Screening for Iron-Deficiency Anemia:

Performing and Assessing Hemoglobins and Hematocrits in WIC

Texas Department of State Health Services
Nutrition Services Section

A WIC Training Guide

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The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a food and nutrition program benefiting infants, children under 5, and pregnant, postpartum and breastfeeding women with low to moderate incomes.

WIC is an equal opportunity program. If you believe you have been discriminated against because of race, color, national origin, age, sex or disability, immediately call the State WIC Office at 1-800-942-3678.

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Contents

Introduction

About This Training Guide

The Screening for Iron-Deficiency Anemia training guide is one in a series of self-paced guides. Self-paced learning allows you, the learner, to proceed through the subject matter and learning process at your own pace.

Instructions

Read the information in this training guide and complete the questions at your own pace. When you have finished all the questions, your answers will be checked by your supervisor. Where there are incorrect answers, you will be asked to reread the section(s) to find the correct answer(s). If you answer the questions correctly, you may begin working on another training guide.

The Problem: Hemoglobin and Anemia — Chapter 1

Objectives for This Chapter:

1. Define hemoglobin and anemia.
2. List three causes of iron-deficiency anemia.
3. List three symptoms of iron-deficiency anemia.

Hemoglobin

Hemoglobin is the iron-containing part of red blood cells that carries oxygen and carbon dioxide. Hemoglobin gives blood its red color. When a person's hemoglobin level is lower than accepted standards, they are said to be anemic.

Anemia

Anemia is a physical state or condition in which there is a decrease in the oxygen-carrying capacity of the blood. Iron-deficiency anemia is one form of anemia. Other forms include physiological anemia, Cooley's anemia, hemolytic anemia and pernicious anemia.

Anemia may be caused by:

- excessive blood loss
- excessive breakdown of red blood cells
- malabsorption (problems with absorption of nutrients by the gastro-intestinal tract)
- inadequate dietary intake of iron and some other minerals (e.g. copper), protein, and certain vitamins (e.g. riboflavin, B6, B12, folic acid, vitamin C)
- bacterial infections
- preterm delivery
- lead poisoning, and
- periods of rapid growth

Causes of Iron-Deficiency Anemia

Iron-deficiency anemia is caused by inadequate intake of dietary iron. It is the most common form of anemia worldwide. Table 1 reflects the incidence of iron-deficiency anemia in the United States.

Table 1: Iron-Deficiency Anemia in the United States
National Health & Nutrition Examination Survey (NHANES), 1999-2000

Age	Percent Population with Iron-Deficiency Anemia
Children, male and female	
1-2 years	7%
3-5 years	5%
6-11 years	4%
Females, 12-49 years*	
12-15 years	9%
16-19 years	16%
20-49 years	12%
White, non-Hispanic	10%
Black, non-Hispanic	19%
Hispanic	22%
Females, 50-70+ years*	
50-69 years	9%
70+ years	6%
Males, 12-70+ years	
12-15 years	5%
16-69 years	2%
70+ years	3%
* Non-Pregnant	

Iron-deficiency anemia occurs primarily in individuals during periods of rapid growth. Rapid growth increases the body's need for iron, exceeding typical dietary intake. Populations at greatest risk include older infants, pre-school children, adolescents (puberty), and pregnant and lactating women. Not surprisingly, iron-deficiency anemia is a common problem in the WIC population.

Factors that may contribute to the risk of developing iron-deficiency anemia include:

- diets low in iron-rich foods, or use of low iron infant formulas
- diets containing foods in which the iron is poorly absorbed
- diets containing foods high in substances that inhibit iron absorption

- periods of increased nutrient demand, such as rapid growth and lactation
- illness, especially certain bacterial or parasitic infections
- blood loss.

Infants

Full-term infants have sufficient iron stores to meet their needs for the first 4 to 6 months of life. Premature, low birthweight, and multiple birth infants (twins, triplets, etc.) are at greater risk of being born with or developing anemia.

A developing fetus begins to store iron during the last trimester of gestation. Infants who are born preterm are born without full iron stores. Preterm and low birthweight infants not only have lower iron stores, but the demands of catch-up growth increase their risk for developing iron deficiency. Without supplementation, the iron stores of premature infants can be depleted by 3 to 4 months.

Infants should be fed breast milk or iron-fortified formula to lessen the likelihood of developing iron-deficiency anemia. Low-iron formula and cows' milk are inappropriate substitutes.

Children

Iron-deficiency anemia is common in children because children are growing rapidly and they don't always eat the recommended number of servings of iron-rich foods.

There are other factors that may complicate the situation for children, such as excessive consumption of cows' milk. The problem with excessive milk consumption and iron status is multifactorial.

