| Wake Forest Baptist Medical Center | Blood Gas Analysis Using Siemens RapidLab 1265 Analyzers CCL-021 | Dept: 324318 | Critical Care Labs |
|---|---|---|---|
| | | Effective Date: | August 2002 |
| | | Revised Date: | Feb 2019 |
| | | Contact: | Ann Shoffner |
| Name & Title: Gregory Pomper, MD CLIA Laboratory Director | | Date: | 2/25/19 |
| Signature: GP | | | |

1) **General Procedure Statement:**
   a. **Purpose:** To provide guidelines and direction for performing blood gas, whole blood chemistry and hemoglobin analysis in the Critical Care Labs using Siemens Rapid Lab 1200 series analyzers.
   b. **Responsible Department/Party/Parties:**
      i. Procedure owner: Ann Shoffner
      ii. Procedure: Critical Care Lab (CCL) Staff
      iii. Supervision: Ann Shoffner
      iv. Implementation: Ann Shoffner and Critical Care Lab (CCL) Staff

2) **PPE Requirements:** Lab Coat. Gloves. Eye wear when performing a task where splashing might occur (emptying waste, flushing tubing, etc)

3) **Procedure:**
   A. **Sample Requirements:**
      1. **Sample Collection** - The collection of arterial blood samples for blood gas analysis is performed primarily by the Respiratory Care staff. Policies and procedures related to the collection of blood for blood gas analysis are determined and written by Respiratory Care. The Department of Nursing defines blood collection procedures for nursing staff. For more information on sample collection, refer to *CCL-009 References for Respiratory Care and Nursing Blood Gas and Lab Collection Procedures* in this manual.
      a. **Arterial blood** - procured by arterial puncture or arterial line is recommended as it accurately reflects acid-base physiology and oxygenation status.
      b. **Venous blood** - obtained by syringe can also be used to provide satisfactory pH and $pCO_2$ however venous $pO_2$ levels may not be significant in routine clinical studies without simultaneous study of arterial $pO_2$. Evacuated tubes (Li Heparin vacutainer) may be used but are not recommended for collecting blood gases. If they are used, ensure that the tubes are completely filled and the samples are mixed by gentle inversion. Li Heparin evacuated tubes may be used for Na, K, Glu and ICAS testing. Note: With the exception of autopsy samples, evacuated tubes should not be used for venous Co-Ox testing. The O2Sat results from evacuated tubes are considerably higher due to air contamination from this collection method.
      c. **Mixed venous** - obtained from a pulmonary artery catheter after carefully clearing the catheter of infusion fluid.
      d. **Capillary blood** - closely resembles arterial blood and may be used for blood gas analysis. Care should be taken to avoid hemolysis as it would falsely elevate K+ levels. Tubes should be capped with rubber caps (clay not recommended). Avoid use of mixing fleas to mix capillary tubes to avoid hemolysis.

      2. **Anticoagulants** - Electrolyte balanced lithium heparin or lithium heparin is the only acceptable anticoagulant suitable for blood gases, ISE and tHb analysis as it minimizes calcium-heparin chelation. A minimum of 2.3 units of heparin for each 1.0 mL of sample is recommended. For ionized calcium analysis, a maximum of 15 units/mL of heparin should be used. Too much heparin can also change the gas tension and pH of the sample and also dilute the hemoglobin and electrolytes. Other anticoagulants such as EDTA, citrate, oxalate and fluoride have significant effects on blood pH and ionized calcium and should not be used. Complete anticoagulation is essential because even microscopic aggregates in a sample can adversely affect a blood gas analyzer by disabling it, or preventing gases from diffusing evenly throughout the sample thereby resulting in erroneous results.

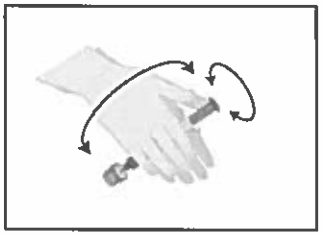
**Li Heparin evacuated tubes may be used for Na, K, Glu, Lactate and ICAS testing.**

**3. Sample Handling** - Blood gases are the most sensitive of the analytes measured by the Siemens 1265 analyzers and the procedures described are based on techniques appropriate to blood gas analysis. Samples collected and handled as described are also suitable for the electrolyte, metabolite and THb analysis. Good pre-analytical sample handling techniques are essential for ensuring accurate results for tests performed in the Blood Gas Lab.

a. **Stability Limits**: With time, metabolic changes occur in a sample between collection and analysis.
   - Blood Gas and COOX samples should be analyzed as soon after collection as possible, within 30 minutes of collection.
   - Ionized Calcium samples collected in either a LiHep tube or heparinized syringe are stable for up to 48 hours on ice and up to 7 hours at Room Temp.
   - Lactate samples should be analyzed within 30 minutes after collection.

b. **Air:** Contamination of the sample by room air should be avoided. Air should be expelled from the syringe which should be capped securely. Corks should never be used as capping devices. Rubber stoppers and caps should be used to prevent gas exchange with the sample.

c. **Mixing:** Effective mixing of samples is imperative to achieving accurate results. Blood Gas Syringes should be mixed by gently rolling while rocking the sample between the hands for a minimum of 10 seconds. Mix all samples using a consistent technique. Evacuated tubes should be gently inverted until the sample is homogenous. Capillary samples must be thoroughly mixed until homogenous.



**4. Sample Volume** – The chart below shows the minimum sample volumes required for testing on the 1265 Analyzer. **NOTE:** To measure CO–ox only, the minimum sample volume required is 100 µL for any sample type.

**Chart 1** **Sample Volume Requirements**

| Sample Type | 1265 Analyzer |
|---|---|
| Syringe | 200 uL for 1mL syringe<br>200 uL for 3mL syringe<br>500 uL for 5mL syringe |
| capillary/<br>all parameters | 175 uL |
| Microsample | 95 uL |
| pH only | 95 uL (pH, lytes, glu, lact) |
| Vacuum tube | 160 uL |
| Coox only - micro | 100 uL |

**5. FIO2 - Liters to % Conversion**

| | | | |
|---|---|---|---|
| **RmAir = 21%** | **3L = 32%** | **6L = 44%** | **9L = 56%** |
| **1L = 24%** | **4L = 36%** | **7L = 48%** | **10L = 60%** |
| **2L = 28%** | **5L = 40%** | **8L = 52%** | |

**6. Sample Labeling** – For sample labeling requirements and discrepancy resolution, refer to *CCL-020 Patient Identification and Identification of blood, body fluids and tissue samples,* the NCBH Labeling Policy and the Department of Pathology labeling policy. The patient identification information on the sample and the requisition must be compared and verified for all samples.

OR Lab - Special Labeling Requirements:

a. Samples submitted to the OR Lab should be accompanied by an OR Lab requisition. A document label stamped with the patient's identifiers and CSN should accompany the first sample. This label should be placed on the OR log sheet. In the event a patient label is not immediately available, OR personnel should be able to provide a first and last name, date of birth, medical record number, account (CSN) number and OR room number as soon as possible.
b. Subsequent OR samples should be submitted with an OR Lab requisition indicating the tests requested.
c. OR study samples on a patient should be logged in a separate block with the patient's name, date of birth, medical record number and study account number. Example: STUDY--Doe, John 1122334.
d. Samples submitted to the lab from other locations should be ordered in Wake One.

**B. Reagents and Supplies** – All reagents for the *Siemens RapidLab™ 1265* are from Siemens and are ready to use and are stored at room temp through the package expiration date with the exceptions as noted below. The electrolytes, pH, glucose, lactate and gases in the reagents are NIST traceable.

