

Facilitator's Guide to Training Health Workers in Ghana to Measure Haemoglobin and Assess Anaemia with the HemoCue® Hb 301 Device



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Facilitator's Guide to Training Health
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ABOUT SPRING

The Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) project is a five-year USAID-funded cooperative agreement to strengthen global and country efforts to scale up high-impact nutrition practices and policies and improve maternal and child nutrition outcomes. The project is managed by JSI Research & Training Institute, Inc., with partners Helen Keller International, The Manoff Group, Save the Children, and the International Food Policy Research Institute.

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DISCLAIMER

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COVER PHOTO: Measurement of haemoglobin using the HemoCue device in the Tamale Central Health Centre in northern Region of Ghana. Provided by Denish Moorthy, SPRING.

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Anaemia prevalence among children under the age of five and women of reproductive age is a major public health challenge in Ghana. Anaemia is considered a major contributing factor to morbidity and mortality in these sub-populations, and especially affects northern Ghana. In response, SPRING/Ghana is collaborating with the Ghana Health Service (GHS) and other partners and sectors to implement program interventions aimed at reducing the prevalence of stunting and anaemia in children under five years of age and anaemia among women of reproductive age, especially within the first 1,000 days of life.

The procurement and delivery of HemoCue® devices in program year 2015 by the U.S. Agency for International Development's SPRING and RING projects has made anaemia screening possible at almost all health centres and CHPS compounds in the Northern Region. The GHS Regional Directorate's request to have health staff properly trained in the use and maintenance of the device led SPRING's Micronutrient Advisor, Dr. Denish Moorthy, to provide technical assistance for the development of this training manual. Dr. Moorthy would like to acknowledge the assistance provided by HemoCue® America, whose training materials served as a generic template for this manual. We also acknowledge the strong support received from the GHS Northern Regional Directorate, especially, Dr. Jacob Y. Mahama; the Regional Director of Health Services, Alhaji Sofo Mutaru; and Regional Nutrition Officers and team members Porbilla Ewura and Benedict Ofori Appiah.

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| | | |
|--------------------------------|---|------------------------|
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INTRODUCTION

Preface

Anaemia is an urgent public health problem that affects children and women throughout the life course and results in a high burden of morbidity and mortality. Caused by multiple factors, anaemia requires a package of mitigating interventions. The main approaches to managing anaemia include malaria prevention, diagnosis, and treatment; helminth prevention and control; and nutrition-related interventions. Nutrition-based approaches include modifying food processing and preparation techniques to ensure optimal availability and absorption; promoting the consumption of adequate amounts of iron-rich foods; increasing the bioavailability of iron-rich foods by supporting farmers in growing and marketing iron-rich crops; mass fortification of food; and biofortification of foods. These strategies are preferable in the long-term; interim interventions are often needed to meet the recommended dietary intake requirements of populations that are not reached using nutrition-based approaches. Point-of use fortification with micronutrient powders or iron tablets or syrups for children can increase iron levels and effectively reduce anaemia. Furthermore, given the high iron requirements during pregnancy, iron–folic acid (IFA) supplementation has long been recommended for all pregnant women, and more recently for all women of reproductive age. Delayed cord clamping is a non-dietary intervention to increase the total body iron content of infants at birth. Interventions having an indirect impact are water, sanitation, and hygiene (WASH) interventions, family planning, and infant and young child feeding practices.

The effectiveness of the interventions depends on accurate and reliable diagnosis of anaemia. The Ghana Health Service has distributed HemoCue[®] point-of-care devices to measure haemoglobin concentration at the health facility level, to assess the prevalence of anaemia. The objective of this manual is to define and explain anaemia, its causes and effects, and methods for diagnosis of—also to outline the procedure for measuring haemoglobin concentration with the HemoCue Hb 301 device. The target audience for this manual is staff from health facilities who have been selected to become master trainers. These selected personnel will travel to the districts to provide training to the health staff in the subcentres and Community-Based Health Planning and Services (CHPS) zones.

Overview

Welcome to the HemoCue trainer’s guide. This manual will:

1. Describe the objectives of the training
2. Describe the nature (underlying assumptions) of the training package
3. Outline the training to be provided

4. Describe the process of measuring haemoglobin concentrations using the HemoCue Hb 301 system
5. Provide information about each lesson/section in this half-day training

Objectives of the Training Programme

The HemoCue training programme is designed to ensure that staff in health centres and CHPS zones have the knowledge and skills needed to diagnose anaemia at health facilities and in the community. This manual is part of a broader integrated anaemia training package designed to revitalise how anaemia is prevented and treated in Ghana.

The objectives of this manual are to:

1. Provide facilitators with sufficient guidance and materials to support their training of health workers on the use of the HemoCue to diagnose anaemia
2. Provide guidance to facilitators to enable them to train health staff in ensuring the supply of essential commodities to sustain the use of the HemoCue device
3. Provide materials that allow facilitators to assess the impact of the training through questionnaires as well as observation

Nature of the Training

This half-day training programme combines didactic lecture, demonstration of process, and self-assessment. The half-day session ensures that the health facility staff will know how to carry out haemoglobin assessment with the HemoCue Hb 301 device. However, it will take practice and repetition for the staff to become familiar with the use of the device. Trainers should highlight the fact that these trainings DO NOT end with the training session, but rather, the training is the start of a process that will involve follow-up and support from the trainers.

How to Use This Manual

This manual is an aid to carrying out the training workshop. It is divided into six timed lessons and one post-training assessment session for a total duration of three hours. Each of the lessons deals with a subject related to the diagnosis of anaemia using the HemoCue Hb 301 device.

Each lesson has instructions on facilitation. Some of the lessons use a corresponding PowerPoint presentation to convey information. These presentations are designed to be printed out as hard copies. The information in the PowerPoint slides is presented in this manual's lesson text in a form that can be used by the facilitator.

Participants in the training will be given a participant's manual to which they can refer for the salient points of the training.

Outline of the Training Workshop: Agenda and Lessons

The information to be imparted in the training workshop has been split into lessons. Each lesson is divided into sections that break the information to be presented into smaller, easy-to-understand pieces. For lessons 2–6, the lesson plan is presented in up to four components—Purpose, Key Information, Materials Needed, and Activities. Note that not each lesson contains each of these components: for example, some lessons consist of lecture only and do not include activities for the participants.

Each lesson title, which is highlighted in bold below, serves as an agenda item for the training workshop. Lesson 1 introduces the workshop to the participants. Lessons 2, 3, and 4 are didactic in nature, and each has a corresponding PowerPoint presentation. Lesson 5 is demonstration and practice—the core objective of the training workshop. Lesson 6 is a paper-based exercise to determine commodity requirements for the sustainability of the HemoCue-based anaemia diagnosis programme.

| # | Lesson | Duration |
|---|---|------------|
| 1 | Introduction to the Workshop | 20 minutes |
| | 1.1 Objectives of the training | 10 minutes |
| | 1.2 Pre-training assessment | 10 minutes |
| 2 | Overview of Anaemia | 30 minutes |
| | 2.1 What is anaemia? | 5 minutes |
| | 2.2 Causes and consequences of anaemia | 5 minutes |
| | 2.3 Prevalence of anaemia: worldwide and in Ghana | 5 minutes |
| | 2.4 Major causes of anaemia in Ghana | 5 minutes |
| | 2.5 Key interventions for anaemia control in Ghana | 10 minutes |
| 3 | Overview of Anaemia Measurement | 20 minutes |
| | 3.1 How is anaemia measured? | 10 minutes |
| | 3.2 What are the cutoffs for diagnosing anaemia? | 5 minutes |
| | 3.3 What do I do after diagnosing anaemia? | 5 minutes |
| 4 | Overview of the HemoCue[®] Hb 301 Device | 40 minutes |
| | 4.1 Components of the HemoCue Hb 301 device | 5 minutes |
| | 4.2 Supplies for estimating haemoglobin with the HemoCue Hb 301 | 5 minutes |
| | 4.3 Steps for testing haemoglobin with the HemoCue Hb 301 | 20 minutes |
| | 4.4 Maintenance and storage of the HemoCue Hb 301 | 10 minutes |
| 5 | Demonstration: Use of the HemoCue Hb 301 Device | 90 minutes |
| 6 | Sustainability of Anaemia Testing with the HemoCue Hb 301 Device | 30 minutes |
| | 6.1 Rationale for ensuring a continuous supply chain | 5 minutes |
| | 6.2 How to estimate supplies needed for HemoCue use | 5 minutes |
| | 6.3 Calculation of supplies needed for anaemia diagnosis using HemoCue | 20 minutes |
| 7 | Post-Training Assessment | 10 minutes |

LESSON 1: INTRODUCTION TO THE WORKSHOP

Total duration of unit: 20 minutes

1.1 Objectives of the Training

Duration: 10 minutes

The purpose of this session is to present the objectives of the training to the participants.