- Milk is low in iron.
- Calcium and other minerals in milk actually interfere with iron absorption.
- It is very likely that if small children are drinking excessive quantities of milk, the milk may be displacing other foods in the diet, specifically iron-rich foods.
- Cows' milk is known to cause gastrointestinal bleeding in some children.

Remember, blood loss is a cause of anemia. Children should consume the recommended number of milk/milk alternative servings, but not much more.

Women

Women of childbearing age need more iron than any other age or gender population group because they lose iron each month during menstruation. Certain life events, such as pregnancy and illness/injury, may increase a woman's need for iron. Obesity and fad dieting can also put women at greater risk for iron deficiency, especially teenage women.

Pregnant women have a critical need for iron, both for themselves and for their developing fetuses. Iron deficiency is the most common nutrient deficiency during pregnancy. Pregnant women need twice as much iron as women who are not pregnant, and almost three times as much iron as men!

Closely-spaced pregnancies can place women at an increased risk of iron-deficiency anemia. Postpartum women need time and plenty of iron-rich foods to build iron stores depleted during pregnancy. If a woman becomes pregnant within 16 months of her last pregnancy, she may not have been able to replenish and rebuild needed nutrient stores, especially without adequate dietary intake and/or supplementation.

Signs and Symptoms of Iron-Deficiency Anemia

Over time, as iron deficiency progresses, signs and symptoms occur in stages:

Stage 1: Iron depletion

The body's iron stores begin to decrease even though no symptoms are present; hemoglobin and hematocrit levels may remain within normal limits.

Stage 2: Iron-deficiency *erythropoiesis*

Erythropoiesis is the process by which the body produces red blood cells. In stage 2 there is a slow-down of red blood cell production due to the body's low iron stores, i.e., iron stores are low enough to impair the normal production of red blood cells. Symptoms may be mild or absent; hemoglobin and hematocrit levels may be marginal, or borderline.

Stage 3: Iron-deficiency anemia

Stage 3 is characterized by the production of smaller-than-normal red blood cells that contain less hemoglobin. At this stage, more noticeable symptoms may occur including:

- fatigue (tiredness) and weakness
- pale appearance
- rapid heartbeat
- irritability
- decreased appetite or loss of appetite
- dizziness or light-headedness
- shorter attention span and difficulty learning
- stalled growth (growth that has slowed or stopped)
- problems breathing, especially during exercise
- decreased ability to regulate temperature
- increased frequency of illness and infections

Infants and children who experience iron deficiency have a greater risk of diminished cognitive development and irreversible effects on the central nervous system. It has been observed that children with iron deficiency have issues related to their learning abilities, specifically with reading and vocabulary skills, and completing math problems.

Screening For Iron-Deficiency Anemia

The participant categories served by the WIC Program include groups that are at highest risk for iron-deficiency anemia. The screening procedure includes a finger puncture to collect a small amount of blood, which is used to determine if the applicant is at risk of developing anemia. Either of two simple testing procedures is performed, a hemoglobin or a hematocrit test.

A hemoglobin test measures the concentration of this iron-containing protein (hemoglobin) in a sample of whole blood. A hematocrit test measures the percentage of red blood cells in whole blood.

WIC clinics can choose to perform hemoglobin tests or hematocrit tests. Both are equally accurate and equally acceptable.

It is important to remember that WIC staff do not diagnose. WIC can only screen applicants for the possibility or risk of anemia. When anemia is suspected, WIC staff should refer participants to their medical home to confirm or rule-out anemia. A medical home is a health care professional or health care clinic that provides comprehensive medical care. Comprehensive care includes care of patients with illnesses and injuries, well-child exams, immunizations, and referrals for specialty care. A medical home is the preferred referral.

Learning Activities

1. Define anemia.

2. Define hemoglobin.

3. List three causes of anemia.

4. List three causes of iron-deficiency anemia.

5. List three symptoms of iron-deficiency anemia.

6. What do hemoglobin and hematocrit tests measure?

7. Define the term medical home.

The Process: Preparation for and Collection of Blood Samples

Chapter 2

Objectives for This Chapter:

1. List the equipment and supplies used to obtain a blood sample.
2. Describe the steps to follow for a finger stick procedure.
3. Explain how to determine a hemoglobin or hematocrit value from a blood sample. Describe the process you would use at your clinic.

Equipment and Supplies

The equipment and supplies used to obtain and analyze a blood sample will depend on the type of test being performed, a hemoglobin test or a hematocrit test. A list of equipment and supplies required for each test is listed below.