- **Reagent Cartridge** (pn 03909458) – Store at 2-8°C. Cartridges can be stored at RT (not exceeding 25 °C) for up to 14 days. Cartridges are stable for 28 days after installation on the analyzer when installed by the Install Date. Cartridges can be installed on the analyzer directly from the refrigerator.
- **Wash Cartridge** (pn 03913056) – Store at 18-25 °C. Do NOT store in the refrigerator.
- **High G/L** (pn 570097) - Once opened, label the container with the special label designated for High G/L. Opened solution is stable for 14 days stored at 2-8°C.
- **Rapid QC Complete Quality Control** Level 1 (pn 108860), Level 2 (pn 108868) and Level 3 (pn 108869)
- **Siemens Calibration Verification Material** for Blood Gas, Electrolyte, Total Hemoglobin and Metabolite Systems CAT#: 116189 or material suitable for per test system operator manual.
- **Co-Ox sample chamber** (pn 06324604) – Chambers are stable for 60 days after installation on the analyzer when installed by the Install Date.
- **Conditioner** (pn 478701) – Once opened, label the container with the special label designated for Conditioner. Opened solution is stable for 24hrs and can be stored at Room Temp.
- **Deproteinizing solution** (pn 105610) –Activate by adding the liquid in D1a to the enzyme powder in D1b per package directions. Once opened, label the container with the special label designated as Deproteinizer. Reconstituted solution is stable for 24hrs and should be stored at 2-8°C.
- **Electrolyte Fill Solution** (pn 748535)-Opened solution is stable for 24hrs and can be stored at RTemp.
- **pH Electrode Fill Solution** (pn 478533) - Opened solution is stable for 24hrs and can be stored at Room Temp .
- **Reference Electrode Fill Solution** (pn 02563698) - Opened solution is stable for 24hrs and can be stored at Room Temp .
- **Air Filter** (pn 122521)
- **Paper** (pn 101404)
- **Tubing Kit Common** (pn 06645048)
- **Tubing Kit Co-Ox** (pn 06645648)
- **Electrodes**:

| | |
|---|---|
| pH (pn 476267) | Ca (pn 01428622) |
| pO2 (pn 05065575) | Reference Inner Electrode (pn 478509) |
| pCO2 (pn 05065729) | Reference refill - cassette, fill soln, o-rings (pn 06451843) |
| Na (pn 476266) | Lactate (pn 476379) |
| K (pn 476270) | Glucose (pn 476378) |

C. **Instrument Maintenance and troubleshooting:**

1. Refer to Section 5 of the *Siemens RapidLab™ 1265 Operator's Guide* for detailed instruction of maintenance tasks. A hard copy of the Operator's Guide can be found in the laboratory. An electronic version can be found under *G:\Lab_Shared\ICU_ORLab\GUIDES, MANUALS, PROCEDURES\1265'S\1265 manual*. Perform all routine maintenance for each instrument according to the manufacturer's instructions and each instrument's maintenance log. Document all routine an unscheduled maintenance on the respective instrument's log.
2. Refer to Section 2 of the *Siemens RapidLab™ 1265 Operator's Guide* for detailed instruction of cartridge replacement. In the event a RapidLab™ 1200 Analyzer reagent cartridge fails, notify Tech Support for possible reimbursement for the cartridge.
3. Refer to Section 6 of the *Siemens RapidLab™ 1265 Operator's Guide* for troubleshooting information.
4. If you remove an electrode from an analyzer, log the transaction on the electrode tracking log found under G:\Lab_Shared\ICU_ORLab\Electrodetracking. Inform the manager and the person in charge of ordering for the dept ASAP so that a replacement electrode can be obtained.
5. For over the phone troubleshooting, call Siemens Technical Support @ 1-877-229-3711, ext 12.
6. If an on-site service visit is necessary, call 1-800-272-3533 and follow the instructions in Attachment 7: Aramark Clinical Engineering Equipment Service Request Procedure.

D. **Calibration**- No operator action is necessary for calibration. Calibration materials are in the measurement cartridge and calibration is performed automatically by the RapidLab™ 1265 Analyzer per manufacturer's specifications:

1. Every 30 minutes - a one-point calibration with adjustment of either the slope or offset for a parameter (except tHb).
2. Accelerated Calibration - a two point calibration is performed for the next 8 hours after the measurement module is opened or an electrode is changed.
3. Every 8 hours - a FULL two-point calibration with adjustment of the slope and offset for each parameter, including tHb.
4. Whenever a new measurement cartridge is installed.
5. After a QC failure
6. If the instrument performance is in doubt
7 If the instrument is relocated
8. The system will interrupt and defer calibration, up to the established maximum allowable time, to allow a specimen to be analyzed. Calibration reports or system status reports can be readily obtained by the operator from the instrument and/or RapidComm. The operator may initiate 1 or 2 point and full calibrations using the touch screen keypad when needed. Refer to refer to *Performing Manual Calibrations, page 3-4 in the Siemens RapidLab™ 1265 Operator's Guide*.
9. If the system detects a problem for a parameter during calibration, the system repeats the calibration up to 2 times. The maximum number of repeat calibrations is 2.
10. If the parameter does not pass calibrations successfully, you may need to perform troubleshooting tasks. Refer to *Troubleshooting Failed Calibrations page 6-4 in the Siemens RapidLab™ 1265 Operator's Guide.*

E. **Running a QC Sample on the RapidLab™ 1265:**

1. Frequency:
   a. Routinely analyze at least two levels of Rapid QC Complete QC at the beginning of each shift.

      **OR Blood Gas Lab** –

      1st shift performs levels 1 and 3

      2nd shift performs levels 1 and 2

      **ICU Blood Gas Lab** – Levels of QC are performed as follows:

      1st shift performs levels 1 and 2

      2nd shift performs levels 1 and 3

      3rd shift performs levels 1 and 2

b. Run 3 levels of Rapid QC Complete post electrode maintenance (refilling, deproteinizing, conditioning), post unscheduled maintenance, after a new reagent cartridge or new Coox sample chamber is installed, after a new electrode is installed, after tubing is changed or any time analyzer performance is in doubt. Exception to the new electrode installation: for Glu and Lactate run the High G/L, level 3 and either level 1 or 2.

2. **Important:** When running QC, start with the analyzer on your left then move to the right.
3. Hold the QC vial between your thumb and index finger and shake vigorously for 10 seconds. Tap the liquid back to the base of the vial. Place the vial upright on the counter and let stand for 1 minute.
4. Press the QC Vial button on the Analysis screen to designate the sample as QC.
5. To run High G/L, press the High/GL button on the Analysis screen to designate the sample as High G/L.
6. Scan the bar code label to identify the QC level.
7. Cover the tip of the ampule with gauze and carefully snap open the ampule.
8. Place a Siemens Quick Adapter onto the open end of the QC vial.
9. Insert the end of the adapter completely into the sample port. It should be fully seated to avoid leakage.
10. Press the green *Analyze* button.
11. Results will display on the 1265's screen and will be transmitted to RapidComm for review and processing.

**F. Documentation of QC results:**

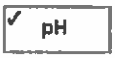
1. Refer to section 4 of the *RapidComm Quick Reference Guide* for instructions on validating QC in RapidComm.
2. QC results should be processed according to the Critical Care Labs QC policy (*CCL-002 Quality Control (QC) Plan).*
3. Corrective action when tolerance limits are exceeded: Control tolerance ranges are calculated based on +/-2 standard deviations from the mean control value. Out of range values must be repeated. **IMPORTANT: All QC values must be in range before patient results can be reported.** Refer to *Attachment 1: BGAS QC Flowchart* for a quick reference guide to processing QC.
4. The tech performing QC is responsible for reviewing and verifying that the QC is acceptable prior to reporting patient testing. The tech should initial CCL-F088 or CCL-F089 Daily QC Verification Log as documentation that they have reviewed QC and deem each respective instrument either acceptable or not acceptable for reporting patient testing.

**G. Running a Patient Sample on the RapidLab™ 1265:**

1. Blood Gas Syringes should be mixed by gently rolling while rocking the sample between the hands for a minimum of 10 seconds. Mix all samples using a consistent technique. Evacuated tubes should be gently inverted until the sample is homogenous. Capillary samples must be thoroughly mixed until homogenous.
2. Expel any air that may be present in the syringe into a gauze or tissue to minimize aerosols.
3. Expel a small drop of blood to check for clots. For capillary samples, a stylet may be pulled through the capillary tube to check for a clot. DO NOT run any samples that are clotted.
4. The analyzer status (top left corner of the 1265's Analysis screen) will read *Ready* when a sample is able to be introduced. Do NOT attempt to introduce a sample if the *Ready* message is not displayed.
5. From the 1265's Analysis screen, select the sample type by pressing its corresponding button. Sample type options are *arterial* (the default), *venous, mixed venous* or *capillary*. Refer to section 2-12 in the Siemens RapidLab™ 1265 Operator's Guide for instructions on *capillary* sampling.
6. From the 1265's Analysis screen, select the sample mode. Sample mode options are *Syringe aspiration* (the default) and *Microsample*. Note that Co-Ox testing is not available in *microsample* mode. Refer to section 2-14 *RapidLab™ 1265 Operator's Guide* for instructions on using the *microsample* mode.
7. Select the tests you wish to perform. The system displays available parameters in the center of the screen. Each parameter can be in a different state, indicated by its appearance, depending on operator selections, definitions in Setup, and current parameter condition. Each analyzer has Individual tests and

panel buttons defined. When the background on a test button is white and a check mark is present, the test is requested to be performed. Select or deselect the test button(s) accordingly.

