



## Critical Care Therapy and Respiratory Care Section

Category:	Clinical
Section:	Diagnostics
Title:	Collection of a Cytology Specimen from a Pulmonary Artery Catheter
Policy #:	03
Revised:	03/00

### 1.0 DESCRIPTION

- 1.1 Definition:** Pulmonary microvascular tumor embolization may occur in some cancer patients causing respiratory distress in these patients. Wedged pulmonary artery catheter-derived blood samples from these patients may yield malignant cells which aid in the diagnosis of tumor spread to the lungs. This may serve to avoid further diagnostic work-up in some patients.
- 1.2 Indications:** Collection of a cytology specimen from a wedged pulmonary artery catheter is useful for the diagnosis of tumor embolization in cancer patients who develop acute respiratory distress with cardiopulmonary insufficiency. In the 10D MICU, these patients will have indwelling pulmonary artery catheters.
- 1.3 Contraindications:** Collection of a cytology specimen from a pulmonary artery catheter should not be attempted when a catheter fails to wedge properly (See Precautions and Procedure).
- 1.4 Complications:**
- 1.4.1 A prolonged wedge of the pulmonary artery catheter may cause pulmonary infarction.
  - 1.4.2 Improper sampling technique may cause arteriospasm or damage to the vessel wall.
  - 1.4.3 A balloon which bursts during the procedure may cause air emboli.
- 1.5 Precautions:**
- 1.5.1 Never leave the catheter in the wedge position for more than two minutes as this could lead to pulmonary infarction.
  - 1.5.2 Always withdraw blood from the distal port of the pulmonary artery catheter slowly to avoid arteriospasm and vessel damage.
  - 1.5.3 Verify that the blood being sampled is pulmonary capillary in origin prior to sending the sample for analysis. (See Procedure.)
  - 1.5.4 To minimize the risk of the balloon bursting, do not pull back on the catheter while the balloon is inflated.
  - 1.5.5 A peripheral blood specimen and a mixed venous blood specimen should be sent with the pulmonary microvascular specimen. These other specimens allow for comparative quantitative analysis of circulating malignant cells which increases the sensitivity of this technique for the diagnosis of pulmonary malignancy.

### 1.6 Adverse Reactions and Interventions:

- 1.6.1 A catheter that fails to wedge should only be manipulated by a physician. If a wedge waveform cannot be obtained with the balloon inflated, or the balloon does not hold air, notify a physician.  
**(CAUTION:** Do not repeatedly attempt to inflate a balloon which does not hold air).
- 1.6.2 If an adequate blood sample cannot be obtained within two minutes, the catheter should be repositioned. Notify a physician.
- 1.6.3 If the blood sample cannot be verified as pulmonary capillary in origin (See Procedure), notify the physician.

## 2.0 EQUIPMENT AND MATERIALS

### 2.1 Mixed Venous Specimen Collection:

- 2.1.1 1 - 3 ml syringe for waste discard
- 2.1.2 1 - 10 ml syringe for specimen collection
- 2.1.3 1 large purple top (heparinized) test tube, #6457
- 2.1.4 1 sterile needle or "needle-less" device for transferring the specimen into the test tube
- 2.1.5 Patient identification label

### 2.2 Peripheral Specimen Collection from an Indwelling Arterial Catheter:

- 2.2.1 1 - 3 ml syringe for waste discard
- 2.2.2 1 - 10 ml syringe for specimen collection
- 2.2.3 1 large purple top (heparinized) test tube, #6457
- 2.2.4 1 sterile needle or "needle-less" device for transferring the specimen into the test tube
- 2.2.5 Patient identification label

a **NOTE:** If the patient does not have an arterial catheter, nursing will obtain peripheral venous specimen via venipuncture.

