



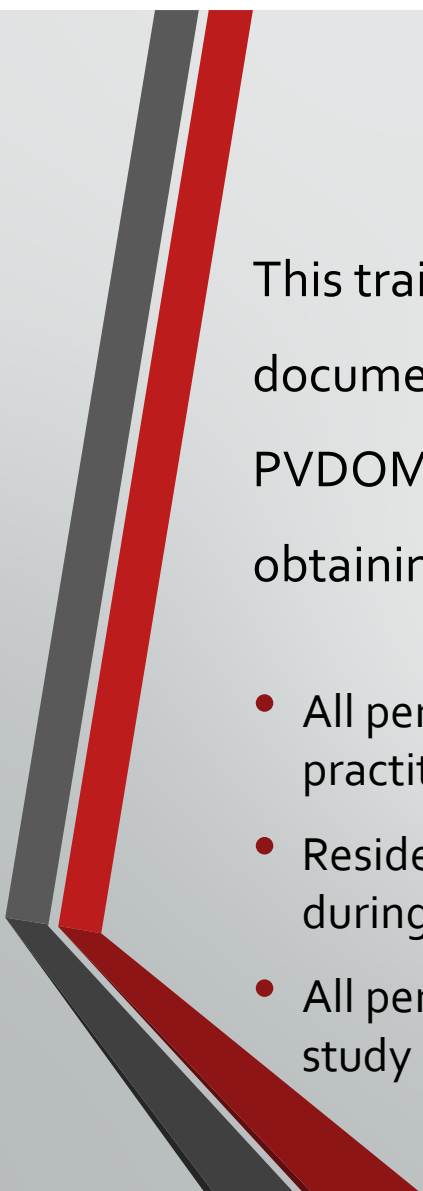
PVDOMICS: Right Heart Catheterization Training

Cardiovascular Physiology Core
Cleveland Clinic, Cleveland OH
November 7, 2016



NHLBI Pulmonary Vascular Disease Phenomics Program

*Funded by the National Heart, Lung, and Blood Institute of the
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Introduction

This training webinar is intended to serve as both a training and a reference document for persons who perform the right heart catheterization for the PVDOMICS study using standardized procedures and techniques. This will aid in obtaining accurate test results and a safe testing environment.

- All persons performing the right heart catheterizations will be licensed medical practitioners in the state where the procedure is taking place.
- Residents or fellows will be supervised by an attending physician who will be present during the entirety of the procedure.
- All persons performing the right heart catheterizations will be trained in the specific study procedures by the data coordinating center (DCC) via webinar instruction.

Contraindications

Absolute Contraindications

- Infection at the insertion site
- Presence of a right ventricular assist device or total artificial heart
- Inability to provide consent

Relative Contraindications

- Coagulopathy (INR > 3.0)
- Thrombocytopenia (< 50,000)
- Electrolyte imbalances/disturbances
- Acid-base disturbance
- Other conditions that may make passage of the swan difficult (e.g. tricuspid valve prosthesis or vegetation)

Anticoagulation Recommendations

- Anticoagulant medications should be managed prior to the right heart cath by the performing physician.

