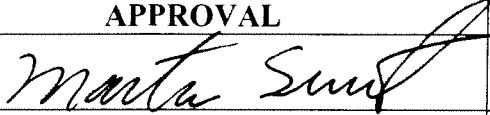
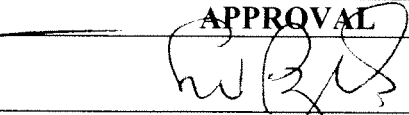
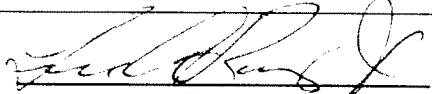


**MEDICAL CENTER OF LOUISIANA AT NEW ORLEANS
DIVISION OF NURSING
STANDARD CLINICAL NURSING PRACTICE MANUAL**

UNIVERSAL STANDARD PROCEDURE	HEMOGLOBIN TESTING WITH HEMOCUE Hb 201
EFFECTIVE: 12/01/2006 REVISION: 05/24/2007, 06/25/08, 05/21/10, 7/01/10	
APPROVAL	APPROVAL
	
Martha G. Smith, RN, MN Associate Hospital Administrator Department of Nursing	Fred Brazda, M.D Deputy Director, Pathology
	 Avery Ragan, Ph.D Director POCC

STANDARDS AND SCOPE OF HEMOGLOBIN TESTING BY THE HEMOCUE Hb 201 PHOTOMETER SYSTEM

Unit based Hemoglobin testing will be performed to ensure prompt quality care through diagnostic use in the screening for anemia and monitoring blood loss. The quantitative hemoglobin determination is indicated as a general fundamental test in acute as well as elective care. The test is used in assessing the status of a patient in such clinical situations as hemorrhage, hemolysis, dehydration, and other shifts in plasma volume-and for verifying the results of transfusion or treatment of other deficiency states as malnutrition.

STANDARD OF PROFESSIONAL PRACTICE

The Point of Care Coordinator (POCC) and/or designated personnel from the Pathology Department are responsible for routine QC and lab proficiency testing. They have the authority to recommend to the Departmental Director the removal of any instrument from an area that does not meet with specific standards of proficiency.

Any competent RN(Registered Nurse), LPN(Licensed Practical Nurse), MT(Medical Technologist), MLT(Medical Lab Technician) or NP (Nurse Practitioner) may perform a hemoglobin test to determine a hemoglobin value using patient capillary blood. A competent operator is defined as any RN, LPN, MT, MLT, or NP whose performance has been verified in the use of the HemoCue Hb 201 Analyzer (i.e., through orientation, in-service programs, and/or annual competency verification). Competency checks are to be performed once initially, at six months and annually thereafter. Documentation of initial competency will be filed in the users' personnel folder/POCT binder on the unit.

Annual competency checks will be done using the employees web based in-service site. In addition, employees will be required to successfully perform a quality control check to complete the competency requirements. Employees will be updated upon completion of the written test. Any operator who does not complete competency on a yearly basis will be locked out from using the HemoCue Hb 201 Analyzer. New employees must complete orientation and the skills checklist before being verified as users. Their operator ID and the date of their competency testing must be submitted to the POCC before they are authorized to use the instrument.

Any operator who demonstrates difficulty in performing Hemoglobin testing must complete an additional in-service in order to be verified as a competent operator.

PRINCIPLE OF OPERATION

The hemoglobin concentration in blood is determined as azidemethemoglobin utilizing a microcuvette with a dry reagent system and a dual wavelength photometer. The erythrocyte membranes are disintegrated by sodium deoxycholate, releasing the hemoglobin. Sodium nitrite converts the hemoglobin iron from the ferrous to the ferric state to form methemoglobin, which then combines with sodium azide to form azidemethemoglobin. Measurements are taken at 570 nm and 880 nm; the latter to correct for turbidity.

EQUIPMENT, REAGENTS, AND SUPPLIES

HemoCue Hb 201 Analyzer

HemoCue Hb 201 Microcuvettes (store at room temperature)

Whole Blood Controls (opened controls stable for 30 days stored refrigerated or at room temperature)

Lancets

Gloves

Alcohol Wipes

Lint free tissue

Hydrophobic material such as Parafilm

REAGENT AND CONTROL GUIDELINES

- A.** Normal precautions are exercised when handling laboratory reagents. Follow the Infection Control guidelines at MCLNO. Gloves should be worn at all times during the testing procedure and all appropriate laboratory safety guidelines should be followed.
- B.** Microcuvettes should be stored at room temperature. Do not refrigerate or freeze.