The parameter is not selected and results will not be reported for this parameter.



The parameter is selected for analysis.

The parameter is not available for analysis because the sensor has failed calibration.

The parameter has failed successive calibrations and is unlikely to become available with further calibrations until corrective action is taken.

8 Insert the sample device completely into the sample port. It should be fully seated to avoid leakage.
9. Press the green *Analyze* key on the 1265 Analysis screen. The system will aspirate the sample.
10. Visually verify that the sample completely fills the sample path in the pH/bgas/ISE chamber. CAUTION! If the trailing edge of the sample is short and bubbles are visible in the measuring chamber, the pO2 and pCO2 values reported may reflect those of air in the tubing rather than the sample itself. DO NOT report results of any analyte that has air in front of its electrode.
11. When sampling is complete, the system will prompt the operator to remove the sample device. Do not leave the sample device in the sample port after the system prompts you to remove it.
12. Press the green arrow key.
13. The sample demographic screen will display. Enter the patient account (CSN) number by scanning the bar coded CSN number from the syringe label. If there is a problem scanning the label from the syringe, one may scan the bar code label on the requisition after carefully re-verifying it with the information on the syringe label. Manually type the CSN only when absolutely necessary. Once the CSN has been entered, the patient's name should populate the *Last Name* and *First Name* fields. If this does not occur, rescan or retype the CSN #. If the patient's name still does not populate, this may be a sign that the interface is not functioning properly. If this continues to occur, follow the interface troubleshooting steps and notify the lab manager.
14. Miscellaneous samples (not for patient reporting) should be given the ID of 123.
15. If a temperature correction is requested for the sample, enter the value in the *Temperature* field. Only enter the patient temperature if a temperature correction is requested.
16. Enter the patient's FIO2 (as a whole number. Ex 40% = 40) in the *FIO2* field. If the FIO2 is not provided, leave this field blank.
17. After you have completed the appropriate fields, press the green arrow key.
18. Results will display on the 1265 screen and will be transmitted to RapidComm for review and processing.
19. To recall previous patient results, click on the *folder* icon at the top of the Analysis or Status screen. Then select *Patients*.

**H. Interpretation of Results:**

All samples with questionable results should be repeated on a different 1265 analyzer and instrument performance verified by reviewing instrument status. **Questionable results include but are not limited to results with instrument flags, diagnostic messages, below or above an instrument's reportable range, questionable critical values or those associated with suspected instrument problems.** PO2's <27.0 on venous blood gases do not have to be repeated unless an instrument problem is suspected.

1. **Instrument flags** - below is a list of flags displayed by RapidLab 1200 instruments that should alert the testing tech about questionable results. Flagged results must be evaluated before being reported.

↑ indicates the result is above the patient expected range.

Ø indicates the result is below the patient expected range.

**Instrument flags continued:**

-----↑ indicates the result is above the reporting range.

-----↓ indicates the result is below the reporting range.

# indicates the system detects the presence of substances in the sample that may interfere with measurement.

-----? Indicates the system has an atypical response when measuring this parameter and cannot report the result. The sensor did not reach stable reading during predefined time limit (No endpoint). A no endpoint flag can also be seen with pO2 results on patients with remarkably high WBC counts.

----↑↑ without a numerical value - indicates the result is extremely above the reportable range

----↓↓ without a numerical value - indicates the result is extremely below the reportable range

2. **Diagnostic errors** - are flagged in RapidComm via an active Diagnostic Dx... button at the bottom of the Sample Validation screen. This Diagnostic button only becomes active if there is an issue with the sample. The most common diagnostic messages are "temperature out of range", "bubbles in sample" or "questionable interfering substance". Click on the active Dx... button to view the message. Verify instrument performance by reviewing instrument status. Samples with Diagnostic messages should be repeated on a different 1265 analyzer if at all possible.

   **"Questionable Interfering Substance"** message – Samples giving this message should be repeated on a different 1265 analyzer if at all possible. If the affected result repeats, report the result but manually append the English text code **INTRF** to the result in Beaker. Refer to Appendix E in the Siemens RapidLab™ 1265 Operator's Guide for a listing of known interfering substances.
3. The analytical ranges have been turned ON for the 1265's. If a result <u>has a numerical value</u> but that value is less than or greater than the reportable range, the instrument will result as < or > that parameter's reportable range. For example, a GLU result of 25 will be reported as <30.
4. Below are the formulas used in calculating the estimated O2Sat, Base Excess and Bicarbonate ($HCO_3$). The instruments are programmed to perform these calculations using the sample's pH, pO2 and pCO2 values. Therefore, If you have a sample that does not give a pH, pO2, or pCO2, re-run the sample and accept the re-run values. Do NOT replace a missing pH, pO2 or pCO2 result with a value from another run. Doing so will affect the calculations.

$$O_2SAT(est) = \frac{N^4 - 15N^3 + 2045N^2 + 2000N}{N^4 - 15N^3 + 24000N^2 - 31100N + 2.4\times10^5} * 100$$

where

$$N = pO_2 \times 10^{[0.48(pH(37)-7.4) - 0.0013\ BE(B)]}$$

Base excess of blood BE(B) is determined as follows:
BE(B) = (1-0.014 x tHb) x [($HCO_3^-$act-24.8)+((7.7+1.43xtHb) x (pH(37)-7.40))]

- Actual bicarbonate ($HCO_3^-$act), which is determined directly from the pH and $pCO_2$ values, based on the recommendations from the Clinical and Laboratory Standards Institute (CLSI) as follows:

$$HCO_3^-act = 0.0307 \times pCO_2 \times 10^{(pH(37)-6.105)}$$

5. There are 2 types of O2Sat's reported from the 1265 analyzers. A measured O2Sat from the Co-OX side and a calculated O2Sat based on the BE(B), HCO3, pO2, pCO2 and pH. If a BGAS and Co-OX are run together, the analyzer automatically hides the calc O2Sat and only reports the measured O2Sat.
6. The rules for reporting out not calculated (NCAL) and estimated values are as follows. RapidComm is programmed to result accordingly.
    a. If the pH is <6.800 or >7.720 then the HCO3, calc O2Sat and the BD/BE are reported as NCAL. If the O2Sat is measured from the Co-OX then the O2Sat can be left alone.
    b. If the pCO2 is <14.5 or >135.0 then the HCO3, calc O2Sat and the BD/BE are reported as NCAL.
    c. If the pO2 is <27.0 or >515.0 then the calc O2Sat is reported as NCAL. If the O2Sat is measured from the Coox the O2Sat can be left alone.
    d. If the tHb is <4.8 on a Co-OX, the tHb is reported as <4.8 and the rest of the Co-OX parameters are reported as NCAL.
    e. If there is a BGAS performed with a tHb and the tHb is <4.8, the BEb and O2Sat is reported as NCAL.
    f. If you have a parameter that does not read due to questionable results, "Not Available" will be resulted for that parameter and NCAL resulted for all other tests affected by that parameter.
    g. For NCAL values associated with Temp Corrected results in which a measured parameter is < or > the reportable range, the temp corrected value that corresponds to that measured parameter will not be reported.

