ADHS Hematology Companion Manual

1. Module 1: Hematology Introduction

1.1 Welcome

Notes:

1.2 Hematology at WIC

Notes:

Hematology. Hema, meaning “blood”, and -ology, meaning “the study of,” means that hematology is the study of blood.

At WIC, we “study blood” by accurately measuring the amount of hemoglobin present by using either an electronic sensor or a fingerstick to draw a small sample of blood.
We then use these hemoglobin measurements to assess whether participants are at risk for anemia, which is a condition that results from not having enough healthy red blood cells.

WIC Federal Regulations about hemoglobin screening closely follow CDC recommendations.

Click on all six types of participants to learn when a hemoglobin measurement is required by WIC.

Infants 0-8 Month (Slide Layer)

Infants 0-8 Month

No blood work is required for infants certifying at 0-8 months of age.

Infants 9-11 Months (Slide Layer)

Infants 9-11 Months

Blood work is required for infants certifying at 9-11 months of age. A follow-up blood test is required 6 months after the initial test.

Children 12-18 Months (Slide Layer)

Children 12-18 Months
For first time blood work taken between 12-18 months, a follow-up blood test is required 6 months after the initial test.

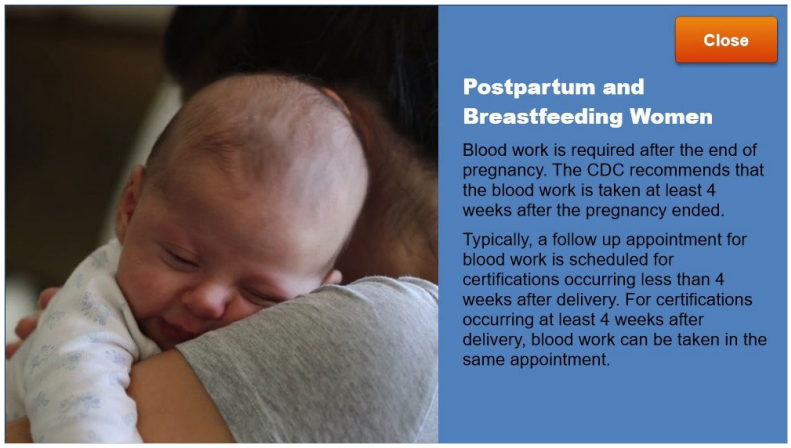
Children Older than 18 Months (Slide Layer)

Children Older than 18 Months
If the value is normal, the test can be done annually. If below normal, the test must be done every six months, until a normal value is obtained.

Pregnant Women (Slide Layer)

Pregnant Women
Blood work is required at the pregnancy certification. Another blood test is not required until 30 days after the end of the pregnancy.

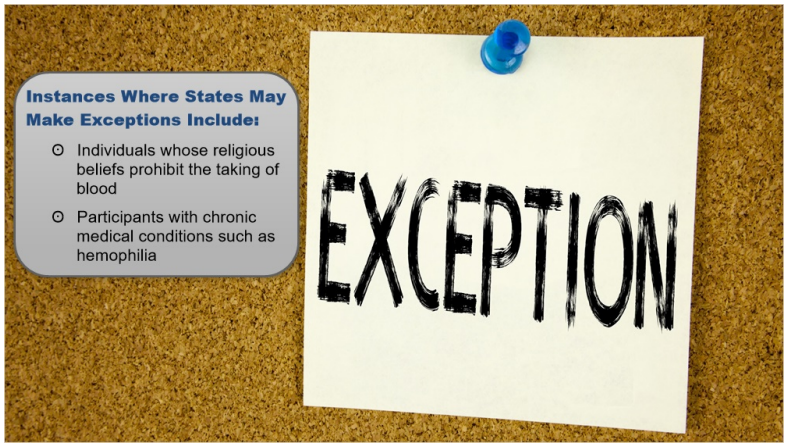
Postpartum and Breastfeeding Women (Slide Layer)



Postpartum and Breastfeeding Women
Blood work is required after the end of pregnancy. The CDC recommends that the blood work is taken at least 4 weeks after the pregnancy ended when hemoglobin concentration is expected to return to pre-pregnancy levels. Measuring hemoglobin values earlier than 4 weeks postpartum is too early to compare to standard cut-off values for detecting anemia.

Typically, a follow up appointment for blood work is scheduled for certifications occurring less than 4 weeks after delivery. For certifications occurring at least 4 weeks after delivery, blood work can be taken in the same appointment.

1.3 Exceptions to Blood Work



Notes:

WIC guidelines allow a few exceptions to taking blood work and require that exceptions be documented in the participant's record. See the Arizona WIC program and policy manual for guidelines.

Some instances where States may make exceptions include:

- Individuals whose religious beliefs prohibit the taking of blood, and
- Participants with chronic medical conditions such as hemophilia

1.6 The Importance of Testing Hemoglobin

Notes:

You may be wondering why we screen for anemia by measuring hemoglobin.
It's a goal of the WIC program to prevent the most common type of anemia called iron deficiency anemia, which is a worldwide nutritional disorder.

An abundance of data shows that young children and women of childbearing age are at greatest risk of developing iron deficiency anemia.

And even among these two highest-risk groups, risk for iron deficiency becomes higher with lower socioeconomic status. This is because those with a lower socioeconomic status are less likely to have, access to quality healthcare, adequate nutrition knowledge, and access to nutritious foods high in iron and vitamin C.

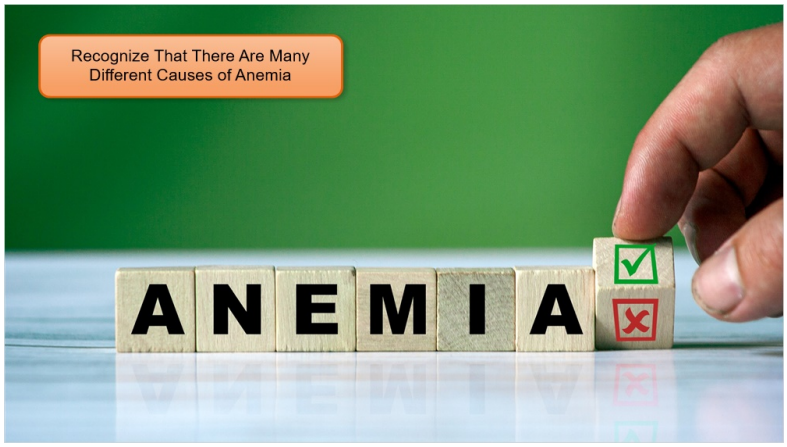
1.7 What is Hemoglobin

Notes:

A healthy red blood cell is made up of many different things, including proteins called hemoglobin. Each of these hemoglobin proteins has several iron atoms bonded to it, and it's these iron atoms in hemoglobin that give red blood cells their color.
Iron atoms play a very special role, as they bind and transport the oxygen we breathe throughout the body.

Without this continuous supply of fresh oxygen to cells throughout the body, we couldn't survive more than a few minutes. Once the hemoglobin has delivered oxygen to the cells, it is then used to transport carbon dioxide, which is a waste product of the cell, back to the lungs, where it leaves the body as we exhale.

1.8 What is Anemia



Notes:

Anemia is a condition resulting from a decreased number of healthy red blood cells circulating in the body.

One of the most common causes of anemia is not having enough hemoglobin in the blood to develop healthy red blood cells, which is why we specifically measure hemoglobin values at WIC.

However, it's important to recognize that there are many different causes of anemia, so next we'll review some of the most common types of anemias.

1.10 Iron Deficiency Anemia

Notes:

Iron deficiency is the most common cause of anemia in the world.
Without enough iron, the body is unable to create enough hemoglobin proteins, and without hemoglobin, the body isn't able to create enough healthy red blood cells. Next, we'll take a closer look at three of the possible causes of iron deficiency anemia.

1.11 Possible Causes of Iron Deficiency Anemia

Notes:

Click on each of the 3 types of iron deficiency anemia to learn more.

Inadequate Dietary Intake of Iron (Slide Layer)

Inadequate Dietary Intake of Iron

The most common cause of iron deficiency anemia is inadequate dietary intake of iron. There are 2 different types of iron in the foods we eat: heme iron and non-heme iron. Heme iron is found most commonly in meat, poultry, and fish. Heme iron is absorbed two to three times more efficiently than non-heme iron.

Examples of sources of non-heme iron are nuts, seeds, legumes, green leafy vegetables, and fortified grains. Anemia can result if a person's diet is too low in heme and/or non-heme iron.

Those with anemia caused by the inadequate intake of iron can improve their iron consumption by:

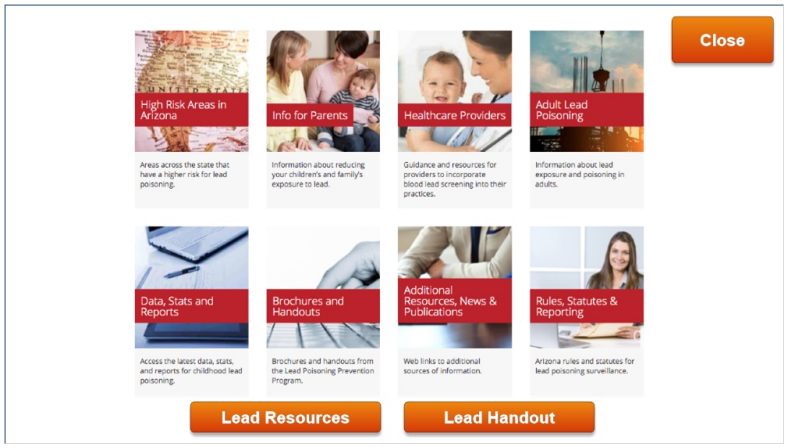
- Eating more heme and non-heme containing foods
- Taking iron supplements
- Cooking foods using cast-iron cookware, since cast-iron cookware adds iron to foods, and
- Eating iron containing foods along with foods containing vitamin C (such as citrus, bell peppers, strawberries, etc.) since vitamin C improves the absorption of iron

Rapid Growth (Slide Layer)

Rapid Growth

Iron deficiency anemia is more common among pregnant women, infants, and children as they may not consume enough iron required to produce the additional hemoglobin proteins necessary during rapid growth. Since these are the populations that we serve in WIC, it's especially important that we screen them for anemia, and ensure adequate dietary intake of iron.

Inadequate Iron Absorption (Slide Layer)



Inadequate Iron Absorption
Iron deficiency anemia can also occur even if there is adequate intake of iron, but something prevents it from being properly absorbed.
For example, coffee contains substances called polyphenols and tea contains substances called tannins, both of which can block iron from being absorbed and cause iron deficiency anemia.

Calcium, a mineral, if taken in large doses, competes for iron absorption and can cause iron deficiency anemia too.

For this reason, high milk consumption (which provides a lot of calcium) can result in iron deficiency anemia. Calcium is also often present in antacids, so regular antacid use can also reduce the amount of iron that is absorbed.

Lead is a toxic metal that can result in lead-poisoning if ingested. Lead also competes for iron absorption, so those with lead-poisoning may also develop iron deficiency anemia.

Lead can be found in paint used to paint homes prior to 1978, old water pipes, contaminated soil, pottery made with lead glazes, and certain folk remedies such as greta and azarcon.

All sources of lead should be avoided if possible. For more information about lead, click on the ‘Lead Resources’ button and the ‘Lead Handout’ button for a handout you can provide to WIC participants.

1.14 Vitamin B12 Anemia/Pernicious Anemia

Notes:

Now let's discuss some other causes of anemia beginning with Vitamin B12 Anemia, and Pernicious Anemia.

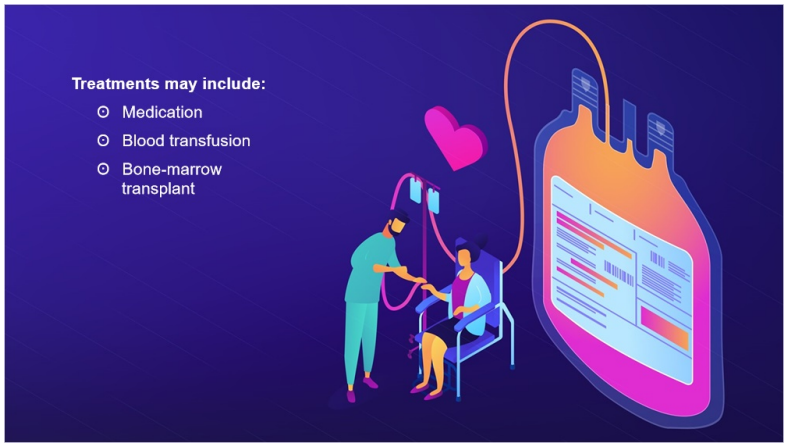
Vitamin B12 is needed in the production of healthy red blood cells. Without enough vitamin B-12, vitamin B12-deficiency anemia can occur. Other than supplements, Vitamin B-12 is only found in animal products such as meat, poultry, fish, eggs, and milk, so vegetarians and vegans are at risk of not consuming enough vitamin B-12 in their diet and developing vitamin B12-deficiency anemia.