Microcuvettes are stable until the expiration date on the vial. Once a vial has been opened, it is stable for 3 months if the cap is kept on tightly between use. Date the vial when opened. Be sure to close the lid tightly after obtaining microcuvette to prevent deterioration of the microcuvettes from exposure to humidity. To insure stability of the cuvettes, the desiccant must be kept in the vial at all times. Cuvettes should be removed as needed for testing just prior to use.

- C. Outdated microcuvettes should be discarded
- D. Hemoglobin controls (low and high) are stable for 30 days once the vial has been opened if kept at room temperature or until the expiration date if it is less than 30 days from the date of opening. Controls are stable for 60 days once the vial has been opened if kept refrigerated or until the expiration date if it is less than 60 days from the date of opening. If refrigerated, controls must be brought to room temperature before use. Put the date that the control is opened on the bottles. They may be stored at room temperature or in the refrigerator.
- E. Any outdated controls should be discarded.
- F. All hemoglobin QC must be run at the time set up for lockout. If the QC is run before the lockout time, you will have to run QC again at the lockout time. QC results will be displayed as **PASS** or **FAIL**.
- G. All QC must be run once every 24 hours.
- H. All reagents and controls will be obtained from the laboratory at UH on the 4th floor. If you have any questions, call 903-3944/3897

START-UP PROCEDURE

1. Pull the cuvette holder out to the loading position. Press and hold the ON/Off button (left button) until the display is activated.
2. The display shows the version number of the program, after which it will show an hourglass and "Hb". During this time the analyzer will automatically verify the performance of the optronic unit.
3. After approximately ten seconds, the display will show three flashing dashes and the HemoCue symbol. This indicates that the HemoCue Hb 201 analyzer is ready for use.

QUALITY CONTROL TESTING PROCEDURE

Selftest:

The HemoCue Hb 201 analyzer has an internal electronic "SELFTEST". Every time the analyzer is turned on, it will automatically verify the performance of the optronic unit of the analyzer. This test is performed at regular intervals if the analyzer is on.

Liquid Quality Control:

1. The analyzer should be in the "Ready" mode prior to filling the cuvette.
2. Remove the vials from the refrigerator and allow to warm at room temperature for 15 minutes before mixing. If the controls are kept at room temperature, immediately proceed to the next step.
3. To mix; hold a vial horizontally between the palms of the hand. Do not pre-mix on a mechanical mixer.
 - a) Roll the vial back and forth for 20-30 seconds; occasionally invert the vial. Mix vigorously but do not shake.
 - b) Continue to mix in this manner until the red cells are completely suspended. Vials stored for a long time may require extra mixing.

- c) Gently invert the vial 8-10 times immediately before sampling.
 - d) Turn the vial upside down and look at the bottom of the vial. All the cells should be in solution before you dispense a sample.
4. Remove the cap from the vial. Dispense drop of control on parafilm or other appropriate material. If you are performing QC on more than one analyzer, do not use the same drop of control for both analyzers. Dispense a drop for each analyzer you are testing. **DO NOT ATTEMPT TO FILL THE CUVETTE DIRECTLY FROM THE CONTROL VIAL. IT WILL BECOME CONTAMINATED.**
 5. Enter your operator ID into the HemoCue. Press OK. If QC needs to be performed, the screen will show the icons for QC and stored data.
 6. Press QC. The choices will appear on the screen. Press "LOW" and fill the microcuvette for that control level. The screen will say to "Please fill and Insert a Cuvette". Fill the cuvette and close the cuvette holder.
 7. At that time, the analyzer will ask for the lot number of the microcuvettes. You can either enter the lot using the numeric key pad or you can scan the barcode on the side of the microcuvette vial. Up to 5 different lots of microcuvettes can be entered into the analyzer. Be sure you are entering the correct lot number.
 8. Once the lot number of microcuvettes is entered, you will be asked to enter the lot number of the control. You will have to enter the lot number by using the alpha-numeric keypad. The lot number is located on the bottle. After typing it in, press OK and the result will appear as **PASS** or **FAIL**.
 9. If the control **PASSES**, then proceed to the next level of control. The screen will go back to the main menu. Press QC and then press "HIGH" and fill the microcuvette for that control level. The screen will say to "Please fill and Insert a Cuvette". Fill the cuvette and close the cuvette holder.
 10. Refer back to Steps 7 and 8.
 11. If both controls "PASS", you may proceed to patient testing. **NO PATIENT TESTING SHOULD BE DONE UNLESS ALL QC RESULTS ARE WITHIN RANGE AND PASS.** As a matter of fact, you will be unable to proceed unless all controls "PASS".
 12. If a control "FAILS", follow the screen prompts. You will be asked to input a comment. Proceed to the comment screen and choose the appropriate comment. If you do not see one, then you can free text the comment you want to put in. You will be asked if you want to delete the control, press "YES" so that the control will not be included in the statistics.
 13. Once you have entered the appropriate comment, repeat the control making sure to use the correct control level. The most common operator error is using the wrong control level initially. If the control "PASSES", you may proceed to patient testing. If it "FAILS" again, repeat the process for the comment and proceed to troubleshooting. It may be necessary to remove the cuvette holder and clean the HemoCue which should be the first step. Repeat QC again. If the QC continues to fail, then it may be that the controls are contaminated. Obtain new controls and repeat testing. If they fail again, obtain new cuvettes as they may not