**I. Reporting Patient Results:**

1. Testing is routinely ordered and resulted via the RapidComm data management system and an Instrument Generated Orders (IGO) interface. Refer to the *RapidComm Quick Reference Guide* for detailed instructions for processing samples in RapidComm.
2. Ionized Calcium samples that come to our lab already ordered in Beaker are processed differently. This workflow was established to maintain the integrity of the order placed in WakeOne.
    a. Receive the sample via the Receiving function in Beaker  .
    b. Click the Actions button and select Result Entry
    c. Run the sample on the 1265
    d. Enter the results in Beaker. Remember to enter CTRB info because Beaker will not prompt you to do so.
    e. Print the result entry screen. Attach the Siemens 1265 printout to the print screen. File in the requisition box.
    f. Process the sample in RapidComm giving it an accurate collect time so we can cross reference if need be. If a critical value, enter the name and time. Mark the sample as a REPEAT.
3. Critical values are documented according to the Department of Pathology Policy and Procedure Bulletin PPB-PCS-LAB 05, NCBH Policy and Procedure Bulletin – Critical Results of Tests and Diagnostic Procedures PPB-NCBH-10 and *CCL-016 Corrected Report/Critical Value Reporting Policy - Exceptions to the Department Policy.* In the event a critical value is reported by the instrument that is not ordered, it must be treated as a critical value and called to the ordering location. This test must be ordered, resulted and documented as called in the LIS.
4. All after hours OR results generated from the ICU Blood Gas Lab should also be called to the respective OR room and documented as intraoperative in RapidComm.
5. Samples unable to be ordered and resulted via the IGO interface can be manually ordered and resulted in Beaker as a last resort. Refer to the Beaker Training Guide for detailed instruction on manually ordering and resulting testing. All manually entered results and corrections should be reviewed in WakeOne for accuracy.
6. Samples from an Outside Facility such as Novant, Home Health Agencies and Nursing Homes require manual ordering and resulting in Beaker via *Requisition Entry.* Refer to the Beaker Training Guide for detailed instruction on manual ordering and resulting. All manually entered results and corrections should be reviewed in WakeOne for accuracy.

7. **Parameters included in a Blood Gas (battery)**

| | |
|---|---|
| Ph | TEMPERATURE (if temperature corrected) |
| pCO2 | TEMP CORR PH (TPHOR) |
| pO2 | TEMP CORR PCO2 (TPCO2) |
| HCO3 | TEMP CORR PO2 (TPO2) |
| BASE EXCESS | |
| BASE DEFICIT | |
| O2 SAT | |
| FIO2 | |
| SPECIMEN TYPE | |
| Blood Gas COMMENT | |
| TECH CODE | |

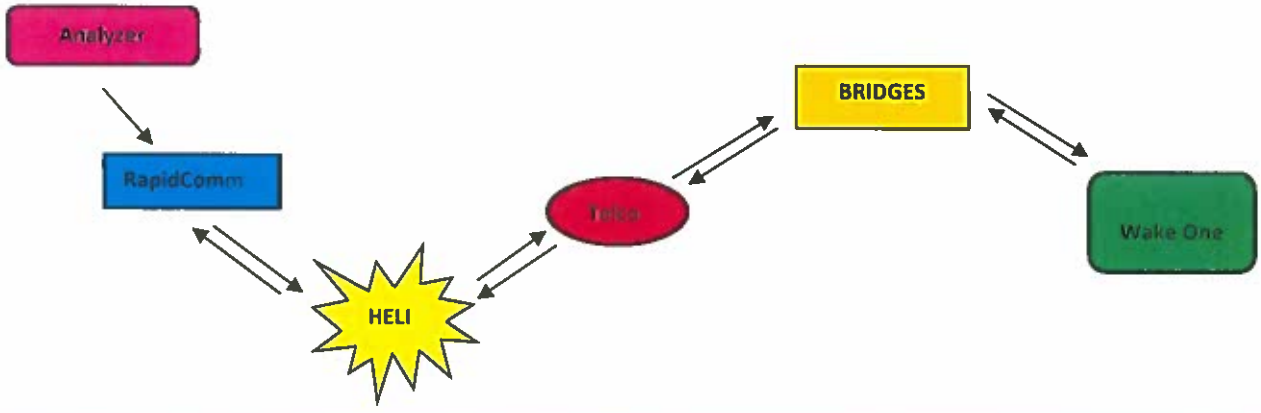
**Parameters included in a COOX (Battery)**

TOTAL HEMOGLOBIN
O2SAT
% OXYHEMOGLOBIN
% CARBOXYHEMOGLOBIN
% METHEMOGLOBIN
% DEOXYHEMOGLOBIN
SAMPLE TYPE
COOX COMMENT

8. Beaker Test Codes:

**AGAS** = Blood Gas, Arterial
**VGAS** = Blood Gas, Venous
**ALAC** = Lactate, Arterial
**VLAC** = Lactate, Venous
**COOXA** = Cooximetry, Arterial
**COOXV** = Cooximetry, Venous
**ICAS** – Ionized Calcium
**NAOR** - Sodium
**KOR** – Potassium
**GLUOR** - Glucose
**THB** – Total Hemoglobin

**J. Data flows through the various interfaces as follows:**



Note: The identity of the analyst resulting the test is not recorded in Beaker when using the Instrument Generated Orders process. However, this information is tracked in RapidComm and can be accessed when needed.

**K. Downtime reporting of blood gas testing:**

**If WakeOne or Telcor is down:**

**ICU Lab:** Process samples as usual through RapidComm. Call or fax results.

**OR Lab:** Process samples as usual through RapidComm.

**If RapidComm is down:**

**ICU Lab:** Run testing. Call or fax results. Process these samples in RapidComm when back up and running.

**OR Lab:** Turn on instrument printing. Print 2 copies of the instrument tapes, one to staple to the requisition and one to hand out to OR staff. Process these samples in RapidComm when back up and running.

**L. Troubleshooting the RapidComm Server:**

If ADT data is not flowing to RapidComm, you may need to restart the interfaces on the RapidComm Server. To restart the interfaces, refer to the *RapidComm Troubleshooting Section* of the *RapidComm Quick Reference Guide*. It is also attachment 8 of this procedure.

**M. Calibration Verification/Analytical Measurement Range Verification:**

Calibration verification involves the assaying of commercially prepared materials with known concentrations to verify that the calibration of an instrument, kit or test system has remained stable throughout the reportable range established for the laboratory. The reportable range of an assay is the range of values that the laboratory reports for that assay. The analytical measurement range (AMR) is the range of analyte values that a method can directly measure on the specimen without any dilution or concentration. Calibration verification verifies system performance in the clinically significant ranges, checking the upper and lower limits of the reportable range of patient results.

**1. Frequency:** Calibration verification is performed upon initial use of a system and every six months thereafter. If QC materials reflect an unusual trend or shift or are outside of the laboratory's acceptable limits, and other means of assessing and correcting unacceptable control values fail to identify and correct the problem. After major repair, relocation, manufacturer stipulation or change of a critical instrument component.

**2. Materials:** Siemens Calibration Verification Material for Blood Gas, Electrolyte, Total Hemoglobin and Metabolite Systems CAT#: 116189 or material suitable for per test system operator manual.

**3. Storage and handling:** CVM® comes ready to use and is stable for up to 30 days at room temperature (18-25°C. If storage for more than 30 days is required, store CVM® at 2-8°C. Refer to the label on the box and on each ampule for the expiration date.

**4. Verifying Calibration and Establishing Reportable Ranges**:

a. Read the package insert thoroughly before proceeding with CVM® studies. Perform CVM® sample analysis per CVM® package insert.

b. ****Important: Prepare each RapidLab 1265 analyzer by turning OFF the analyzer's analytical ranges and turning on the analyzer's printer.**

c. Identify the samples in the analyzer by using the level # as the ID, CVM® as the last name and CVM® plus the level # as the first name. Ex. ID # 1= CVM®, CVM®1.

d. Classify the CVM® samples as "Linearity" in RapidComm.

e. Use the performance variability tables provided in the package insert for evaluation of instrument performance. Previously defined precision limits may also be used.

f. Calibration of a test system is verified if the mean results are within the performance variability or meet other evaluation criteria that the lab has established. Compare mean results with performance variability. CVM® passes if the mean results are within the performance variability guidelines. CVM®

fails if one or more of the mean result values for a particular level are outside the performance variability range. Initiate troubleshooting and corrective action prior to repeating CVM® analysis.

g. After CVM® analysis is completed, turn the instrument's analytical ranges back on.

**5. Result Review:** Results are reviewed and signed by the lab manager and the medical director or designee. The lab director will review CVM® reports requiring corrective action to fall within the limits of acceptability.

**6. Record Retention:** Reviewed and signed CVM® reports and instrument tapes will be stored for a minimum of two years.

**N. Principles of Operation and Specific Analyte Information:** Refer to Appendix E of the 1200 Series Operator's Manual for detailed information regarding interfering substances.
**Note:** Arterial reference ranges are reported on Siemens RapidLab 1265 instrument tapes because only one reference range can be defined in the instrument.

