Blood Glucose Testing: Using a Venous Blood Sample

What is Testing Blood Glucose Using a Venous Blood Sample?

Blood glucose (BG) testing refers to the process of measuring (in mg/dL) and evaluating (at the bedside or in a clinical laboratory) the concentration of glucose in a sample of venous blood. Most commonly, the blood sample used for bedside BG measurements is obtained via a prick to the dermal layer of the skin and contains a mixed concentration of blood from cut arterioles and venules. However, using a venous blood specimen can be more appropriate in critically ill patients and when capillary blood sampling is not feasible or advisable (e.g., in patients with significant burns). For more information about the affect of critical illness on the accuracy of capillary blood samples, see Why is Testing Blood Glucose Using a Venous Blood Sample Important?, below. The focus of this Nursing Practice & Skill paper is nurse-directed BG testing at the bedside using a sample of venous blood obtained by venipuncture. (Note: Although it is possible to obtain venous blood from short-term peripheral catheters [as opposed to midline peripheral catheters], the negative pressure created when aspirating the blood into the catheter can cause the fibrin buildup [that develops at the proximal tip of the catheter shortly after initial catheter placement] to collapse against the lumen and restrict blood return.) For information on BG testing using a blood obtained from a central venous catheter, see the series of Nursing Practice & Skill papers about blood sampling through central venous access devices. For information on continuous BG measurement (i.e., continuous measurement of interstitial glucose using a subcutaneously implanted sensor), see Nursing Practice & Skill...Blood Glucose Monitoring, Continuous: Assisting with...

• What: Glycemic levels are routinely monitored most frequently in patients who are receiving parenteral nutrition (PN) and for patients with diabetes mellitus (DM), especially for patients with DM who use insulin. The incidence of PN-induced hyperglycemia is variable, ranging from 10 to 88%, and PN-induced hyperglycemia is a risk factor for mortality (Kumar et al., 2010)

• How: Although the most accurate BG measurements are obtained from venous specimens that are analyzed in a clinical laboratory, bedside (i.e., point-of-care [POC]) BG testing of venous blood (obtained via venipuncture or from an indwelling catheter) is frequently used when multiple measurements are required throughout the day. (Note: Regardless of the method [capillary fingerstick, interstitial cannula, venipuncture, arterial puncture] or the type of blood, it is critical to use a consistent method and blood source to evaluate the trend of BG levels.) If laboratory testing will be performed, the blood is transferred to a specimen tube via a direct-draw device (e.g., Vacutainer, Vacuette). If POC testing will be performed, a droplet of the specimen is transferred to a BG testing strip and inserted into the glucometer

• Where: The BG level of a venous blood specimen can be analyzed in all healthcare settings that are equipped with a glucometer that is designed to analyze venous blood or with laboratory equipment (e.g., centrifuge, analyzer) needed to separate red blood cells (RBCs) from venous plasma and analyze the plasma for BG level

• Who: Only licensed clinical personnel are permitted to perform venipuncture or aspirate venous blood. Typically, phlebotomists are authorized to assist a registered nurse (RN) or physician in obtaining a specimen from an indwelling catheter; however, phlebotomists are not permitted to access an I.V. catheter directly. Licensed personnel...
What is the Desired Outcome of Testing Blood Glucose Using a Venous Blood Sample?
› The desired outcome of testing the BG level in a venous blood sample is to aid in the management of glucose metabolism.