The most common type of vitamin B12-deficiency anemia is called pernicious anemia. A protein produced in the stomach called intrinsic factor and is required to absorb vitamin B12.

If something prevents enough intrinsic factor from being made, such as gastric bypass surgery which reduces the size of the stomach, or an autoimmune disease that attacks the cells that produce intrinsic factor in the stomach, the body isn't able to absorb vitamin B12, and pernicious anemia could develop.

The treatment for vitamin B12 Anemia usually involves eating foods high in B12, taking B12 supplements. However, among those with Pernicious Anemia that have difficulty absorbing enough B12 in their GI tract, the treatment commonly involves intramuscular B12 injections.

1.15 Hemolytic Anemias



Notes:

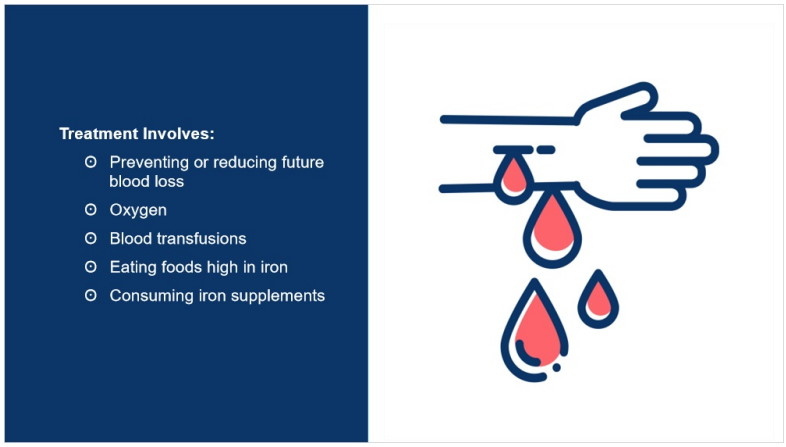
The usual lifespan of a healthy red blood cell is approximately 120 days, after which point the body will break apart the red blood cell in a process called hemolysis.

However, someone with a hemolytic anemia will have their red blood cells undergo hemolysis much faster, sometimes as short as just a few days. As a result, red blood cells are destroyed faster than they can be replaced.

Thalassemia and sickle cell anemia are two of the most common hemolytic anemias. They're caused by genetic blood disorders that affect red blood production. Thalassemia results in misshapen or insufficiently produced hemoglobin, and sickle cell anemia results in the production of "sickle-shaped" red blood cells. The body will intentionally destroy these misshapen red blood cells, leading to chronic anemia.

Treatment for sickle cell anemia and thalassemia often includes medication, blood transfusions, and sometimes, bone-marrow transplants.

1.17 Possible Cause of Anemia: Blood Loss



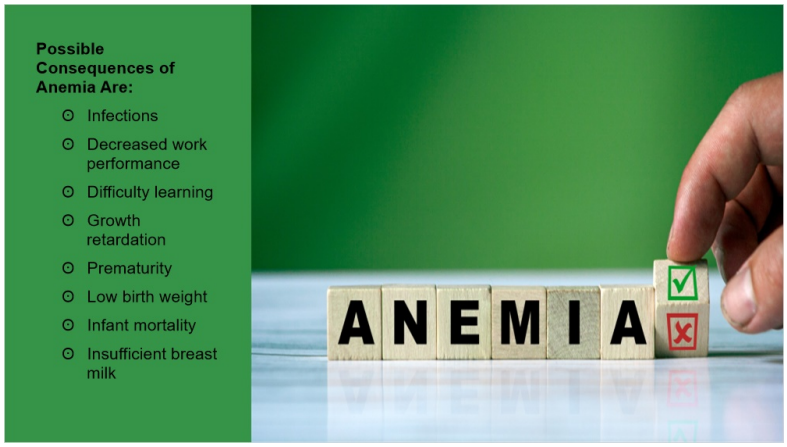
Notes:

Blood loss is another possible cause of anemia. Some common causes of blood loss are:

- Accidents
- Injuries
- Surgery (such as C-sections)
- Burns
- Menstrual bleeding
- Parasites such as hookworms and roundworms,
- Childbirth, and
- Ulcers

The treatment for anemia caused by blood loss, commonly involves preventing or reducing future blood loss, oxygen, blood transfusions, eating foods high in iron, and consuming iron supplements.

1.18 Symptoms of Anemia



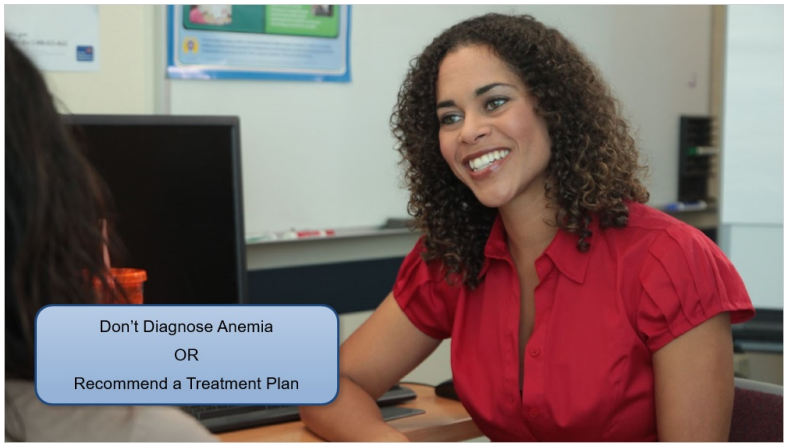
Notes:

As we've just seen, there are many different types of anemia, but since all of them result in inadequate numbers of healthy red blood cells, the symptoms end up being similar. Without enough healthy red blood cells, the body lacks enough oxygen to supply its tissues and organs.

As a result, possible symptoms of anemia include:

- Tiredness, weakness, or fatigue
- Headache
- Poor appetite, and
- Pale skin
- Some of the possible consequences of anemia are:
- Increased susceptibility to infections, especially respiratory infections
- Decreased work performance
- Difficulty learning or poor intellectual development
- Growth retardation, if prolonged
- For prenatal women - increased risk of prematurity or low birth weight, and even infant mortality, and
- For postpartum women - possible development of insufficient breastmilk

1.19 Low Hemoglobin Measurements

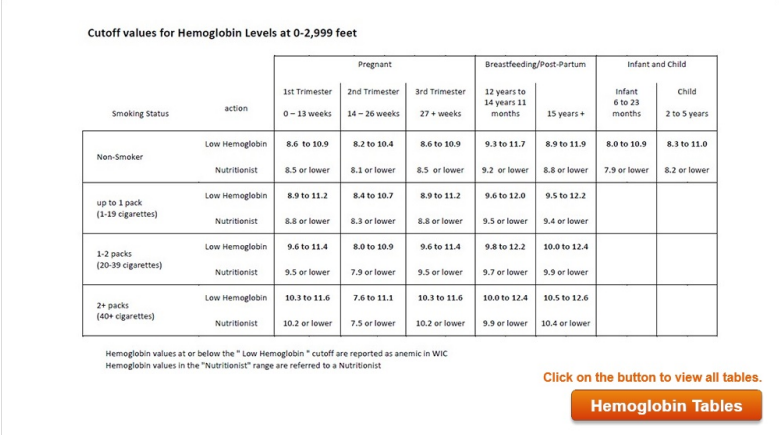


Notes:

As you now know, there are several different types, causes, symptoms, and treatments of low hemoglobin/anemia. Although the low hemoglobin measurements we obtain at WIC can be useful in screening for anemia, it's important to note that you will NOT be using these measurements to diagnose anemia.

If you ever obtain a low-hemoglobin measurement, don't assume that the participant has a specific type of anemia, or recommend a treatment plan. You will learn more about what to do when you obtain a low hemoglobin values in Module 4.

1.20 Vitamins



Cutoff values for Hemoglobin Levels at 0-2,999 feet

Smoking Status	action	Pregnant			Breastfeeding/Post-Partum		Infant and Child	
		1st Trimester 0 – 13 weeks	2nd Trimester 14 – 26 weeks	3rd Trimester 27 + weeks	12 years to 14 years 11 months	15 years +	Infant 6 to 23 months	Child 2 to 5 years
Non-Smoker	Low Hemoglobin	8.6 to 10.9	8.2 to 10.4	8.6 to 10.9	9.3 to 11.7	8.9 to 11.9	8.0 to 10.9	8.3 to 11.0
	Nutritionist	8.5 or lower	8.1 or lower	8.5 or lower	9.2 or lower	8.8 or lower	7.9 or lower	8.2 or lower
up to 1 pack (1-19 cigarettes)	Low Hemoglobin	8.9 to 11.2	8.4 to 10.7	8.9 to 11.2	9.6 to 12.0	9.5 to 12.2		
	Nutritionist	8.8 or lower	8.3 or lower	8.8 or lower	9.5 or lower	9.4 or lower		
1-2 packs (20-39 cigarettes)	Low Hemoglobin	9.6 to 11.4	8.0 to 10.9	9.6 to 11.4	9.8 to 12.2	10.0 to 12.4		
	Nutritionist	9.5 or lower	7.9 or lower	9.5 or lower	9.7 or lower	9.9 or lower		
2+ packs (40+ cigarettes)	Low Hemoglobin	10.3 to 11.6	7.6 to 11.1	10.3 to 11.6	10.0 to 12.4	10.5 to 12.6		
	Nutritionist	10.2 or lower	7.5 or lower	10.2 or lower	9.9 or lower	10.4 or lower		

Hemoglobin values at or below the " Low Hemoglobin " cutoff are reported as anemic in WIC
Hemoglobin values in the "Nutritionist" range are referred to a Nutritionist

Click on the button to view all tables.

Hemoglobin Tables

Notes:

Although not as common, it is also possible for participants to have high hemoglobin levels. The two most common causes of high levels of hemoglobin are living at high altitudes, and smoking.

The higher the altitude a person lives at, the more their body creates additional red blood cells to make-up for a limited oxygen supply in the air.

Similar to living at high altitudes, smoking decreases the amount of oxygen able to be absorbed by the lungs and the body responds by creating additional red blood cells to make up for the reduced oxygen supply.

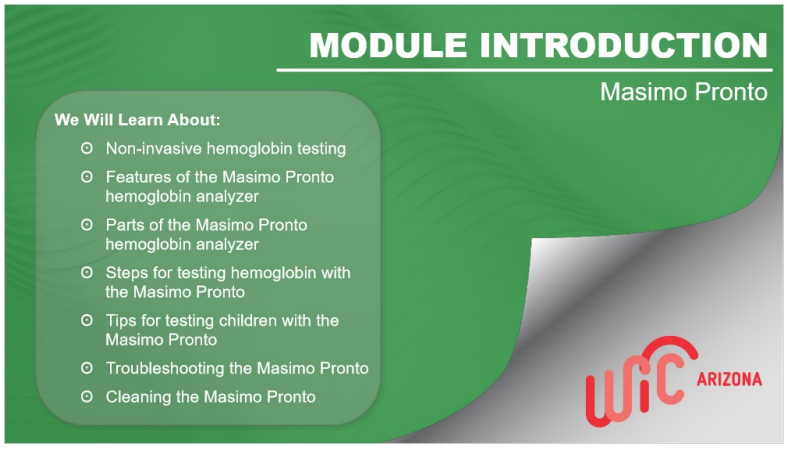
It’s also possible for high hemoglobin levels to be the result of other conditions such as:

- Dehydration
- Chronic Obstructive Pulmonary Disorder (COPD)
- Emphysema, and
- Heart Disease

Your clinic will have tables of hemoglobin cut-off values based on the altitude in your area to help you assess the risk of anemia among women who smoke, women who don’t smoke, infants, and children. We’ll review these tables in more detail a little later.

2. Module 2: Masimo Pronto

2.1 Module 2 Introduction



Notes:

Welcome to Module Two. In this module, you'll learn about:

- Non-invasive hemoglobin testing
- Features of the Masimo Pronto hemoglobin analyzer
- Parts of the Masimo Pronto hemoglobin analyzer
- Steps for testing hemoglobin with the Masimo Pronto
- Tips for testing children with the Masimo Pronto, and
- Troubleshooting the Masimo Pronto, and how to clean the Masimo Pronto

2.2 Masimo Introduction

Notes:

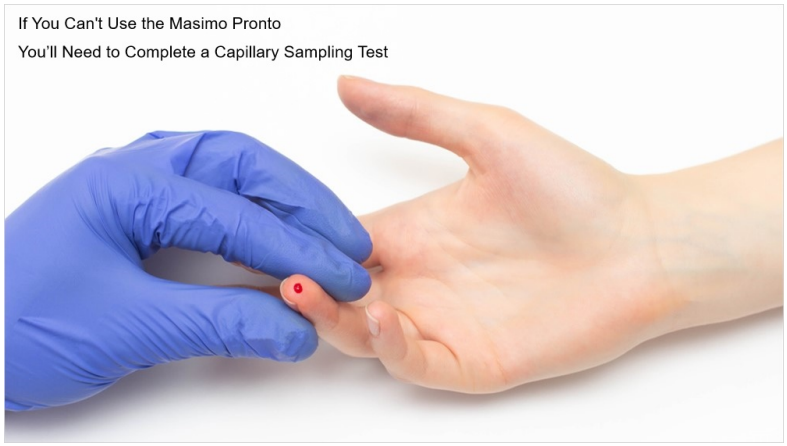
There are two methods of hemoglobin screening available at WIC, the non-invasive Masimo Pronto which can measure hemoglobin levels through the skin, and the invasive capillary sampling method.