Activity:

Interactive discussion

1. Introduce yourself and ask each of the participants to introduce themselves.
2. Present the objective as below.

The objective of the training programme is to provide health workers in subcentres and CHPS zones with:

- a. Guidance and materials in the use of the HemoCue device to diagnose anaemia.
 - b. Guidance on the maintenance and storage of the HemoCue device.
 - c. Guidance on how to use the results of the haemoglobin testing—either to provide counselling or refer the person being tested to a more specialised health facility.
 - d. Guidance on ensuring the supply of essential commodities to sustain the use of the HemoCue device.
3. Lay out the expectations for participants as follows.
 - a. They will pay attention during the lectures and demonstration.
 - b. They will practice the procedure taught in the field.
 - c. They will ask questions if they have not understood any part of the training, no matter how simple it seems.
 4. Ask them if they have any questions about why they are at the training. If participants ask questions about content that is to be covered later in the session, assure them that you will answer their questions at the appropriate time.

1.2 Pre-Training Assessment

Duration: 10 minutes

The Pre-Training Questionnaire assesses participants' knowledge of the HemoCue Hb 301 device and capillary blood sampling.

Materials Needed:

Pre-training questionnaire, pens

Hand out the printed copies of the Pre-Training Questionnaire (Annex A) and ask the participants to fill it out.

After the workshop, rate the answers using the **answer key** also provided in **Annex A**, following the questionnaire. You will compare the Pre-Training and Post-Training Questionnaires to see how well the participants have retained the information provided in the training session.

LESSON 2: OVERVIEW OF ANAEMIA

Total duration: 30 minutes

Purpose:

The aim of this lesson is to highlight the importance of anaemia with regard to body function. This session uses the PowerPoint presentation titled “**Anaemia – An Overview**”. Please follow the slides as numbered in the presentation. Request that the participants ask questions at the end of the presentation. The total duration of the presentation allows time for participants’ questions.

Materials Needed:

PowerPoint presentation, projector, computer

Key Information:

2.1 What Is Anaemia?

Duration: 5 minutes

Open the presentation titled “**Anaemia—An Overview**”. Provide the following key information in **slide #2 (What is Anaemia?)** of the presentation, to the participants:

1. *Anaemia* comes from a Greek word that refers to a “want for blood”. This indicates that anaemia causes problems through its effects on the circulatory system.
2. The red blood cells fulfil an important function—carrying oxygen from the lungs to the tissues. *Point out that the two pictures show an electron microscopic view of human red blood cells, which have a dumbbell shape.*
3. The oxygen is carried in the red blood cells by a protein called haemoglobin.
4. Decrease in haemoglobin levels can cause a decrease in transport of oxygen to the body cells, causing all the effects of anaemia.
5. Reduced haemoglobin is referred to as anaemia, and therefore it is important to measure the haemoglobin levels in the body to determine anaemia.

2.2 Causes and Consequences of Anaemia

Duration: 5 minutes

Provide the following key information in **slide #3 (Causes of anaemia)** and **slide #4 (Consequences of anaemia)** of the presentation titled “**Anaemia—An Overview**” to the participants:

On **slide #3**, provide the following information to participants:

1. There are four main causes of anaemia—deficient intake, infectious disease such as malaria and helminth infection, inflammation from common diseases such as diarrhoea and pneumonia, and genetic disorders.
2. These micronutrients—iron, folate, vitamin A, vitamin B12, and zinc—are needed for the formation, maturation, and function of red blood cells. Deficiencies in these micronutrients due to decreased intake results in red blood cells that are poorly formed, die easily, or are unable to carry out their main function of carrying oxygen.
3. Malarial parasites grow and multiply inside the red blood cells. When the parasites mature, they rupture the red blood cells, thus causing increased destruction and decreased levels of red blood cells. In addition, inflammation due to malaria leads to decreased production of red blood cells.
4. Helminth infections cause loss of blood from the intestines, thus leading to anaemia.
5. Common chronic infections lead to a state of inflammation, which reduces the absorption of micronutrients such as iron from the small intestine, as well as the ability of the body to access stores of iron in the blood macrophages.
6. Genetic disorders such as thalassemia, sickle cell disease, Hb-E, and Hb-C cause increased destruction of abnormal red blood cells, which may not properly develop due to the genetic defect. They also cause the decreased production of *normal* red blood cells, thus causing anaemia.
7. Note that the references for these statements are on the bottom on the slide.

On **slide #4**, state the following for the participants:

1. Anaemia affects all life stages.
2. On the slide, the high-risk, vulnerable groups are represented—pregnant women on top right, children under five on bottom right, adolescent girl on bottom left, and the country as a whole on top left.
3. For pregnant women, anaemia causes low birthweight and increases the risk of preterm delivery and maternal mortality.
4. For children under five, anaemia leads to decreased development in all domains—the physical, cognitive, and socio-emotional—and causes increased risk of infections and mortality.
5. For adolescent women, anaemia decreases academic performance and overall quality of life.
6. For the nation as a whole, anaemia increases the risk of disease and disability in the population, dampening economic productivity and increasing overall cost to society.

2.3 Prevalence of Anaemia: Worldwide and Ghana

Duration: 5 minutes

Provide the following key information in **slide #5 (Anaemia in the World)** and **slide #6 (Anaemia in Ghana)** of the presentation titled **“Anaemia—An Overview”** to the participants.

On **slide #5**, state the following for the participants:

1. The graphic represents the prevalence of anaemia in the world—in children under five years on the left and in pregnant women on the right. Note that the darker the colour, the higher the prevalence of anaemia.
2. Anaemia affects one-quarter of the world’s population, and young children under five and women are the population groups at high risk for anaemia.
3. On the map, the darkest colours are present in south Asia and West Africa. The burden of disease due to anaemia is highest in these two regions. Due to the higher population of South Asia, the number of people with anaemia is higher, but the levels of severity are higher in West Africa.

On **slide #6**, state the following for the participants:

1. The graph represents the status of anaemia in Ghana among children under five in blue, and among menstruating women in orange. The graph shows the prevalence of anaemia in these two groups in 2008 and 2014. The data comes from the 2014 Ghana Demographic and Health Survey. Mention that the 40 percent line represents anaemia as a public health problem.
2. At present, 7 of every 10 children under five in Ghana has anaemia, based on a prevalence of 66 percent in 2014.
3. At present, 4 of every 10 women in Ghana has anaemia, based on a prevalence of 42 percent in 2014.
4. Anaemia in children and women has decreased over the last six years, but it remains a major problem.

2.4 Major Causes of Anaemia in Ghana

Duration: 5 minutes

Provide the following key information in **slide #7 (Causes of Anaemia in Ghana)** of the presentation titled **“Anaemia—An Overview”** to the participants:

1. The slide shows the prevalence of the major causes of anaemia in Ghana—malaria, helminth infection, and micronutrient deficiency, specifically of iron, vitamin A, vitamin B12 and folate, and zinc.

2. Apart from malaria, the prevalence figures of other causes are reported from multiple studies, and they are not representative of the nation. Also note that the most common cause of anaemia varies widely within Ghana, and the most prevalent cause in one region may not be the most prevalent in another.
3. Malaria affects almost one-third of children in Ghana.
4. Helminth infection affects anywhere from 1 percent to almost 50 percent of the population.
5. Micronutrient deficiencies also vary widely in different regions of Ghana, as shown.

2.5 Key Interventions for Anaemia Control in Ghana

Duration: 10 minutes

Provide the following key information in **slide #8 (Supplementation and Fortification)**, **slide #9 (Disease Control)**, **slide #10 (Dietary Intervention)**, and **slide #11 (Water, Sanitation, and Hygiene. Family planning, and Social and behaviour change communication)** of the presentation titled “**Anaemia—An Overview**” to the participants.

On **slide #8**, state the following for the participants:

1. Supplementation and fortification can have a major impact on anaemia prevalence.
2. Supplementation is with iron–folic acid (IFA), vitamin A, and a multiple-micronutrient formulation. The groups targeted for supplementation are children 6–23 months of age and women of reproductive age. Interventions shown to have the maximum impact include IFA for pregnant women, IFA for adolescent girls ages 15–19 years, IFA for women of reproductive age (15–49 years), vitamin A supplementation for children under five years (for children of ages 6–11 months, we give 100,000 IU; for children of 12–59 months, we give 200,000 IU), and micronutrient powders for children of 6–23 months.
3. Mass fortification is another proven intervention. Fortification refers to the addition of micronutrients to cereal staples such as wheat, rice, and maize; iodine and iron to salt; and vitamin A to fats and oils, and sugar;. Mention that village-level fortification also exists in Ghana. The asterisk marks the intervention which is not as well studied as the others.

On **slide #9**, state the following for the participants:

1. Control of malaria with these interventions—intermittent preventive treatment in pregnant women; malaria prevention with bed nets (long-lasting insecticide-treated nets); indoor residual spraying; and prompt diagnosis and treatment with antimalarials—has been shown to reduce anaemia prevalence.
2. Control of worm infections during pregnancy and in children ages 1–5 years reduced anaemia by reducing the loss of blood from the intestine.