Figure 1: HemoCue® hemoglobinometer and microcuvettes

Hemoglobin

1. Hemoglobinometer, also known as a photometer
2. Reagent cuvettes/microcuvettes

Figure 2: HemataSTAT® microcentrifuge, plastic clay sealant, and capillary tubes

Hematocrit

1. Centrifuge or microcentrifuge, such as a HemataSTAT
2. Capillary tubes
3. Plastic clay capillary tube sealant
4. Hematocrit reading device

Supplies

The following supplies are needed when obtaining blood samples regardless of the type of test being performed:

- Disposable gloves, available in latex and vinyl, with and without powder
- Alcohol (70% isopropyl) or alcohol prep pads
- Gauze squares
- Lancets
- Sharps container and Biohazard waste receptacle
- Optional: Cotton balls and/or adhesive strips (band-aids) to slow/stop blood flow. Cotton balls shouldn't be used for cleansing fingers with alcohol because they may leave behind microscopic fibers that can clog capillary tubes and cuvettes.

Figure 3: Sharps container, alcohol prep pad, gauze squares, 70% alcohol, disposable lancets, and disposable gloves

Puncture Sites

A blood sample can be obtained from an applicant's finger or heel. For an infant less than one year who is not yet walking, the heel may be used. Heels have larger surface areas and are easier to grasp than tiny fingers. A heel may also be easier since some infants and children have a tendency to make a tight closed fist, which can be difficult to unfold.

Figure 4: Heel with shaded area for sticking.

DO NOT STICK THE BACK CENTER OR BASE OF THE HEEL

Heel stick punctures should be performed on the sides of the heel, the shaded areas in the diagram above. Be sure to avoid the back center or base of the heel.

Figure 5: Hand with middle and ring fingers shaded for sticking

Figure 6: Finger with shaded area for sticking

The ring and middle fingers are recommended for finger sticks. The stick, or puncture, should be made to the side of the finger pad. This area is typically less calloused, and the skin is easier to puncture.

Preparation Procedures

1. Begin with a clean work area. It is recommended to prepare the work area with a protective barrier. A barrier can consist of paper towels, butcher paper, exam table paper, or a plastic backed pad. Use of a barrier reduces the risk of contamination and makes cleaning easier.
2. Greet the applicant and verify their identity. Have them sit comfortably in a chair.
3. Explain the purpose and procedure of blood collection. If the applicant is a child, ask the parent or guardian to hold the child on his/her lap. To further aid the process, ask the parent to hold the child's arm at the elbow during the procedure. The parent may also want to tuck the child's legs between his/her own to lessen the possibility of staff being kicked.

Note: Stop services and reschedule applicants who attempt to hit, kick, bite, and spit.

Figure 7: Recommended position for obtaining a blood sample from children who may resist

4. Wash hands with liquid soap and water.
5. Gather together the blood collection equipment and supplies.

Blood Collection Procedures

1. Put disposable gloves on both hands.
2. Ask the participant to warm the puncture site by rubbing his/her hands together or by making a fist and relaxing it several times. These actions will stimulate blood flow to the area.
3. Cleanse the applicant's skin with 70% alcohol. Check with the equipment manufacturer's instructions to determine whether to allow the skin to air dry or to wipe dry. Use a gauze square if wiping dry.
4. Puncture the skin using a sterile, disposable lancet or a mechanical lancet with a sterile disposable platform. Make a quick but firm jab that is deep enough to allow blood to flow freely. If a mechanical lancet is used, follow the manufacturer's instructions. Disposable lancets and platforms should be disposed of directly into a Sharps container after use. It is important to handle lancets and platforms as little as possible to decrease the risk of a stick injury.

Figure 8: Dispose of sharps directly into a Sharps container

5. Wipe away the first blood droplet(s) with a sterile gauze square. Again, follow the equipment manufacture's instructions to determine the precise number of blood droplets to wipe away.

Figure 9: Appropriate position for obtaining a blood sample from women

Note: If the blood does not flow freely, you may try lowering the applicant's hand. If lowering the hand doesn't help, puncture a different finger or a different site on the heel. Do not milk or squeeze the puncture as this may cause tissue fluids to mix with the blood and corrupt the sample.

Figure 10: Lower a participant's hand/arm to increase blood flow

6. Wait for a droplet of blood to form and collect the sample. Place the capillary tube or cuvette at the edge of the blood drop and fill with one continuous draw. Do not break contact with the drop of blood; this could cause air bubbles.
   - If using a cuvette, fill until full. Wipe any excess blood from the sides of the cuvette using a gauze square.
   - If using an uncalibrated capillary tube, fill it at least ½ full to ¾ full.
   - For calibrated tubes, fill from the end furthest away from the calibration mark to the calibration mark. Whenever possible, obtain two samples. Wipe any excess blood from the outside surface of the capillary tubes using a gauze square.
7. After the blood sample is collected, press a gauze square or cotton ball to the puncture site until bleeding has stopped.