Because capillary sampling can cause discomfort and anxiety in many participants, the non-invasive Masimo Pronto is the preferred method of hemoglobin screening whenever possible.

Before completing a hemoglobin test, regardless of method, make sure an Authorized Representative has signed the “Consent” signature type, within the medical tab in HANDS, giving you permission to perform the hemoglobin screening. Without permission, you cannot perform a hemoglobin test.

In this module, we’ll review the Masimo Pronto, which is a device that offers a safe, accurate, and painless way to obtain hemoglobin level readings from the majority of WIC participants.

2.3 Who Can Use the Masimo Pronto



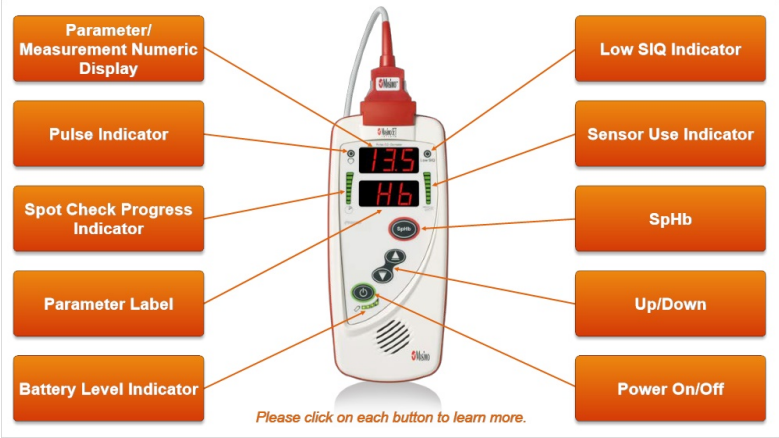
Notes:

The Masimo Pronto is the preferred method to obtain hemoglobin measurements from women and children 2 years of age and older (as long as their fingers are large enough to fit in the sensor).

It cannot be used for children with very small fingers or who are unable to sit still long enough for the hemoglobin measurement to be completed.

If you need to obtain a hemoglobin measurement from a participant, but you're not able to use the Masimo Pronto, you'll need to complete a capillary sampling test, which we'll discuss in the next module.

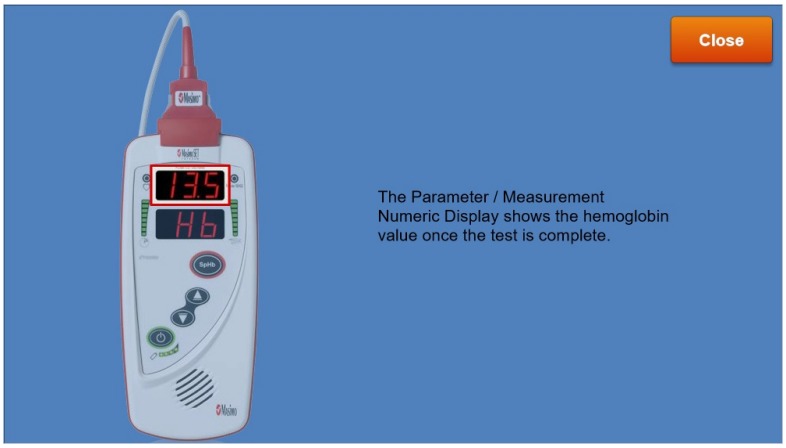
2.4 Features of the Masimo Pronto



Notes:

Now let's take a look at the features of the Masimo Pronto. Click each button to learn more.

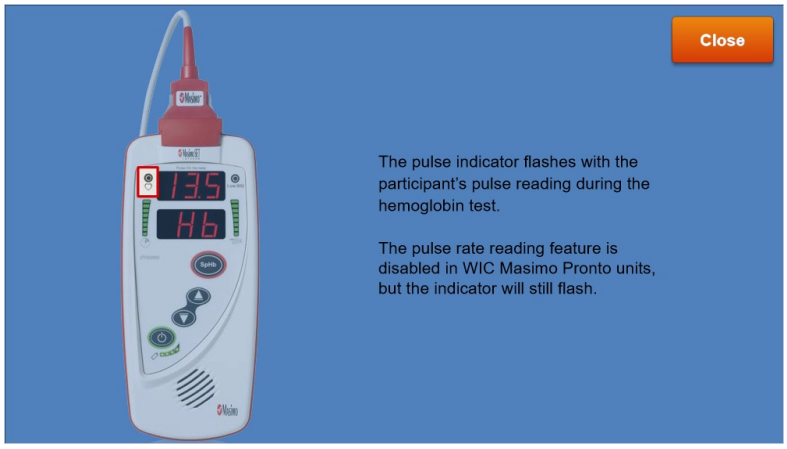
Parameter/Measurement Numeric Display (Slide Layer)



Parameter/Measurement Numeric Display

The Parameter / Measurement Numeric Display shows the hemoglobin value once the test is complete.

Pulse indicator (Slide Layer)

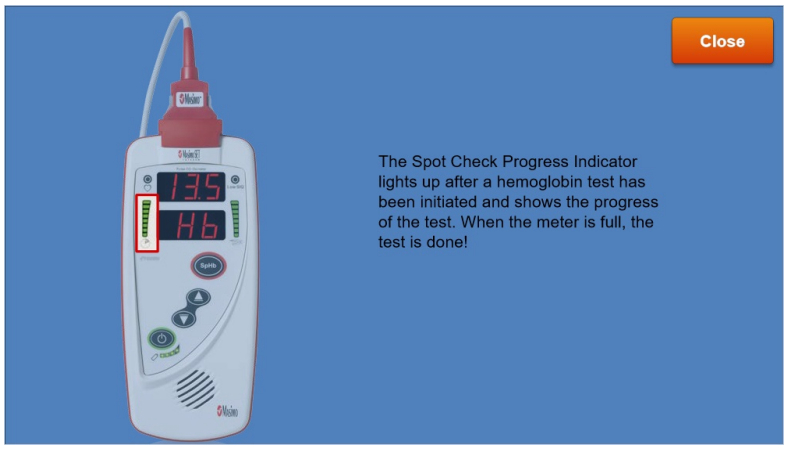


Pulse Indicator

The pulse indicator flashes with the participant's pulse reading during the hemoglobin test.

The pulse rate reading feature is disabled in WIC Masimo Pronto units, but the indicator will still flash.

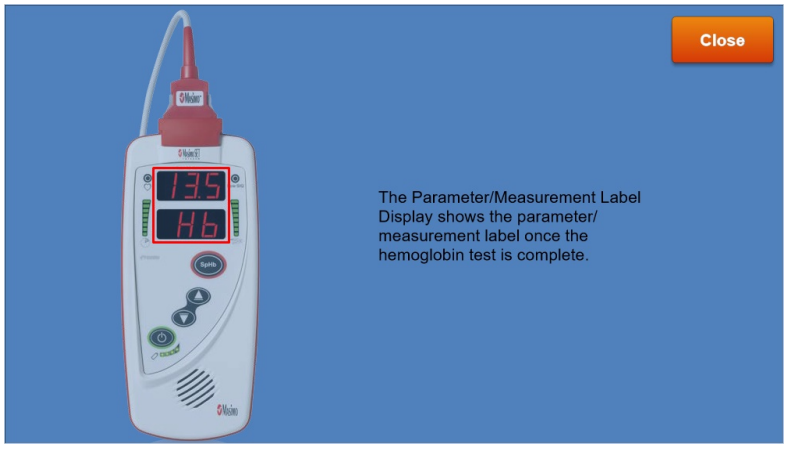
Spot Check Progress Indicator (Slide Layer)



Spot Check Progress Indicator

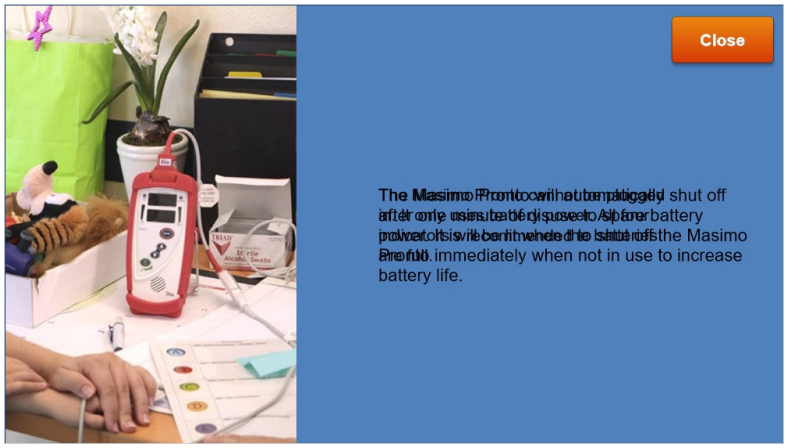
The Spot Check Progress Indicator lights up after a hemoglobin test has been initiated and shows the progress of the test. When the meter is full, the test is done!

Parameter Label (Slide Layer)



Parameter Label
The Parameter/Measurement Label Display shows the parameter/measurement label once the hemoglobin test is complete.

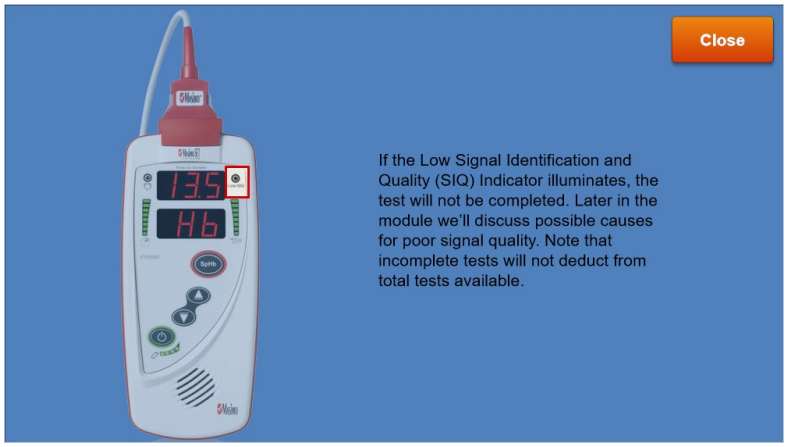
Battery Level Indicator (Slide Layer)



Battery Level Indicator
The Masimo Pronto cannot be plugged in. It only uses battery power. All four indicators will be lit when the batteries are full. The batteries will need to be replaced once the Battery Level Indicator shows that the batteries are low.

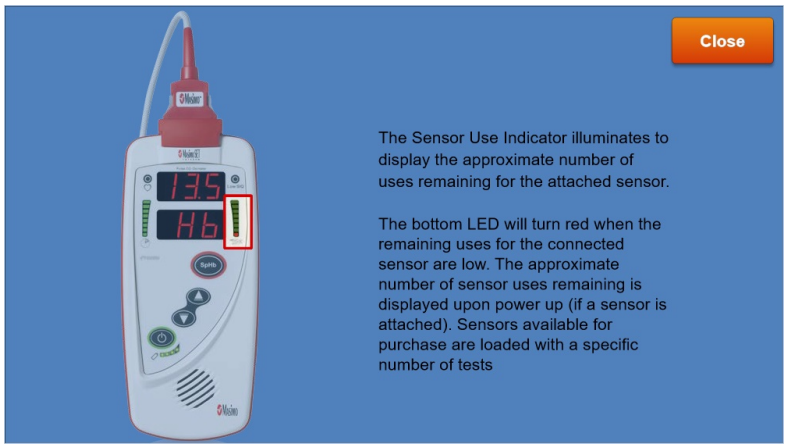
The Masimo Pronto will automatically shut off after one minute of disuse to spare battery power. It is recommended to shut off the Masimo Pronto immediately when not in use to increase battery life.

Low SIQ Indicator (Slide Layer)



Low SIQ Indicator
If the Low Signal Identification and Quality (SIQ) Indicator illuminates, the test will not be completed. Later in the module we'll discuss possible causes for poor signal quality. Note that incomplete tests will not deduct from total tests available.