Why is Testing Blood Glucose Using a Venous Blood Sample Important?
› Routine BG testing helps to guide treatment decisions directed toward maintaining BG levels within an appropriate range, as determined by the treating clinician (for information about normal BG levels in patients with and without DM, see What You Need to Know Before Testing Blood Glucose Using a Venous Blood Sample, below). Routine BG testing helps prevent hypoglycemia and hyperglycemia, potentially life-threatening conditions, and is essential to maintaining a high quality of life (QOL) and increasing life expectancy in patients.
   • Severe hyperglycemia (i.e., BG level < 240 mg/dL) can lead to diabetic ketoacidosis (DKA) and hyperglycemic hyperosmolar nonketotic syndrome (HHNS), life-threatening medical conditions (see Quick Lesson About...Diabetes Mellitus, Type 2). Sustained hyperglycemia leads to widespread vascular damage; long-term complications of DM include neuropathy, retinopathy, and renal failure. Hyperglycemia is associated with increased morbidity and mortality in critically ill and non-critically ill patients. Although the mechanism of injury to various organ systems due to hyperglycemia is not well understood, hyperglycemia is known to
     – alter the activity of phagocytes, impairing neutrophil and monocyte activity
     - increase production of inflammatory cytokines and oxidative stress. Increased oxidative stress impairs the immune, nervous, and cardiovascular systems
     - endothelial cell function
     - hemostasis
     - inflammatory response
     – promote apoptosis (i.e., programmed cellular death)
   • Hypoglycemia can lead to unconsciousness if the brain does not receive sufficient glucose to function. Severe hypoglycemia (i.e., BG level < 40 mg/dL) can lead to seizures, coma, and death.

BG measurements obtained from capillary, venous, and arterial blood are not equally meaningful. Venous blood offers a more accurate reflection of the body’s metabolic efficiency than arterial or capillary blood because venous levels indicate the level of glucose after the blood has diffused from the capillaries through the interstitial fluid, where it is metabolized by the cells. Typically, changes in venous plasma BG levels precede changes in interstitial BG levels and thus provide an earlier indication of developing hyper-or hypoglycemia (Cengiz et al., 2009).
   • During times of BG stability, there is a 3–5 mg/mL difference between the BG levels obtained from arterial blood and venous blood—the difference is higher in the postprandial state (i.e., 2 hours after a meal). Some factors that can produce false BG readings include
     – abnormal levels of Hct (i.e., Hct > 50% or < 40%)
     – delay in processing a venous blood sample, which can decrease BG levels by 5–7%/hour
   • When BG levels are changing rapidly, usually due to variable blood flow (i.e., > 2 mg/dL/min), BG levels from different body sites vary considerably. For more information regarding factors that can cause BG levels to change rapidly, see Indications for BG Testing in What You Need to Know Before Testing Blood Glucose Using a Venous Blood Sample, below.

Not all methods of obtaining venous blood are equally accurate.
• The levels of glucose, potassium, and bicarbonate can differ markedly in samples drawn from venipuncture and I.V. catheters (Zlotowski et al., 2001).
• The release of analytes from hemolyzed RBCs, especially cells that have been hemolyzed as a result of rapid aspiration, will cause the test results to be falsely elevated and can interfere with the analytical methodology.

Facts and Figures
› BG levels are often higher in hospitalized patients, primarily due to physiologic stress. Hyperglycemia is estimated to occur in 40% of hospitalized patients, and it is not unusual for critically ill patients to have BG levels > 200 mg/dL (Qaseem et al., 2011).
Results of the Leuven Intensive Insulin Trials indicated that maintaining tight glycemic control (also known as intensive insulin therapy) in trauma patients and in cardiac, thoracic, abdominal, and vascular surgery patients lowered morbidity (but not mortality) rates, the risk of central line bloodstream infections, and acute kidney injury and reduced the duration of mechanical ventilation (Van den Berghe et al., 2006). Conversely, intensive insulin therapy also carries risks. Investigators who conducted a systematic review and meta-analysis of randomized controlled trials that compared the mortality rate among critically ill patients whose glycemic index was maintained within a narrow range to patients whose glycemic index was maintained within a broader range reported that tight glycemic control (Marik et al., 2010)
• did not affect mortality or increase the need for renal replacement therapy (e.g., dialysis)
• increased the risk of hypoglycemia among all patients
• increased the risk of death from hypoglycemia among patients who did not receive PN