### 2.3 "Wedge" Specimen:

- 2.3.1 2 - 10 ml syringes one each for waste discard and specimen collection
- 2.3.2 1 large purple top (heparinized) test tube, #6457
- 2.3.3 1 sterile needle or "needle-less" device for transferring the specimen into the test tube
- 2.3.4 Heparinized 3 ml syringe for blood gas analysis
- 2.3.5 Patient identification labels

## 3.0 PROCEDURE

- 3.1 Place the patient in the supine, flat position (as tolerated). This is necessary to increase the likelihood that the "wedge" specimen is obtained from Zone 3 of the lung, that zone which has optimal pulmonary capillary blood flow.
- 3.2 Obtain a mixed venous specimen from the pulmonary artery catheter. Place it in a test tube clearly marked "mixed venous specimen," and place a patient label on the test tube.
- 3.3 Inflate the balloon of the pulmonary artery catheter and verify a pulmonary artery occlusion waveform on the cardiopulmonary monitor.

**NOTE: Do not keep balloon inflated for more than two minutes.**

- 3.4 Slowly withdraw 10 ml (or 8 ml in patients less than 12 years of age) of the blood and flush solution mixture from the pulmonary artery catheter and discard.
- 3.5 Draw an additional 1 ml of blood in the heparinized blood gas syringe, and analyze it for the partial pressure of oxygen. Ideally, the PaO<sub>2</sub> should be greater than 100 mm Hg for verification of a microvascular derived sample. If the PaO<sub>2</sub> is not greater than 100 mm Hg, repeat steps 3.3. and 3.4. above for verification of the specimen or consult the aid of a physician. The pulmonary artery catheter may need to be repositioned. If repositioning fails to improve the PaO<sub>2</sub>, consult the physician for instruction regarding the need to continue the procedure.

**NOTE: If PaO<sub>2</sub> is <100 mmHg, still send specimens to lab for analysis.**

- 3.6 Slowly withdraw an additional 10 ml of blood (for patients greater than 12 years of age) or 8 ml of blood (for patients less than 12 years of age) from the catheter for the cytology specimen. Place the blood sample in a test tube clearly marked "wedge specimen," and place a patient label on the test tube.
- 3.7 Deflate the balloon, and verify a pulmonary artery pressure waveform on the cardiopulmonary monitor.
- 3.8 Obtain a peripheral blood sample from the arterial catheter, and place it in a test tube clearly marked "peripheral specimen." Place a patient label on the test tube. In the absence of an arterial catheter, a nurse will obtain a peripheral venous blood sample.
- 3.9 Send the specimens for analysis. Each specimen must be accompanied to the lab by a transmittal slip. Refer to section 5.0 for ordering transmittal slips.
- 3.10 Place the specimens and the transmittal slips in a Ziploc bag, and deposit them on the specimen cart. These will be picked up by the lab runner.
- 3.11 Send a MIS-o-gram to request a specimen pick-up of the lab runner.

#### **4.0 POST PROCEDURE**

- 4.1 Discard all disposable materials and assure patient comfort.
- 4.2 Document the following on the Critical Care Flowsheet:
  - 4.2.1 Pulmonary Capillary Blood Gas
  - 4.2.2 Specimens collected in lab section
  - 4.2.3 Total amount of blood drawn for pediatric or patients with fluid restriction
- 4.3 Document the following in the progress notes
  - 4.3.1 How the patient tolerated the procedure
  - 4.3.2 Any complications the patient may have experienced

## **5.0 Pulmonary Capillary Pullback Ordering Procedure**

- 5.1** Sign onto the **MIS**
- 5.2** Select **MD ORDERS**
- 5.3** Select **ENTER ORDERS**
- 5.4** Select the **PATIENT**
- 5.5** Confirm the patient
- 5.6** Select (order received) **WRITTEN**
- 5.7** You should now be on the **CRITICAL CARE PHYSICIAN MASTER GUIDE**
- 5.8** Select **PULMONARY CAPILLARY PULLBACK**
- 5.9** Select **ALL OF THE ABOVE** or click on each specimen you want to order
- 5.10** Click on **REVIEW**, then **ENTER**
- 5.11** All three slips will print out at this time

SIGNATURE: \_\_\_\_\_  
(Assistant Section Chief, CCTRCS, CCMD)

Date: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_  
(Section Chief, CCTRCS, CCMD)

Date: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_  
(Medical Director, CCTRCS, CCMD)

Date: \_\_\_\_\_

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(Rev. 3/00)