**1. pH:** The hydrogen ion is actually the determinant of the acidity of blood or plasma. Normal cellular metabolism requires an exacting environment where hydrogen ion concentration must be maintained within narrow limits. Hydrogen ion activity reflects the acid-base balance within blood. pH is clinically significant as a means of determining acid-base disturbances. The pH sensor, which is based on ISE technology, is a half-cell that forms a complete electrochemical cell when combined with the external reference sensor. It contains a silver/silver chloride wire surrounded by a buffer solution. A glass membrane that is highly sensitive and specific for hydrogen ions separates the sample from the solution. As the sample comes in contact with the membrane of the pH sensor, a membrane potential develops due to the exchange of hydrogen ions in the membrane. The silver/silver chloride inner conductor transmits the potential to a voltmeter where it is compared to the constant potential of the reference sensor. The final measured potential reflects the hydrogen ion concentration of the sample and is used to report the pH value of the sample.

RapidLab 1200 Reportable Range = 6.800 – 7.720
Normal Range = Arterial: 7.350 – 7.450
Venous: 7.320 – 7.420
Critical Value = <7.200 and >7.600

**2. pCO2:** Disturbances in the partial pressure of CO2 (pCO2) in the blood indicates disorders in acid-base balance.- CO2 is a natural product of cellular metabolism. The *p*CO2 sensor is a complete electrochemical cell that consists of a measuring electrode and an internal reference electrode. The measuring electrode, which is a pH electrode, is surrounded by a chloride bicarbonate solution. A membrane permeable to gaseous CO2 separates this solution from the sample. The internal reference electrode, which contains a silver/silver chloride electrode surrounded by the chloride-bicarbonate solution, provides a fixed potential. As the sample comes in contact with the membrane, CO2 diffuses into the chloride-bicarbonate solution, which causes a change in the hydrogen ion activity. The internal pH electrode detects the change in hydrogen concentration occurring in the chloride bicarbonate solution and generates a half-cell potential. This potential, when compared to the fixed potential of the reference electrode, results in a measurement that reflects pH change in the chloride bicarbonate solution. The change in pH is related to the log of the partial pressure of CO2.Together, pH and *p*CO2 provide a more definitive diagnostic tool in assessing respiratory function. An increase in the *p*CO2 value and a decrease in pH indicate respiratory acidosis, a condition in which CO2 is retained by the lungs. A decrease in the *p*CO2 value and an increase in pH indicate respiratory alkalosis, a condition in which the lungs are expiring too much CO2 relative to the amount produced.

RapidLab 1200 Reportable Range = 14.5 – 135.0 mmHg
Normal Range = Arterial: 35.0 – 45.0 mmHg
Venous: 38.0 – 48.0 mmHg
Critical Value =<25.0 or >60.0 mmHg

3. **pO2:** The extent of oxygen (O2) exchange in the lungs and the ability of the blood to adequately perfuse the body tissues with oxygen may be assessed in part by determining the partial pressure of oxygen (pO2) in whole blood or plasma. The pO2 electrode consists of a platinum cathode, a silver anode, an electrolyte fill solution and an oxygen permeable membrane. A constant voltage called the polarizing voltage is maintained between the anode and the cathode. When dissolved oxygen from the sample diffuses across the membrane into the fill solution, it is reduced at the cathode due to the applied voltage. The circuit is completed at the anode, when the Ag is oxidized. The magnitude of the high current is proportional to the partial pressure of the oxygen in the sample.

   RapidLab 1200 Reportable Range = 27 – 515 mmHg
   Normal Range = Arterial: 80 – 100 mmHg
   Venous: 35 – 45 mmHg
   Critical Value = <50 mmHg

4. **Na:** Sodium (Na+) is the most abundant cation in the extracellular space in the body. Na+ is the major determinant of extracellular osmotic regulation and plays a central role in determining body fluid volume. The sodium sensor is a half-cell that combines with the external reference sensor to form a complete electrochemical cell. The sensor contains a silver/silver chloride wire surrounded by an electrolyte solution that has a fixed concentration of sodium and chloride ions. The membrane, a specially formulated glass capillary that is highly selective for sodium ions over other clinically encountered cations, separates the electrolyte solution from the sample. As the sample comes in contact with the membrane of the sensor, a potential develops due to the exchange of sodium ions in the membrane. The potential developing across the membrane is compared to the constant potential of the external reference sensor. The final measured potential is proportional to the sodium ion concentration in the sample. The potential developed by the electrochemical cell varies with the ion activity in each sample

   RapidLab 1200 Reportable Range = 109 – 168 mmol/L
   Normal Range = 135 – 146 mmol/L
   Critical Value = <120 or >160 mmol/L

5. **Glucose:** Glucose is the fundamental molecule in carbohydrate metabolism. Depending on the presence or absence of oxygen, glucose catabolism can be divided into two phases: anaerobic (no oxygen) and aerobic (oxygen). Determining the blood glucose level is helpful in diagnosing metabolic diseases such as diabetes mellitus, Cushing's disease, hyperthyroidism, pancreatitis, Addison's disease, hypopituitarism, and advanced liver disease. Glucose is measured using a biosensor that incorporates amperometric technology. The biosensors consist of four electrodes: The MEASURING ELECTRODE contains platinum and glucose oxidase, the REFERENCE ELECTRODE is composed of Ag/AgCl, the COUNTER ELECTRODE is a Pt(platinum) conductor that ensures a constant applied potential, MEASURING ELECTRODE (without enzyme) determines interfering substances in the sample by removing the potential from interfering substances from the total differential measurement. A constant polarizing voltage is maintained and glucose interacts with the glucose oxidase to form hydrogen peroxide and gluconic acid. The polarizing voltage causes oxidation of the peroxide to oxygen which creates a current flow that is directly proportional to the glucose in the sample.

   RapidLab 1200 Reportable Range = 30 – 650 mg/dL
   Normal Range = 0 days 45-90 mg/dL
   7 days 50 -90 mg/dL
   14 days 50-90 mg/dL
   1 month 60 - 99 mg/dL
   18 years 70 - 99 mg/dL
   Critical Value = <50 and >600 mg/dL.

6. **ICAS:** Ionized calcium (Ca++) is the physiologically active form of calcium, comprising approximately 45% of the calcium in plasma. Ca++ is essential for the contractility of smooth vascular muscle and plays a vital part in cardiovascular function. Ca++ is also important in muscle function, nerve function, and bone formation, and it is a cofactor in many cellular hormone and enzyme reactions. Extreme abnormalities of ionized calcium reflect a potentially life-threatening pathophysiologic state that must be corrected promptly. The calcium sensor is a half-cell that combines with the external reference sensor to form a complete electrochemical cell capable of measuring calcium levels in a blood sample. The sensor contains a silver and silver chloride wire surrounded by an electrolyte solution that has a fixed concentration of calcium ions. A membrane, consisting of an ionophore imbedded in a polyvinyl chloride membrane, separates the electrolyte solution from the sample. When the sample comes in contact with the membrane of the measuring sensor, a membrane potential develops as calcium ions interact with the membrane. This membrane potential is compared to the constant potential of the external reference sensor. The final measured potential is proportional to the calcium ion concentration in the sample. The potential developed by the electrochemical cell varies with the ion activity in each sample.

   **Sample Stability:** Ionized Calcium samples collected in either a LiHep tube or heparinized syringe are stable for up to 48 hours on ice and up to 7 hours at Room Temp.

   RapidLab 1200 Reportable Range = 0.55 – 3.12 mmol/L
   Normal Range = 1.00 – 1.30 mmol/L
   Critical Value = <0.75 or >1.40 mmol/L

7. **Lactate:** Lactate acid is an intermediary product of the anaerobic metabolism of glucose. Glycolysis is the term commonly used to describe the conversion of glucose to lactic acid. Under normal circumstances, glycolysis occurs during muscle contraction where the rate of metabolism outpaces the oxygen supply in the cells. During strenuous exercise, the level of lactic acid increases significantly and passes to the blood where it is transported to and metabolized by the liver. In normal aerobic conditions, the lactic acid is readily oxidized in the cell to pyruvic acid which is eventually degraded to $CO_2$ and $H_2O$. The concentration of lactate in the blood is affected by the rate of production, the rate of metabolism and the availability of oxygen at the cell level. Determining the blood lactate level is helpful is assessing the supply of oxygen at the tissue level. Increased oxygen deprivation causes the normal oxidation of pyruvic acid to lactate and can cause severe acidosis called lactic acidosis. This condition is characterized by increased lactate levels due to the lack of cellular oxidative process. Elevations of lactate are a sign of inadequate delivery of oxygen to the peripheral tissues as occurs in respiratory failure, circulatory failure and clinical shock.