3. Control of common infectious diseases reduced inflammation, thus contributing to lower anaemia rates. The asterisk marks the intervention which is not as well studied as the others.

On **slide #10**, state the following for the participants:

1. Although dietary interventions at the household level—such as increasing the diversity of food and also increasing intake of micronutrient-rich food—can help, the evidence of their impact is indirect; that is, they decrease anaemia by increasing overall health, resulting in the improved biological functions that come with good health. Mention that each health care contact should include counselling for appropriate nutrition.
2. From left to right, the photos shown: (1) iron-rich pearl millet crop; (2) promotion of foods rich in vitamin C that can increase iron absorption; and (3) foods rich in iron.
3. Infant and young child feeding practices—early initiation of breastfeeding, promotion of exclusive breastfeeding for six months, and appropriate complementary feeding—improve micronutrient status and help reduce anaemia.

On **slide #11**, state the following for the participants:

1. The icons on the slide show other interventions that can help reduce anaemia.
2. WASH interventions at the community level—safe, improved water supply, improved sanitation facilities, behavioral interventions to promote hygiene and use of facilities, and prevention of environmental enteric dysfunction—help reduce anaemia by reducing causes of chronic inflammation. *Environmental enteric dysfunction* is a condition in which the intestines are unable to absorb nutrients due to the chronic inflammation brought on by poor sanitation and hygiene.
3. Family planning interventions increase birth spacing, which improves anaemia by allowing the mother to replenish her iron stores between pregnancies.
4. All direct and indirect interventions need a social and behavior change communication component in order to work.

Stress that anaemia control requires a combined joint effort among many sectors—health, nutrition, education, reproductive health, and agriculture. Among the interventions discussed, some are supported by strong evidence of impact on anaemia. On the other hand, other interventions which we know can affect anaemia have not been conclusively proved effective in high-quality studies.

End the presentation after slide #12 (“thank you” slide), and open the floor for questions.

LESSON 3: OVERVIEW OF ANAEMIA MEASUREMENT

Total duration: 20 minutes

Purpose:

The aim of this lesson is to highlight the importance of accurately measuring hemoglobin level to assess the level of anaemia. This session uses the PowerPoint presentation titled “**Overview of Anaemia Measurement**”. Please follow the slides as numbered in the presentation. Request that the participants ask questions at the end of the presentation. The total duration of the presentation allows time for participants’ questions.

Materials Needed:

PowerPoint presentation, projector, computer

Key Information:

3.1 How Is Anaemia Measured?

Duration: 10 minutes

Open the presentation titled “**Overview of Anaemia Measurement**” Provide the following key information in **slide #2 (Clinical Signs and Symptoms)**, **slide #3 (Devices)**, **slide #4 (Haemoglobin Colour Scale)**, **slide #5 (Automated Analysers)**, and **slide #6 (HemoCue®)** of the presentation, to the participants.

On **slide #2**, state the following for the participants:

1. Detecting anaemia is very important. Knowing the signs and symptoms will help you to recognize it. A sign is something a doctor or observer (you) can see or feel. A symptom is something the person affected feels and reports to you. We can help detect anaemia by taking a thorough clinical history, doing a clinical examination, and testing the blood to estimate haemoglobin level.
2. A patient with anaemia will present with any of the following signs and symptoms: weakness and getting tired easily, dizziness, shortness of breath, palpitations.
3. You should be patient, friendly, and observant as you interview the patient. On examination, you may find that they have pale palms, nail beds, or conjunctiva. These will make you suspect that the person may have anaemia which can be confirmed by blood tests, if possible.

On **slide #3**, state the following for the participants:

1. The surest way you can confirm the presence of anaemia is through haemoglobin measurement.
2. Three devices are available for estimating haemoglobin; each has advantages and disadvantages. They are:
 - a. The Tallquist method or the haemoglobin colour scale
 - b. Automated haematology analyser
 - c. The HemoCue device
3. The more accurate methods measure the concentration of haemoglobin in the blood directly, using an automated haematology analyser in the laboratory or using a HemoCue device if one is available in the clinic.

On **slide #4**, state the following for the participants:

1. The Tallquist is a method commonly used by many facilities.
2. This method compares the colour intensity of a drop of blood on filter paper to a colour code. Blood gets its colour from haemoglobin and so the more intense the colour, the more haemoglobin is in the blood. This gives a very rough estimate of the haemoglobin level, which should be confirmed by laboratory tests.
3. The main advantages of this method are its low cost and immediate result.
4. It is simple and portable, and does not require reagents or electricity.
5. It does, however, require a special filter paper.
6. The colour on the filter paper is affected by lighting, temperature, humidity, and the size and thickness of the blood spot.
7. The assessment of observers comparing the same blood spot can vary greatly.

On **slide #5**, state the following for the participants:

1. Automated haematology analysers are used in laboratories.
2. They are accurate and reliable.
3. They are, however, laboratory-dependent, and require infrastructural support. This makes them expensive to use.
4. The measurement involves an additional step of transport of the blood specimen from its collection point to the laboratory.

On **slide #6**, state the following for the participants:

1. HemoCue devices are used for quantitative whole blood haemoglobin determination in primary care or blood donation settings.
2. The HemoCue device has many uses: screening of high-risk populations—children, pregnant women, adolescent girls—in both health facilities and in the community, for surveillance of anaemia, and as part of research studies where haemoglobin measurements are included.
3. HemoCue devices provide an immediate result.
4. The HemoCue is accurate and reliable.
5. It can be battery operated.
6. It is ideal for use in a setting with limited resources and skills.
7. It is, however, also the most expensive method because the microcuvettes needed for the test are expensive.

3.2 What Are the Cutoffs for Diagnosing Anaemia?

Duration: 5 minutes

Provide the following key information in **slide #7 (Haemoglobin Cutoffs)** of the presentation titled **“Overview of Anaemia Measurement”** to the participants:

1. The World Health Organization has provided the cutoffs to determine when a child, man, or woman has anaemia, based on the measure of haemoglobin concentration.
2. The table shows the cutoffs in grams/deciliter that are used to determine whether a person has anaemia.
3. The table also shows a range of values that determine the severity of anaemia—mild, moderate, and severe. Severe anaemia usually requires therapeutic treatment in all age groups. Note for participants the levels at which anaemia is determined and also the levels which indicate severe anaemia.
4. **Note to facilitator: Please hand out printed copies of the table on slide #7 to the participants, reproduced below, for them to use as a reference when conducting hemoglobin assessments.**
5. With greater age, the cutoffs levels increase. **Children under five years** and **pregnant women** have the same cutoffs for anaemia—11 g/dL to indicate anaemia and 7 g/dL to indicate severe anaemia.
6. The cutoffs for determining anaemia in **Menstruating women, including adolescent girls** and in **children of ages 12–14 years**, are the same—12 g/dL to indicate anaemia and 8 g/dL to indicate severe anaemia.
7. **For children ages 5–11 years**, the cutoffs are 11.5 g/dL to indicate anaemia and 8 g/dL to indicate severe anaemia.

8. For men, the cutoff levels are higher—13 g/dL to indicate anaemia and 8 g/dL to indicate severe anaemia.

| Age Group | No Anaemia (g/dL) | Anaemia (g/dL) | | |
|----------------------------------|-------------------|----------------|----------|--------|
| | | Mild | Moderate | Severe |
| Children 6–59 months (< 5 years) | > 11 | 10–10.9 | 7–9.9 | < 7 |
| Children 5–11 years | > 11.5 | 11–11.4 | 8–10.9 | < 8 |
| Children 12–14 years | > 12 | 11–11.9 | 8–10.9 | < 8 |
| Nonpregnant women > 15 years | > 12 | 11–11.9 | 8–10.9 | < 8 |
| Pregnant women | > 11 | 10–10.9 | 7–9.9 | < 7 |
| Men > 15 years | > 13 | 11–12.9 | 8–10.9 | < 8 |

3.3 What Do I Do after Diagnosing Anaemia?

Duration: 5 minutes

From the presentation titled **“Overview of Anaemia Measurement”**, provide the following key information in **slide #8 (After Diagnosis)** to the participants:

1. It is important to know what to advise the patient who has been diagnosed with anaemia.
2. Please be patient and answer all questions asked by the patient to the best of your ability.
3. If a patient is severely anaemic, please advise them to see a medical professional to seek advice on the best course of treatment. They may need further testing and follow-up to determine the cause of the anaemia and then treat it accordingly.
4. If the patient has mild or moderate anaemia, consider these five evidence-based options that have been shown to have an impact on anaemia, and one or more of which should be included in the management of anaemia:
 - a. IFA supplementation for pregnancy
 - b. For malaria, intermittent preventive treatment in pregnancy (IPTp), insecticide-treated nets
 - c. Deworming
 - d. Reducing infections by—

- I. Reducing exposure to human and animal faeces
 - II. Washing hands with soap
 - III. Exclusive breastfeeding from 0–6 months
- e. Advising consumption of an iron-rich/diverse diet (4-Star diet, with each “star” denoting one of these 4 foods - Energy giving foods, Animal-source body building foods, Protective foods, and Water) for children 6–23 months, adolescent girls, and pregnant and menstruating women
- 5. Promotion of consumption of fortified foods to help ensure supply of the micronutrients required to prevent and reduce anaemia.
 - 6. Other evidence-based interventions will need to be promoted. These include weekly IFA supplementation for women of childbearing age, including adolescent girls; use of MNPs for children ages 6–23 months; and delayed cord clamping for newborns.