Figure 11: Raise a participant's hand/arm to decrease blood flow

Note: If the blood continues to flow, you may try raising the applicant's hand. Adhesive bandages or band-aides should only be used if there is excessive bleeding. In very young children there is a serious risk of aspiration with bandages, especially the spot type. For this reason, explain the importance of removing bandages as soon as the bleeding stops and remind parents to dispose of bandages/band-aids properly.

Determining Hematocrit Levels

After collecting a blood sample:

1. Gently rotate the capillary tube 5 to 10 times to mix the heparin (anti-coagulant in the tube) with the blood.
2. Seal the tube on the "collection" end with plastic clay sealant.
3. Place the tube in a centrifuge.

Figure 12: Capillary tube placed in centrifuge

4. Follow the manufacturer's instructions for spinning samples.
5. Use a hematocrit reading device. Follow the manufacturer's instructions for using the hematocrit-reading device. Do NOT use a "Readacrit" on top of the centrifuge.

Note: If using the HemataSTAT equipment, it is acceptable to read hematocrit values with the built-in analyzer. Follow the manufacturer's instructions carefully.

Figure 13: Hematocrit value from built-in analyzer on a HemataSTAT® microcentrifuge

6. Record the value to the nearest whole number on the applicant's assessment form. For example, a value of 34.7% should be recorded as 35% rounding up, and a value of 33.5% should be recorded as 33%, rounding down.

Determining Hemoglobin Levels

1. Place the filled cuvette in a hemoglobinometer and follow the manufacturer's instructions for use.
2. Read the displayed value.

Figure 14: Hemoglobin value displayed on a Hemocue® hemoglobulinometer

3. Record the value on the applicant's assessment form. Hemoglobin values are not rounded.

Equipment Calibration and Maintenance

To ensure the accuracy of blood sample measurements, it is necessary for equipment to be calibrated and maintained according to Clinical Laboratory Improvement Amendments (CLIA) requirements. The following steps will help to ensure proper equipment maintenance:

1. Equipment must be calibrated in accordance with the manufacturer's recommendations and instructions.
2. If a clinic has a lab with a certificate of moderate complexity, then equipment will need to be calibrated twice a day and the results recorded in a maintenance log.
3. All preventative maintenance performed on assessment equipment must be recorded in a maintenance log.

Learning Activities

1. List all the supplies you would use to collect a blood sample. List the equipment you have in your blood collection area.

2. How would you train a new employee on finger punctures and hemoglobin/hematocrit testing? Be specific. Give step-by-step instructions.

The Precautions: Bloodborne Pathogens and Universal Precautions

Chapter 3

Objectives for This Chapter:

1. Define bloodborne pathogens and Universal Precautions.
2. List at least two bloodborne pathogens that are potential concerns for WIC staff that perform finger sticks.
3. List at least five Universal Precautions.

Always use caution when handling blood and contaminated items. Knowing the risks of bloodborne pathogens and practicing Universal Precautions will protect WIC staff from unnecessary exposure.

Bloodborne Pathogens

Bloodborne pathogens are microorganisms found in blood that have the capacity to produce disease. Human immunodeficiency virus and the viruses that cause hepatitis are examples of bloodborne pathogens.

Human immunodeficiency virus (HIV)

Human immunodeficiency virus (HIV) is the virus that causes AIDS, Acquired Immuno-Deficiency Syndrome. HIV gradually destroys the immune system of an infected individual, resulting in greater risk of infections that the body is not able to fight. Individuals who become infected may be symptom-free for up to 10 years, although they are carriers and are able to infect others. HIV is transmitted through sexual contact, exposure to infected blood and blood components, and possibly from an infected mother to her fetus.

Hepatitis

Hepatitis, a general condition of inflammation of the liver, can be caused by many agents including infections, bacteria, parasites, viruses, alcohol, drugs, and poisonous substances such as poisonous mushrooms. Five types of hepatitis have been identified.

Hepatitis A (HAV)

Hepatitis A (HAV) can affect anyone. This virus is spread primarily by oral/fecal contamination, and by exposure to infected blood and other body fluids. The major causes of HAV are blood transfusions and poor hygiene practices, such as not washing hands after using the bathroom or changing a diaper. Hepatitis A is not considered a significant health risk to healthcare workers.

Hepatitis B (HBV)

Hepatitis B (HBV) is a more serious form of hepatitis and is a major risk to healthcare workers. Infection can occur when one comes into contact with contaminated blood, body fluids, and/or contaminated needles/sharps, etc. The virus can also be spread through sexual contact and from an infected mother to her fetus. In most people the infection is self-limiting, with the immune system mounting an effective response. However, in about 6-10% of those infected, the immune system can not fight off the virus which then may go on to cause a lifelong infection, cirrhosis (scarring of the liver), liver cancer, liver failure, and death. Protected steps for health care workers include the HBV vaccine, prevention of stick injuries, and practicing routine barrier precautions, such as wearing gloves and protective eye wear during blood collection and handling.