What You Need to Know Before Testing Blood Glucose Using a Venous Blood Sample

Prior to testing a patient’s BG using a venous blood sample, become familiar with the following:
• The procedure for venipuncture. According to the Infusion Nurses Society (INS), the most commonly accessed veins for venipuncture are the median cubital, the cephalic, and the basilic veins of the antecubital area. These sites are preferred because they are usually superficial and are larger, more stable, and offer less painful points of access for the patient. If these veins cannot be used, large veins on the dorsum of the forearm or hand can be accessed
  – The cephalic vein can be accessed in the upper arm and in the forearm
  – The basilic vein can be accessed in the forearm, where it wraps around the forearm and joins with the brachial vein. It can also be accessed in the upper arm but typically becomes less superficial about midway up the arm
  – The median cubital vein lies over the cubital fossa (i.e., anterior side of the elbow). It serves as the anastomosis between the basilic and cephalic veins
Figure 1: Peripheral veins commonly accessed for venipuncture. This image is in the public domain

- Veins on the dorsum of the foot are accessed less often because of the higher risk of complications. (Note: Some facility protocols require an order from the treating clinician prior to accessing pedal veins
- Blood specimens should not be obtained from extremities that are being used for ongoing procedures, e.g.,
  - sites above a heparin lock, an I.V. cannula, a fistula, or a vascular graft
  - an arm in which I.V. therapy is being administered because the fluid can dilute the blood specimen
  - an arm in which a blood transfusion is being administered because a blood sample drawn during the transfusion will contain a disproportionate volume of the transfused blood and can result in an inaccurate analysis
- Venipuncture should not be performed at the site of a hematoma or in
  - areas of scarring (e.g., burns)
  - atherosclerotic veins
  - an arm on the same side as a mastectomy or one with lymphedema
an area that is edematous, infected, or with skin conditions such as eczema
- an arm affected by a stroke or other neurological injury that has resulted in a loss of sensation that would result in the patient’s inability to alert you to pain or other problems

- Typically, central venous access is preferred to blood specimen collection (other than specimens required for blood culture) because aspiration is not necessary to fill the syringe or collection container. Once the vein has been cannulated, blood flow pressure will cause the blood to divert to a syringe (an area with lower pressure) or be suctioned into a vacuum container. The medical literature regarding the subject of using indwelling peripheral I.V. lines for venous blood draws discusses the risks associated with the practice (e.g., increased risk of infection, sample hemolysis, and I.V. device malfunction [e.g., intraluminal collapse due to the negative pressure generated by aspiration, fibrin residue being pulled into the lumen, clotting due to inadequately flushed catheter]). Many hospitals have specific policies limiting use of indwelling peripheral I.V. lines for venous blood draws and some require a specific order from the treating clinician to permit the practice

- The facility/unit-specific policy regarding the methods of handling blood specimens. In response to the Needlestick Safety and Prevention Act (United States Senate and House of Representatives, 2000), many facilities now utilize needleless devices when accessing intravenous sites

- Standard precautions in health care and should be able to demonstrate competence in adhering to aseptic technique practices

- Both venipuncture and blood sampling from an existing I.V. line are performed using general aseptic non-touch technique (ANTT; i.e., the skin should not be touched after it has been prepared with antiseptic cleanser and any item introduced into the patient is sterile prior to insertion), which is used for simpler and less invasive procedures than those that require surgical aseptic technique

- The Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011, issued by the U.S. Centers for Disease Control and Prevention (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) and endorsed by the Infectious Diseases Society of America (IDS) and the Association for Professionals in Infection Control and Epidemiology (APIC), recommend that I.V. access ports be scrubbed with antiseptic before accessing the system (O’Grady et al., 2011)

- For more information, see Evidence-Based Care Sheet: Catheter-Related Bloodstream Infections (CRBSIs): Guidelines for Prevention and Nursing Practice & Skill...Aseptic Technique and Infection Prevention: Applying Principles

- Indications for BG testing, which include

- DM. Patients with DM often undergo BG tests several times daily, depending upon their diet and exercise patterns, insulin production, and the type of antihyperglycemic medication used (e.g., oral antihyperglycemic or insulin)

- PN (also called hyperalimentation). The Guidelines issued by the American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) state