End the presentation after slide #9 (“thank you” slide), and open the floor for questions.

LESSON 4: OVERVIEW OF THE HEMOCUE HB 301 DEVICE

Total duration: 40 minutes

Purpose:

The aim of this lesson is to describe the HemoCue Hb 301 device, along with instructions for operation and maintenance. This session uses the PowerPoint presentation titled “**Overview of HemoCue**”. Please follow the slides as numbered in the presentation. Request that participants ask questions at the end of the presentation. The total duration of the presentation allows time for participants’ questions. The following lesson is drawn from the *HemoCue® Hb 301 System Training Guide*, provided by HemoCue America.

Materials Needed:

PowerPoint presentation, projector, computer

Key Information:

4.1 Components of the HemoCue Hb 301 Device

Duration: 5 minutes

Open the presentation titled “**Overview of HemoCue**”. If it is possible, play the movie on **slide #2**. From the open presentation, present the information in **slide #3 (Components)** to the participants.

On **slide #2**, state the following for the participants:

1. This is a short movie clip that shows how the HemoCue device is used.
2. We will describe the various aspects of its use in the next few slides.

On **slide #3**, state the following for the participants:

1. The slide is animated.
2. The slide shows the various components (with photographs) that have been supplied with the HemoCue Hb 301 device, in numbered order.
 - a. HemoCue Hb 301 analyser
 - b. AC adapter
 - c. 4 type AA batteries (used where there is no power supply)
 - d. HemoCue Hb 301 microcuvettes

- e. Operating manual, training CD, Quick Reference Guide
 - f. HemoCue cleaner
3. The HemoCue Hb 301 analyser is powered by AC adapter or 4 AA batteries. It uses a wavelength of 506 nanometres (nm) for haemoglobin and a wavelength of 880 nm to adjust for turbidity. The machine is factory calibrated and there is no need for recalibration. If the machine displays an error code, it indicates potential malfunctions or conditions; please refer to the manual for an explanation of the error codes.
 4. The HemoCue Hb 301 analyser has an internal self-test that verifies measurement performance. An error code will display if the self-test fails.
 5. The HemoCue Hb 301 microcuvettes serve as pipettes and measuring vessels. Each one holds approximately 10 µL of blood. They are made of polystyrene plastic and contain no active ingredients. A package contains four bottles, with 50 microcuvettes in each bottle. An unopened bottle should be stored at temperature of 50–104°F (10–40 °C). If a bottle is opened, the microcuvettes should be used within 12 months.

4.2 Supplies for Estimating Haemoglobin with the HemoCue Hb 301

Duration: 5 minutes

Purpose:

Participants learn about the supplies needed to conduct haemoglobin testing with the HemoCue Hb 301 device.

Key Information:

Present the information in **slide #4 (Supplies)** of the presentation titled **“Overview of HemoCue”** to the participants.

On **slide #4**, state the following for the participants:

1. The slide is animated.
2. The slide shows the supplies needed to conduct haemoglobin testing with the HemoCue Hb 301 device:
 - a. Alcohol prep pads to clean the finger from which blood is to be drawn
 - b. Lancets to draw capillary blood
 - c. Lint-free gauze to wipe excess blood from the microcuvette
 - d. HemoCue Hb 301 analyser

- e. HemoCue Hb 301 microcuvettes
 - f. Sterile gloves
3. The supplies are used with the Hb 301 analyzer and microcuvettes.

4.3 Steps for Testing Haemoglobin with the HemoCue Hb 301

Duration: 20 minutes

Present the information in in **slide #5** to **slide #7 (Using the Hb 301 Analyser)**, and **slide #8** to **slide #12 (Drawing a Capillary Sample)** of the presentation titled “**Overview of HemoCue**” to the participants.

On **slide #5**, state the following for the participants:

- 4. Before pressing the power button, pull the cuvette holder out to the loading position. The loading position is one in which the well of the microcuvette holder is exposed. The measuring position is one in which the well of the microcuvette holder is hidden.
- 5. Turn on the HemoCue Hb 301 device.
- 6. Press and hold the start button until the display is activated.
- 7. The analyser automatically performs a self-test. This is seen as “888” on the screen along with all the other icons being activated, as shown in the top photograph.
- 8. After about 10 seconds, the display will show three flashing dashes, indicating that the analyser is ready for use, as shown in the bottom photograph.

On **slide #6**, state the following for the participants:

- 1. Haemoglobin testing is done in three simple steps:
 - a. Draw a finger-stick sample of capillary blood to completely fill the microcuvette. Place a drop of blood from the sample onto a sterile surface and fill the microcuvette from that drop. This is shown in the top photograph. A venous or arterial sample can be used.
 - b. Place the filled microcuvette into the analyser within 40 seconds of filling. This is shown in the centre photograph.
 - c. Wait for the analyser to show the haemoglobin value in g/dL. This is displayed in the bottom photograph. Record the result.

On **slide #7**, state the following for the participants:

- 1. If the cuvette holder remains in the measuring position, the result will remain on the display.
- 2. Record the result in your logbook or database.

3. Pull the cuvette holder out to the loading position and dispose of the microcuvette in an appropriate biohazard container.
4. Once the display shows three flashing dashes, another test may be performed.

Provide the following key information to the participants:

Taking a capillary sample and filling the microcuvette can result in measurement error if it is not done properly. The next few slides will take you through the process of drawing a capillary sample from a finger-stick puncture using a lancet.

On **slide #8**, state the following for the participants:

1. Capillary sampling is taken from the finger of a patient or donor.
2. The donor should be seated and their hand should be warm and relaxed to stimulate blood flow.
3. It is best to use the middle or ring finger as shown in the top photograph.
4. Any tight rings that can constrict the blood supply should be removed from the fingers.
5. Clean the fingertip (puncture site) with alcohol as shown in the bottom photograph.
6. Wipe the alcohol off with a dry, lint-free wipe or allow to air-dry COMPLETELY.
7. Note that the puncture site should not be on the tip of the finger, but rather to the side. This is done because the tip has many nerve endings and a puncture on the tip is very painful.

On **slide #9**, state the following for the participants:

1. Prior to performing the puncture, "prime" the fingertip by applying pressure at the upper joint with your thumb, using a rolling motion towards the tip of the finger, as shown in the top photograph.
2. **Do not "milk" the finger**, that is, do not slide your thumb from the palm of the hand towards the puncture site. Milking the finger will result in the mixing of plasma with blood and give an erroneous value of hemoglobin.
3. Apply pressure with your thumb at the upper joint and place your index finger on the side of the patient's finger, in a position that will allow you to gently squeeze.
4. Position the lancet off-centre from the fingertip and press the lancet firmly against the finger prior to activating the it, as shown in the bottom photograph. This will aid in obtaining a good sample.

On **slide #10**, state the following for the participants:

1. After the puncture has been made, apply gentle pressure as needed to extrude a large drop of blood, as shown in the top photograph.

2. Wipe away 2–3 good-sized drops of blood.
3. Hold the microcuvette opposite the filling end and insert the tip of the cuvette into a large drop of blood.
4. Hold the microcuvette in place until the entire teardrop-shaped cavity is filled with blood, as shown in the bottom photograph.
5. If the microcuvette is not completely filled, discard and use a new microcuvette.
6. DO NOT add blood to a partially filled microcuvette. Ensure that there are no air bubbles in the microcuvette.
7. Provide a gauze pad to the patient to allow them to put pressure on the puncture site for a minute to stop the bleeding.

On **slide #11**, state the following for the participants:

1. Wipe off the excess sample from the outer surfaces of the microcuvette with a dry, lint-free wipe in a “bread and butter” fashion” (wipe both the flat sides and the straight back edge of the microcuvette, as shown in the top photograph).
2. Be careful not to touch the open end of the microcuvette with the wipe. This may cause blood to be removed which could produce an erroneous result.
3. After testing, dispose of the lancet, microcuvette, and other biohazardous material as required according to local policy, as shown in the bottom photograph. See **Annex B** for proper disposal of sharps and blood products.

On **slide #12**, state the following for the participants:

For an error-free collection of capillary blood sample, remember the following simple precautions when carrying out the procedure:

1. The puncture site on the finger is to the side.
2. Make sure 2–3 large drops of blood are wiped away prior to filling the microcuvette.
3. NO “MILKING” or SQUEEZING.
4. Make sure the HemoCue Hb 301 microcuvette is filled completely in one continuous motion.
5. Make sure blood is not drawn out of the microcuvette when wiping the outside.
6. Make sure there are no air bubbles in the microcuvette.