- have been properly stored. If they continue to fail, contact the POCC.
14. When both controls have passed, you will see an icon appear on the screen which is a microcuvette with a drop of blood falling from it. This is the icon you will press to proceed with patient testing.
 15. All results are stored in the memory of the HemoCue data manager and transmitted to a computer in the central laboratory. They will be reviewed by the POCC. Therefore, it will not be necessary to record any QC unless directed otherwise by the POCC.

PATIENT AND SPECIMEN TESTING

Capillary Testing-Finger

1. After start-up and QC testing, the cuvette holder should be in the loading position.
2. The hand should be warm and relaxed. It is a good idea to heat cold hands in warm water, or by other means, before sampling to increase the blood circulation. The patient's fingers should be straight but not tense, to avoid stasis. For best results, use the middle or ring finger for sampling. Avoid fingers with rings for sampling.
3. Remove a cuvette from the vial and recap immediately.
4. Clean the puncture site with alcohol. Wipe off the alcohol with a clean, dry lint-free wipe or allow it to air dry completely.
5. Using your thumb, lightly press the finger from the top of the distal knuckle to the tip. This stimulates the blood flow towards the sampling point.
6. Position the lancet device so that the puncture will be made across the lines of the fingerprint. Press the lancet firmly against the finger prior to activating the lancet to aid in obtaining a good sample.
7. While maintaining gentle pressure on the tip of the finger, perform the stick off-center on the fingertip. Discard the lancet in an approved container.
8. Using a dry gauze or other lint-free tissue, wipe away the first two or three large drops of blood, applying light pressure as needed again until another drop of blood appears. This stimulates blood flow and lessens the likelihood of a dilutional effect by interstitial fluid. Avoid "milking of the finger".
9. Make sure that the drop of blood is big enough to fill the cuvette completely. Hold the cuvette opposite the filling end and introduce the cuvette tip into the middle of the drop of blood. Fill the cuvette in one continuous process. Do not refill a partially filled cuvette.
10. Wipe off any excess blood from the outside of the cuvette using a clean, lint-free tissue, taking care not to touch the open end of the cuvette.
11. Visually inspect the cuvette for air bubbles in the optical eye. If bubbles are present in the optical eye, discard the cuvette.
12. The filled cuvette should be analyzed immediately, or at the latest, 10 minutes after it has been filled. Place the filled cuvette into the cuvette holder and gently slide the holder into the measuring position.
13. Once the cuvette holder has been moved into the measuring position, the display

will now ask for lot number of the cuvettes. It may be entered by using barcode scanner or you may enter it using the numeric pad. After the lot number is entered, you will be asked to enter the patient ID. You use the patients 8 digit medical record number. If that number is not available, you may use the patient's social security number or use the abc pad to enter the patients name. Once the patient's information is entered, press OK.

14. The display will now ask you verify the lot number of the cuvettes and the patient ID. Press OK if correct. The patient result will now display. If the result is not a critical value, record the result into the patients chart and proceed to the next patient test.
15. If the result is critical, repeat the test within 15 minutes. If the result checks, notify MD and follow policy for confirmation.

Repeat any critical value. If the repeated test result remains in the critical range, the physician should be informed and proper management may include performing a confirmatory specimen in the laboratory at the request of the attending physician.

Venous or Arterial Specimen from Vacuum Tubes

1. Obtain a specimen according to established procedure. A fresh, well-mixed anti-coagulated blood (EDTA-lavender top tube) is to be used. Refrigerated samples may be used but must be allowed to come to room temperature prior to testing.
2. Mix the sample on a mechanical mixer for at least two minutes or gently invert by hand eight to ten times.
3. Dispense a drop of blood onto a hydrophobic surface.
4. Proceed as in Steps 9-15 of the capillary sampling instructions.

Venous or Arterial Specimen from Syringes

NOTE: It is very important to test the sample immediately to avoid potentially erroneous results due to coagulation or separation of the specimen.