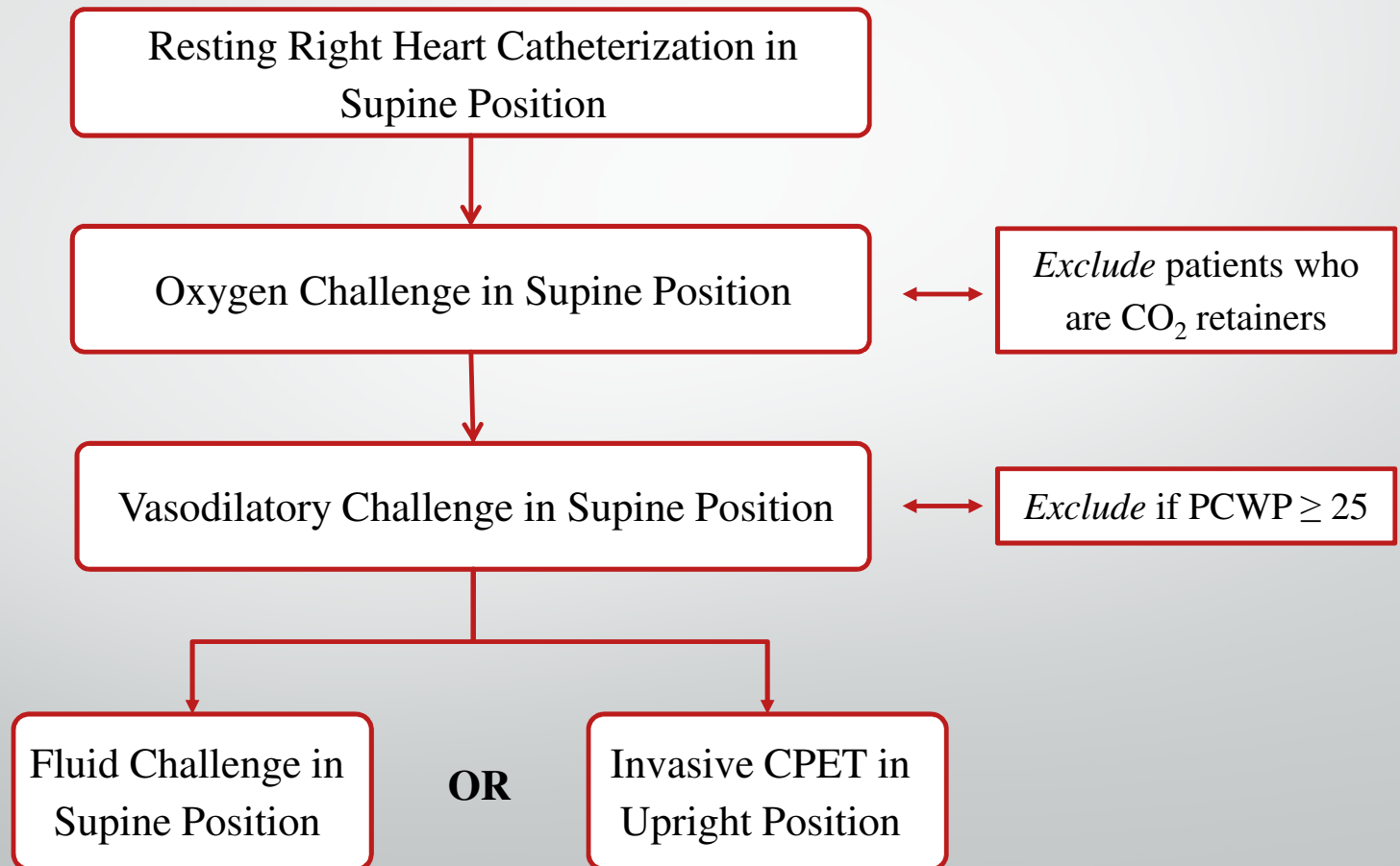
However:

- Participants must be off of heparin for *at least 30 minutes* prior to procedure.
- Participants must be off of low molecular weight heparin for *at least 8 hours* prior to the procedure.

Requirements for RHC

- The participant should be in the same position for each set of hemodynamic measurements at each study time point.
- Participants will be in a supine position for resting right heart catheterization measurements.
- The pulmonary artery catheter size should be at least 6F to prevent shearing of blood samples.
- Site of access should be internal jugular vein, antecubital vein, or femoral vein (femoral is the least preferred option)

Order of Procedures



Data To Be Obtained

Pressures	Saturations	Outputs
RA	SVC	Thermodilution
RV	PA	Direct Fick (<i>optional</i>)
PCWP	PCWP	
PA		
DPG		

Data Obtained: Zeroing the Transducer

- Check the pressure transducer level to ensure it is at the level of the right atrium.
- The transducer should be “zeroed” before each condition.
 - For participants undergoing an invasive CPET, the following procedure will be used for calibration. The PA and PCWP are recorded under fluoroscopy to ensure proper location of the catheter tip. The patient is then moved to the upright position, and the pressure calibrator is opened to ambient air (“zeroed”), calibrated, and leveled to the fourth intercostal space at the midaxillary line, approximately 5 cm below the angle of Louis or 3 finger breadths below the axilla. (see Manual of Operations Chapter 111 (iCPET))
- Details of the technique to zero the transducer are available in the MOP