Hepatitis C (HCV)

Hepatitis C (HCV) is the most common chronic infection found in blood in the United States according to the Centers for Disease Control and Prevention. eighty percent of those infected with HCV have no signs or symptoms, and it is typically discovered by chance during blood donations. By the time symptoms are present, liver damage has already occurred. Those at greatest risk of developing HCV are IV drug users and people receiving large quantities of donated blood. HCV is spread by exposure to contaminated blood and contaminated needles/sharps, sexual contact, and from infected mother to fetus. Since both hepatitis B and C are transmitted in the same manner, any person at risk for one virus is also at risk for the other. Unlike hepatitis B, there is no vaccine to prevent HCV, but the hepatitis B vaccine can help prevent co-infection.

Hepatitis D (HDV)

Hepatitis D (HDV) is a defective virus that can only exist if a person is already infected with hepatitis B. HDV is spread by exposure to contaminated blood and contaminated needle/sharps, sexual contact, and from infected mother to fetus. There is no vaccine to prevent HDV, but again, the hepatitis B vaccine can help prevent co-infection.

Hepatitis E (HEV)

Hepatitis E (HEV) is rarely seen in the United States. It is transmitted the same way as hepatitis A, via the oral/fecal route or by eating/drinking contaminated food or water. To help prevent infection, health care workers should follow proper hand-washing procedures.

To lessen the likelihood of exposure to any bloodborne pathogen, WIC staff should practice Universal Precautions when collecting and handling blood samples.

Universal Precautions

Universal Precautions are safety guidelines developed by the Occupational, Safety and Health Administration (OSHA) and the Centers for Disease Control and Prevention (CDC). The guidelines are intended to protect workers who handle human blood and/or other potentially infectious body fluids (including urine, saliva, semen, etc.). The overall concept, or main idea, of Universal Precautions is that human blood and other body fluids should be assumed to be infectious for bloodborne pathogens, and therefore the strictest measures should always be practiced when handling any of these substances.

WIC staff should practice the following Universal Precautions:

Wear disposable protective gloves when:

- Handling blood or any body fluid or feces (diapers)
- Handling contaminated equipment and supplies used in the collection and analysis of hematocrit or hemoglobin, including centrifuges, photometers, cuvettes/capillary tubes, lancets/platforms, clay sealant, gauze/cotton balls, etc.
- Making contact with a work surface used for blood collection, or items located on these surfaces, such as pens, paper
- Moving or transporting contaminated equipment and supplies
- Making physical contact with anyone who has open cuts, sores, lesions, etc.
- Examining the mouth or assisting with dental care

It is important to remember that you need to wear a *pair* of gloves through the entire process of blood collection. Be sure to change gloves between each participant, even between family members. Disposable gloves are intended for one-time use only: that's why they are disposable. Never reuse gloves.

Do not wash or disinfect gloves for continued use. Washing may reduce the barrier properties of the gloves, allowing fluids to pass through invisible holes in the gloves. And, disinfecting agents may cause deterioration.

Wash your hands with liquid soap and water before and after:

- wearing disposable gloves
- blood collection procedures
- giving first aid
- contact with any body fluids

Use precautions to prevent stick injuries caused by needles and other sharps. Use care when disposing of trash.

- Do not bend, break, or recap needles/lancets.
- Put used capillary tubes/cuvettes, lancets/platforms, and other sharp objects in puncture-proof Sharps containers.
- Never put your hand into a Sharps container.
- Put other contaminated waste such as used cotton balls/gauze in a separate biohazard waste receptacle.

Note: For convenient disposal of contaminated materials, place sharps containers and biohazard waste receptacles in blood collection areas. These containers should always be located out of children's reach.

When full, sharps containers and biohazard waste should be disposed of according to approved state and/or local environmental health regulations.

Use disinfectants to clean.

- Clean areas soiled or potentially soiled with a disinfectant approved by the Environmental Protection Agency (EPA), or use a solution of one part chlorine bleach to 10 parts water.
- Clean equipment following manufacturers' instructions using an approved disinfectant. A bleach solution may damage equipment.

Other safety tips to follow in the blood collection area.

- Do not eat, drink, or smoke.
- Do not apply make-up or insert/remove contacts.
- Only closed-toed shoes should be worn, not sandals.
- Do not put items such as pens, lancets, capillary tubes, etc., in your mouth.

Learning Activities

1. Define bloodborne pathogens.

2. What is HIV? How is HIV related to AIDS?

3. Define hepatitis.

4. Define Universal Precautions.

5. List at least 5 Universal Precautions.

Match the form of hepatitis on the left with the appropriate information on the right.