   **Lactate - Limitations of Procedure:**
   a. Lactate samples should be analyzed within 30 minutes after collection.
   b. Normal values depend on the sample type and must be appropriately assigned.

   RapidLab 1200 Reportable Range = 0.36 – 24.0 mmol.L
   Normal Range = Arterial: 0.36 – 1.25 mmol/L. Venous: 0.90 – 1.70 mmol/L
   Critical Value = N/A

8. **K:** Potassium (K+) is the major intracellular cation. K+ plays an important role in maintaining cell membrane potential in neuromuscular tissue. Extreme abnormalities of potassium reflect a potentially life-threatening pathophysiologic state that must be corrected promptly. The potassium sensor is a half-cell that combines with the external reference sensor to form a complete electrochemical cell. The sensor contains a silver/silver chloride wire surrounded by an electrolyte solution that has a fixed concentration of potassium ions. The membrane, which consists of the ionophore valinomycin immobilized in a plasticized PVC (polyvinyl chloride)

matrix, separates the electrolyte solution from the sample. As the sample comes in contact with the membrane of the potassium sensor, a membrane potential is created by the interaction of potassium ions with the membrane. The potential developing in the potassium sensor is compared to the constant potential of the external reference sensor. The final measured potential is directly proportional to the potassium ion concentration in the sample. The potential developed by the electrochemical cell varies with the ion activity in each sample.

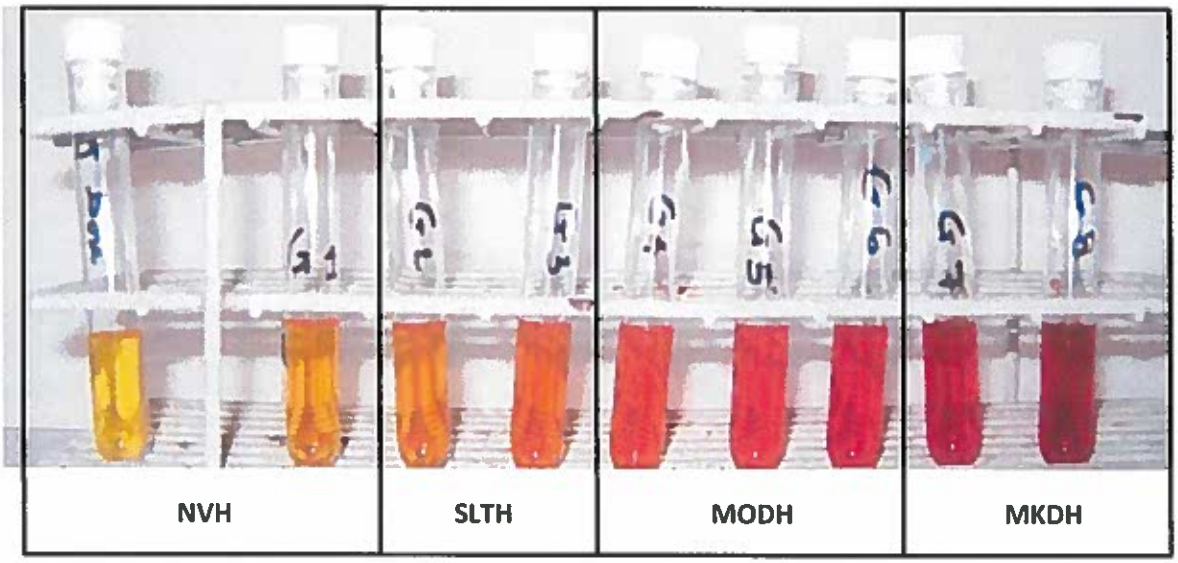
RapidLab 1200 Reportable Range = 1.36 – 12.1 mmol/L
Normal Range = (Age 18) 3.5 - 5.3 mmol/L
Critical Value = <3.0 or >6.0 mmol/L

**Limitations of Procedure – Hemolysis:** Hemolysis can falsely elevate potassium levels. Samples from non-cardiopulmonary bypass patients with K's greater than 5.0 mmol/L must be spun and the plasma portion evaluated for hemolysis as follows:

Inject some of the well-mixed whole blood sample in question into a micro-centrifuge tube labeled with the patient's MR# or last 4 digits of the CSN. The patient's last name alone is not an acceptable identifier.
Be gentle to avoid mechanical hemolysis of the sample. Spin the sample. Remove the tube from the centrifuge and examine for hemolysis.

ICU Lab: Use the StatSpin Microprep 2 centrifuge. Press Start (RPM set @ 8 x 1000, Timer set @ 1 min)
OR Lab: Use the LW Scientific ZIPspin Centrifuge. Set the speed to high. Turn the timer dial to 1 min.

- No Visible Hemolysis (NVH) – The plasma layer has no visual pink or red coloration.
- Slight Hemolysis (SLTH) – The plasma layer has a pale pink to red tinge
- Moderate Hemolysis (MODH) – The plasma layer has a definite red color but is lighter than the red cells.
- Marked Hemolysis (MKDH) – The plasma layer is a dark red color




**Exception:** Cardioplegic solution used in bypass surgery contains a large bolus of $K^+$ which can cause circulating $K^+$ levels to be above 5.0. It is not necessary to check samples for hemolysis on cardiopulmonary bypass patients while they are "on pump". The OR staff will mark the requisition indicating that the patient is "on bypass. Select the "Patient on Bypass" hemolysis grading option in RapidComm.

Refer to *Validating Patient Results – Hemolysis Grading in the RapidComm Quick Reference Guide* for instructions on documenting hemolysis in RapidComm.

9. **tHb and Co-Oximetry:**

Total hemoglobin is the total of all measured hemoglobin fractions. *tHb = FO2Hb + FHHb + FMetHb + FCOHb.* Total hemoglobin determination is important in the assessment of oxygen transport and in the evaluation of anemia. The need for hemoglobin determinations led to the development of a number of methods to determine the concentration of total hemoglobin, hemoglobin derivatives, and dyshemoglobins in human whole blood. The presence of dyshemoglobins and toxins changes the oxygen binding capacity of hemoglobin and therefore its ability to transport oxygen.

- Oxyhemoglobin (O2Hb) is the fraction of hemoglobin that is actually delivering oxygen to body tissues.
- Deoxyhemoglobin (HHb) refers to the hemoglobin capable of binding oxygen. This is the fraction of hemoglobin that could deliver more oxygen to body tissues if pulmonary oxygenation were improved This is a fraction of hemoglobin that cannot deliver oxygen to body tissues and is elevated in certain metabolic diseases.
- Carboxyhemoglobin (COHb) is hemoglobin covalently bound to carbon monoxide. Hemoglobin has over 200 times greater affinity for carbon monoxide than for oxygen. Hemoglobin bound to carbon monoxide is unavailable for oxygen transport, and high levels of carboxyhemoglobin result in hypoxia and cyanosis, which can be fatal.

Hemoglobin derivatives have characteristic absorbance spectra. Each derivative absorbs light differently at different wavelengths. The Rapidlab 1200 system CO-ox module measures the light from human whole blood at several wavelengths, and detects and quantitates total hemoglobin and other related quantities in the sample. The tungsten halogen lamp resides in a housing that contains a pair of lenses and filters. Light from the lamp passes through these lenses and filters and is transmitted through a fiber optic cable. The light exiting the cable enters the optics head assembly, which directs the light through the sample chamber. Before reaching the sample chamber, a portion of the light is diverted to a photodiode feedback sensor located on the main circuit board. The photodiode sensor provides electrical feedback to the lamp's control circuit to control the lamp's output intensity. The cable that connects the components of the measurement module is a multi-fiber bundle containing hundreds of fibers designed to deliver light that is uniformly distributed over the fiber face. The sample chamber has a sliding cell design that opens and closes to allow for measurement. The sample chamber also contains a thermistor to control the temperature of the sample during measurement and a detector mechanism to sense the position of the chamber cell. The

**tHb and Co-Oximetry cont....**

polychromater separates the sample into its component wavelengths. The polychromater measures the intensity of light at the different wavelengths and converts the electrical signal to a digital value for further processing.