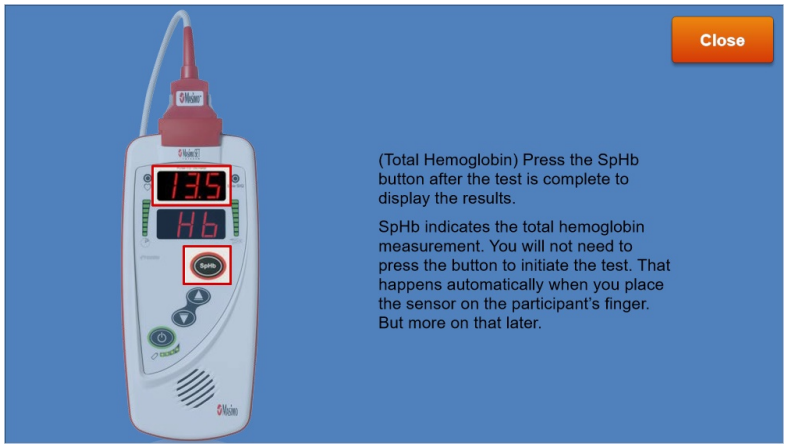
Sensor Use Indicator (Slide Layer)



Sensor Use Indicator
The Sensor Use Indicator illuminates to display the approximate number of uses remaining for the attached sensor.

The bottom LED will turn red when the remaining uses for the connected sensor are low. The approximate number of sensor uses remaining is displayed upon power up (if a sensor is attached). Sensors available for purchase are loaded with a specific number of tests.

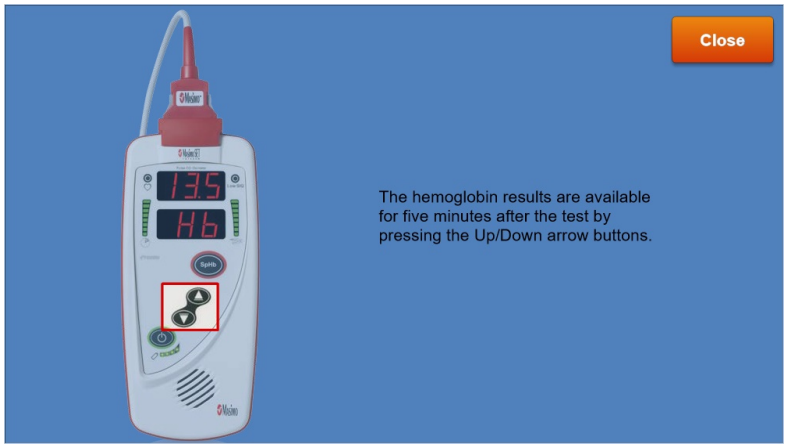
SpHb (Slide Layer)



SpHb
(Total Hemoglobin) Press the SpHb button after the test is complete to display the results.

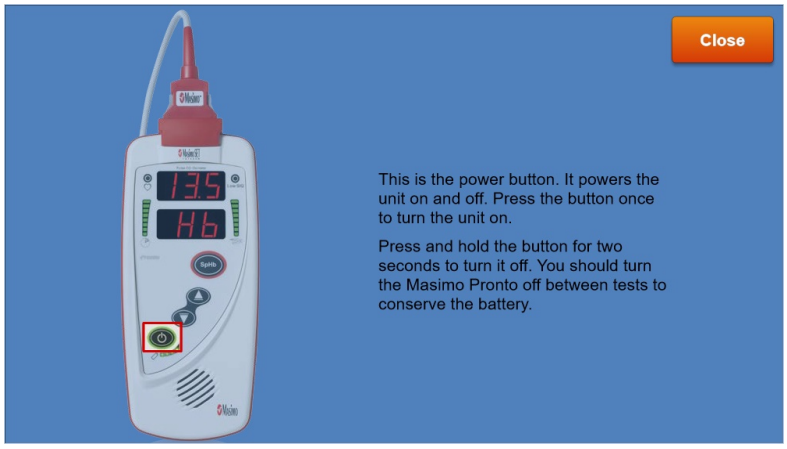
SpHb indicates the total hemoglobin measurement. You will not need to press the button to initiate the test. That happens automatically when you place the sensor on the participant's finger. But more on that later.

Up/Down (Slide Layer)



Up/Down
The hemoglobin results are available for five minutes after the test by pressing the Up/Down arrow buttons.

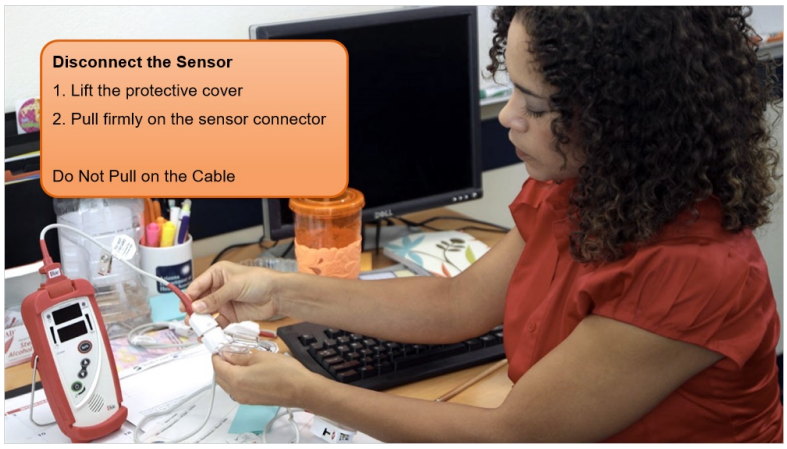
Power On/Off (Slide Layer)



Power On/Off
This is the power button. It powers the unit on and off. Press the button once to turn the unit on.

Press and hold the button for two seconds to turn it off. You should turn the Masimo Pronto off between tests to conserve the battery.

2.6 Masimo Pronto Cable and Sensors



Notes:

Now, let's take a closer look at the cables and sensors of the Masimo Pronto.
This is the “Patient Cable.” It connects the Pronto to the sensors which are worn by the participant.

These are the “Rainbow“ sensors you will use. Rainbow sensors are reusable and are pre-loaded with a specific number of tests.

When all the loaded tests have been used, sensors are considered electronic waste and should be treated like cell phones or other electronic devices. Please check with your agency about their policy for disposal of electronic waste.

There are adult finger sensors and pediatric/slender finger sensors. On the top of each sensor, there are raised lines that correspond to the sensor inside. You can use these lines to line up the finger and ensure it is long enough for a successful reading.

To connect the sensor, properly orient the sensor connector and insert it completely into the “Patient Cable” connector, ensuring that there are no kinks or twists.
If the cable isn’t kept straight, it may interfere with the reading.

Completely close the protective cover. Each sensor can be used for the specific number of tests purchased, but the tests do not expire.

When you connect the sensor, the Masimo Pronto will tell you how many uses the sensor has left before it needs to be replaced. To disconnect the sensor, lift the protective cover and pull firmly on the sensor connector. Do not pull on the cable, or you could damage it.

2.7 Selecting a Sensor/Finger

Notes:

It is important to choose the appropriate Masimo Pronto sensor based on the participant's finger size.

The pediatric sensor can be used for children as well as women who have slender fingers. When it comes to finger selection on adults, use the ring or middle finger (preferably on the non-dominant hand).

In addition to the ring and middle finger, the thumb may also be used for children. The selected finger must reach the end of the sensor, and the sensor should fit snugly. Each sensor comes with a Digit Gauge that will help you determine the appropriate sensor size.

To measure a participant's finger using the Digit Gauge, slide the gauge circle onto the finger as shown in the image. If the gauge circle stops at any point of the nail bed before the cuticle, the sensor can be used on that finger.

If the gauge slides past the cuticle, the digit is too slender for that sensor in which case you'll need to try a different finger, or switch to the pediatric sensor if all of the participants fingers are too small for the adult sensor.

Also, do not place the sensor on an anatomically disfigured finger or a finger with a tight ring.

If you're using the pediatric digit gauge and determine that all of the child's fingers are too small for the pediatric sensor, you'll need to do a capillary sampling test.

2.8 Preparing the Masimo Pronto Hemoglobin Test

Notes:

Choose a relaxed setting where participants are less likely to be stressed. For example, Masimo Pronto tests do not have to be conducted in a lab, and may even be completed in WIC offices.

Use the digit gauge to determine the appropriate sensor size.
Connect the selected sensor to the “Patient Cable” on the Pronto device, and turn the device on. It will go through a self-test, during which time all the front panel indicators will light up.

Once the self-test is complete a tone will be heard indicating the Masimo Pronto is ready to use, and it will display the number of sensor uses remaining.

Next, be sure the participant is seated, calm, and breathing normally since changes in heart rate can cause problems with the test.

Clean the participant’s chosen finger with an alcohol wipe but be sure that their finger is dry before placing it in the sensor.

Hand sanitizer is not a suitable replacement for alcohol wipes and must not be substituted for cleaning the finger during this step.

Use the image of the finger on top of the sensor to correctly position the participant’s finger. The pad of the finger or thumb should completely cover the detector window in the lower half of the sensor. If the detector window is not covered, the Pronto will not take a reading.

The tip of the finger should reach the end of the sensor, at the vertical finger stop. If the fingernail is long, it may extend and pass over the vertical finger stop. The cord should run straight to the back of the hand. Try to keep the cord as straight as possible to avoid signal interference.

The Masimo Pronto test also requires the participant to have their hands remain still while the readings are being taken. This can be challenging for small children!
Later in this module, you will learn some strategies to help a child sit still long enough for the test to be completed.

2.9 Completing the Masimo Pronto Hemoglobin Test

Notes:

As soon as you place the sensor on the chosen finger, the Masimo Pronto will begin the test.

The time to complete a test will vary depending on the Perfusion Index, the quality of the signal, and room brightness. If you need to monitor the Perfusion Index (PI) during the test, you may press the Up or Down arrows to switch between the two readings.

The spot check progress indicator will light up to show you the test progress.

When the meter is completely lit, a tone will sound and the test is over!

Once the test is complete, press the SpHb button to switch the display to show the total hemoglobin reading.

After you disconnect the sensor, you may still view the hemoglobin measurement for up to 5 minutes by pressing the up and down buttons. The machine does not save the readings beyond 5 minutes, so be sure to record readings right away. The recorded readings will be entered into HANDS in order to satisfy the required hemoglobin testing program requirements.

2.12 Tips for Testing Children

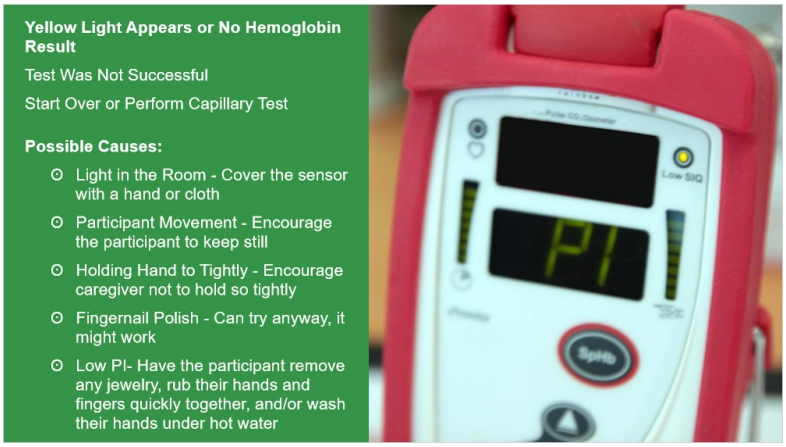
Notes:

One of the benefits of using the Masimo Pronto is that many children can be tested without a fingerstick.

However, it can be challenging to keep a child calm and still for the time it takes to get a reading. There are several things you can do to make sure a child stays still long enough to take the reading. Some ideas include:

- Conduct the test in your office instead of in the lab.
- Have the child sit in the lap of the caregiver
- Explain that there will be no pain anytime during the test
- Have the child watch the progress indicator
- Sing a song with the child
- Offer the child a reward for sitting still during the test, such as a high-five.
- Ask the child to describe their favorite activities / hobbies, and
- Offer to let the child play with a toy in the hand not being used for the Masimo Pronto test

2.13 Troubleshooting the Masimo Pronto



Notes:

Now we'll go over some common errors and troubleshooting steps for the Masimo Pronto.

If the display shows "SENS OFF" at any time during the reading, that indicates that the sensor was not placed correctly, and you must start over.

If the yellow light for the Low SIQ appears during the test, or if there is no hemoglobin result, then the test was not successful, and you will have to repeat the test or perform a capillary sampling test instead. Note that if a reading fails, it does not reduce the number of tests left on the sensor.

Some common causes of a yellow light or no hemoglobin result being displayed are: Light getting into the sensor: Light in the room may enter the sensor, especially if the sensor shield is not able to fully block light from entering due to finger size. Repeat the test while covering the sensor with a hand or cloth.

Participant movement: If the participant moves their finger during the test it can prevent a reading from being possible. Repeat the test and encourage the participant to keep their hand as still as possible.

