both hyperglycemia (high blood sugar) and hypoglycemia (low blood sugar) can lead to significant health complications. Effective patient education and self-management strategies empower individuals to maintain their blood glucose levels within a target range, thereby reducing the risk of long-term complications such as neuropathy, nephropathy, retinopathy, and cardiovascular diseases.

Hyperglycemia occurs when there is an excessive amount of glucose in the bloodstream. It is frequently a result of insufficient insulin production, insulin resistance, or excessive carbohydrate intake. Symptoms of hyperglycemia may include frequent urination, increased thirst, fatigue, and blurred vision. Chronic hyperglycemia can lead to severe complications, including ketoacidosis, a severe condition that can be life-threatening if not managed promptly.

Conversely, hypoglycemia occurs when the glucose levels in the blood fall below normal levels, typically defined as less than 70 mg/dL. This condition can result from various factors, including taking too much insulin or diabetes medication, skipping meals, excessive exercise, or drinking alcohol without eating. Symptoms of hypoglycemia may include shakiness, confusion, sweating, irritability, and extreme hunger. In severe cases, hypoglycemia can lead to seizures, loss of consciousness, or even death if left untreated [35].

The Importance of Patient Education

Patient education is fundamental in fostering self-management behaviors among individuals with

diabetes. By equipping patients with essential knowledge about their condition, treatment options, and the significance of lifestyle modifications, healthcare professionals can motivate patients to be active participants in their care. Effective education enhances patients' understanding of the underlying causes of their blood sugar fluctuations, thereby enabling them to make informed decisions that can prevent episodes of hyperglycemia and hypoglycemia.

Patient education should encompass information on diet, physical activity, medication management, monitoring blood glucose levels, and recognizing the signs and symptoms of both hyperglycemia and hypoglycemia. Additionally, education is best delivered through tailored approaches—considering the patient's age, cultural background, literacy levels, and personal preferences—and implemented through various channels such as individual consultations, group classes, and support groups [36].

Self-Management Strategies

1. Monitoring Blood Glucose Levels:

Continuous monitoring of blood glucose levels is vital for managing both hyperglycemia and hypoglycemia. Patients should be educated on how to use glucose meters or continuous glucose monitoring (CGM) systems, which provide real-time data regarding their blood sugar levels. Regular monitoring allows patients to recognize patterns, make necessary adjustments, and take prompt action when levels deviate from the target range. Individuals should keep a record of their results alongside any relevant factors, such as food intake, physical activity, and medication use, to facilitate correlation and analysis [37].

2. Diet and Nutrition:

A well-balanced diet is essential for managing blood glucose levels. Patients should learn to incorporate a variety of foods, including whole grains, lean protein, healthy fats, and a wide array of fruits and vegetables. Carbohydrate counting and understanding the glycemic index of foods are critical components of dietary

management. Patients should be encouraged to consume meals and snacks at regular intervals to avoid spikes in blood sugar levels and to prevent the risk of hypoglycemia [37].

3. **Physical Activity:**

Regular physical activity is linked to improved insulin sensitivity and blood glucose control. Patients should be encouraged to include moderate-intensity aerobic exercises, strength training, and flexibility exercises in their routine, as recommended by the American Diabetes Association. It is crucial for individuals to understand that while exercise is beneficial, it may also impact blood glucose levels, potentially leading to hypoglycemia. Patients should monitor their blood sugar before and after exercising and make necessary adjustments to their food intake or medication to maintain stable levels.

4. **Medication Management:**

Understanding medication is vital for effective blood glucose management. Education should cover the types of insulin and oral anti-diabetic medications, their mechanisms of action, dosing schedules, and potential side effects. Patients must be aware of how their medications interact with lifestyle choices, such as diet and exercise. Moreover, education should emphasize the importance of adhering to prescribed regimens and recognizing when adjustments may be required, such as during illness or increased physical activity [38].

5. **Recognizing and Responding to Symptoms:**

Patients must be educated on identifying the symptoms of both hyperglycemia and hypoglycemia. They should also be aware of the potential complications that can arise from failure to manage these conditions effectively. Strategies for responding to hypoglycemia include consuming a fast-acting source of glucose, such as glucose tablets, juice, or candy, followed by a snack that includes protein and carbohydrates to

stabilize levels. For hyperglycemia, patients should understand the importance of hydration, taking medications as prescribed, and consulting their healthcare provider if symptoms persist.

6. **Support Systems:**

Involving family members and caregivers in the education process can enhance management strategies. Support systems can provide encouragement, reminders for blood glucose monitoring, and assistance in meal preparation. Additionally, engaging with community resources, such as diabetes support groups, can offer ongoing education, emotional support, and motivation for individuals working to manage their condition [39].

Conclusion and Future Directions in Diabetes Care:

Diabetes is a chronic health condition that affects millions of individuals globally, significantly influencing patients' lifestyles and the healthcare systems that support them. As diabetes continues to be one of the leading chronic illnesses, the emphasis on effective management, prevention strategies, and personalized treatment approaches becomes increasingly critical. As we draw conclusions from current practices and research findings in diabetes care, it is essential to explore future directions that may enhance patient outcomes, improve quality of life, and reduce the burden on healthcare systems [40].