4.4 Maintenance and Storage of the HemoCue Hb 301

Duration: 10 minutes

Present the information in **slide #13 (Maintenance)** and **slide #14 (Storage)** of the presentation titled “**Overview of HemoCue**” to the participants.

On **slide #13**, state the following for the participants:

1. No preventative maintenance is required for the electronic components.
2. Clean the cuvette holder each day of use using alcohol (70 percent) or mild detergent.
3. Dry the cuvette holder completely before re-inserting.
4. The optronics unit should be cleaned using the cleaner provided as shown or a dry, lint-free cloth wrapped around a stick, as shown in the photograph.

On **slide #14**, state the following for the participants:

1. When not in use, store the HemoCue Hb 301 analyser in a cool, dry place.
2. Keep away from direct heat and moisture.
3. Microcuvettes must be stored in a bottle between 50–104°F (10–40°C)
4. The microcuvettes in an opened bottle should be used within 12 months.

End the presentation after slide #15 (“thank you” slide), and open the floor for questions.

LESSON 5: DEMONSTRATION: USE OF THE HEMOCUE HB 301 DEVICE

Total duration: 90 minutes

Purpose:

Participants use the HemoCue Hb 301 device to measure haemoglobin.

Key Information:

In this session, participants practice and learn the correct technique to draw blood, use the HemoCue Hb 301 device, and learn to appreciate that measurement error results from variation from the correct method.

Materials Needed:

HemoCue Hb 301 analyser, HemoCue Hb 301 microcuvettes, alcohol prep pads, lancets, lint-free gauze, and sterile gloves

Activities:

Demonstration, group work, and interactive discussion

The activities in this lesson will be divided into three sessions.

1. In the **first session of 30 minutes** duration, titled *Demonstration*, the trainer will demonstrate the proper technique for the use of the HemoCue Hb 301 analyser to measure haemoglobin. She or he will cover topics related to capillary blood draw, precautions to be taken during each step of the process, and maintenance and storage of the instruments and supplies.
2. In the **second session lasting 45 minutes**, titled *Review and Experiment*, each participant will pick a partner. Each group of two will review the PowerPoint presentation titled **"Overview of HemoCue"** and ask the facilitator for clarifications on the procedure, if necessary. They will review **Annex C, Hb 301 Training Checklist**, and test each other's familiarity with the steps in the checklist. They will then try to assess each other's haemoglobin using the HemoCue Hb 301 device, as per the instructions that they have reviewed. The trainer should be on hand to provide guidance.
3. In the **third session of 15 minutes**, titled *Feedback*, each group will report on the activities of the second session to the rest of the participants. They will highlight what went right, what went wrong, and how they plan to ensure that any errors do not happen again.

LESSON 6: SUSTAINABILITY OF ANAEMIA TESTING WITH THE HEMOCUE HB 301 DEVICE

Total duration: 20 minutes

A potential drawback of the HemoCue device is its dependence on proprietary microcuvettes. These microcuvettes are expensive. For the health system to avail of the other advantages of this portable and simple-to-use device, the health worker must be able to anticipate the total number of microcuvettes and other supplies needed to ensure continued use of the HemoCue device.

This lesson presents a simple method to calculate the quantities and cost of the replacement commodities needed. That information can be used for both planning and requisitions within the health system. The role of policymakers is to explore ways to ensure adequate funding for the use of these devices for measuring anaemia.

Purpose:

Participants learn how to calculate quantities of replacement microcuvettes needed for sustainability of the programme.

Key Information:

6.1 Rationale for Ensuring a Continuous Supply Chain

Duration: 5 minutes

Participants will understand the need to predict requirements for the main supplies for haemoglobin estimation—microcuvettes, gloves, alcohol prep pads, lancets, and gauze pads—to ensure that they can continue to provide high-quality data on anaemia prevalence in Ghana.

Provide the following key information to the participants:

1. The process of estimating the quantities and costs of products required for a specific health programme (or service)—in this case, the estimation of haemoglobin concentration using the HemoCue device—is called quantification. This also involves determining when the products should be delivered to ensure an uninterrupted supply for the programme.
2. The most common reason that HemoCue devices are not used extensively is the lack of replacement commodities, especially the microcuvettes.
3. The other supplies for testing, including lancets and materials for asepsis, are available within the health system.

4. The health facility worker can do simple calculations to determine how many of each replacement product they would need to continue carrying out haemoglobin testing using the HemoCue device.

Open the floor for discussion.

6.2 How to Estimate Supplies Needed for HemoCue Use

Duration: 5 minutes

The following information will allow participants to understand the main inputs needed to calculate the quantity and cost of the supplies needed to continue the use of HemoCue for anaemia diagnosis in their health centre.

Lead the participants through the following key points, soliciting their feedback:

1. The main inputs needed to calculate the yearly (or quarterly or half-yearly, based on the data being input) requirement of HemoCue components are:
 - a. Data/numbers:
 - I. Population of your coverage area.
 - II. The different groups for whom anaemia diagnosis will be done using HemoCue in your health facility.
 - III. The percentage (or actual number) of the population that fall into each of those groups in your coverage area.
 - IV. The average number of haemoglobin measurements for each of those groups in the specified time frame. For example, in pregnant women, there are at the least two measurements—at first visit and at 36 weeks—that have to be done. The frequency for other groups can be varied, as appropriate.
 - V. Multiply the average number of haemoglobin measurements for each group by the total number of people in the group to obtain the total number of haemoglobin tests done for each group
 - VI. Sum up the total tests across all the groups
 - b. The cost per unit of the microcuvettes, lancets, alcohol prep swabs, and lint-free gauze
 - c. Sum up the cost per unit across all the supplies
2. Components (a) and (b) can be multiplied to get an estimate of how much it would cost to continue using the HemoCue.
3. Cost of delivery is not being included in this estimate, as it is hoped that this will be subsumed under the essential commodity supply chain.

4. The estimates can be increased by a certain percentage (2–3 percent) to account for losses due to many causes—such as equipment failure, losses in transport, storage or measurement.
5. If the budget is limited, the inputs can be changed as appropriate so that the total quantity and cost will fall within the budget. This will allow the health facility to explore whether one group or another will be prioritised for testing with HemoCue.
6. The sources of numerical estimates can be health facility reports or patient cards. Please revise accordingly if you feel that the estimates are in error. These are average values and should be replaced by local data, where available. Use cost estimates from wholesale distributors in Accra.

6.3 Calculation of Supplies Needed for Anaemia Diagnosis Using HemoCue

Duration: 20 minutes

Purpose:

Participants will understand how to calculate the supplies needed for anaemia diagnosis by HemoCue.

Use the worksheet in the activities section below to calculate the quantities, enter the cost, and calculate the totals.

Materials Needed:

Pen, worksheet, sheets of paper, calculator

Activity:

Group Work

Split into groups of four, with each sharing one common worksheet.

WORKSHEET

Indicate time period (quarterly, biannually, yearly)

All values to be entered in Ghanaian cedis

Numbers required

- a. Total population of your coverage area: _____ (A1)
- b. The different groups for whom anaemia diagnosis will be done by HemoCue® in your health facility or in your community (*ENTER EITHER A NUMBER OF PERCENTAGE*):
 - i. Pregnant women
 1. Number (if available) _____ (A2)

If the number of pregnant women is not known but percentages are known, then use two questions below to get an estimate – recognizing that it is only an estimate.

2. Percentage of total population _____ (A3)
3. Calculated number = $[A3 \times A1 / 100]$ _____ (A4)
4. Total pregnant women—EITHER (A2) or (A4) _____ (A5)

ii. Nonpregnant women of reproductive age (WRA) (excluding adolescents)

1. Number (if available) _____ (A6)

If the number of WRA is not known but percentages are known, then use two questions below to get an estimate – recognizing that it is only an estimate.

2. Percentage of total population _____ (A7)
3. Calculated number = $[A7 \times A1 / 100]$ _____ (A8)
4. Total WRA (nonadolescent)—EITHER (A6) or (A8) _____ (A9)

iii. Adolescent women 11–19 years of age

1. Number (if available) _____ (A10)

If the number of adolescent women is not known but percentages are known, then use two questions below to get an estimate – recognizing that it is only an estimate.

2. Percentage of total population _____ (A11)
3. Calculated number = $[A11 \times A1 / 100]$ _____ (A12)
4. Total adolescents—EITHER (A10) or (A12) _____ (A13)

iv. Children 6–23 months

1. Number (if available) _____ (A14)

If the number of children 6-23 months is not known but percentages are known, then use two questions below to get an estimate – recognizing that it is only an estimate.