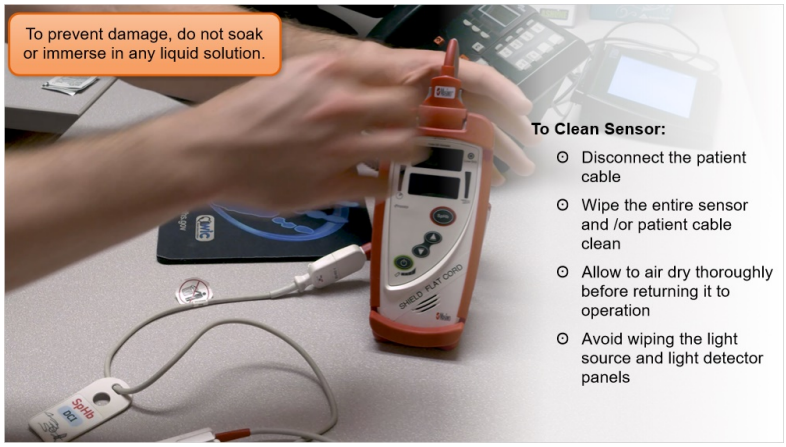
Holding Hand to Tightly: A caregiver is holding onto a child's hand to tightly during the test, restricting the child's blood flow to their fingers. Encourage the caregiver to not hold the child's hand too tightly.

Fingernail polish: Fingers with nail polish or acrylic nails can disrupt the test, but it is recommended to attempt a measurement as the Pronto may successfully take a reading in the presence of nail polish. Note that you can trust the reading provided by the Masimo Pronto even if the finger has nail polish.

Low PI: The participant's perfusion index should be greater than 1.0 to obtain a successful reading. If a participant has low PI, it indicates inadequate amounts of blood being pumped into the participant's finger. This is most likely due to low blood volume, a disease or object preventing normal blood flow, or the participant having cold fingers. Have the participant remove any jewelry restricting blood flow, rub their hands and fingers quickly together, and/or wash their hands under hot water, before restarting the test.

If one or more troubleshooting attempts have failed, obtain the hemoglobin measurement using a capillary sampling test.

2.14 Cleaning the Masimo Pronto



Notes:

The Pronto requires cleaning at least once daily and should be cleaned immediately if you notice debris or grime.

It is recommended to spray cleanser on a cloth and NOT directly on the Pronto. The outer surface of the Pronto can be cleaned with a soft cloth dampened with soap and a warm water solution. Other appropriate cleaning agents include commercial products such as Cidex Plus (3.4% Glutaraldehyde), 0.25% Ammonium Chloride, 70% Isopropyl Alcohol, or by preparing a 10% Bleach solution.

Do not allow liquids to enter the interior of the Pronto. Do not autoclave, pressure sterilize, or gas sterilize the Pronto. Do not soak or immerse the Pronto in any liquid. Do not use petroleum-based or acetone solutions, or other harsh solvents, to clean the Pronto.

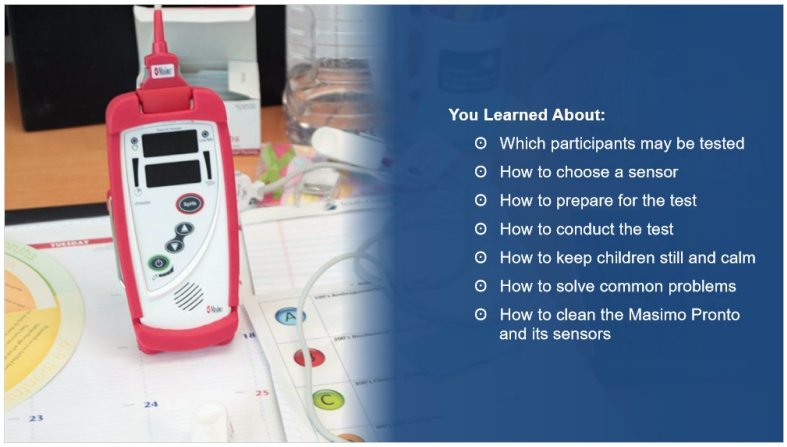
It is important to clean sensors anytime you notice debris or grime. Keep sensors clean by always cleansing fingers to be measured with a 70% Isopropyl alcohol pad before placement in the sensor. Sensor life can be affected by frequent use of disinfecting agents.

Limit routine cleaning of the sensor to once daily with an alcohol pad, and any time debris or grime is observed. To remove dirt or grime from the sensor, disconnect the patient cable from the device. Wipe the entire sensor and / or patient cable clean with 70% Isopropyl alcohol pad.

Allow to air dry thoroughly before returning it to operation. When cleaning the sensor, be careful to avoid bringing the light source and light detector panels into direct contact with the alcohol pad.

To prevent damage, do not soak or immerse in any liquid solution. And do not attempt to sterilize by irradiation, steam, autoclave, or ethylene oxide.

2.17 Module Two Summary

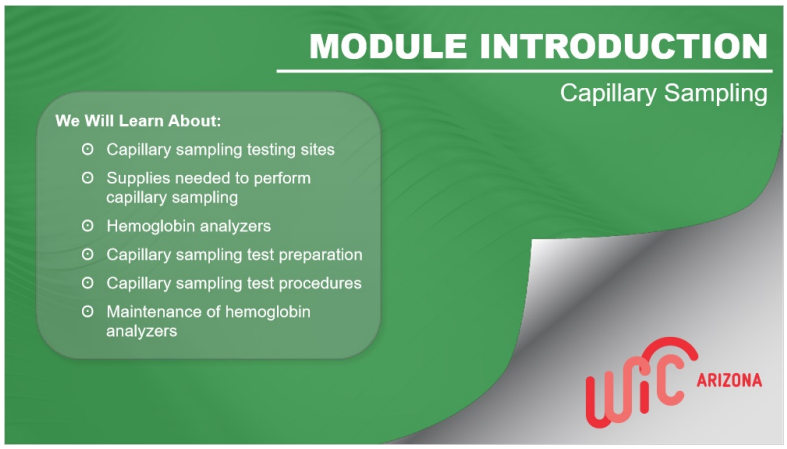


Notes:

In this module, you learned about the Masimo Pronto, a non-invasive testing device that can measure hemoglobin levels through the skin using a sensor instead of drawing blood. You learned which participants may be tested using the Masimo Pronto, how to choose the correct sensor and prepare the unit and participant for the test, how to conduct the test, strategies to keep children still and calm during the test, how to recognize and solve common problems encountered while using the Pronto, and how to clean the Masimo Pronto and its sensors.

3. Module 3: Capillary Sampling

3.1 Module 3 Introduction



Notes:

Welcome to Module Three. In this module, you'll get to see how to do a capillary sampling test for participants who are not eligible for a Masimo Pronto screening, namely children under the age of two.

In this module you will learn about:

- Capillary sampling testing sites
- Supplies needed to perform capillary sampling
- Hemoglobin analyzers
- Capillary sampling test preparation
- Capillary sampling test procedures
- Maintenance of hemoglobin analyzers

3.2 Capillary Sampling Introduction

Notes:

As we previously learned, WIC is not required to obtain hemoglobin values during certifications for infants aged 0-8 months.

However, infants aged 9-11 who are being certified for the first time, as well as children 12-23 months are required to have hemoglobin values obtained during certifications via capillary sampling. Capillary sampling may also be performed on children aged 2-5 years, as well as women, if a hemoglobin value is not able to be obtained using the Masimo Pronto.

3.3 Capillary Sampling Testing Sites

Notes:

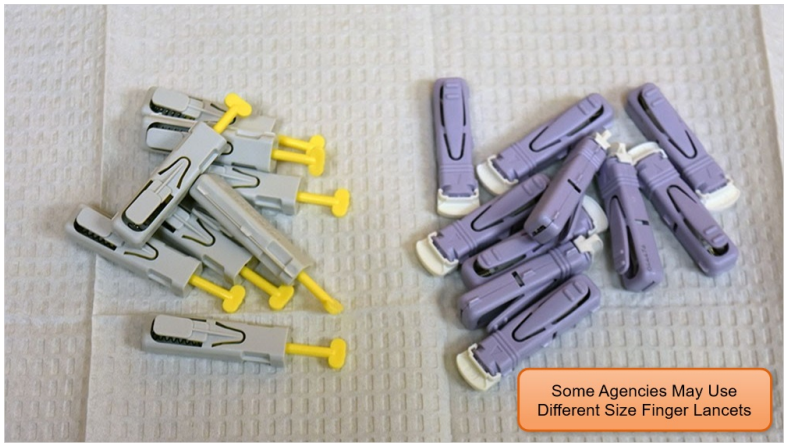
In the Arizona WIC program, capillary sampling will generally be performed using a participant's finger, but the heel may also be used for some participants.

The primary capillary sampling testing site for infants aged 9-11 months is the finger.

However, some local agencies may choose to use the heel for capillary sampling on infants aged 9-11 months as long as they have not yet started walking.
Heelsticks should not be performed on infants 12 months of age or older. Fingers are the only acceptable capillary sampling sites for children (aged 1 to 5 years) as well as women.

Let's start by taking a closer look at some of the tools required to perform this test: lancets, cuvettes, and hemoglobin analyzers.

3.4 Lancets



Notes:

The capillary sampling test requires the use of a lancet, which is a needle used to puncture the skin.

By pressing down on a button, the lancet punctures the skin, then retracts inward, so there is less chance for accidental sticks.

Some local agencies use different size finger lancets for adults than they use for infants and children, and some agencies use different lancets for completing heel sticks than they use for completing finger sticks. Please speak with your trainer to ensure that you're familiar with the different lancets used in your agency.

3.5 Cuvettes

Notes:

Cuvettes (or as they're sometimes called microcuvettes) are the plastic vials you'll use to capture blood samples after puncturing a site with a lancet. Only use cuvettes that are specifically designed for the hemoglobin analyzer your clinic uses for capillary sampling testing. In this section, we will discuss the cuvettes used for the Hemocue 201, Hemocue 301, and the McKesson Consult.

Before opening a new container of cuvettes for a HemoCue Analyzer, make sure to pull on the tear-away plastic strip.

Cuvettes for the Hemocue 201 Analyzer expire 90 days after opening, and cuvettes for the Hemocue 301 Analyzer expire 24 months after opening. Immediately write the date opened on the container, as soon as the bottle of cuvettes has been opened.

Also check for the manufacturer's expiration date printed at the bottom of the container. Beyond this date, the cuvettes should not be used, regardless of whether the bottle has been opened or not, as they are more likely to give inaccurate results.

Use cuvettes for the McKesson Consult prior the expiration date printed on the package regardless of whether the package has been opened or not.

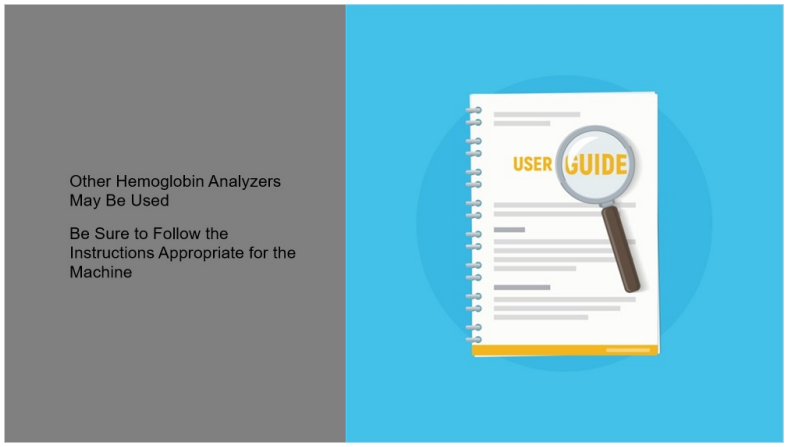
To open a bottle of cuvettes for HemoCue analyzers, put your finger through the loop, and in the direction of the arrow, plant your thumb and rock back so the lid opens.

To open a bag of McKesson cuvettes, simply tear open the top of the resealable bag. Grab the cuvette by its base when taking it out of the container. Only take out one cuvette at a time, even if performing multiple tests on the same family members.

Once removed, cuvettes for the HemoCue 201 should quickly be used, as they contain a reagent that is sensitive to moisture and light. Cuvettes for the HemoCue 301 and McKesson Consult do not contain any reagent, so they are not sensitive to moisture or light.

Always tightly seal cuvette containers after each use.

3.7 Hemoglobin Analyzers



Notes:

Once a blood sample has been collected in a cuvette, its hemoglobin content can be evaluated using a hemoglobin analyzer.

Due to their wide use in the Arizona WIC program, the Hemocue 201, Hemocue 301, and the McKesson Consult hemoglobin analyzers will be the focus of this module. The manuals for each of these hemoglobin analyzers may be found in the resources section of this training.

There are other similar hemoglobin analyzers manufactured by other companies that may be used in your clinic. If your clinic uses a hemoglobin analyzer that is not discussed in this training, be sure to follow the instructions appropriate for the machine your clinic uses.

3.8 Exposure Control Plan

Notes:

Since you will be exposed to blood and sharp objects in the lab, your agency should have an Exposure Control Plan. Familiarize yourself with this plan. This exposure plan instructs you on what to do if you're exposed to blood and bodily fluids while completing a capillary sampling test.

