PhenX Toolkit

Data Collection Worksheet

Please Note: The Data Collection Worksheet (DCW) is a tool to aid integration of a PhenX protocol into a study. The PhenX DCW is not designed to be a data collection instrument. Investigators will need to decide the best way to collect data for the PhenX protocol in their study. Variables captured in the DCW, along with variable names and unique PhenX variable identifiers, are included in the PhenX Data Dictionary (DD) files.

Blood is drawn anaerobically from a peripheral artery (radial, brachial, femoral, or dorsalis pedis) via a single percutaneous needle puncture, or from an indwelling arterial cannula or catheter for multiple samples.

Either method provides a blood specimen for direct measurement of partial pressures of carbon dioxide ($PaCO_2$) and oxygen (PaO_2), hydrogen ion activity (pH), total hemoglobin (Hbtotal), oxyhemoglobin saturation (HbO_2), and the dyshemoglobins carboxyhemoglobin (COHb) and methemoglobin (MetHb).

Indications:

1. The need to evaluate the adequacy of ventilatory ($PaCO_2$) acid-base (pH and $PaCO_2$), and oxygenation (PaO_2 and SaO_2) status, and the oxygen-carrying capacity of blood (PaO_2, HbO_2, Hbtotal, and dyshemoglobins).
2. The need to quantitate the patient's response to therapeutic intervention and/or diagnostic evaluation (e.g., oxygen therapy, exercise testing).
3. The need to monitor severity and progression of a documented disease process.

Contraindications:

Contraindications are absolute unless specified otherwise.

1. Negative results of a modified Allen test (collateral circulation test) are indicative of inadequate blood supply to the hand and suggest the need to select another extremity as the site for puncture.
2. Arterial puncture should not be performed through a lesion or through or distal to a surgical shunt (e.g., as in a dialysis patient). If there is evidence of infection or peripheral vascular disease involving the selected limb, an alternate site should be selected.
3. Agreement is lacking regarding the puncture sites associated with a lesser likelihood of complications; however, because of the need for monitoring the femoral puncture site for an extended period, femoral punctures should not be performed outside the hospital.

4. A coagulopathy or medium-to-high-dose anticoagulation therapy (e.g., heparin or coumadin, streptokinase, and tissue plasminogen activator but not necessarily aspirin) may be a relative contraindication for arterial puncture.
5. Improperly performing equipment, untrained personnel, or improper collection and/or handling of the specimen.

Limitations of Method/Validation of Results

Limitations:

• Artery may be inaccessible due to periarterial tissues (overlying muscle, connective tissue, or fat).

• Pulse may not be palpable.

• Arteriospasm may preclude collection despite successful introduction of needle into the artery.

• Arterial blood specimens withdrawn from the body only reflect the physiologic condition at the moment of sampling (e.g., pain from the puncture itself may lead to hyperventilation with consequent changes in values).

• Specimens drawn at peak exercise best reflect response to exercise; however, specimens drawn within 15 seconds or less of termination of exercise may be acceptable (otherwise results do not reflect ventilatory status during dynamic activities and may yield false-negatives for hypoxemic events).

• Specimens from mechanically ventilated patients with minimal pulmonary pathology adequately reflect the effects of oxygen concentration change 10 minutes after the change. In spontaneously breathing patients, at least 20-30 minutes should elapse following oxygen concentration change (patients with obstructive defects and increased residual volumes may require the full 30 minutes or longer).

• Specimens held at room temperature must be analyzed within 10-15 minutes of drawing; iced samples should be analyzed within 1 hour. The PaO_2 of samples drawn from subjects with elevated white cell counts may decrease very rapidly. Immediate chilling is necessary. Some dual-purpose electrolyte/blood gas analyzers stipulate immediate analysis without chilling because of possible elevations in potassium from chilling; however, the accuracy of the blood gas results should not be affected by the chilling.

Validation of results:

• Sample must be obtained anaerobically and anticoagulated, with immediate expulsion of air bubbles. Sample should be immediately chilled or analyzed within

10-15 minutes if left at room temperature.

• When a sample is obtained, date, time, patient's body temperature, position, activity level, respiratory rate, sample site, results of Allen test, inspired oxygen concentration or supplemental oxygen flow, and mode of supported ventilation should be documented in the patient's medical record with the results of blood gas analysis.

• Appropriate sample size depends on the anticoagulant used, the requirements of the specific analyzers to be used, and the presence of a need for other assays.

• If liquid heparin (sodium or lithium, 1,000 units/mL of blood) is used, excess heparin (all except that filling the dead space of the syringe and needle) should be expelled and a blood sample of 2-4 mL be drawn (liquid heparin dilutes the specimen and changes PCO_2 and PO_2 in direct relationship to the heparin volume).

• If lyophilized heparin is used, the minimum volume drawn depends on the design of the analyzers and the need for other assays.

• If other assays are required (e.g., electrolyte determination), the choice of anticoagulant and the volume of the blood sample should be guided by the analyzer manufacturer's recommendations.

Protocol source: https://www.phenxtoolkit.org/protocols/view/90202