**Limitations of Procedure:** Any substance that absorbs light in the same regions as whole blood could potentially cause an interference. Hyperlipemia can result in artificially increased methemoglobin values. High bilirubin concentrations can falsely increase oxyhemoglobin values. Hyperlipemia and administration of fat emulsions can increase total hemoglobin values. Samples frozen with liquid nitrogen can have decreased total hemoglobin levels. Samples from patients receiving blood substitutes yield unreliable results for oxygen content because of the different oxygen solubility of the blood substitutes.

| | |
|---|---|
| **tHb** | RapidLab 1200 Reportable Range = 4.8 – 20.8 g/dL<br>Normal Range = Male: 13 – 18 g/dL. Female: 12 – 16 g/dL<br>Critical Value: ≤ 6.0 or ≥ 20.0 g/dL |
| **O2Sat** | Reportable range = 15 – 100<br>Normal Range = Arterial: >95%. Venous: <70%. |
| **O2Hb** | Normal Range = Arterial: 96 – 97%. Venous: 40 – 70% |
| **COHb** | Normal Range = Non -smoker: <1.5%. Smoker: 1.5 – 5.0% |
| **MetHb** | Normal Range = <1.5% |
| **HHb** | Normal Range = <4.5% |

**10. p50**

Half saturation of hemoglobin by oxygen (*p*50) indicates the partial pressure of oxygen when oxygen has saturated 50% of the available hemoglobin. The *p*50 value indicates the position of the oxygen-hemoglobin dissociation curve:

- Low *p*50 shifts the curve to the left and indicates increased oxygen-hemoglobin affinity
- High *p*50 shifts the curve to the right and indicates decreased oxygen-hemoglobin affinity

The *p*50 value is useful in indicating the presence of abnormal hemoglobin that affects the oxygen transport mechanism, and as an indirect measure of the 2, 3 DPG concentration. The *p*50 can also indicate changes in pH, *p*CO2, and temperature. The *p*50 value is reported for *s*O2 values between 20% and 90% and is determined using the following equation:

$p50 = 26.6 \times (pO2c / pO2s)$ where $pO2c = pO2 \times 10^{-[0.48 \times (7.4 - pH(37)) + 0.0013BE(B)]}$
and *p*O2s is calculated with an interactive program.

**How to run and report a p50:** The RapidLab 1265 has the capability to report a p50. In order to perform a p50, you need a venous blood gas with a Co-Ox. If the O2Sat is <20% or >90%, the p50 will NOT be reported. To run a p50, turn the p50 parameter on in the analyzer as follows:

1. Setup
2. Parameters
3. Parameters On/Off
4. Press the down arrow button to get to the 2nd page of options
5. Select the p50 box (located on the 4th column, 2nd row)
6. Turn on the p50 and SAVE
7. Run the Venous blood gas and Co-Ox as you normally would. The p50 will print under the oxygen satus (p50 xx.x mmHg)
8. There is not a test code for p50 in the LIS. Result the p50 in the LIS under the BGCM prompt with a free text comment (p50 = __._ mmHg)
9. When finished, using steps 1-6, turn off the p50 parameter in the analyzer.

**11. Running a Penile Blood Gas:**

The collection of a penile blood gas sample should be collected from the corpus cavernosum. The blood gas is drawn to try and distinguish between an ischemic priapism and a non-ischemic priapism. In the case of a non-ischemic priapism (best scenario for patient) the blood should closely resemble arterial blood. **So, arterial blood should be selected when running a specimen**. Men with ischemic priapism typically have a PO2 of < 30 mm Hg, a PCO2 of > 60 mm Hg and a pH < 7.25.

**12. Changing the sample type after results are reported:**

To change the sample type (arterial to venous and vice versa) refer to the *Telcor Quick Reference Guide*.

**O. Proficiency Testing on the RapidLab 1265:**

Before running proficiency testing, you must turn off the analytical ranges.
From the 1265 Menu, select:

1. Setup
2. Secured Options
3. Analysis Options
4. Password = 12345
5. Uncheck the "Analytical Ranges" box
6. Save

***If you turn off the Analytical Ranges, you must turn them back on before testing patient/QC samples.

**P. Product Information:**

| | |
|---|---|
| **1265A** Serial Number 13017<br>NCBH Decal Number: CO46518<br>Date Installed: January 2007<br>Siemens Functional Location: 226765 | **1265D** Serial Number 16619<br>Date Installed: April 2012<br>NCBH Decal Number: CO46513<br>Siemens Functional Location: 410441 |
| **1265B** Serial Number 13008<br>Date Installed: March 2007<br>NCBH Decal Number: CO46515<br>Siemens Functional Location: 226764 | **1265E** Serial Number 16613<br>Date Installed: April 2012<br>NCBH Decal Number: CO46517<br>Siemens Functional Location: 410442 |
| **1265C** Serial Number 13022<br>Date Installed: March 2007<br>NCBH Decal Number: CO46516<br>Siemens Functional Location: 226766 | |

**Q. Service Hotline/Technical Information:**

1-877-229-3711, ext 12.
Ext 3 for RapidLab 1200
Ext 4 for RapidComm (RapidComm Serial Number = 0130-03343)
Customer Service: 1-800-255-3232. Account # 88027
**Aramark Clinical Engineering: 1-800-272-3553**

Brief description of the On Site Service Process:

1. We call Trimedx (formerly Aramark)
2. Trimedx calls our Biomed Dept (Guys in Red Shirts)
3. Biomed calls lab to touch base and verify we need on site service
4. Biomed requests a PO from Trimedx. Includes a $$ amount and brief description
5. The system sends a message to the Biomed supervisor's phone. The supervisor reads the brief description
6. The Biomed Supervisor punches "approve"
7. The approval goes back to Trimedx
8. Someone from Trimedx orders the PO
9. Biomed waits for the PO to generate
10. Once the PO is generated, Biomed calls Siemens with the PO to request on site service

**R. Turning the RapidLab 1265 analyzer off/on:**

1. Analyzer Status
2. Shutdown
3. Toggle the switch off in the back right hand corner of the instrument
4. To turn the instrument on, toggle the switch off in the back right hand corner of the instrument.

**S. Changing patient sample ranges in Siemens 1265 analyzer**

1. Press "Analyzer" icon in upper right corner
2. Press "Setup" button in lower right corner
3. Press "Sample" button in first column
4. Press "Patient Ranges" button in second column
5. Use up or down arrows on left to find the parameter that needs changing
6. Touch the parameter in the white box that needs changing

7. Touch the "High" or "Low" button to highlight value box
8. To remove old value, press the "Clear" button
9. Using the number pad, enter the range by entering low end and high end values
10. If changing more than one parameter, repeat steps 5 – 9 for each parameter you need to change
11. After changing all parameters needing to be changed, hit the green "Save" button
12. Press the green back arrow and then the "syringe" symbol in the upper right to return to home screen

**T. Changing a QC lot from *Trial* to *Active* in the Siemens RapidLab 1265 analyzer:**

1. Press the "machine" icon in upper right corner
2. Press the "Setup" button in low right corner
3. The QC button is already checked, press "Required QC Ranges" button on right side
4. Pick the level your wish to make active from the trial lot line
   **Important: Once a trial lot is made active, the previous active lot ranges are deleted**
5. Press the "Set Active" button in lower left corner and hit green "Save" button

**U. Changing a QC lot from *Trial* to *Active* in Rapidcomm:**

1. In Rapidcomm, select "Devices" from the top of the screen
2. Select "Material Setup" under Devices
3. Select "Assign Lots" under Material Setup
4. Double click the trial lot you wish to make active
5. Using the drop down box under "State" in upper right corner, change from trial to actice
6. Click the "OK" button in lower right corner, the lot is now active
   **Important: Rapidcomm does allow more than one active lot**
7. To make old lot inactive, highlight it and click delete at bottom of screen (This will not delete data)

**V. Annual Verification of the Lab's Barometric Pressure Device:**

The Lab's Barometric device is compared annually to the pressure measured at our nearest airport. Results are recorded on form *CCL-F074 Thermometer/Hygrometer Record*. Results should agree +/- 4 mm Hg.