  - that patients who receive PN should undergo fingerstick/glucometer BG tests every 6 hours until they are metabolically stable

  - strict glucose control for patients receiving PN (i.e., maintaining serum glucose levels between 80 and 110 mg/dL). For more information, see Nursing Practice and Skill...Parenteral Nutrition: Administration -- an Overview

- Critical illness (e.g., infection, sepsis, burns, respiratory failure). Critically ill patients are more likely to be hyperglycemic due to the increase in metabolic energy resulting from the release of stress hormones in response to injury or illness. As a result, target BG levels for critically ill patients are often higher than those for non-critically ill patients (see Facts and Figures, above). The American Diabetes Association (ADA) recommends a target BG of < 180 mg/dL for critically ill patients and 100–140 mg/dL for non-critically ill patients (Moghissi et al., 2009)

- Fasting (e.g., as ordered prior to surgery or due to loss of appetite). Fasting increases the risk of symptomatic hypoglycemia

- Changes in medication

- BG testing in patients with DM, including knowledge of normal and abnormal BG levels

- BG testing using a glucometer provides immediate feedback and the opportunity to perform more frequent BG checks, which promotes tighter glycemic control. Typically, for patients who require insulin, BG testing is performed 3 or more times daily—before meals and prior to bedtime. In bothinsulin- and non-insulin-dependent patients, if BG levels remain stable, the treating clinician can reduce the frequency with which BG tests be performed (e.g., once or twice daily)

- BG checks should be performed more frequently than usual when eating patterns are altered or when medication regimens are adjusted

- Normal BG levels for patients without DM are 70–130 mg/dL when fasting and before meals and < 180 mg/dL postprandial. Normal BG levels for patients with DM are typically higher (e.g., 110–125 mg/dL) than normal BG levels
for patients without DM. Typically, facility protocol or the treating clinician establishes the ‘action range’ (i.e., range of BG levels that require action on the part of the nurse clinician [e.g., administering or holding insulin or oral diabetic medications as prescribed, notifying the treating clinician]) appropriate for each patient

• Methods of testing BG levels using venous blood (i.e., laboratory analysis and use of a bedside glucose meter)
  –Laboratory method: Venous blood is forwarded to the laboratory, where it is centrifuged to separate RBCs from plasma. The plasma is processed by an analyzer, which is typically calibrated several times each day. Tests on venous blood must be performed within 30 minutes after blood sampling to reduce the risk of falsely low BG results that can occur if the glucose in the blood is allowed to glycosylate (i.e., attach to the proteins in RBCs)
  - Venous blood collected for laboratory analysis should be placed in a tube containing fluoride (e.g., grey-top) because fluoride inhibits glycolysis, which can substantially reduce the level of glucose. If the blood is first drawn into a syringe, it should be inoculated immediately into vacuum tubes at the bedside—do not transport the blood away from the bedside while it is contained in a syringe. Mix the specimen with the additive in the tube by gently inverting the tube the prescribed number of times (Figure 2)—contact the laboratory to verify the correct number of inversions to be completed. Arrange to have the specimen transported to the laboratory as quickly as possible

  Figure 2: Mix by inverting the vacuum tube. One inversion involves gently rotating the vacuum tube over and upright. Copyright© 2014, EBSCO Information Services.

  –POC glucose meters offer a rapid method of testing the amount of glucose in a sample of blood. There are more than 60 models of glucose meters on the market, and most permit BG results to be stored so that individual patient trends can be evaluated. Most are designed for use with capillary blood, although many models can be programmed for use with venous blood. Review the manufacturer’s instructions for the glucometer and the meter strips before using venous blood
  - Verify the glucometer is designed to function with venous blood—it may be necessary to program the equipment to work in the ‘venous mode’ to account for the difference in BG results taken from capillary, arterial, and venous specimens. Some meter strips are designed for capillary blood only and will give false results if venous blood is used