1. Obtain a specimen according to established procedure.
2. Mix the syringe according to procedure.
3. Dispense a drop of blood onto a hydrophobic surface.
4. Proceed as in Steps 9-15 of the capillary sampling instructions.

GUIDELINES

1. Refer problems to charge nurse or manager. The charge nurse or manager will attempt to correct any problems. If problem continues, contact 903-3944/3897 during routine hours (M-F 0630-1500). After hours and on weekends, contact the HemoCue Hotline for assistance (1-800-426-7256).
2. If an instrument needs to be replaced, contact the POCC and instructions will be given for obtaining a new instrument. If it is after hours, on the weekend, or on a holiday and the instrument needs to be replaced, you may obtain the spare

instrument from the Lab. Have the charge nurse notify the POCC on the next working day so that replacement instruments may be obtained. DO NOT CONTACT BIOMED. They will be unable to assist you.

3. Reference Values

Adult Males: 13.5-17.5 g/dl

Adult Females: 12.0-16.0 g/dl

Infants after neonatal period: 9.0-14.0 g/dl

Critical Values: <7.0 and >20.0

Neonates: <8.5

Repeat any critical value. If the repeated test result remains in the critical range the physician should be informed and proper management may include performing a confirmatory specimen in the laboratory at the request of the attending physician.

4. The HemoCue Hb 201 analyzer corrects for turbidity in specimens, and, therefore, might produce lower results than those expected for other hemoglobin instruments that do not have this correction feature. Therefore, only controls that are assayed for the HemoCue Hb 201 system are recommended.
5. Results above 25.6 g/dl will be displayed as HHH. Refer to the Troubleshooting Guide in the Operating Manual for interpretations of other error codes.

DOCKING STATION

The docking station serves a dual purpose. It serves as a charger for the analyzer which has a rechargeable battery and it communicates with the computer in the central laboratory. It is connected to a network jack sending back all QC and patient results to the central computer.

THE ANALYZER MUST BE POWERED ON WHEN IT IS PLACED INTO THE DOCKING STATION AND LEFT POWERED ON WHILE SITTING IN THE DOCKING STATION.

To reactivate the analyzer, simply touch the screen.

A green flashing light on the docking station indicates that the instrument is communicating with the central computer. When the instrument is removed from the docking station, the light will turn solid green. If the docking station is flashing a red light, it indicates that the analyzer is no longer communicating with the central computer. When the central laboratory shuts down the computer at the end of the day (to protect software on the computer), the docking station is taken off line and can no longer communicate. On the next working day when the program is restarted the docking station will be on line again. The only other reason it may begin flashing red is when there is a problem with the network.

The docking stations are monitored in the central laboratory by the POCC.

MAINTENANCE

A. Policy

1. The HemoCue Hb 201 analyzer should be handled with care. Sudden shocks caused by dropping or rough treatment may affect performance. If the system is dropped, performance is verified by quality control testing.
2. The HemoCue Hb 201 analyzer should be stored away from direct sunlight, extreme temperatures and humidity.
3. Disposable gloves should be worn when performing preventive maintenance and cleaning on the system. Cleaning and maintenance of the system may be performed by a qualified operator.
4. If personnel are unable to correct a problem with the system, it is removed from service and sent back to the manufacturer for repair/replacement.

No preventative maintenance is needed for the electronic components of the analyzer.

B. Procedure

1. Cuvette Holder

The cuvette holder should be removed at the end of each day of use for cleaning:.

- a. Check that the analyzer is turned off (the display should be blank).
- b. Pull the cuvette holder out to the loading position. Using a pointed object, carefully press the small catch in the upper right hand corner of the cuvette holder.
- c. While pressing the catch, carefully rotate the cuvette holder to the left for removal.
- d. Clean the cuvette holder with alcohol or a mild detergent and allow to dry completely before replacing it in the analyzer.

2. Analyzer

The exterior of the photometer may be cleaned as necessary with alcohol or a mild soap solution.

3. Optronic Unit

The optronic unit should be cleaned as directed in the Troubleshooting Guide of the HemoCue Hb 201 Operating Manual. See the instructions in the Maintenance section of the Operating Manual or call HemoCue Technical Support.

REFERENCE

HemoCue Hb 201 DM Analyzer and HemoCue DM Docking Station Reference Manual

DISTRIBUTION

Division of Nursing Standards of Clinical Nurse Practice Manual, all patient care areas, Pathology and Anesthesia.

STANDARD BASIS

Quality Improvement _____

Ethical Issues _____

Legal Issues _____

Current Nursing Practice _____

Nursing Research _____