This plan contains information such as:

- How to minimize the chance of exposure.
- How to dispose of used items (such as lancets, dirty gloves and gauze/wipes).
- How to report an exposure or injury to yourself or a participant.
- The cleaning schedule and approved disinfectants to use.
- Any exposure training you may attend. and,
- Whether your agency provides Hepatitis B vaccines. These may be offered, depending on your position and level of exposure risk.

If you are exposed to blood or stuck with a used lancet, follow your exposure plan and report the incident to your supervisor immediately.

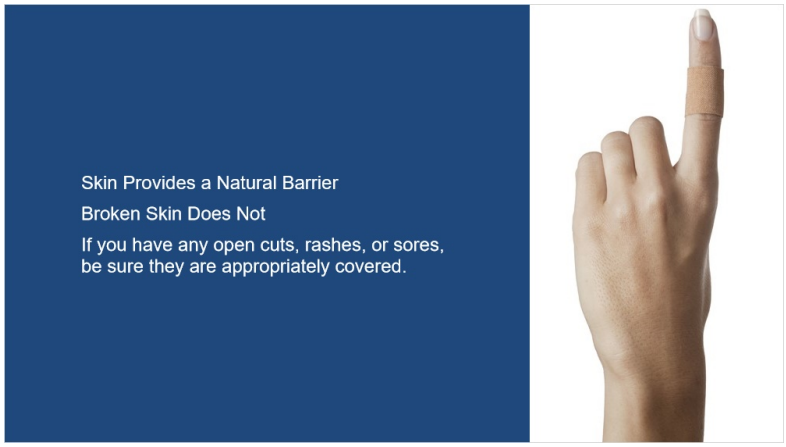
3.9 Capillary Sampling Test Preparation: Hand Washing

Notes:

Once you have escorted the authorized representative and any participants whom you'll be completing a capillary sampling test on to the lab, thoroughly wash your hands. Even though you'll put on gloves make sure to thoroughly wash your hands before putting them on. Focus on scrubbing and washing all parts of your hands for at least 20 seconds as this could easily make the difference between the transmission of an infectious disease or not.

If a sink isn't available, as is often the case when taking blood samples at remote locations, an alcohol-based hand sanitizer can be used. Make sure to still thoroughly scrub all parts of your hands when using hand sanitizer.

3.10 Capillary Sampling Test Preparation: Gloves



Notes:

Once you have washed your hands, put your gloves on and assemble the supplies. Whenever you're about to perform a capillary sampling test, gloves must be worn on both hands.

All blood and bodily fluids from any person should be considered potentially infectious. Therefore, gloves should be worn when touching blood, cleaning contaminated surfaces, or handling items soiled with blood to ensure that you are not exposed to any infectious blood or bodily fluid. Gloves also protect the participant from exposure to any cuts you have on your own hands.

Your unbroken skin provides a natural barrier against infections; however, broken skin does not. If you have any open cuts, rashes, or sores, be sure they are appropriately covered.

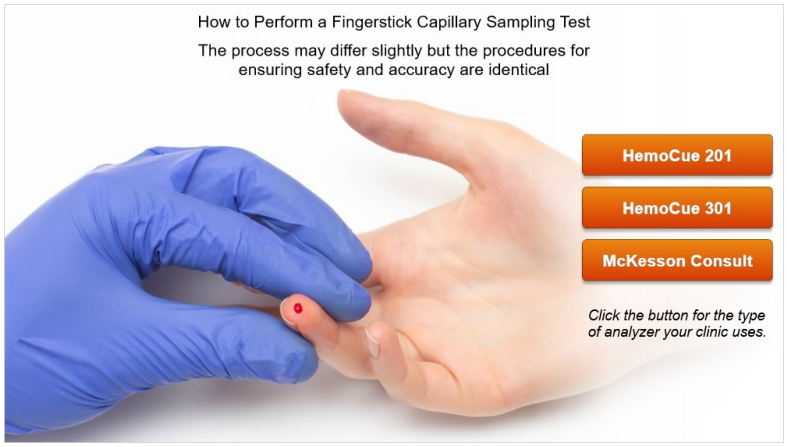
3.11 Capillary Sampling Test Preparation: Gathering Supplies

Notes:

Gather the following supplies before beginning any capillary sampling test:

- A sterile lancet
- Alcohol prep pads
- Cuvettes designed to work in hemoglobin analyzer being used
- Bandage
- Lint-free wipes or gauze, not tissue or cotton balls, as these can leave pieces of cotton behind
- Sharps container (or biohazard bag)
- Hemoglobin analyzer (Hemocue 201, Hemocue 301, or McKesson Consult), and
- 10% bleach solution or disinfectant spray

3.13 Fingerstick Capillary Sampling Test Video



Notes:

Now we'll watch a video that demonstrates how to perform a fingerstick capillary sampling test.

Note: The process for use of the various hemoglobin analyzers (HemoCue 201, HemoCue 301, and McKesson Consult) differ slightly after successfully obtaining a blood sample, but the procedures for ensuring safety and accuracy are identical.

Click the button for the type of analyzer your clinic uses. Although not necessary, you may also watch the other videos before continuing.

HemoCue 201 (Slide Layer)

HemoCue 201
To perform a capillary sampling test, first make sure all of your capillary supplies are ready for testing. After pressing power, the cuvette holder should be moved into its loading position.

The display will show three flashing dashes and the HemoCue symbol. Make sure that the patient's hand is warm and relaxed. Clean with a disinfectant such as alcohol and allow to dry. Use only the middle or ring finger for sampling. Avoid fingers with rings on them. Take the microcuvette out of the package. If a vial is being used. Close the lid immediately. Using your thumb, press lightly at the top knuckle towards the tip. This stimulates blood flow towards the sampling point. For best blood flow and least pain, sample at the side of the finger, not in the center.

Prepare the lancet, by pushing the plunger down, twisting, and removing it. While lightly pressing towards the fingertip, prick the finger using a lancet. Wipe away the first two or three drops of blood. Reapply light pressure towards the fingertip until another drop of blood appears. When the drop of blood is large enough to fill the microcuvette, fill it in one continuous motion. If the cuvette is not completely filled, discard it and fill a new cuvette. Do not refill! Wipe off any excess blood from the outside of the microcuvette tip, making sure no blood is drawn out of the microcuvette during this process.

Look carefully for air bubbles in the filled microcuvette. If any are present, discard this microcuvette, and take a new sample. Small bubbles around the edge can be ignored. Place the filled microcuvette in the cuvette holder. This should be performed within ten minutes of filling the microcuvette. Rotate the cuvette holder into its measuring position. During the measurement, an hourglass will be shown on the display. After 15 to 60 seconds the hemoglobin value of the sample is displayed. The result will remain on the display as long as the cuvette holder is in the measuring position. When operating on battery power, if the analyzer is not used it will automatically switch off after approximately five minutes. Properly dispose of the cuvette following local regulations.

To turn off the analyzer, press and hold the left button until the display reads off and the screen becomes blank.

McKesson Consult (Slide Layer)

McKesson Consult
To perform a fingerstick capillary sampling test, first make sure to gather all of the necessary supplies. Disinfect and dry the puncture site. Only the middle or ring finger should be used, making sure to only use fingers without rings on them. Prepare the lancet, by pushing the plunger down, twisting, and removing it.

Gently massage the finger towards the tip to increase blood flow. Avoid going past the first knuckle. Make the incision on the upward-facing side of the fingertip, so that the blood drop sits on top of the finger, to facilitate filling of the cuvette. Apply light pressure towards the fingertip (but not past the first knuckle) until a blood drop appears. Wipe away the first 3 drops and make sure there is a free blood flow before filling the cuvette with the fourth drop. Be sure to have a sufficient sized blood drop to fill the cuvette. Fill the cuvette completely by touching the corner of the cuvette to the blood drop. Do not refill the cuvette. If a cuvette cannot be filled in one continuous process, or if the cuvette contains air bubbles, discard the cuvette and use a new one. Gently wipe off the excess blood on the outside of the cuvette with a gauze pad or wipe. Be sure to gently wipe both sides. Do not wipe too close to the open end as this can draw blood out of the cuvette.

A filled cuvette should be kept in the horizontal position until measurement and should be analyzed within 1 minute after filling. Insert the filled cuvette in the cuvette holder. Press down gently until you feel a “click” and hold in position until the result appears on the screen. If the McKesson Consult® Hemoglobin analyzer has been out of use for a couple of hours, an error code may appear after the first measurement.

Remove the filled cuvette, make a “blank” measurement by pressing down the empty cuvette holder and then reinsert the filled cuvette for measurement. Pull the cuvette out of the McKesson Consult® Hemoglobin quickly. Dispose of the used cuvette in a

container for potentially infectious waste. Record the test result as soon as the check-mark is shown.

The result will remain on the display until replaced by the next measurement. To erase the latest result, press down on the empty cuvette holder.

HemoCue 301 (Slide Layer)

HemoCue 301
To perform a capillary sampling test, first make sure all of your capillary supplies are ready for testing. After pressing power, the cuvette holder should be moved into its loading position.

The display will show three flashing dashes and the HemoCue symbol and is now ready for testing. Make sure that the patient's hand is warm and relaxed. Clean with a solution such as alcohol and allow to dry. Use only the middle or ring fingers for sampling. Avoid fingers with rings on them. Take the microcuvette out of the package. If a vial is being used. Close the vial immediately. Using your thumb, lightly press at the top knuckle towards the tip. This stimulates blood flow towards the sampling point.

For best blood flow and least pain, sample at the side of the finger, not in the center. Prepare the lancet, by pushing the plunger down, twisting, and removing it. While lightly pressing towards the fingertip, prick the finger using a lancet. Wipe away the first two or three drops of blood. Reapply light pressure towards the fingertip until another drop of blood appears. When the drop of blood is large enough to fill the microcuvette, fill it in one continuous motion. If the cuvette is not completely filled, discard it and fill a new cuvette. Be sure not to refill. Wipe off any excess blood from the outside of the microcuvette tip, making sure no blood is drawn out of the microcuvette during this procedure.

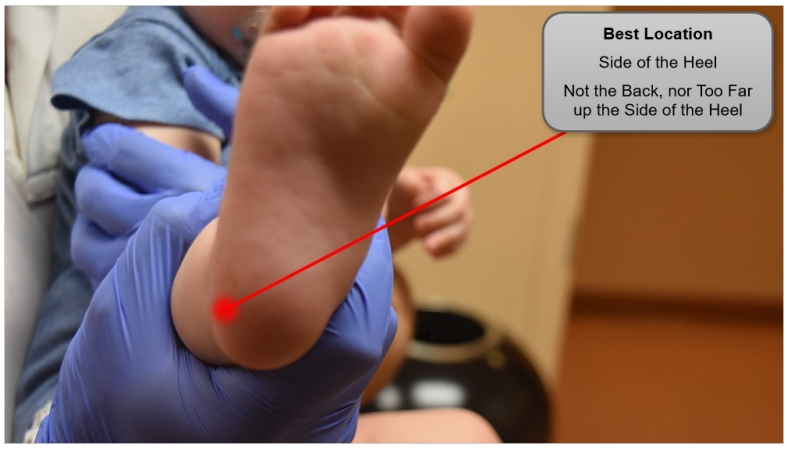
Look carefully for air bubbles in the filled microcuvette. If they are present, discard this microcuvette, and take a new sample. Small bubbles around the edge can be ignored.

Place the microcuvette in the cuvette holder. This should be performed within 40 seconds after filling the microcuvette. Rotate the cuvette holder into its measuring position. During the measurement, an hourglass will be shown on the display. After 3 seconds the hemoglobin value of the sample is displayed. The result will remain on the display as long as the cuvette holder is in the measuring position.

When operating on battery power, if the analyzer is not used it will automatically switch off after approximately five minutes. Properly dispose of the cuvette following local regulations.

To turn off the analyzer, press and hold the left button until the display reads off and the screen becomes blank.

3.14 Introduction to Heelstick Capillary Sampling Test Video



Notes:

Each of the prior videos correctly demonstrated the best location for puncturing the fingerstick, which is off the centerline of the end of either the middle or ring finger. When performing a heelstick, the correct location is shown here. Note that the side of the heel is to be punctured, and not the back, nor too far up the side of the heel towards the ankle.

Now let's watch a short video that demonstrates how to correctly puncture the heel. It will not show the steps for the analysis of the collected blood sample, since you will analyze it using the same steps that were indicated in the video you just watched.

3.15 Heelstick Capillary Sampling Test Video

Notes:

When performing a heelstick capillary sampling test, ensure that you have all of the correct supplies to perform the test. Make sure to select a lancet that is designated to use for heelsticks in your agency, and prepare it according to the manufacturer's instructions.