A. Hepatitis A: # _____
B. Hepatitis B: # _____
C. Hepatitis C: # _____
D. Hepatitis D: # _____
E. Hepatitis E: # _____

1. A defective virus that can only exist if a person is already infected with hepatitis B; no vaccine is available.
2. Transmitted via the oral-fecal route; rarely seen in the United States.
3. A major concern for United States healthcare workers; 6 to 10% of those infected can not fight off the infection which can lead to cirrhosis, liver cancer, liver failure, and death; a protective vaccine is available.
4. Transmitted via the oral-fecal route; not a significant health risk to healthcare workers.
5. Most chronic infection found in blood in the United States 80 percent of those infected have no symptoms and the infection is usually discovered by chance; no vaccine is available

The Participant: Who Gets Screened and Who Doesn't

Chapter 4

Objectives for This Chapter:

1. List who should be screened for hemoglobin or hematocrit.
2. Give examples of when blood work can be waived for participants.
3. List the risk codes that allow children greater than 2 years to have their blood work waived.

Infants and Children

Infants and children are required to have blood tests performed between 9 and 12 months, and again between 15 and 18 months.

Premature infants should not have blood tests performed before 9 months corrected/adjusted age. However, blood work may be performed on full-term infants between 6 and 9 months if:

- the Certifying Authority (CA) determines blood work is required because the infant may be at nutritional risk, and/or
- the requirement to return to the clinic for blood work between 9 and 12 months presents a barrier for program participation.

Children 1 to 2 years must be screened for iron deficiency at each certification. Children older than 2 years are screened for iron deficiency at each certification unless they meet the criteria for waiving bloodwork discussed below.

Blood work guideline tables are included in the appendix and are intended to provide clarification to help staff ensure that the Centers for Disease Control and Prevention blood work recommendations are followed, to clearly outline when to collect or waive blood work, and to identify the appropriate blood work codes to enter into the Texas WIN automation system. These guidelines apply to all infants and children ages six months and older.

Women

The most common nutrient deficiency during pregnancy is iron deficiency. As discussed in Chapter 1, there is a critical need for iron during pregnancy, not just for the mother, but also for the developing fetus. In WIC, pregnant women are required to have blood work at certification.

Postpartum and breastfeeding women must also have blood work at certification. Due to depletion of nutrient stores during pregnancy, it is very important to check the iron status of all postpartum and breastfeeding women.

Waiving the Requirement for Hemoglobin and Hematocrit Testing

There are several circumstances when blood tests to screen for iron deficiency can be waived. Those circumstances include:

1. Infants who are under nine months. Blood work on infants younger than 9 months is not required and is not an allowable WIC expense, except as specified above.

2. Children, 2 to 5 years, who at the previous certification qualified for one or more of the following dietary risk conditions only:
   401 – Failure to Meet Dietary Guidelines
   428 – Risk Associated with Complementary Feeding Practices
   470 – Inappropriate Nutrition Practices
   Note: In such cases, blood work may be waived for one certification period. Local agencies are responsible for ensuring that blood tests are performed on these children at least once every 12 months.

3. Applicants who have hemoglobin or hematocrit test results from another healthcare source. These documented results must not be older than:
   - 30 days for infants, and
   - 60 days for women and children.

4. Applicants whose religious beliefs do not allow them to have blood drawn. Acceptable documentation includes:
   - a written, signed statement by the applicant or parent/guardian,
   - documentation by WIC staff that is signed by the applicant or parent/guardian.

5. Applicants with serious "life-long" medical conditions such as, hemophilia, fragile bones, and osteogenesis imperfecta. A written, signed statement by the healthcare provider, a physician, or someone working under a physician's orders is required.
6. Applicants with skin conditions where blood collection may cause harm. A written, signed statement by the healthcare provider, a physician, or someone working under a physician's orders is required.

Note: Documentation of circumstance or a statement of refusal to have blood testing is always required when blood work is waived.

Waiving Blood Work and Texas WIN Documentation

When blood work is waived, there is no hemoglobin or hematocrit value to enter on the participant form or into theTexas WIN system. Instead, use the following values:

- 99.9 for hemoglobin
- 99 for hematocrit

When these values are entered, risk condition **201 Low hematocrit/Low Hemoglobin** cannot be used.

The exception to this would be when a participant brings the result of blood work that was obtained from another health care source. In such a case, use the actual result in the hemoglobin or hematocrit field.

Learning Activities

1. Which categories of WIC participants are eligible for hemoglobin/hematocrit screening? Be specific.

2. List 3 circumstances that allow for waiving of blood collection.

3. For children, blood work can be waived if at the previous certification they only qualified for one or more specific risk conditions. What are those specific risk conditions?