Diabetes care has evolved over the years, transitioning from a one-size-fits-all approach to a more personalized model that takes into account individual patient needs, preferences, and lifestyles. Key aspects of diabetes management include blood glucose monitoring, dietary modifications, exercise, medication adherence, and regular health provider visits. The two major types of diabetes—Type 1, characterized by insulin deficiency, and Type 2, primarily driven by insulin resistance—require different management strategies. Now, advancements in technology, pharmacotherapy, and a growing understanding of diabetes pathophysiology enable healthcare providers to adopt more nuanced treatment plans [40].

Chronic disease management paradigms have shifted toward integrated care models that promote collaboration among multidisciplinary teams. These teams often include endocrinologists, dietitians, diabetes educators, mental health professionals, and primary care providers, all working together to provide comprehensive care tailored to the individual's needs. This holistic approach aims to address biological, psychological, and social factors that influence diabetes management [41].

Despite significant advances in diabetes care, several challenges remain. A major concern is the widespread prevalence of diabetes, with the International Diabetes Federation (IDF) estimating that approximately 537 million adults were living with diabetes worldwide in 2021—a number expected to rise significantly in the coming decades. This surge can be attributed to factors such as unhealthy lifestyles, increasing obesity rates, and an aging population, which necessitates innovative solutions and policies focused on prevention and management [42].

Another challenge is the disparity in diabetes care access and outcomes. Social determinants of health, including socioeconomic status, race, and geographic location influence individuals' ability to receive adequate care. Populations in rural areas or low-income urban settings may have limited access to specialist care, medications, and diabetes self-management training. Consequently, these disparities often lead to inequities in health outcomes, making it imperative for the healthcare community to develop strategies that enhance accessibility and equity in diabetes care [43].

Additionally, mental health issues associated with chronic diseases, including diabetes-related stress, anxiety, and depression, can hinder effective management. Psychological support should be integrated into diabetes care to foster resilient coping strategies and improve overall health outcomes [44].

Future Directions in Diabetes Care

As we look to the future of diabetes care, several promising directions are emerging, including advancements in technology, innovative pharmacotherapies, and a focus on prevention and community-based interventions [45].

1. **Technological Advancements:** The rise of digital health tools, such as continuous glucose monitoring (CGM) devices, insulin delivery systems, and telehealth platforms, represent a significant turning point in diabetes management. CGM technology allows patients to track their blood glucose levels in real-time, leading to timely interventions and more informed decision-making. Furthermore, telehealth services provide access to diabetes care, especially for those in remote areas or with mobility issues, thereby expanding the reach and flexibility of diabetes management [46].
2. **Data-Driven Personalized Medicine:** The integration of artificial intelligence (AI) and machine learning in diabetes management can facilitate personalized treatment strategies. By analyzing vast datasets from patient records and continuous monitoring devices, healthcare providers can identify patterns, predict complications, and tailor interventions that align with individual patient profiles. Moreover, such approaches could potentially refine risk stratification and improve clinical outcomes [47].
3. **Innovative Pharmacotherapies:** The development of new pharmacological agents continues to play an essential role in diabetes care, particularly with a focus on cardiovascular and kidney protection, which are significant concerns for individuals with diabetes. Medications such as sodium-glucose co-transporter 2 (SGLT2) inhibitors and glucagon-like peptide-1 (GLP-1) receptor agonists have shown benefits beyond glycemic control. Future research aims to explore combination therapies and new classes of diabetes medications that can provide comprehensive health benefits [48].
4. **Community-Based Interventions and Prevention Strategies:** Tackling the diabetes epidemic requires a multi-faceted approach that transcends the clinical setting. Community-based interventions that promote healthier lifestyles, better nutrition, and physical activity can combat

the underlying risk factors for diabetes. Initiatives that engage local organizations, schools, and workplaces to create supportive environments can drive behavioral change on a larger scale. The incorporation of culturally competent care recognizes the importance of tailoring interventions to meet the diverse needs of populations at risk [49].

5. **Enhanced Education and Support:** Empowering patients through education and access to resources is vital for effective self-management of diabetes. Future efforts should focus on enhancing diabetes education programs, utilizing peer support models, and incorporating psychosocial support to promote a holistic approach to patient empowerment [50].

Conclusion:

In conclusion, effective management of hyperglycemia and hypoglycemia is vital for optimizing the health outcomes of diabetic patients. Nursing guidelines play a critical role in equipping healthcare providers with the tools and knowledge necessary to identify and respond to the complexities of diabetes management. By implementing consistent blood glucose monitoring, recognizing symptoms early, and applying appropriate intervention strategies, nurses can significantly mitigate the risks associated with both high and low blood sugar levels. Furthermore, patient education and empowerment are essential components of this management, enabling individuals to actively participate in their care and make informed lifestyle choices. As we look to the future, ongoing research and continuing education for healthcare professionals will enhance our understanding and approaches to diabetes management, ultimately improving patients' quality of life and reducing the incidence of diabetes-related complications.

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