Data Obtained: Blood Samples

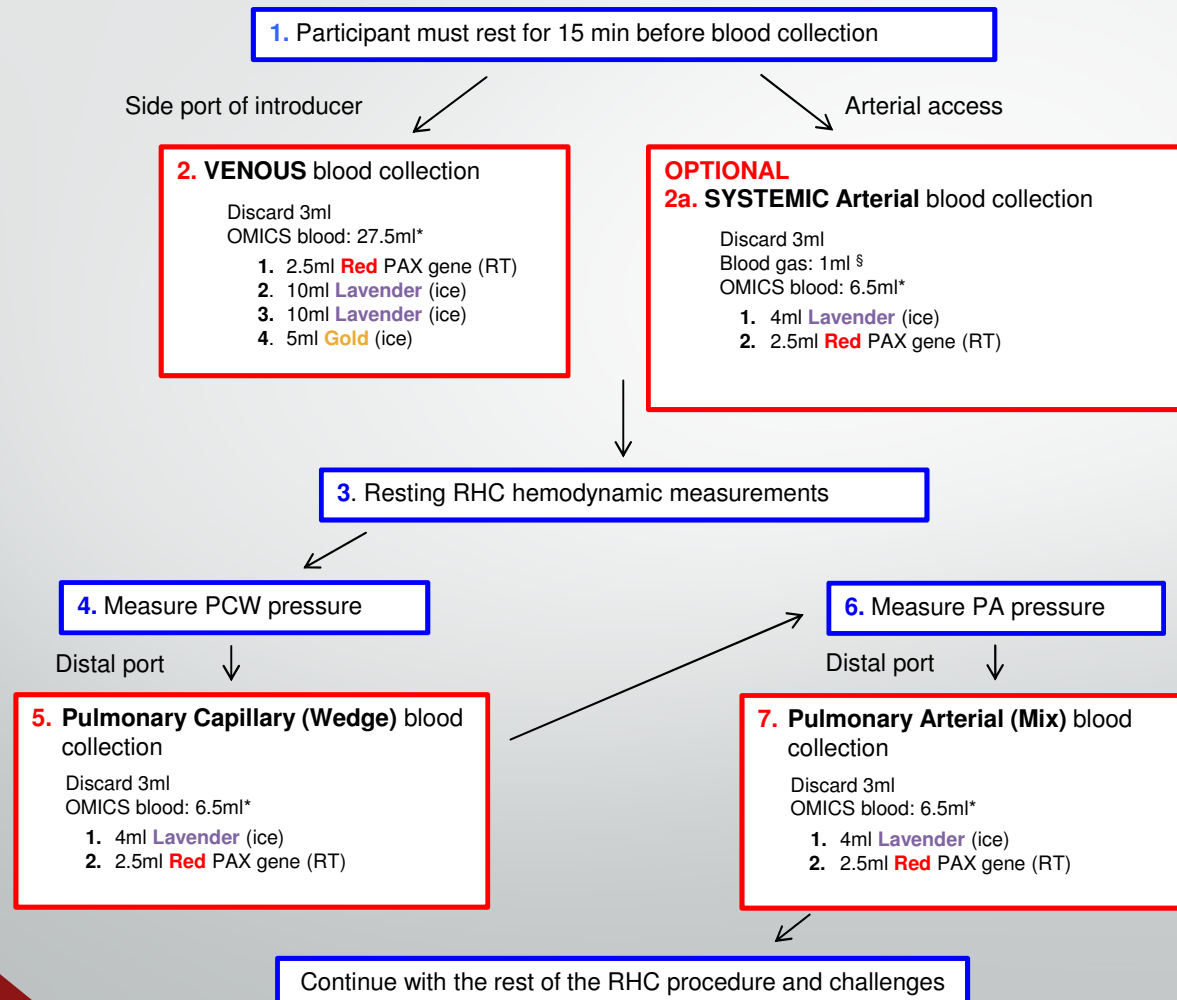
- The following blood samples will be obtained during the resting RHC per the blood protocol.
 - Venous (via introducer, *before* RHC) (27.5mL)
 - Systemic Arterial (optional, *before* RHC) (6.5mL)
 - Pulmonary Capillary (Wedge) (6.5mL)
 - Pulmonary Arterial (Mix) (6.5mL)
- All blood samples must reach the lab within 1 hour of the draw time.