4. True or False: It is standard practice to obtain blood samples from infants who are at least 6 months.

The Plan: Chapter 5
Interpretation and Action Plan

Objectives for This Chapter:

1. Recognize that "normal" blood values vary depending on participant category, age, and trimester of pregnancy.
2. Describe the referral process for participants with low or high hemoglobin values.
3. List at least 5 iron-rich foods.
4. List several iron absorption enhancers and inhibitors.

Interpreting Hemoglobin and Hematocrit Values

After hematocrit or hemoglobin values have been determined, a WIC certification specialist (WCS) or a certification authority (CA) will assess the values to identify whether screened participants are at risk for anemia or not.

The hemoglobin and hematocrit values in the table on the following page are those used by the Texas WIC Program. Look at the table. Notice that within each category of participation there are different values for what is considered "normal." Values differ for infants and children, and for women, depending on participant category, age, and trimester of pregnancy.

For example, a hemoglobin value of 10.5 g/dL and a hematocrit value of 32% are both considered within normal limits for a pregnant woman in her second trimester. However, the same values would be considered below normal for a woman in her first or third trimester, a breastfeeding woman, and a post-partum woman. What about these same values for an infant or a child? Look at the following table.

Table 2: WIC Hemoglobin and Hematocrit Assessment Values

Category	Hematocrit (Hct)	Hemoglobin (Hgb)
Pregnant Women		
1st trimester	Less than 33.0 %	Less than 11.0 g/dL
2nd trimester	Less than 32.0 %	Less than 10.5 g/dL
3rd trimester	Less than 33.0 %	Less than 11.0 g/dL
Breastfeeding Women		
12 through 14 years	Less than 36.0 %	Less than 11.8 g/dL
15 years or older	Less than 36.0 %	Less than 12.0 g/dL
Postpartum Women		
12 through 14 years	Less than 36.0 %	Less than 11.8 g/dL
15 years or older	Less than 36.0 %	Less than 12.0 g/dL
Infants		
6 through 12 months	Less than 33.0 %	Less than 11.0 g/dL
Children		
12 through 23 months	Less than 33.0 %	Less than 11.0 g/dL
2 through 4 years	Less than 33.0 %	Less than 11.1 g/dL

Action Plans for Participants

Participants with Normal Blood Iron Values

For participants with normal blood iron values, no specific action is necessary — that is to say, it is not necessary to make referrals. However, it could be a good conversation starter to say "I see your iron level is good. Do you enjoy iron-rich foods?"

Participants with Low Blood Iron Values

The following actions are recommended for participants with hemoglobin values below normal:

- Increase intake of iron-rich foods, such as fortified cereals, legumes, soy foods, and meats. Consume these foods along with iron-absorption enhancers, such as orange juice and strawberries.
- Avoid foods and other substances that inhibit iron absorption, such as tea, spinach, and antacids.
- Refer participants to their medical homes. Participants with blood values that are significantly below normal require the attention of a medical professional.

Participants with High Blood Iron Values

Hemoglobin values slightly above normal can simply indicate a minor condition such as mild dehydration. For participants with blood values above normal limits, no action is generally necessary unless the values are excessively high. In the WIC population, excessively high values are extremely rare.

Participants with abnormally high hemoglobin or hematocrit levels should be referred to their medical homes. If a participant claims to be taking a vitamin/mineral supplement with iron, WIC staff should recommend that he/she stop taking any unprescribed supplements until he/she has discussed her current status with his/her health care provider.

Iron overload is a condition of excessive iron in the body. Just as low iron levels are of concern, excessive levels are also worrisome. An abnormally high iron level can be a sign of a genetic problem, hemochromotosis (a disease condition of iron overload), heart disease or other cardiac problems, etc.

Iron-Rich Foods

Iron-rich foods should be included in most peoples' diet on a regular basis. For individuals who are at risk of anemia, or who are anemic, it is important that they consume several iron-rich foods on a daily basis.

Heme iron is the iron found in animal products. Its bioavailability is good, which means that the iron is easily and well absorbed.Examples of foods containing heme iron include:

- meat (beef, pork, chicken, lamb, fish, etc.)
- eggs
- supplements

Non-heme iron is the iron found in plant products. Its bioavailability is not as good as heme iron, but it is improved if a non-heme iron food is consumed along with a food rich in vitamin C, such as orange juice or strawberries.