  › Laboratory testing provides the most accurate analysis of BG using venous blood (if the blood is tested within 30 minutes of withdrawal from the patient) because laboratory testing
    • of BG relies on plasma (which has a higher percentage of dissolved glucose than whole blood) that has been separated from the whole venous blood
    • laboratory standards require that a designated volume of blood be analyzed, as compared to the varied size of a “droplet” of blood applied at the bedside
    • equipment is calibrated more frequently than bedside equipment

  › Preliminary steps that should be taken prior to performing BG testing using a venous blood sample include the following:
    • Review facility/unit-specific protocol for BG testing
      –If forwarding the specimen to the laboratory, determine the appropriate specimen tube, the required sample volume, and the number of times the tube should be inverted to adequately mix the additive
      –Note facility/unit-specific action ranges for high or low BG levels
    • Review the treating clinician’s order for BG testing
–If performing venipuncture, note if the clinician has ordered a topical anesthetic cream (e.g., lidocaine, EMLA [Eutectic Mixture of Local Anesthetics; i.e., a 5% emulsion containing 2.5% each of lidocaine and prilocaine]) to be applied to reduce the pain and discomfort associated with venipuncture
–Note the frequency and timing of BG checks and applicable action ranges (if different from the facility/unit-specific protocol)

• Review the patient’s medical history/medical record for any allergies (e.g., to latex, medication, or other substances); use alternative materials, as appropriate
• If using a glucometer to analyze the blood specimen, familiarize yourself with the manufacturer’s instructions for the type of glucometer in use. Confirm
  –the quality control tests on the glucometer are current
  –the equipment is in good working order
• Confirm the test strips to be used are appropriate for the type of glucometer to be used—test strips cannot be arbitrarily interchanged among different types of glucometers—and that
  –the expiration date of the test strips has not passed
  –the glucometer has been programmed for the batch of strips to be used (if using a meter that requires coding)
  –the strips are functioning properly. (Note: Most routine quality control checks performed per facility/unit-specific protocol include use of an unexpired control solution to test the functionality of test strips)
• Verify completion of facility informed consent documents, if appropriate
  –Typically, the general consent for treatment that is executed by patients upon admission to a healthcare facility includes standard provisions that encompass laboratory testing and BG testing

How to Test Blood Glucose Using a Venous Blood Sample

 › Perform hand hygiene and don nonsterile gloves and other necessary PPE, depending on anticipated exposure to body fluids
 › Identify the patient according to facility protocol
 › Establish privacy by closing the door to the patient’s room and/or drawing the curtain surrounding the patient’s bed
Introduce yourself to the patient and family member(s), if present, and explain your clinical role. Assess coping ability of the patient and family and for knowledge deficits and anxiety regarding BG testing, particularly the use of a venous blood sample.

- Determine if the patient/family requires special considerations regarding communication (e.g., due to illiteracy, language barriers, or deafness); make arrangements to meet these needs if present
  - Use a professional certified medical interpreter, either in person or via phone, when a language barrier exists
- Assess the patient’s understanding of and previous experience with the procedure; explain the procedure for venipuncture to the patient and patient’s family; answer any questions and provide emotional support, as needed
  - Do not tell the patient the procedure is painless because this can result in mistrust and heightened anxiety
- Obtain verbal consent for venipuncture

Position the patient to permit easy access to the selected venipuncture site. The selected extremity should be held straight and in a dependent position (i.e., lower the arm over the bedside to facilitate movement of blood into the veins by gravity), if possible

- Identify a potential venipuncture site. Apply the tourniquet 3–4 inches/7.6–10 cm proximal to the insertion site using a quick-release knot (Figure 3). Tie the tourniquet with enough tension to compress the vein but not the artery. (Arterial blood flow can be verified by palpating an arterial pulse point distal to the tourniquet [e.g., brachial or radial pulse if using an upper extremity].) Use your index finger to trace the path of the vein. The vein should be straight for ~ 1 inch/2.5 cm. Tap the vein to encourage venous distention; remove the tourniquet once the vein has been identified

![Figure 3: Use a quick-release knot to tie the tourniquet proximal to the venipuncture site. Copyright© 2014, EBSCO Information Services.](image)