Data Obtained: Blood Samples

Venous “omics” Blood Draw

- Participant has to be resting for 15 minutes before drawing the blood.
- After the introducer has been placed, but before any other procedures or measurements are performed, draw the venous blood sample from the SVC through the side port of the sheath.
- Draw back 3mL of blood using a sterile syringe and discard the sample. Then, using a second sterile syringe, draw 27.5mL of blood for “omics” analysis.
- Team member or coordinator will then fill the tubes using a sterile transfer device.

Data Obtained: Blood Samples



□ Order of RHC
□ Order of OMICS Blood Collection 2

* non-heparinized syringe
§ heparinized syringe

RT = room temperature
ice = place on wet ice

Recording Data: Pressure Tracings

- All pressure tracings must be accompanied by a simultaneous ECG tracing
- All pressure tracing recordings or “snapshots” should contain at least three (3) entire respiratory cycles.
- All hemodynamic recordings should be taken twice – once while the participant is breathing spontaneously and once during an end-expiratory breath hold.
- Digitized or computer generated “mean line” should be recorded with all tracings.

Condition should be noted

1. Rest: Pressure Calculations 01:04:54 PM+1 s

AXIOM Sensis XP VC11D

ECG tracing



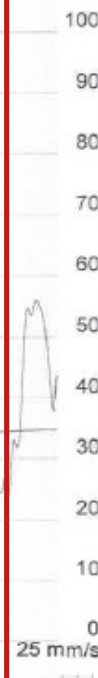
PA 100 mmHg B

Measurement location must be noted somewhere



Mean Line

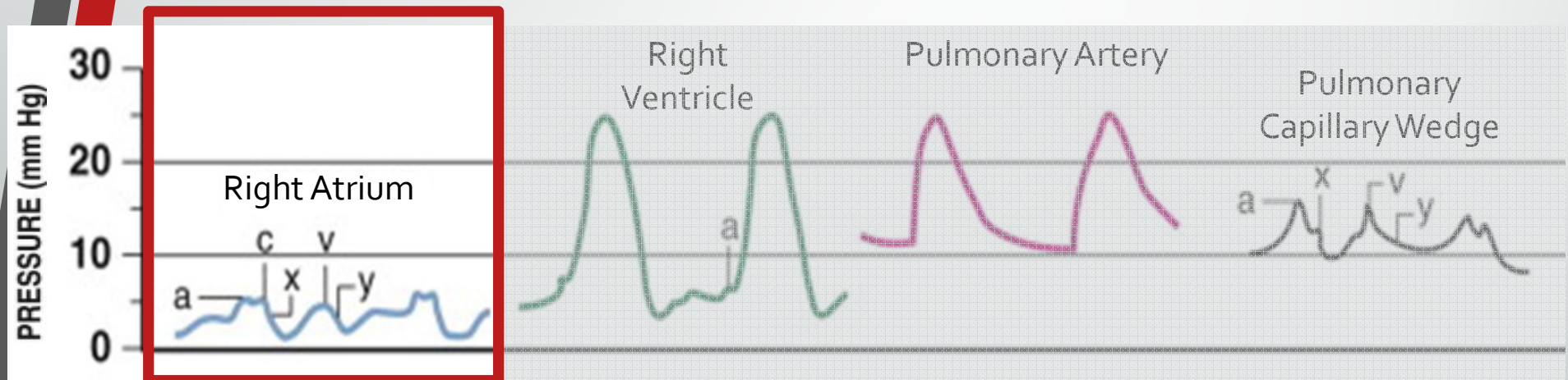
Summary: 65HR: PA 55/24/34



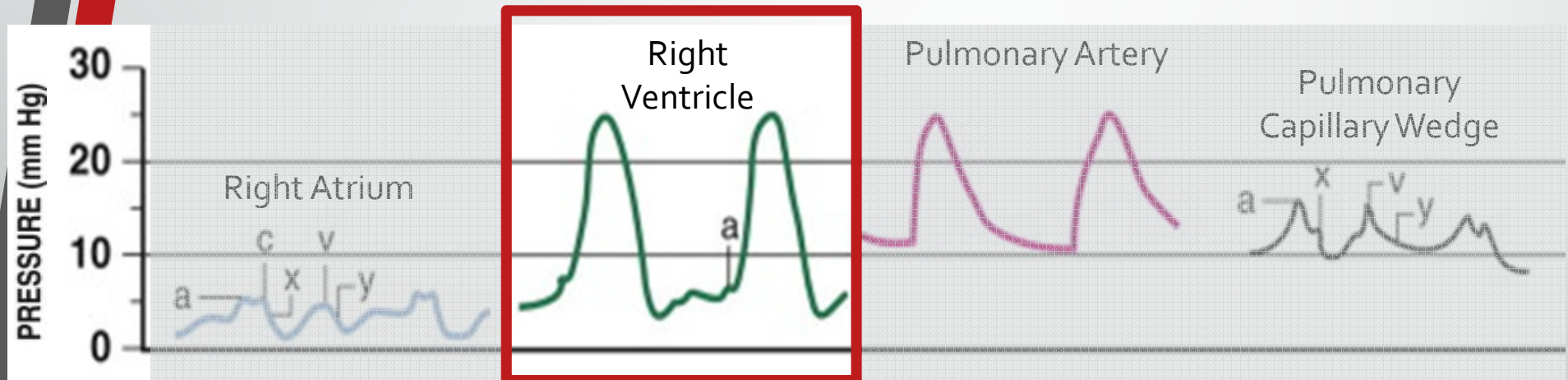
Pressure scale and Speed

Study: Coronary*Heart Fail...

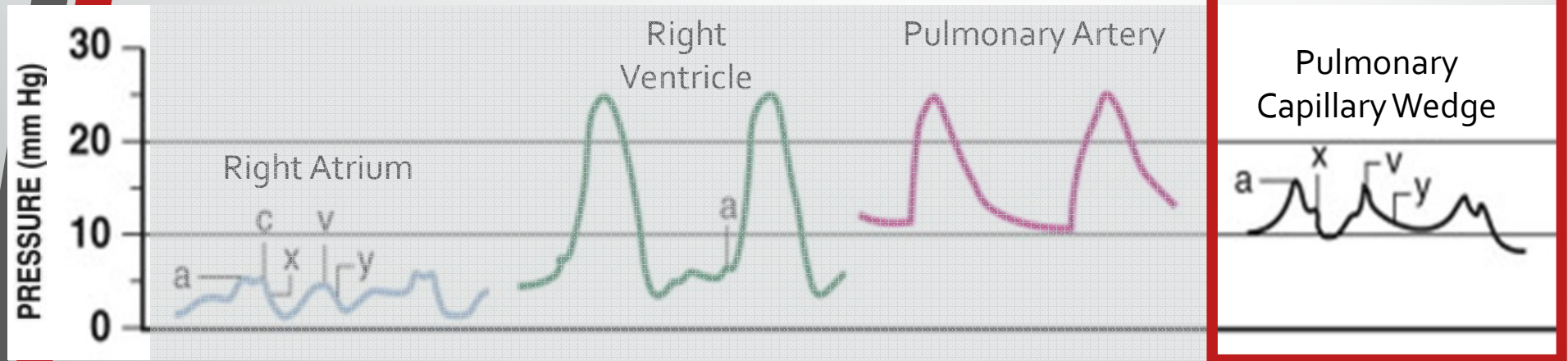
Recording Data: Pressure Tracing Examples



Recording Data: Pressure Tracing Examples



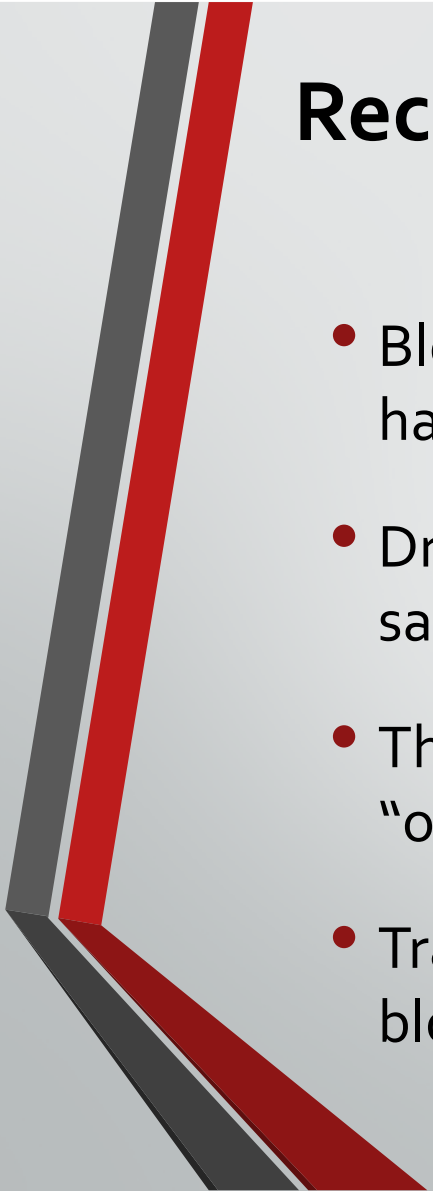
Recording Data: Pressure Tracing Examples