Examples of foods containing non-heme iron include:

- dried beans, peas, legumes
- fortified bread and cereal
- fortified rice and pasta
- tofu and veggie "meats"
- nuts and seeds, and their butters
- some fruits and vegetables

Fruits and vegetables rich in non-heme iron include:

- greens (e.g. turnip, beet, collards)
- brussel sprouts
- squash (e.g. acorn, pumpkin)
- avocado
- green peas
- sea vegetables (found in chinese foods)
- prunes and prune juice
- raisins
- apricots, dried
- peaches, dried
- tomato juice

Enhancers and Inhibitors of Iron Absorption

As mentioned, vitamin C enhances the absorption of non-heme iron. In addition to vitamin C, other enhancers include organic acids in fruits and vegetables, and vitamin A. Current research indicates vitamin A and beta-carotene in plant food may improve the absorption of non-heme iron.

Inhibitors of iron absorption include phytate and fiber, tannic acid, coffee, and calcium and dairy products. Phytate, a substance found in spinach, is a strong inhibitor; it is able to block as much as 90% of the available iron in food. Tannic acid, found in tea and Indian spices such as turmeric, coriander, tamarind, etc., can block about 50% of available iron. Dairy products and calcium can also block about 50 to 60% of available iron. This doesn't mean that spinach and milk are bad foods, just that they interfere with iron absorption. A participant with a low hemoglobin value may be advised to choose other greens over spinach and to avoid milk and tea with meals until their blood iron normalizes.

Follow-Up

Anytime you refer a participant to their healthcare provider, be sure to document this in the medical record. At a subsequent certification, check with the participant regarding the referral. Has the participant seen his/her doctor? Was blood drawn? What was the outcome?

If the participant's condition has improved, let her know that she was successful. If the participant's condition has not improved or has worsened, refer him/her to his/her medical home again.

Learning Activities

1. The following blood values are low for all WIC participants regardless of category, age or trimester of pregnancy, true or false:

   T/ F: Hematocrit 32%

   T/ F: Hemoglobin 10 g/dL

   T/ F: Hematocrit 31%

   T/ F: Hemoglobin 10.5 g/dL

2. List 5 foods that would be appropriate high iron snacks for toddlers.

3. Can the iron absorption of the above snacks be enhanced by including any additional foods or beverages? List 5 of those enhancers.

4. Spinach is rich in iron and phytate. Is spinach a recommended food for increasing one's intake of iron? Why or why not?

5. What action should be taken when a participant's blood iron is higher or lower than normal?

Congratulations!

You have now completed the Screening for Iron Deficiency Anemia training guide. You should refer to the guide when questions or problems arise.

Our goal in producing this guide was to provide a quick and easy reference to help you provide the superior service that is typical of the service excellence being sought in WIC clinics across Texas.

The journey to service excellence follows a long and winding road. It is a trip that never ends. Bon Voyage!

Blood Work Guidelines and Schedule for Infants and Children

Appendix

Table 3: Blood Work (BW) Guidelines for Infants and Children

Age at Initial Cert	Perform Blood Work?	Tx WIN Code
Birth to 6 months	No	Hct/Hg field blocked — bloodwork is not allowed
6 months	No*	99/99.9 or valid blood value if CA determines BW is required
7 or 8 months	No**†	78/78.0 99/99.9 or valid blood value if CA determines BW is required
9 to 12 months	Yes	valid blood value
12 months and older	Yes	valid blood value or 99/99.9

* Perform blood test ***only*** if CA determines BW necessary.

† Enter 78/78.0 and schedule BW appointment between 9 and 12 months,
or Enter 99/99.9 if client refuses BW based on religious beliefs or valid medical condition, or
perform BW and enter value *only* if deemed necessary by CA

Codes 99/99.9 – Allowable reasons for waiving blood work include the following and must be documented in the client's chart:

1. Infant is 6 months and blood work is waived to comply with CDC guidelines.
2. Applicants whose religious beliefs shall not allow them to have blood drawn.
3. Applicants with "life-long" medical conditions such as hemophilia, fragile bones, or osteogenesis imperfecta.
4. Applicants with a treatable skin disease or with a serious skin condition, where the blood collection may cause harm to the applicant.

Table 4: Blood Work Schedule for Infants Initially Certified During Their 7th or 8th Month – Use of 78/78.0 codes

Age	Appointment Type	BW Value Entered
7 or 8 months	**IC — Initial Certification**	**78, 78.0**
9 through 12 months	BW — blood work	Actual blood value
13 or 15 months	SC — Sub-Certification	78, 78.0
15 through 18 months	BW – Blood Work	Actual blood value
19 or 20 months	SC — Sub-Certification	Record previous blood value if within last 60 days
		Record new blood value if previous BW is older than 60 days
25 or 26 months	SC — Sub-Certification	Perform blood test based on previous BW value*

* Blood test must be performed at each certification prior to 24 months.
Blood test may be waived for children 2 to 5 years old, if at ***previous*** certification:
Hct was 33% or greater, **or** Hgb was 11.1 g/dL or greater **and**
Only qualified for risks 401, 428, and/or 470.

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