2. Percentage of total population _____ (A15)
 3. Calculated number = $[A15 \times A1 / 100]$ _____ (A16)
 4. Total children < 2 years—EITHER (A14) or (A16) _____ (A17)
- v. Children 24–59 months

1. Number (if available) _____ (A18)

If the number of children 24-59 months is not known but percentages are known, then use two questions below to get an estimate – recognizing that it is only an estimate.

2. Percentage of total population _____ (A19)
3. Calculated number = $[A18 \times A1 / 100]$ _____ (A20)
4. Total children 2–5 years—EITHER (A18) or (A20) _____ (A21)

Total population covered using the HemoCue = $A5 + A9 + A13 + A17 + A21$
 _____ (A22)

- c. Average number of haemoglobin measurements for each of those groups
- i. Pregnant women _____ (A23)
 - ii. Nonpregnant WRA (excluding adolescents) _____ (A24)
 - iii. Adolescent women 11–19 years of age _____ (A25)
 - iv. Children 6–23 months _____ (A26)
 - v. Children 24–59 months _____ (A27)

- d. Total number of tests to be performed
- i. Pregnant women $[A23 \times A5]$ _____ (A28)
 - ii. Nonpregnant WRA (excluding adolescents) $[A24 \times A9]$ _____ (A29)
 - iii. Adolescent women 11–19 years of age $[A25 \times A13]$ _____ (A30)
 - iv. Children 6–23 months $[A26 \times A17]$ _____ (A31)
 - v. Children 24–59 months $[A27 \times A21]$ _____ (A32)

Total tests per time period = $A28 + A29 + A30 + A31 + A32 =$ _____ (A33)

Cost of supplies

- e. Cost per unit of microcuvettes
 - i. Cost of microcuvettes _____ (B34)
 - ii. Number of units _____ (B35)
 - iii. Cost per unit of microcuvettes [34/35] _____ (B36)
- f. Cost per unit of gloves
 - i. Cost of gloves _____ (B37)
 - ii. Number of units _____ (B38)
 - iii. Cost per unit of gloves [37/38] _____ (B39)
- g. Cost per unit of lancets
 - i. Cost of lancets _____ (B40)
 - ii. Number of units _____ (B41)
 - iii. Cost per unit of lancets [40/41] _____ (B42)
- h. Cost per unit of alcohol prep swabs
 - i. Cost of alcohol prep swabs _____ (B43)
 - ii. Number of units _____ (B44)
 - iii. Cost per unit of alcohol prep swabs [43/44] _____ (B45)
- i. Cost per unit of lint-free gauze
 - i. Cost of lint-free gauze _____ (B46)
 - ii. Number of units _____ (B47)
 - iii. Cost per unit of lint-free gauze [46/47] _____ (B48)

Total per unit cost of all supplies = B36 + B39 + B42 + B45 + B48 (B49)

Cost of doing HemoCue testing = [A33*B49] _____ (C50)

Inefficiency losses (2%) = [2*C50/100] _____ (D51)

Total cost of doing HemoCue testing = B49 + D51 _____ (E52)

Budget for anaemia testing = _____ (E53)

Budget shortfall (if appropriate) = [E53 – E52] _____

LESSON 7: POST-TRAINING ASSESSMENT

Total duration: 10 minutes

Purpose:

You will assess the knowledge of participants on the HemoCue device and capillary blood sampling at the end of the training session.

Materials Needed:

Printed copies of the Post-Training Questionnaire (**Annex D**)

Activity:

At the end of the workshop, hand out the printed copies of the Post-Training Questionnaire (**Annex D**) and ask participants to fill out. This questionnaire is the same as the Pre-Training Questionnaire. The idea is to compare the participants' answers on the Pre-Training and Post-Training Questionnaires to see how well the participants have retained the information provided in the training session.

ANNEX A

Training in HemoCue® 301 Use Pre-Training Questionnaire

Name: _____ Date: _____

Title: _____

Multiple choice (check all that apply):

| | | |
|--------------------------|--|---|
| 1. | Samples for use with the HemoCue Hb 301 microcuvettes include: | |
| <input type="checkbox"/> | a. | Capillary blood |
| <input type="checkbox"/> | b. | Venous blood |
| <input type="checkbox"/> | c. | Arterial blood |
| <input type="checkbox"/> | d. | Urine |
| 2. | How long do you have to introduce the filled microcuvette into the HemoCue Hb 301 analyser? | |
| <input type="checkbox"/> | a. | 50 seconds |
| <input type="checkbox"/> | b. | 10 minutes |
| <input type="checkbox"/> | c. | 40 seconds |
| <input type="checkbox"/> | d. | 5 minutes |
| 3. | The cuvette holder should be cleaned: | |
| <input type="checkbox"/> | a. | After each use |
| <input type="checkbox"/> | b. | Monthly |
| <input type="checkbox"/> | c. | Daily or more frequently if desired |
| <input type="checkbox"/> | d. | Never |
| 4. | When directed to do so in the Troubleshooting Guide in the Operating Manual, you should clean the inside of the optical unit with: | |
| <input type="checkbox"/> | a. | Bleach |
| <input type="checkbox"/> | b. | HemoCue cleaner or a cotton-tipped swab moistened with water or alcohol (without additives) |
| <input type="checkbox"/> | c. | Dip the entire unit in soap and water |
| 5. | Once a bottle is opened, HemoCue Hb 301 microcuvettes in vials are stable: | |
| <input type="checkbox"/> | a. | Until the expiration date on the vial |
| <input type="checkbox"/> | b. | For 30 days |
| <input type="checkbox"/> | c. | For 12 months |
| <input type="checkbox"/> | d. | Forever |

| | | |
|--------------------------|---|---|
| 6. | Supplies needed for a capillary sample include: | |
| <input type="checkbox"/> | a. | Lint-free wipes |
| <input type="checkbox"/> | b. | Alcohol prep pads |
| <input type="checkbox"/> | c. | Paper clips |
| <input type="checkbox"/> | d. | HemoCue microcuvette |
| 7. | How many cuvettes should be removed for a single capillary sample? | |
| <input type="checkbox"/> | a. | 1 (for immediate use) |
| <input type="checkbox"/> | b. | 3 |
| <input type="checkbox"/> | c. | 10 |
| <input type="checkbox"/> | d. | 6 |
| 8. | The patient's/donor's hands should be: | |
| <input type="checkbox"/> | a. | Cold |
| <input type="checkbox"/> | b. | Warm |
| <input type="checkbox"/> | c. | Relaxed |
| <input type="checkbox"/> | d. | Tense |
| 9. | The puncture site should be cleaned with: | |
| <input type="checkbox"/> | a. | Soap and water |
| <input type="checkbox"/> | b. | Hand sanitiser |
| <input type="checkbox"/> | c. | Alcohol prep pad |
| <input type="checkbox"/> | d. | None of the above |
| 10. | It is important during the capillary procedure to: | |
| <input type="checkbox"/> | a. | Maintain pressure on the fingertip when performing the finger stick |
| <input type="checkbox"/> | b. | Position and activate the lancet correctly |
| <input type="checkbox"/> | c. | Apply firm pressure to the lancet |
| <input type="checkbox"/> | d. | None of the above |
| 11. | How many drops of blood should be wiped away prior to filling the microcuvette? | |
| <input type="checkbox"/> | a. | None |
| <input type="checkbox"/> | b. | 1 good-sized drop |
| <input type="checkbox"/> | c. | 2–3 good-sized drops |
| <input type="checkbox"/> | d. | None |
| 12. | To clean excess residue from the filled microcuvette you should: | |
| <input type="checkbox"/> | a. | Wipe both flat sides and the straight back edge (in "bread and butter" fashion) |
| <input type="checkbox"/> | b. | Tap the cuvette on a napkin |
| <input type="checkbox"/> | c. | Rinse the cuvette under running water |
| <input type="checkbox"/> | d. | None of the above |

| True or false (check the box in the appropriate column) | TRUE | FALSE |
|---|--------------------------|--------------------------|
| The patient/donor should be seated during the capillary sampling procedure. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is not important to check the expiration date of the HemoCue microcuvettes. | <input type="checkbox"/> | <input type="checkbox"/> |
| The microcuvette should be removed prior to opening or handling alcohol for cleaning fingers. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is recommended to use the middle or ring finger for sampling. | <input type="checkbox"/> | <input type="checkbox"/> |
| The finger should be "milked" prior to performing the procedure. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is important to allow the alcohol-cleaned site to dry completely prior to sampling. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is okay to go back and fill the microcuvette if it was not completely filled in one continuous motion. | <input type="checkbox"/> | <input type="checkbox"/> |
| The HemoCue Hb 301 analyser will perform a "self-test" upon start-up and every second hour thereafter if left ON. | <input type="checkbox"/> | <input type="checkbox"/> |