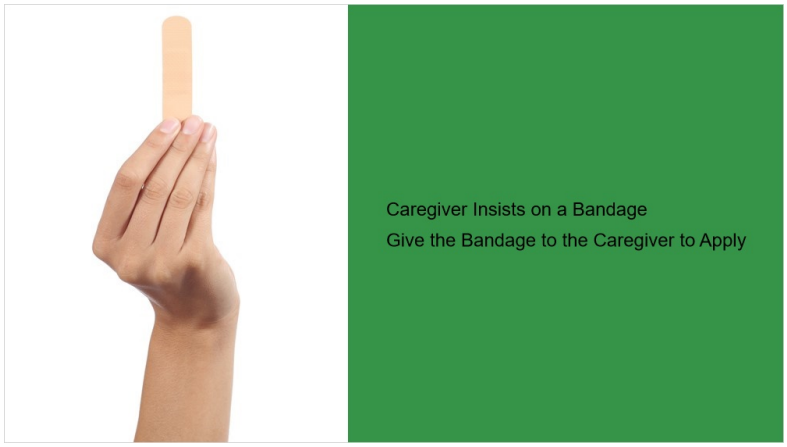
Position the infant laying on their back. Clean the intended puncture site with an antiseptic solution and allow it to air dry. Position the heel between your thumb and forefinger with your other fingers underneath the infant's calf.

Apply a small amount of pressure to flex the foot back. Place the lancet in the correct position on the side of the infant's foot and press the button to lance the skin. Apply mild pressure with your thumb and forefinger. Wipe away the first two or three drops of blood. Reapply light pressure, and once another drop of blood appears, fill a microcuvette in one continuous motion.

Check for any air bubbles and to make sure that the cuvette is completely filled. If the cuvette isn't completely filled, or air bubbles are present, discard the microcuvette, and collect another sample.

Prepare the microcuvette for analysis in your clinic's hemoglobin analyzer by wiping off any excess blood on the outside of the microcuvette tip and checking for air bubbles.

3.16 Bandaging the Collection Site



Notes:

Either while the hemoglobin analyzer is measuring the amount of hemoglobin in the sample, or immediately afterward, you may need to bandage the participant's puncture site. Do not use an alcohol swab on a puncture site as it can cause a burning sensation. Never bandage a child's finger who is under 2 years of age, due to the likelihood they will put the bandage in their mouth, which could cause choking. Explain to caregivers of children under the age of two why you won't bandage the child's finger.

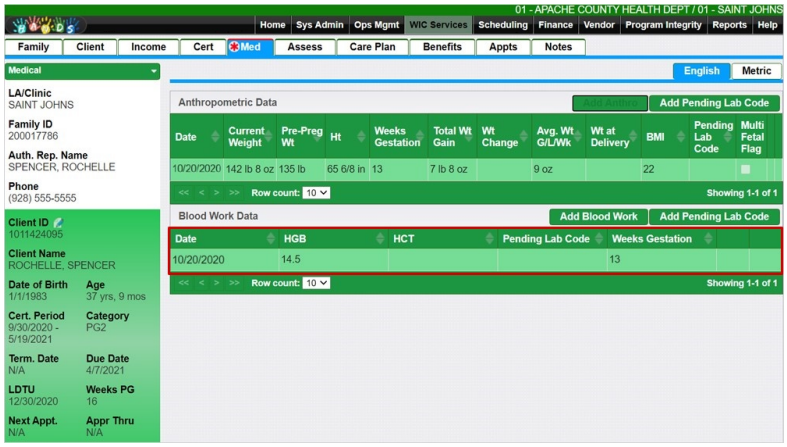
If the caregiver insists on a bandage, give the bandage to the caregiver so they can apply it to their child.

3.17 Cleaning the Work Surface

Notes:

Immediately clean any blood spills on work surfaces or skin, with a 10% bleach solution or an agency-approved disinfectant spray. Allow the bleach solution or disinfectant spray to remain on the surface for 10 minutes before wiping the contaminated area.

3.18 Recording the Hemoglobin Value



Notes:

Once the hemoglobin analyzer has completed its scan of the sample, write down the hemoglobin value displayed.

Remember that the hemoglobin value displayed on the display screen will only remain on the display when the cuvette holder is in the measuring position.

Once you open the cuvette holder of HemoCue hemoglobin analyzers, or remove the cuvette from McKesson hemoglobin analyzers, the hemoglobin value will disappear. If completing more than one capillary sampling test, write down each hemoglobin value, being sure to indicate which participant it corresponds with.

Each hemoglobin value will later be entered into the “Medical” screen in HANDS.

3.19 Disposing of Supplies

Notes:

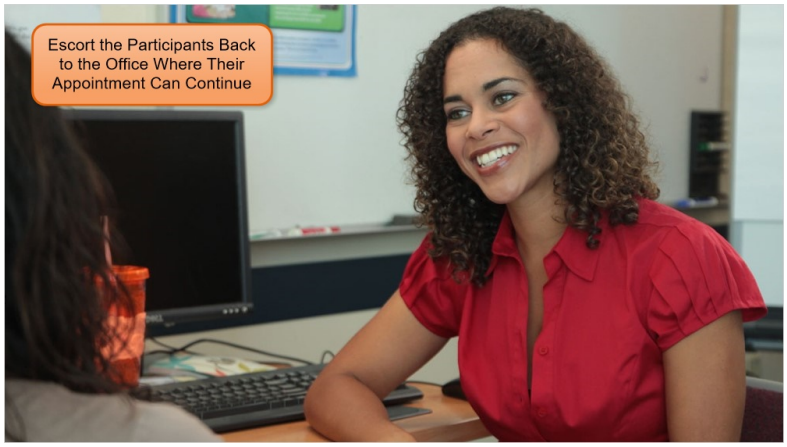
Do not discard lancets and cuvettes into biohazard bags or trash bags since they may puncture bags and contaminate other surfaces. Instead, always dispose of used lancets and cuvettes in an approved puncture-resistant sharps container. Sharps containers should be labeled clearly to indicate they contain hazardous materials. The container should be located close to where you perform your blood tests. Never attempt to open a container to retrieve anything that has been placed inside. Never force items into a full container. Sharps containers must be disposed of according to your biohazard waste disposal rules.

After the capillary sampling test, make sure to throw away any paper wrappers, alcohol prep pads, gauze, lint-free tissues, gloves and any other supplies which are not saturated with blood, in a wastebasket or biohazard bag (if your clinic uses them).

An easy way to gather up contaminated paper supplies is to fold them up, then place this paper square in one of your gloved hands, then take the glove off so it turns inside out and wraps itself around the contaminated supplies. You can then place this in the second gloved hand, and turn it inside out, so it wraps around the contaminated supplies, before tossing the ball of waste into the biohazard bag or wastebasket.

If your gloves or supplies are saturated with blood, make sure to discard them in an agency approved biohazard container.

3.20 Completion of Capillary Sampling Test



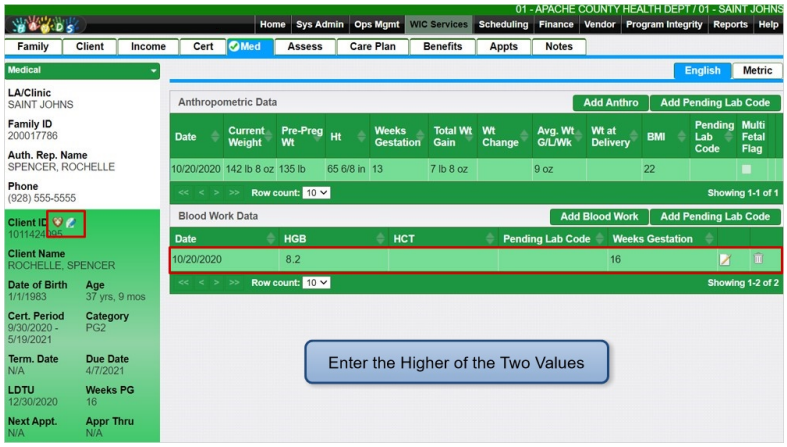
Notes:

After discarding the supplies, immediately clean your hands with antimicrobial soap and water or alcohol-based cleanser or hand wipes, if water is not available.

The lab counter may also be cleaned after each capillary sampling test but must be cleaned at least once daily.

Finally, escort the authorized representative, as well as any tested participants back to the office where their appointment can continue.

3.21 Performing a Second Test



Notes:

If you have other participants from the same family in need of a test, you can leave the hemoglobin analyzer on. After completing the first capillary sampling test by disposing of supplies and gloves and washing your hands, repeat the same testing procedure from the beginning on each subsequent family member. It's especially important to put on a new pair of gloves, even if the participants being tested are members of the same family. Also, if a participant's hemoglobin value is in the "Nutritionist Range" the first time you complete the test, you'll need to perform a second capillary sampling test on the same participant. (We'll review what the "Nutritionist Range" means, along with the other steps necessary to appropriately respond to low hemoglobin values in a moment). If possible, have a different staff person complete the second test on a different puncture site, such as an alternate finger.

The higher of the two values will be entered into the "Medical" screen in HANDS.

3.23 Maintenance of Hemoglobin Analyzers

Notes:

Now we'll watch a video that demonstrates how to maintain the Hemoglobin Analyzers. Click the button for the type of analyzer your clinic uses. Although not necessary, you may also watch the other videos before continuing.

HemoCue 301 (Slide Layer)

HemoCue 301
The cuvette holder should be cleaned each day of use. To clean the cuvette holder first turn off the analyzer, then rotate the holder out to the loading position. Using a pointed object depress the silver button in the upper righthand corner of the cuvette holder.

While keeping the button depressed, pull the holder in the direction which the handle is pointing. Clean the cuvette holder with alcohol, water, or a mild soap solution. The cover

can also be cleaned with the alcohol, water, or a mild soap solution. Remember, the cuvette holder must be completely dry before it can be replaced in the analyzer.

The optronic unit should be cleaned as recommended by manufacturer's instructions. Please refer to your operator's manual if an error message is displayed. To clean the optronic unit, turn the analyzer off and remove the cuvette holder. Using a HemoCue cleaner or cotton tip swab, push the cleaner or swab in and out of the optronic unit five to ten times.

Upon removal, if it is stained, dispose and repeat the steps with a new cleaner. Once the cleaner is removed and is unstained, cleaning is complete. Wait 15 minutes to allow the analyzer to air-dry before reinserting the cuvette holder."

HemoCue 201 (Slide Layer)

HemoCue 201
The cuvette holder should be cleaned daily. To clean the cuvette holder, first turn off the analyzer, then rotate the holder out to the loading position. Using a pointed object or your thumb, depress the small catch in the upper righthand corner of the cuvette holder. While keeping the catch depressed, pull the holder in the direction which the handle is pointing. The cover can be cleaned with alcohol, water, or a mild soap solution.

Remember, the cuvette holder must be completely dry before it can be replaced in the analyzer. The optronic unit should be cleaned as recommended by manufacturer's instructions.

Please refer to your operator's manual if an error message is displayed. To clean the optronic unit turn the analyzer off and remove the cuvette holder. Using a HemoCue cleaner or long-tip cotton swab moistened with alcohol or water, push the cleaner or swab in and out of the optronic unit five to ten times.

Upon removal, if it is stained, dispose and repeat the steps with a new cleaner or swab. Once the cleaner or swab is removed and is unstained, cleaning is complete. Wait 15 minutes to allow the analyzer to air-dry before reinserting the cuvette holder.

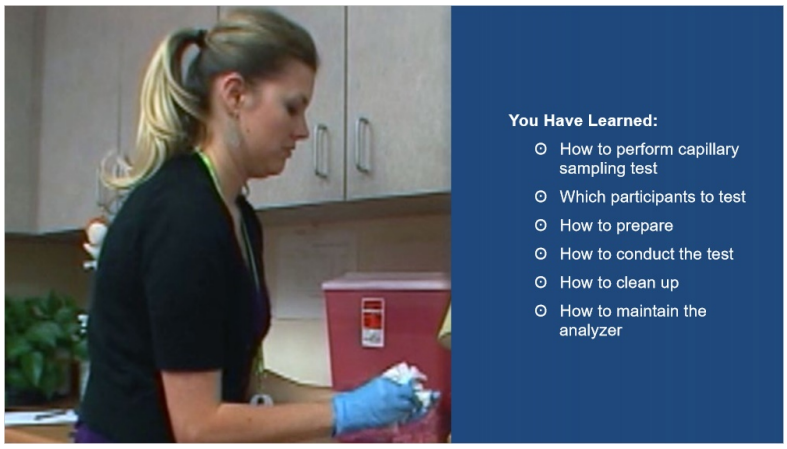
McKesson Consult (Slide Layer)

McKesson Consult
Pull the backside of the cuvette holder slightly towards you and lift up. Using a swab, clean the cuvette holder with cold water or a mild detergent, followed by disinfectant. Dry thoroughly. Reinsert the dry cuvette holder by pressing down until you feel a “click.”

Clean device with cold water or mild detergent, followed by disinfectant. To disinfect the instrument, use conventional solvent-free surface disinfectants, McKesson disposable germicidal surface wipes, or PDI Super Sani-Cloth® germicidal disposable wipes and follow labeling directions.