1. The local airport provides a relative pressure corrected to sea level conditions. To compare the pressure reported at Smith Reynolds Airport to the lab's barometer, the airport pressure has to be corrected based on the altitude from where it is reported.
2. Determine the altitude (in feet) of your facility. The altitude of Smith Reynolds Airport is 969 feet.
3. Determine the correction factor (CF):
   NOTE: The Barometric Pressure drops by 26 millimeters for every 1000 feet above sea level.
   26 ÷ 1000 = 0.026. Therefore, we multiply the altitude in feet by 0.026.
   CF = [760 - (Altitude x 0.026)] ÷ 760
   CF= [760 - (969 x 0.026)] ÷ 760 = 0.9668
   Therefore our correction factor for altitude is 0.9668
4. The altimeter barometric pressure reported at Smith Reynolds Airport is reported in inches of mercury so it will have to be converted to millimeters of mercury. One inch of Hg is equal to 25.4 mm of Hg. So take the altimeter pressure from Smith Reynolds Airport weather report http://w1.weather.gov/obhistory/KINT.html and multiply by 25.4 to convert to mm of Hg.
5. The current pressure in mm of Hg from Smith Reynolds Airport can then be corrected to altitude by multiplying it by our correction factor of 0.9668. This is the actual pressure of the lab in mm Hg. Here is the simplified formula to calculate the actual pressure. First look up the current barometric pressure reported at Smith Reynolds Airport by going to the link [http://w1.weather.gov/obhistory/KINT.html] and using the altimeter pressure reading in inches. Use that pressure with this formula to compare the local pressure to the reading in the lab.
   (Altimeter pressure in inches from Smith Reynolds) x (25.4) x (0.9668) = Actual Pressure of Lab in mm Hg.

W. **Siemens 1265 Peer Group QC Online Program:** RapidComm QC data is transferred via a RapidComm export file to RTQC data conversion software. The conversion software massages the data and changes the format of the report. The report is then sent to Siemens and peer group data is generated. To pull the peer group report, follow the steps below. Note: both RapidComm and the RTQC Data Conversion software must be loaded on the PC.

1. **Exporting Data from RapidComm**
    1. Log on to RapidComm
    2. From the toolbar at the top, select "Utilities"
    3. From the dropdown box, select "Export"
    4. Select "QC Data"
    5. Enter the start and end dates for the data you wish exported
    6. Click the "Export" button on the bottom right of the screen
    7. Select the path *G:\Lab_Shared\ICU_ORLab\RComm export file* in the "Export QC Data" box
    8. Name the file with the appropriate dates (For example: PeerQCExport_02_01_2014 – 02_28_2014.xml)
    9. Click "Save"
    10. Close RapidComm
2. **Converting the data into a usable format for Siemens**
    1. Open the RTQC-Data Converter software
    2. Enter the "beginning date" and "ending date" of the data to be converted. 3. Click the "Go" button in the upper left corner
    4. Highlight the monthly PeerQCExport file you wish to convert
    5. Click the "open" button in the "Select the File to Convert" box
    6. If the folder does not automatically appear, select the path *G:\Lab_Shared\ICU_ORLab\RComm export files* in the "Save RT File to..." box
    7. Name the file with the appropriate month (For example: February QC.RT)
    8. Click the "save" button.
    9. The software will convert the files and show the amount of data converted. Note: A large file size equals a successful download.
    10. Errors will show in the Notes section of the converter. Close the converter software
3. **Submitting the data to Siemens**
    1. Open the Internet Link http://siemensdiagnostics.rtqc.hematronix.com
    2. Enter the Username: 127157
    3. Enter the Password (case sensitive): 082349B4
    4. The "Wake Forest University Baptist Medical Center" page appears
    5. Verify that the month, year and lot numbers of the QC to be uploaded are correct.
    6. Click on the red "Enter QC Data" box
    7. Re-verify that the month and year are correct
    8. Click "save changes"
    9. There are 2 "Go" buttons on this screen. Click the "Go" button on the left hand side next to "uploading your QC data"
    10. Click the "browse" button next to the File Name box
    11. Select the file for the appropriate month named QC.rt under the folder *G: Lab_Shared\ICU_OR Lab\RComm export files*. (This is the file that was created above in section B step 6)
    12. Click "open"
    13. Click the "upload" button under the File Name box
    14. Wait until the instruments and download information appear on the screen
    15. Click "update database" in the lower right hand corner
    16. Click on the red "Home" box

17. Click "Reports" beside each instrument
18. Click "Build" beside the report you wish to see
19. For each instrument, print The Statistical Analysis Report (pages 9 and 10)

**4) Related Procedures/Information/Guides:**

- *CCL-020 Patient Identification and Identification of blood, body fluids and tissue samples*
- *CCL-QRG-008 RapidComm Quick Reference Guide*
- *CCL-009 References for Respiratory Care and Nursing Blood Gas and Lab Collection Procedures*
- *Siemens RapidLab™ 1265 Operator's Guide 0208742 Rev. V, 2010-01.* (This manual is located under G:\Lab_Shared\ICU_ORLab\1265\1265 manual ICUOR Lab)
- Department of Pathology Policy and Procedure Bulletin PPB-PCS-LAB 05
- NCBH Policy and Procedure Bulletin – Critical Results of Tests and Diagnostic Procedures PPB-NCBH-10
- *CCL-016 Corrected Report/Critical Value Reporting Policy - Exceptions to the Department Policy*
- StatSpin Technologies, Norfolk Scientific Inc., 85 Morse Street, Norwood, Ma. 02062. StatSpin III Operator's Manual 1991. StatSpin Microprep 2 Operator's Manual
- *CCL-QRG-010 Beaker Quick Reference Guide*
- *CCL-QRG-009 Telcor Quick Reference Guide.*
  *Included in this procedure*

**5) Addition Items included in this procedure:**

Item 1 - BGAS QC Flowchart
Item 2 - Chart - Normal values, Critical Values, Technical Limits, Sample Stability, Sample Type.
Item 3 - Temperature Conversion Chart
Item 4 - Back Flushing a Blood Clot from the Rapidlab 1265
Item 5 - RapidLab 1265 Error Messages, Fluid Path Diagram
Item 6 - Capillary Tube Comparison: RNA Medical Safe Wrap CT 220 (new) vs. Natelson Lithium Heparin (current)
Item 7 - Aramark Clinical Engineering Equipment Service Request Procedure
Item 8 - Millibars to mmHg conversion chart

**6) Related Forms:**

CCL-F014 OR Lab Requisition. G:\Lab_Shared\ICU_ORLab\FORMS and LOGS\REQUISITIONS\CCL-F014 ORLAB_REQUISITION 05_2012.xlsx)

CCL-F032 thru CCL-F036 MAINTENANCE SHEET SIEMENS 1265. (G:\Lab_Shared\ICU_ORLab\FORMS and LOGS\Maintenance and QC Forms.xlsx)

CCL-F038 thru CCL-F042 1265 Troubleshooting and Unscheduled Maintenance Logs. (G:\Lab_Shared\ICU_ORLab\FORMS and LOGS\Maintenance and QC Forms\Problem Logs.xlsx)

CCL-F088 and CCL F089 Daily QC Verification Log. (G:\Lab_Shared\ICU_ORLab\FORMS and LOGS\Maintenanc and QC Forms)

CCL-F074 Thermometer/Hygrometer Record (G:\Lab_Shared\ICU_ORLab\FORMS and LOGS\TEMPERATURE Monitoring\CCL-F074 CCL Thermometer record.xlsx)

**7) References:**


- *Siemens RapidLab™ 1265 Operator's Guide*, Siemens Corning Diagnostics Corp, Medfield, MA. PN 105951 Rev C, Copyright 4/2007. A hard copy of the Operator's Guide can be found in the laboratory. An electronic version can be found under *G:\Lab_Shared\ICU_ORLab\GUIDES, MANUALS, PROCEDURES\1265'S\1265 manual.*
- NCCLS Document C27-A, Vol. 13 No. 6. "Blood Gas Pre-Analytical Considerations: Specimen Collection, Calibration, and Controls". Approved Guideline, April 1993.
- http://w1.weather.gov/obhistory/KINT.html

8) **Related CAP Standards:** COM.40600, COM.30550, LSV.41490, LSV.41570, LSV.41650, LSV.41730, LSV.41810

9) **Review/Revision/Implementation:**
   - Review Cycle: All procedures must be reviewed at least every 2 years.
   - Office of Record: Department of Pathology, Critical Care Laboratory

10) **Previous Revision Date(s):** 04/03, 05/07, 03/11,6/14, 4/15, 2/17, 2/18, 8/18

11) **Revised/Reviewed Dates and Signatures:**

Reviewed/Revision Date:_____ Signature:_____

Reviewed/Revision Date:_____ Signature:_____

Reviewed/Revision Date:_____ Signature:_____