- Avoid arteries, which pulsate, have thick walls, and are more elastic to the touch than veins
- Avoid atherosclerotic veins, which are less resilient, feel cordlike, and roll easily
- Patients who are dehydrated or who have been fasting may not have prominent veins. Maintain the arm in a downward position to promote gravitational flow. If veins are not easily palpated or clearly visible, it may be helpful to
  - place a warmed towel over the site to increase circulation and aid in vein selection
  - massage the arm gently from wrist to elbow to force a small amount of blood into superficial veins
  - briskly rub the site with an alcohol swab to encourage venous dilation by causing a release of histamine
  - have the patient clench and unclench the fist
- If a topical anesthetic has been ordered, apply it at this time and allow adequate time for it to become effective before proceeding

Using ANTT, prepare the skin site for percutaneous venipuncture before obtaining the blood sample according to facility protocol (for more information about phlebotomy, see Nursing Practice & Skill...Blood Sampling: Phlebotomy--Performing)

- Briskly scrub, an area ~ 2 inches/5 centimeters in radius from the intended puncture site
  - with an alcohol swab, followed by
  - a facility-approved antiseptic agent
- Allow the skin to air dry completely. **Do not palpate or otherwise touch site during this time even if you are wearing sterile gloves**
› Use the drying time
  • (if using laboratory analysis) to place the direct draw device (e.g., Vacutainer) and specimen tube in an accessible location
  • (if performing POC analysis) to
    – power on the glucometer
    – program the hand-held meter with the patient’s identification information (name, medical record number, room/bed number) per facility protocol
    – remove a glucose test strip from the container and recap the container tightly

› Perform venipuncture using ANTT
  • Position the selected extremity (e.g., arm) straight with little or no flexion at the elbow and in a dependent position, if possible
  • Apply the tourniquet as described above
  • With your nondominant hand, anchor the selected vein by drawing the skin taut away from the puncture site toward the hand as follows:
    – Place your thumb just below the venipuncture site (~ 1 inch/2.5 cm distal to where the needle is to enter the skin)
    – Press down on the arm, slightly to the side of the site
    – Pull the skin taut laterally
  • Align the needle so that it is parallel to the vein. Use a smooth, continuous motion to insert the needle into the skin and vein ata 30–45° angle, bevel side up—match the angle of the needle to the depth of the vein. If it is necessary to use a large-bore needle in a small vein, insert the needle bevel side down to avoid puncturing the posterior wall of the vein. You should feel a slight “pop” when the skin is punctured and another “pop” when the vein is punctured. Once the needle has entered the vein, reduce the angle of the needle to ~ 10° to the skin to prevent advancing it farther into and through the opposite wall of the vein.
  – If using a winged-infusion set, pick up the butterfly needle by its wings—the outside of the wings are textured to improve the grip
  • Observe for a “flash back” of blood as it enters the cannula, then attach the direct draw device and blood specimen tube
  • Transfer the blood sample from the syringe to the laboratory specimen tube
  – If using a Vacutainer/specimen tube to collect the blood, attach the direct draw device and blood specimen tube and wait until the vacuum is exhausted and the blood flow ceases (Figure 4)

Figure 4: Blood will be drawn into the vacuum tube. Copyright© 2014, EBSCO Information Services.

– If using a syringe to collect the blood, verify the plunger is in the depressed position before drawing the blood. Aspirate the plunger gently and slowly to avoid hemolysis and vein collapse. Hold the barrel of the syringe tightly so that the needle does not exit the vein. NEVER PUSH THE PLUNGER DOWN WHILE IT IS IN THE PATIENT’S VEIN
  • Release the tourniquet when the specimen tube or syringe contains an appropriate volume of blood—volume will depend on method of BG analysis (i.e., POC or laboratory). Be sure to release the tourniquet before the needle is removed from the vein to reduce the risk of hematoma at the puncture site
  • Remove the needle from the vein, making sure the needle is covered by a sliding sheath or retractable cover. Use care when handling all needles, even those with safety devices. Needlestick injuries are still possible even when safety devices are employed
• Immediately place a folded square of sterile gauze over the site and apply firm pressure over the gauze to control bleeding and avoid hematoma formation. Maintain pressure until the venipuncture site stops bleeding (~1–2 minutes). If desired, apply a small bandage to protect the site.