Do not spray the instrument when cleaning, as this will damage the instrument! Only use wipes lightly dampened in water/detergent/disinfectant for cleaning and disinfection.

3.24 Module Three Summary

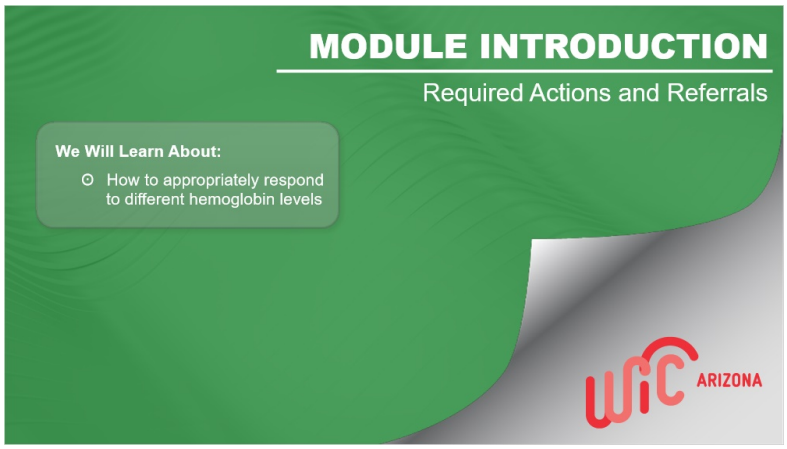


Notes:

In this module, you learned about how to perform capillary sampling tests using hemoglobin analyzers, which are devices that measure the blood collected in cuvettes. You learned which participants should be tested using capillary sampling, how to prepare for a capillary sampling test, how to safely conduct the test, how to clean up after a test, and how to properly maintain hemoglobin analyzers.

4. Module 4: Required Actions and Referrals

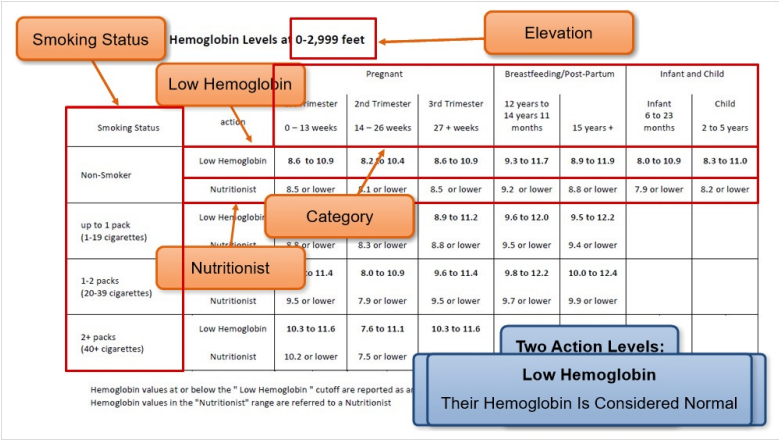
4.1 Module 4 Introduction



Notes:

In this module you'll learn how to appropriately respond to different hemoglobin levels. It's important to note that whether you obtain a hemoglobin value using the Masimo Pronto or a Hemoglobin Analyzer, you will take the same action.

4.2 Hemoglobin Cut-Off Values



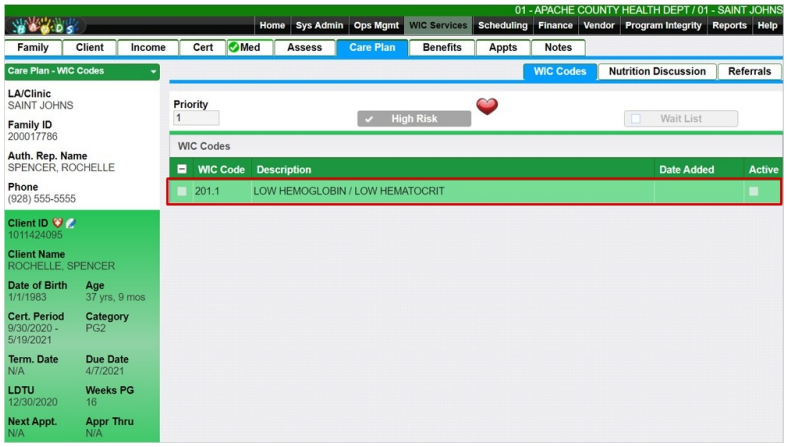
Smoking Status	action	Pregnant 1st Trimester 0 – 13 weeks	Pregnant 2nd Trimester 14 – 26 weeks	Pregnant 3rd Trimester 27 + weeks	Breastfeeding/Post-Partum 12 years to 14 years 11 months	Breastfeeding/Post-Partum 15 years +	Infant and Child Infant 6 to 23 months	Infant and Child Child 2 to 5 years
Non-Smoker	Low Hemoglobin	8.6 to 10.9	8.2 to 10.4	8.6 to 10.9	9.3 to 11.7	8.9 to 11.9	8.0 to 10.9	8.3 to 11.0
	Nutritionist	8.5 or lower	8.1 or lower	8.5 or lower	9.2 or lower	8.8 or lower	7.9 or lower	8.2 or lower
up to 1 pack (1-19 cigarettes)	Low Hemoglobin			8.9 to 11.2	9.6 to 12.0	9.5 to 12.2		
	Nutritionist		8.3 or lower	8.8 or lower	9.5 or lower	9.4 or lower		
1-2 packs (20-39 cigarettes)	Low Hemoglobin	o 11.4	8.0 to 10.9	9.6 to 11.4	9.8 to 12.2	10.0 to 12.4		
	Nutritionist	9.5 or lower	7.9 or lower	9.5 or lower	9.7 or lower	9.9 or lower		
2+ packs (40+ cigarettes)	Low Hemoglobin	10.3 to 11.6	7.6 to 11.1	10.3 to 11.6				
	Nutritionist	10.2 or lower	7.5 or lower					

Hemoglobin values at or below the " Low Hemoglobin " cutoff are reported as a
Hemoglobin values in the "Nutritionist" range are referred to a Nutritionist

Notes:

The CDC has established hemoglobin cutoff values below which someone is considered at risk for anemia. Hemoglobin cut-off values vary, depending upon participant smoking status, level of elevation, and category. One of these tables should be posted in your lab for you to evaluate your participant's test result. There are 6 different tables based on elevation level. From there, each table is broken down by smoking status, and category (pregnant [by trimester], postpartum/breastfeeding, and children and infants).
As you can see, there are also two action areas listed, “Low Hemoglobin” and “Nutritionist”, and different hemoglobin value ranges associated with these action areas. If a participant’s hemoglobin value is above the “Low Hemoglobin” range, their hemoglobin is considered normal, and no additional action is necessary.

4.3 Low Hemoglobin Risk Codes



Notes:

The Low Hemoglobin Risk Code 201 has been stratified into 2 different risk codes based on severity: 201.2 is a low risk code for those at risk for anemia in the “Low Hemoglobin” range, and 201.1 is a medium risk code for those with even more risk of anemia within the “Nutritionist” range. Let’s take a look at some examples of how each of these codes would be assigned.

Imagine that you complete a hemoglobin test on a non-smoking pregnant woman in her first trimester. She lives in the Phoenix Area, where the elevation is just over 1000 feet, so you reference this chart (0-2,999 feet) that is posted in the lab.

Since she is a non-smoker, and is in her first trimester, you know that you’ll be comparing her value to the ranges in this section in the upper left corner. If the hemoglobin value you obtain from this participant is 10.5, HANDS would automatically assign the risk, ‘201.2- Low Hemoglobin” as soon as this hemoglobin value is saved into the HANDS medical screen since the value is within the “Low Hemoglobin” cutoff range of 8.6 to 10.9.

However, if the hemoglobin value you obtained is 8.3, a second test must be run (preferably on the other hand and by another WIC staff member) since that value is within the Nutritionist cutoff range of 8.5 or lower. When the second test is complete, you would record the higher of the two test values.

If this second value is still within the ‘Nutritionist’ range, HANDS would automatically assign the risk, ‘201.1- Low Hemoglobin” as soon as this hemoglobin value is saved into the HANDS medical screen.

4.4 Required Actions for Low Hemoglobin

Notes:

Any 201 risk code is considered at-risk for anemia, indicating additional action should be taken. If a participant has a hemoglobin value within the “Low Hemoglobin” range and is assigned risk code 201.2, no additional referral is required since it is a low risk code. However, a referral to a healthcare provider may be provided to determine the cause of the low hemoglobin and to discuss possible treatment options.

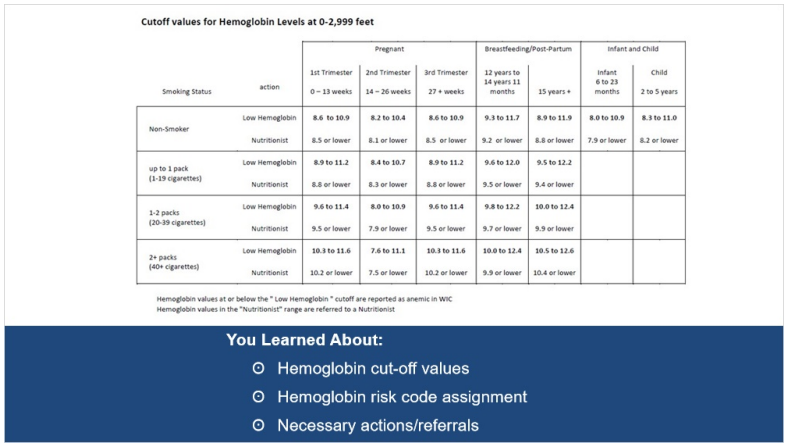
Since iron deficiency anemia is by far the most common cause of low hemoglobin values, it may also be useful to attempt to determine the potential cause and discuss tips to increase dietary iron intake.

If a participant has a hemoglobin value within the “Nutritionist” range and is assigned risk code 201.1, a referral to a medium risk nutritionist or high-risk nutritionist is required since it is a medium risk code. Once again, a referral to a healthcare provider may be provided to determine the cause of the low hemoglobin and to discuss possible treatment options.

Some participants assigned risk code 201.1 may have very low hemoglobin values. This chart shows what critically low values are for the state of Arizona. Since this condition can be life-threatening, refer them to their healthcare provider immediately and refer these participants to a medium-risk nutritionist or high-risk nutritionist for their next WIC visit.

Each local agency is required to have a procedure for handling referrals for very low hemoglobin values, so speak with your trainer or supervisor to learn more about making referrals for very low hemoglobin in your agency.

4.7 Module 4 Summary



Cutoff values for Hemoglobin Levels at 0-2,999 feet

Smoking Status	action	Pregnant: 1st Trimester 0 – 13 weeks	Pregnant: 2nd Trimester 14 – 26 weeks	Pregnant: 3rd Trimester 27 + weeks	Breastfeeding/Post-Partum: 12 years to 14 years 11 months	Breastfeeding/Post-Partum: 15 years +	Infant and Child: Infant 6 to 23 months	Infant and Child: Child 2 to 5 years
Non-Smoker	Low Hemoglobin	**8.6 to 10.9**	**8.2 to 10.4**	**8.6 to 10.9**	**9.3 to 11.7**	**8.9 to 11.9**	**8.0 to 10.9**	**8.3 to 11.0**
	Nutritionist	8.5 or lower	8.1 or lower	8.5 or lower	9.2 or lower	8.8 or lower	7.9 or lower	8.2 or lower
up to 1 pack (1-19 cigarettes)	Low Hemoglobin	**8.9 to 11.2**	**8.4 to 10.7**	**8.9 to 11.2**	**9.6 to 12.0**	**9.5 to 12.2**		
	Nutritionist	8.8 or lower	8.3 or lower	8.8 or lower	9.5 or lower	9.4 or lower		
1-2 packs (20-39 cigarettes)	Low Hemoglobin	**9.6 to 11.4**	**8.0 to 10.9**	**9.6 to 11.4**	**9.8 to 12.2**	**10.0 to 12.4**		
	Nutritionist	9.5 or lower	7.9 or lower	9.5 or lower	9.7 or lower	9.9 or lower		
2+ packs (40+ cigarettes)	Low Hemoglobin	**10.3 to 11.6**	**7.6 to 11.1**	**10.3 to 11.6**	**10.0 to 12.4**	**10.5 to 12.6**		
	Nutritionist	10.2 or lower	7.5 or lower	10.2 or lower	9.9 or lower	10.4 or lower		

Hemoglobin values at or below the " Low Hemoglobin " cutoff are reported as anemic in WIC
Hemoglobin values in the "Nutritionist" range are referred to a Nutritionist

You Learned About:

- Hemoglobin cut-off values
- Hemoglobin risk code assignment
- Necessary actions/referrals

Notes:

In this module, you learned about the hemoglobin cut-off values, how the low hemoglobin risk codes are assigned, and what actions / referrals are necessary depending on the varying risk of anemia.