Recording Data: PCWP Saturation

After PCWP recording, a pulmonary capillary wedge oxygen saturation (PCWP sat) should be measured.

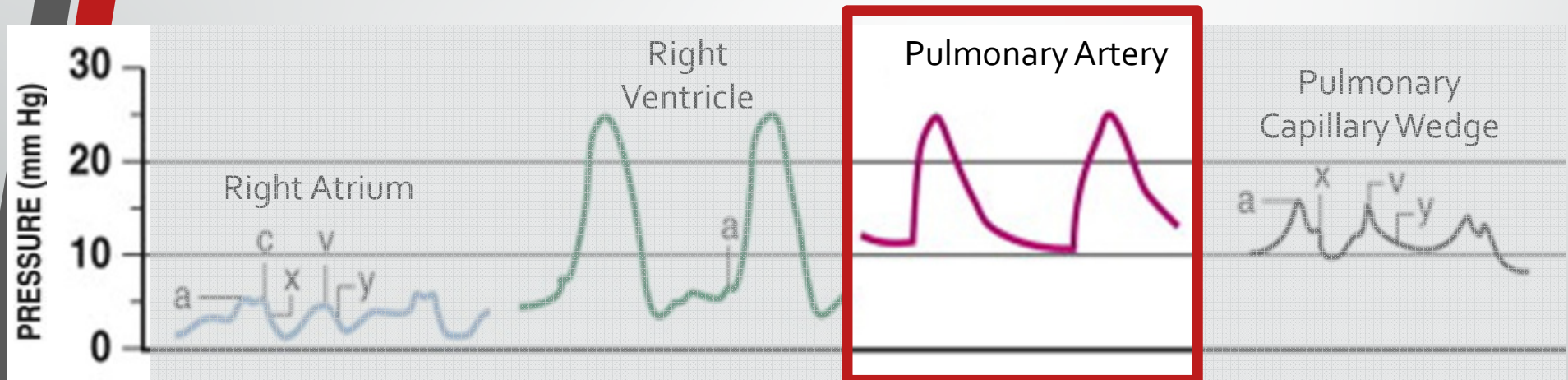
- While the balloon is inflated, slowly draw back at least 3mL of blood from the distal port of the PA catheter until the blood sample turns bright red. Discard this sample.
- Draw 1mL of blood for a PCWP sat.
- PCWP sat should be at least 90% (assuming the arterial saturation measured by pulse oximetry is at least 90%). If PCWP saturation is < 90%, reposition the catheter, re-record PCWP tracing, and re-draw PCWP saturation.
 - After two attempts, if PCWP sat is still < 90% but operator deems fluoroscopy and waveforms are sufficient to confirm wedge, you may proceed without obtaining PCWP sat $\geq$ 90%.
 - If PCWP saturation cannot be obtained after 3 attempts, please note this on the form.



Recording Data: PCW “Omics” Blood Draw

- Blood draw must be done after all pressure measurements have been completed.
- Draw back 3mL of blood using a sterile syringe and discard the sample.
- Then, using a second sterile syringe, draw 6.5mL of blood for “omics” analysis as per blood protocol.
- Transfer the blood from the sterile syringe to the appropriate blood collection tubes using a blood transfer device.