Training in HemoCue® 301 Use Pre-Training Questionnaire – Answer Key

Name: _____ **Date:** _____

Title: _____

Multiple choice (check all that apply): ☒

| | | |
|-------------------------------------|--|---|
| 1. | Samples for use with the HemoCue Hb 301 microcuvettes include: | |
| <input checked="" type="checkbox"/> | a. | Capillary blood |
| <input checked="" type="checkbox"/> | b. | Venous blood |
| <input checked="" type="checkbox"/> | c. | Arterial blood |
| <input type="checkbox"/> | d. | Urine |
| 2. | How long do you have to introduce the filled microcuvette into the HemoCue Hb 301 analyser? | |
| <input type="checkbox"/> | a. | 50 seconds |
| <input type="checkbox"/> | b. | 10 minutes |
| <input checked="" type="checkbox"/> | c. | 40 seconds |
| <input type="checkbox"/> | d. | 5 minutes |
| 3. | The cuvette holder should be cleaned: | |
| <input type="checkbox"/> | a. | After each use |
| <input type="checkbox"/> | b. | Monthly |
| <input checked="" type="checkbox"/> | c. | Daily or more frequently if desired |
| <input type="checkbox"/> | d. | Never |
| 4. | When directed to do so in the Troubleshooting Guide in the Operating Manual, you should clean the inside of the optical unit with: | |
| <input type="checkbox"/> | a. | Bleach |
| <input checked="" type="checkbox"/> | b. | HemoCue cleaner or a cotton-tipped swab moistened with water or alcohol (without additives) |
| <input type="checkbox"/> | c. | Dip the entire unit in soap and water |
| 5. | Once a bottle is opened, HemoCue Hb 301 microcuvettes in vials are stable: | |
| <input type="checkbox"/> | a. | Until the expiration date on the vial |
| <input type="checkbox"/> | b. | For 30 days |
| <input checked="" type="checkbox"/> | c. | For 12 months |
| <input type="checkbox"/> | d. | Forever |

| | | |
|-------------------------------------|---|---|
| 6. | Supplies needed for a capillary sample include: | |
| <input checked="" type="checkbox"/> | a. | Lint-free wipes |
| <input checked="" type="checkbox"/> | b. | Alcohol prep pads |
| <input type="checkbox"/> | c. | Paper clips |
| <input checked="" type="checkbox"/> | d. | HemoCue microcuvette |
| 7. | How many cuvettes should be removed for a single capillary sample? | |
| <input checked="" type="checkbox"/> | a. | 1 (for immediate use) |
| <input type="checkbox"/> | b. | 3 |
| <input type="checkbox"/> | c. | 10 |
| <input type="checkbox"/> | d. | 6 |
| 8. | The patient's/donor's hands should be: | |
| <input type="checkbox"/> | a. | Cold |
| <input checked="" type="checkbox"/> | b. | Warm |
| <input checked="" type="checkbox"/> | c. | Relaxed |
| <input type="checkbox"/> | d. | Tense |
| 9. | The puncture site should be cleaned with: | |
| <input type="checkbox"/> | a. | Soap and water |
| <input type="checkbox"/> | b. | Hand sanitiser |
| <input checked="" type="checkbox"/> | c. | Alcohol prep pad |
| <input type="checkbox"/> | d. | None of the above |
| 10. | It is important during the capillary procedure to: | |
| <input checked="" type="checkbox"/> | a. | Maintain pressure on the fingertip when performing the finger stick |
| <input checked="" type="checkbox"/> | b. | Position and activate the lancet correctly |
| <input checked="" type="checkbox"/> | c. | Apply firm pressure to the lancet |
| <input type="checkbox"/> | d. | None of the above |
| 11. | How many drops of blood should be wiped away prior to filling the microcuvette? | |
| <input type="checkbox"/> | a. | None |
| <input type="checkbox"/> | b. | 1 good-sized drop |
| <input checked="" type="checkbox"/> | c. | 2-3 good-sized drops |
| <input type="checkbox"/> | d. | None |
| 12. | To clean excess residue from the filled microcuvette you should: | |
| <input checked="" type="checkbox"/> | a. | Wipe both flat sides and the straight back edge (in "bread and butter" fashion) |
| <input type="checkbox"/> | b. | Tap the cuvette on a napkin |
| <input type="checkbox"/> | c. | Rinse the cuvette under running water |
| <input type="checkbox"/> | d. | None of the above |

| True or false (check the box in the appropriate column) | TRUE | FALSE |
|---|-------------------------------------|-------------------------------------|
| The patient/donor should be seated during the capillary sampling procedure. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| It is not important to check the expiration date of the HemoCue microcuvettes. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| The microcuvette should be removed prior to opening or handling alcohol for cleaning fingers. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| It is recommended to use the middle or ring finger for sampling. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| The finger should be "milked" prior to performing the procedure. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| It is important to allow the alcohol-cleaned site to dry completely prior to sampling. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| It is okay to go back and fill the microcuvette if it was not completely filled in one continuous motion. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| The HemoCue Hb 301 analyser will perform a "self-test" upon start-up and every second hour thereafter if left ON. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

ANNEX B

Disposal of Sharps and Blood Products

Relevant sections have been extracted from the Ghana Ministry of Health's *National Policy and Guidelines for Infection Prevention and Control in Health Care Settings, 2015*, available at http://www.ghanahealthservice.org/downloads/National_Policy_and_Guidelines%20for_Infection_Prevention_and_Control_in_Health_Care_Settings_2015.pdf

Safety and Handling of Sharps Products

Adapted from Section 13: Injection Safety and Handling of Sharps; p. 69

This section deals with safe disposal of the lancets used for capillary blood drawing.

Please follow the following guidelines for handling the lancet:

- Do not recap, bend, break, or remove used needles from the lancet.
- Dispose of lancet into the appropriate sharps container after use (figure below).



Figure: Sharps container

- Sharps containers must be:
 - a. Rigid and puncture-resistant
 - b. Sealed on all sides, and must have a one-way lid opening system
 - c. Tamper-proof
- Label all sharps containers appropriately with the international biohazard symbol.
- Do not recycle lancets.
- Sharps must be segregated at the source of generation—i.e. at time of capillary blood draw.

Safety and Handling of Blood Products

Adapted from Section 15.3: Components of Health Care Waste Management; p. 75

This section deals with collection and disposal of the gloves, lint-free gauze, and alcohol prep pads. After the measurement is completed and after ensuring that the patient has stopped bleeding from the puncture site, collect the gauze handed to them, the microcuvette that was used to measure the patient's haemoglobin, the alcohol prep pad, and the gauze on which the microcuvette was wiped. Hold them in the palm of your hand, and remove the glove from your hand in a way that the materials are collected inside the glove. Hold the glove that you have removed in the other gloved hand. Now remove this glove in a similar fashion, so that the blood products are inside a double gloved layer. Dispose of the glove in a yellow marked container for collecting blood waste (see figure below).



Yellow bin

Figure: Blood waste collection container

Containers for the blood product should have the following characteristics:

- They should be nontransparent.
- They should be impervious.
- They should be leak-proof.
- They should have close-fitted lids.
- They should have sufficient strength to prevent easy damage during handling or use.

Disposal of the blood waste should be done as per Ghana Health Service protocol.

ANNEX C

HemoCue® Hb 301 Training Checklist

The user demonstrates an understanding of the features and the ability to perform these procedures.

The intended use of the HemoCue Hb 301 system

- How to power ON the Hb 301 analyser
- The purpose of the "self-test"
- When the analyser is ready for patient testing
- How to perform a finger stick as demonstrated by a certified HemoCue trainer
- How to properly fill the microcuvette.
- How to wipe the microcuvette in a "bread and butter" fashion after it has been filled
- The amount of time to perform the test once the microcuvette has been filled
- The storage requirements and expiration date of the microcuvettes
- How to clean the outside of the Hb 301 analyser
- How to clean the inside optronics unit of the Hb 301 analyser
- How to remove and clean the cuvette holder