• Disconnect the syringe or specimen tube from the infusion set and immediately discard the infusion set into a biohazard/sharps container, taking care to manage the catheter and the tubing to avoid tubing recoil as they are placed in the container.

If the sample will be analyzed in the laboratory:

• invert the specimen tube—DO NOT SHAKE—the appropriate number of times

• label the blood specimen according to facility policy, which usually includes the following:
  – Date, time, and site of collection
  – Initials of the person who withdrew the blood

• complete the necessary laboratory requisition slip and arrange for prompt transport of the specimen to the laboratory.

If the sample will be analyzed at the bedside using a glucometer:

• confirm that the meter indicates it is available for BG testing

• transfer a droplet of the blood sample from the syringe to the glucometer strip so that the entire target area is covered; discard the syringe in a biohazard/sharps container

• insert the glucose test strip into the hand-held meter (some devices require this step be completed prior to obtaining the blood sample) and allow the meter to calculate the BG reading
  – Do not remove or disturb the test strip while the meter is analyzing

• note the BG reading when it appears on the meter display screen

• remove the test strip and dispose of it and other used supplies in the appropriate receptacles

• power off the meter

• disinfect the glucose meter according to facility/unit-specific protocol and return it to the appropriate storage location

Dispose of used materials in appropriate receptacles; perform hand hygiene

• Update the patient’s plan of care, if appropriate, and document phlebotomy in the patient’s medical record, including the following information:
  • Date and time of the procedure
  • Location of venipuncture site
  • Use of topical anesthetic, if any
  • Patient’s response to the procedure, including pain/discomfort experienced during and immediately following the procedure
  • Any unexpected patient events or outcomes, interventions performed, and whether or not the treating clinician was notified
  • Patient/family member education, including topics presented, response to education provided/discussed, plan for follow-up education, and details regarding any barriers to communication and/or techniques that promoted successful communication

Other Tests, Treatments, or Procedures that May Be Necessary Before or After Testing Blood Glucose Using a Venous Blood Sample:

• Medication can be adjusted by the treating clinician to provide more effective glycemic control

• BG levels will be retested if a false reading is suspected or if the reading is unexpectedly abnormal

In addition to periodic chemistry testing, patients with DM typically undergo testing for glycosylated hemoglobin (HbA1c; i.e., a form of hemoglobin that indicates the average plasma glucose concentration over the previous 60–90 days) to detect the extent of chronic hyperglycemia and to evaluate the patient’s control of BG levels over a prolonged period.

What to Expect After Testing Blood Glucose Using a Venous Blood Sample:

• An accurate reading of venous BG levels is obtained

• Results of the testing will guide appropriate diagnosis and treatment

Red Flags:

• Never perform venipuncture above an indwelling catheter because tourniquet pressure can damage the catheter—many midline or peripherally inserted central catheters (PICCs) extend 7–12 inches/18–30.5 cm or more

• Consider retesting if clinical presentation does not correspond with the BG reading

• The most common complication of venipuncture is the development of hematoma. Hematoma can be caused by inserting the angle of the needle too steeply or advancing the needle too far when entering the vein, resulting in puncture of the opposite wall of the vein. Hematomas are typically treated by warm soaks to the area. Some cases require surgical drainage
A vasovagal reaction (i.e., syncope triggered by activation of the vagus nerve) can occur in some patients due to anxiety and/or nausea associated with venipuncture. It is important that patients not be permitted to remain standing during venipuncture.

What Do I Need to Tell the Patient/Patient’s Family?
› Explain the difference between venous blood sampling and capillary blood sampling and why venous blood sampling has been ordered
› Explain the purpose of venipuncture and the steps involved, and address any questions or concerns

References