Recording Data: Pressure Tracing Examples

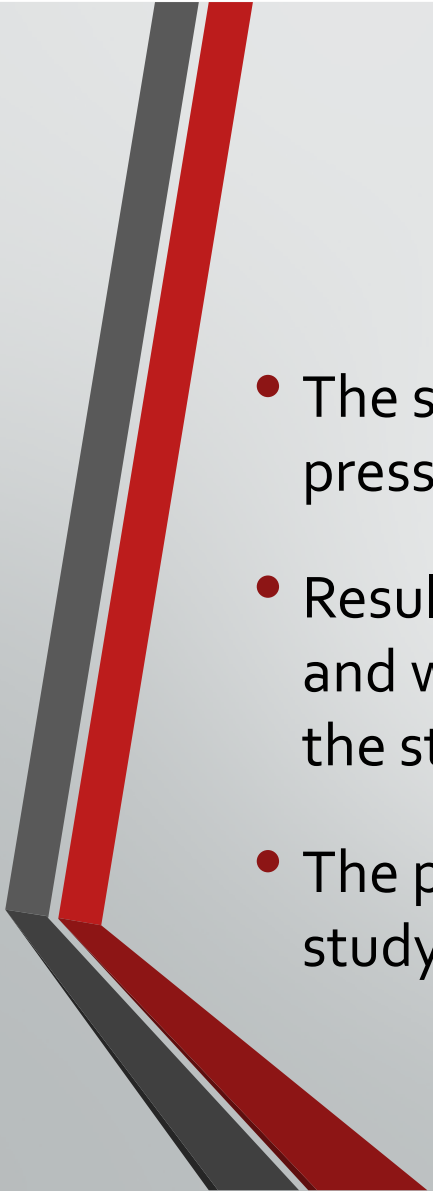


Recording Data: PA Sat & “Omics” Blood

- After PAP tracing is recorded, pull back and discard 3mL of blood from the distal port. Then draw 1mL of blood, analyze, and record saturation.
- Pulmonary Artery (PA) “omics” Blood Draw
 - Blood draw must be done after all pressure measurements have been completed.
 - Draw back 3mL of blood using a sterile syringe and discard the sample.
 - Then use a second sterile syringe to draw 6.5mL of blood for “omics” analysis.
 - Transfer the blood from the sterile syringe to the appropriate blood collection tubes using a blood transfer device.

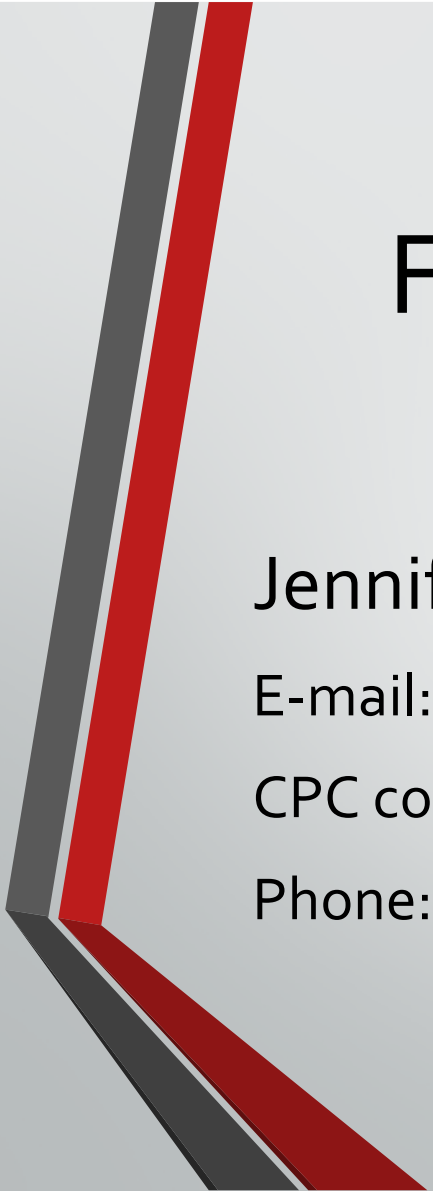
Cardiac Output

- All sites will obtain thermodilution cardiac output (TDCO) in triplicate.
 - If there is >10% variability between measurements additional measurements should be taken until three measurements have <10% variability. The average will be taken from these measurements.
- Direct Fick cardiac output can also be obtained
 - Optional
 - Fick cardiac output cannot be obtained while the participant is receiving supplemental oxygen.
 - Note: If the participant is undergoing an invasive CPET, then a direct Fick CO will be required during that procedure



Recording Results

- The study coordinators will record the results and transmit pressure tracings to the DCC
- Results will be recorded on a paper copy of the reporting form and will also be manually entered into the electronic database by the study coordinator.
- The paper copy of the participant's results will be kept in their study file maintained at the local site.



For Questions Please Contact

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