ANNEX D

Training in HemoCue® 301 Use Post-Training Questionnaire

Name: _____ Date: _____

Title: _____

Multiple choice (check all that apply): ☒

| | | |
|--------------------------|--|---|
| 1. | Samples for use with the HemoCue Hb 301 microcuvettes include: | |
| <input type="checkbox"/> | a. | Capillary blood |
| <input type="checkbox"/> | b. | Venous blood |
| <input type="checkbox"/> | c. | Arterial blood |
| <input type="checkbox"/> | d. | Urine |
| 2. | How long do you have to introduce the filled microcuvette into the HemoCue Hb 301 analyser? | |
| <input type="checkbox"/> | a. | 50 seconds |
| <input type="checkbox"/> | b. | 10 minutes |
| <input type="checkbox"/> | c. | 40 seconds |
| <input type="checkbox"/> | d. | 5 minutes |
| 3. | The cuvette holder should be cleaned: | |
| <input type="checkbox"/> | a. | After each use |
| <input type="checkbox"/> | b. | Monthly |
| <input type="checkbox"/> | c. | Daily or more frequently if desired |
| <input type="checkbox"/> | d. | Never |
| 4. | When directed to do so in the Troubleshooting Guide in the Operating Manual, you should clean the inside of the optical unit with: | |
| <input type="checkbox"/> | a. | Bleach |
| <input type="checkbox"/> | b. | HemoCue cleaner or a cotton-tipped swab moistened with water or alcohol (without additives) |
| <input type="checkbox"/> | c. | Dip the entire unit in soap and water |
| 5. | Once a bottle is opened, HemoCue Hb 301 microcuvettes in vials are stable: | |
| <input type="checkbox"/> | a. | Until the expiration date on the vial |
| <input type="checkbox"/> | b. | For 30 days |
| <input type="checkbox"/> | c. | For 12 months |
| <input type="checkbox"/> | d. | Forever |

| | | |
|---|----|---|
| 6. Supplies needed for a capillary sample include: | | |
| <input type="checkbox"/> | a. | Lint-free wipes |
| <input type="checkbox"/> | b. | Alcohol prep pads |
| <input type="checkbox"/> | c. | Paper clips |
| <input type="checkbox"/> | d. | HemoCue microcuvette |
| 7. How many cuvettes should be removed for a single capillary sample? | | |
| <input type="checkbox"/> | a. | 1 (for immediate use) |
| <input type="checkbox"/> | b. | 3 |
| <input type="checkbox"/> | c. | 10 |
| <input type="checkbox"/> | d. | 6 |
| 8. The patient's/donor's hands should be: | | |
| <input type="checkbox"/> | a. | Cold |
| <input type="checkbox"/> | b. | Warm |
| <input type="checkbox"/> | c. | Relaxed |
| <input type="checkbox"/> | d. | Tense |
| 9. The puncture site should be cleaned with: | | |
| <input type="checkbox"/> | a. | Soap and water |
| <input type="checkbox"/> | b. | Hand sanitiser |
| <input type="checkbox"/> | c. | Alcohol prep pad |
| <input type="checkbox"/> | d. | None of the above |
| 10. It is important during the capillary procedure to: | | |
| <input type="checkbox"/> | a. | Maintain pressure on the fingertip when performing the finger stick |
| <input type="checkbox"/> | b. | Position and activate the lancet correctly |
| <input type="checkbox"/> | c. | Apply firm pressure to the lancet |
| <input type="checkbox"/> | d. | None of the above |
| 11. How many drops of blood should be wiped away prior to filling the microcuvette? | | |
| <input type="checkbox"/> | a. | None |
| <input type="checkbox"/> | b. | 1 good-sized drop |
| <input type="checkbox"/> | c. | 2-3 good-sized drops |
| <input type="checkbox"/> | d. | None |
| 12. To clean excess residue from the filled microcuvette you should: | | |
| <input type="checkbox"/> | a. | Wipe both flat sides and the straight back edge (in "bread and butter" fashion) |
| <input type="checkbox"/> | b. | Tap the cuvette on a napkin |
| <input type="checkbox"/> | c. | Rinse the cuvette under running water |
| <input type="checkbox"/> | d. | None of the above |

| True or false (check the box in the appropriate column) | TRUE | FALSE |
|---|--------------------------|--------------------------|
| The patient/donor should be seated during the capillary sampling procedure. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is not important to check the expiration date of the HemoCue microcuvettes. | <input type="checkbox"/> | <input type="checkbox"/> |
| The microcuvette should be removed prior to opening or handling alcohol for cleaning fingers. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is recommended to use the middle or ring finger for sampling. | <input type="checkbox"/> | <input type="checkbox"/> |
| The finger should be "milked" prior to performing the procedure. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is important to allow the alcohol-cleaned site to dry completely prior to sampling. | <input type="checkbox"/> | <input type="checkbox"/> |
| It is okay to go back and fill the microcuvette if it was not completely filled in one continuous motion. | <input type="checkbox"/> | <input type="checkbox"/> |
| The HemoCue Hb 301 analyser will perform a "self-test" upon start-up and every second hour thereafter if left ON. | <input type="checkbox"/> | <input type="checkbox"/> |

Training in HemoCue® 301 Use Post-Training Questionnaire – Answer Key

Name: _____ **Date:** _____

Title: _____

Multiple choice (check all that apply): ☒

| | | |
|-------------------------------------|--|---|
| 1. | Samples for use with the HemoCue Hb 301 microcuvettes include: | |
| <input checked="" type="checkbox"/> | a. | Capillary blood |
| <input checked="" type="checkbox"/> | b. | Venous blood |
| <input checked="" type="checkbox"/> | c. | Arterial blood |
| <input type="checkbox"/> | d. | Urine |
| 2. | How long do you have to introduce the filled microcuvette into the HemoCue Hb 301 analyser? | |
| <input type="checkbox"/> | a. | 50 seconds |
| <input type="checkbox"/> | b. | 10 minutes |
| <input checked="" type="checkbox"/> | c. | 40 seconds |
| <input type="checkbox"/> | d. | 5 minutes |
| 3. | The cuvette holder should be cleaned: | |
| <input type="checkbox"/> | a. | After each use |
| <input type="checkbox"/> | b. | Monthly |
| <input checked="" type="checkbox"/> | c. | Daily or more frequently if desired |
| <input type="checkbox"/> | d. | Never |
| 4. | When directed to do so in the Troubleshooting Guide in the Operating Manual, you should clean the inside of the optical unit with: | |
| <input type="checkbox"/> | a. | Bleach |
| <input checked="" type="checkbox"/> | b. | HemoCue cleaner or a cotton-tipped swab moistened with water or alcohol (without additives) |
| <input type="checkbox"/> | c. | Dip the entire unit in soap and water |
| 5. | Once a bottle is opened, HemoCue Hb 301 microcuvettes in vials are stable: | |
| <input type="checkbox"/> | a. | Until the expiration date on the vial |
| <input type="checkbox"/> | b. | For 30 days |
| <input checked="" type="checkbox"/> | c. | For 12 months |
| <input type="checkbox"/> | d. | Forever |

| | | |
|-------------------------------------|---|---|
| 6. | Supplies needed for a capillary sample include: | |
| <input checked="" type="checkbox"/> | a. | Lint-free wipes |
| <input checked="" type="checkbox"/> | b. | Alcohol prep pads |
| <input type="checkbox"/> | c. | Paper clips |
| <input checked="" type="checkbox"/> | d. | HemoCue microcuvette |
| 7. | How many cuvettes should be removed for a single capillary sample? | |
| <input checked="" type="checkbox"/> | a. | 1 (for immediate use) |
| <input type="checkbox"/> | b. | 3 |
| <input type="checkbox"/> | c. | 10 |
| <input type="checkbox"/> | d. | 6 |
| 8. | The patient's/donor's hands should be: | |
| <input type="checkbox"/> | a. | Cold |
| <input checked="" type="checkbox"/> | b. | Warm |
| <input checked="" type="checkbox"/> | c. | Relaxed |
| <input type="checkbox"/> | d. | Tense |
| 9. | The puncture site should be cleaned with: | |
| <input type="checkbox"/> | a. | Soap and water |
| <input type="checkbox"/> | b. | Hand sanitiser |
| <input checked="" type="checkbox"/> | c. | Alcohol prep pad |
| <input type="checkbox"/> | d. | None of the above |
| 10. | It is important during the capillary procedure to: | |
| <input checked="" type="checkbox"/> | a. | Maintain pressure on the fingertip when performing the finger stick |
| <input checked="" type="checkbox"/> | b. | Position and activate the lancet correctly |
| <input checked="" type="checkbox"/> | c. | Apply firm pressure to the lancet |
| <input type="checkbox"/> | d. | None of the above |
| 11. | How many drops of blood should be wiped away prior to filling the microcuvette? | |
| <input type="checkbox"/> | a. | None |
| <input type="checkbox"/> | b. | 1 good-sized drop |
| <input checked="" type="checkbox"/> | c. | 2-3 good-sized drops |
| <input type="checkbox"/> | d. | None |
| 12. | To clean excess residue from the filled microcuvette you should: | |
| <input checked="" type="checkbox"/> | a. | Wipe both flat sides and the straight back edge (in "bread and butter" fashion) |
| <input type="checkbox"/> | b. | Tap the cuvette on a napkin |
| <input type="checkbox"/> | c. | Rinse the cuvette under running water |
| <input type="checkbox"/> | d. | None of the above |

| True or false (check the box in the appropriate column) | TRUE | FALSE |
|---|-------------------------------------|-------------------------------------|
| The patient/donor should be seated during the capillary sampling procedure. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| It is not important to check the expiration date of the HemoCue microcuvettes. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| The microcuvette should be removed prior to opening or handling alcohol for cleaning fingers. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| It is recommended to use the middle or ring finger for sampling. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| The finger should be "milked" prior to performing the procedure. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| It is important to allow the alcohol-cleaned site to dry completely prior to sampling. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| It is okay to go back and fill the microcuvette if it was not completely filled in one continuous motion. | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| The HemoCue Hb 301 analyser will perform a "self-test" upon start-up and every second hour thereafter if left ON. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

SPRING

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