

CONSIDERATIONS:

1. Hyperglycemia is an abnormally high level of glucose in the blood, most frequently associated with diabetes:
 - a. Blood glucose level greater than 130 mg/dl is considered high
 - b. Hyperglycemia may be the result of a slow or sudden rise in blood glucose
2. Persistent hyperglycemia has been shown to be a causative factor in such chronic complications as diabetic nephropathy, diabetic retinopathy, cardiovascular complications, and peripheral vascular disease.
3. The most common causes for hyperglycemia in a person diagnosed with diabetes include:
 - a. Inaccurate or inadequate amounts of insulin and/or oral or non-insulin injectable anti-diabetic agents
 - b. Dietary non-adherence
 - c. Infection, illness, or stress
 - d. Decreased exercise or activity less than usual
 - e. Pain
4. Medications and therapies which can raise blood glucose include:
 - a. Total parental nutrition
 - b. Anti-metabolites
 - c. Atypical antipsychotics
 - d. Diuretics
 - e. Steroids/immunosuppressive
 - f. Antihypertensives
 - g. Female replacement hormones
5. Signs and symptoms of hyperglycemia may be absent or unrecognized, but when present may include:
 - a. Polyuria, polyphagia, polydipsia
 - b. Weakness or fatigue
 - c. Blurred vision
6. Conditions associated with hyperglycemia include Myocardial Infarction/Cerebrovascular accident, underlying renal/cardiac disease, dehydration, anemia, and/or insulin resistance.
7. Target blood glucose levels should be established by the primary care provider for:
 - a. Fasting
 - b. Pre-prandial
 - c. Two-hour postprandial
 - d. Hemoglobin A1C
3. American Diabetes Association and European Association for the Study of Diabetes (ADA/EASD) Standards (2012) identify the glycemic target points for type 2 diabetes as:
 - a. Fasting and pre-prandial < 130mg/dl
 - b. Postprandial < 180 mg/dl
 - c. Hemoglobin A1C < 7% (mean plasma glucose of 150 - 160 mg/dl)
8. American Association of Clinical Endocrinologist AACE (2011) recommends glucose targets be individualized, take into account residual life expectancy, duration of disease, presence or absence of microvascular and macrovascular complications, CVD risk factors, comorbid conditions and risk for severe hypoglycemia. These should be formulated in the context of the patient's psychological, social, and economic status.
9. ADA Standards of Care (2013) recommendations for glycemic control:
 - a. Self-monitoring blood glucose (SMBG) should be carried out three or more times daily for patients using multiple insulin injections or insulin pump therapy
 - b. For patients using less-frequent insulin injections, noninsulin therapies, or medical nutrition therapy (MNT) alone, SMBG may be useful as a guide to management
 - c. Perform the A1C test at least two times a year in patients who are meeting treatment goals (and who have stable glycemic control)
 - d. Perform the A1C test quarterly in patients whose therapy has changed or who are not meeting glycemic goals
10. ADA's "Standards of Medical Care in Diabetes" recommends lowering A1C to 7.0% in most patients to reduce the incidence of microvascular disease. Less stringent A1C goals (such as < 8%) may be appropriate for patients with a history of severe hypoglycemia, limited life expectancy, advanced microvascular and macrovascular complications, extensive comorbid conditions and those with long-standing diabetes in whom the general goal is difficult to attain despite DSME, appropriate glucose monitoring, and effective doses of multiple glucose-lowering agents including insulin.

EQUIPMENT:

Blood glucose testing equipment (See *Blood Glucose Testing*)

PROCEDURE:

1. If patient's Blood Glucose Log or symptoms indicate hyperglycemia, assess for causes and perform a blood glucose test.
2. Assess the patient's/caregiver's diabetes management since the last visit including:
 - a. Blood glucose log book, if available, or through the blood glucose meter memory
 - b. Activity/exercise, including increases and decreases
 - c. Diabetes medication management, with attention to missed or under-dosing
 - d. Meal planning and carbohydrate counting, with attention to non-adherence to meal plan goals

- e. Illness and use of sick day management protocol, as appropriate
- 3. Assess the patient's health status for any indication of infection, including but not limited to urinary tract, dental, yeast, skin or upper respiratory infections.
- 4. Assess for new medications added to the patient's regime, particularly those that may increase insulin resistance, for example: steroids, HIV and anti-cancer therapies.
- 5. Assess the patient for signs of depression, anxiety or confusion impacting the patient's ability to manage diabetes on a day-to-day basis.
- 6. Assure that the meter is functioning properly:
 - a. Assure proper coding
 - b. Perform all quality control tests
 - c. Assure all quality control results fall within expected range
 - d. Check the machine to see if it needs cleaning
 - e. Check the strips for any defaults
 - f. Batteries generally need replacing after about 1,000 blood glucose checks or after about a year
- 7. Have patient/caregiver perform a capillary blood glucose test. (See *Endocrine System - Blood Glucose Testing*.) If the blood glucose is greater than 300 mg/dl, repeat the test to assure accuracy.
- 8. If the repeat blood glucose test is still greater than 300 mg/dl:
 - a. Guide the patient/caregiver in determining the reason for hyperglycemia
 - b. Notify the physician of the blood glucose level value (greater than 300 mg/dl) and causative factors identified
 - c. Obtain diabetes management plan verbal change orders from the physician, as appropriate
 - d. Instruct the patient/caregiver on the diabetes management change orders
 - e. Unless contraindicated, encourage patient to drink extra water (or other non-caloric, non-caffeinated beverage)
- 9. If patient is sick, instruct the patient/caregiver on "sick-day" guidelines:
 - a. Always take oral medications or insulin
 - b. Monitor blood glucose levels every 3 - 4 hours around the clock
 - c. Drink 8-ounces of calorie-free fluids every hour while awake
 - d. If food is not tolerated, liquids or soft carbohydrate-containing foods (which contain 15 grams of carbohydrates) every other hour are appropriate
 - e. Contact physician if blood glucose levels are greater than 240 mg/dl for two consecutive tests, or as otherwise specified by the physician managing the patient's diabetes

- f. Contact physician if vomiting or diarrhea persists for more than 4 - 6 hours

AFTER CARE:

1. Document in patient's record:
 - a. Signs or symptoms of hyperglycemia noted
 - b. Results of blood glucose test
 - c. Trends and patterns identified in glucose values
 - d. Causes identified leading to glucose excursions
 - e. Treatment given and patient's response to the treatment
 - f. Confidence and commitment of the patient/caregiver to implement a change and regain glucose control
 - g. Physician notification, response and orders received
 - h. Instructions given to patient/caregiver
2. Communicate with physician if blood glucose is 300 mg/dl or is outside of parameters given by physician.

REFERENCE:

- American Association of Clinical Endocrinologist (2012).
American Association of Clinical Endocrinologist (2011). *Medial Guidelines for Clinical Practice for Developing a Diabetes Mellitus Comprehensive Care Plan*. Retrieved May 18, 2012 from <https://www.aace.com/files/dm-guidelines-ccp.pdf>
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- Diabetes: A Patient-Centered Approach*. Retrieved May 17, 2012 from <http://care.diabetesjournals.org/content/early/2012/04/19/dc12-0413>
- Management of Hyperglycemia of Hospitalized Patients in Non-critical Settings*. Retrieved May 17, 2012 from: <http://www.endo-society.org/guidelines/upload/FINAL-Standalone-Management-of-Hyperglycemia-Guideline.pdf>

Adopted VNAA; Approved Policy Committee 03/11/14