Providence HEALTH CARE	Department: **Respiratory Services**	Date Originated: November 2010 Date Reviewed/Revised: **July 2011**
POLICY & PROCEDURE	Topic: Critical Care - Ventilation Perfusion (V/Q) Scan Using the Technegas Generator and Easy-breather Accessory (Respiratory Therapy) Number: B-00-12-12072	Related Links:

APPLICABLE SITES:

St. Paul's Hospital

POLICY STATEMENT:

Mechanically ventilated patients (invasive or non-invasive) that require a nuclear medicine ventilation/perfusion (V/Q) scan must be accompanied by a Respiratory Therapist for the procedure. A Respiratory Therapist will also be present for all patients with a tracheostomy in-situ or for anyone requiring high flow oxygen therapy greater than 45%.

GENERAL INFORMATION:

Diagnosis of pulmonary embolism (PE) is a challenge and depends on the appropriate utilization & evaluation of available tests in the right clinical setting, accuracy of the test results, and pretest clinical probability. Ventilation-perfusion (V/Q) scans are one of the main screening tests used for suspected PE, although they are not without limitation. V/Q scans have a high positive predictive value in the setting of high clinical probability. Patients who have a non-diagnostic V/Q scan require additional testing to rule out PE (ie. pulmonary angiography with/without CT).

The Technegas system is an aerosol generating device which creates Technegas. Technegas is an ultrafine dispersion of Tc99m labeled carbon used for nuclear medicine V/Q exams. The Technegas Generator with Easy-Breather Accessory is an equipment adjunct for performing Nuclear Medicine ventilation perfusion scans for patients requiring ventilatory support. ***The process involves providing the patient with several breaths of a slightly hypoxic gas mixture (Technegas) without PEEP via the Technegas Generator.*** The patient is manually ventilated using the Technegas Easy Breather Accessory, which is essentially a manual resuscitation bag connected to the Technegas Generator.

INDICATIONS:

Diagnosis of pulmonary embolism.

CONTRAINDICATIONS:

Patients with very high FiO_2 and/or PEEP requirements who would not tolerate 3 – 5 breaths of a slightly hypoxic gas mixture without PEEP.

EQUIPMENT (provided by Nuclear Medicine):

- Patient administration set
- Technegas manual resuscitator

NOTE: The manual resuscitator used for this procedure will be provided by Nuclear Medicine staff as part of their system setup. Do NOT use the patient's own resuscitator.

Technegas Generator with attached manual resuscitator

Patient administration set (with mouthpiece)

PROCEDURE:

1. Prior to leaving for the test, assess the patient to ensure they will be able to tolerate the procedure with respect to the contraindication noted above. Assess the patient for 1 minute on room air without PEEP as follows:

    a. Set the ventilator FiO_2 to 0.21
    b. Set the PEEP to 0
    c. Monitor the patient for signs of intolerance (i.e. desaturation, cardiac dysrhythmias, increased work of breathing); if not tolerated return patient to previous settings and inform the physician
    d. After a 1 minute assessment return the patient to the previous FiO_2 and PEEP settings

2. Upon arrival in Nuclear Medicine and prior to the commencement of the test, pre-oxygenate the patient for a minimum of 5 minutes. Ensure the patient is adequately monitored with a cardiac monitor including pulse oximetry.

3. The Nuclear Medicine Technologist will have prepared and set up the Technegas Generator device prior to the patient's arrival in Nuclear Medicine.

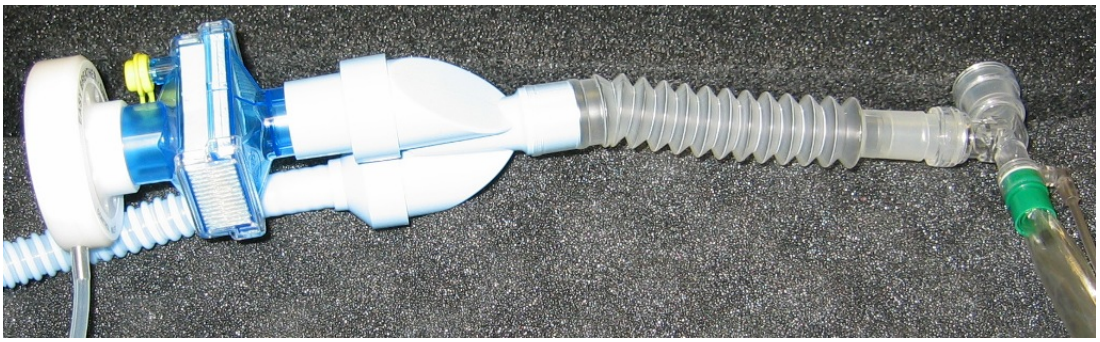
4. The Technologist will also set up and attach a Patient Administration Set (PAS) to the device. The PAS is comprised of an inspiratory limb, patient wye, and expiratory filter, as well as an exhalation valve for manually ventilated patients. The inspiratory limb of the PAS is connected to the Technegas generator, and the expiratory filter is connected to an exhalation valve system. The exhalation valve occludes the expiratory filter whenever positive pressure is applied via the manual resuscitator. The wye of the PAS is to be connected to the flex tube of the inline suction when the test is ready to begin.

Patient Administration Set with Exhalation Valve and Flextube

Exhalation Valve | Patient Wye & Expiratory Filter | Flextube to Patient

5. Upon instruction from the Technologist, disconnect the patient from the ventilator and connect the PAS to the flex tube of the inline suction catheter.

Patient Administration Set – fully assembled



6. The next 3 – 5 breaths will be delivered manually by the Respiratory Therapist using the existing manual resuscitator attached to the rear of the Technegas generator device. The Technologist must first open the Patient Delivery Valve of the Technegas generator to allow the manual ventilations to reach the patient.

   NOTE: The Technologist will instruct the RT on when to deliver the manual respirations, while the RT will monitor the patient's respiratory status and inform the technologist immediately if the patient condition deteriorates such that the test must be aborted.

7. Ensure that there is an inspiratory pause of 3 – 5 seconds following each inspiration to simulate a breath hold. This can be achieved by holding the compression on the manual resuscitator bag which will allow for maximum distribution of Technegas throughout the patient's lungs. After each inspiratory pause, release the bag to allow exhalation.

8. Repeat the process until the technologist determines that sufficient Technegas has been delivered to the patient (usually 4 consecutive breaths). The Technologist will then release the patient delivery valve.

9. Immediately return the patient to the ventilator. The Technologist will dispose of the PAS. No other safety precautions are required as the lungs will have absorbed most of the radioactive material – leakage of radioactive material into the room is minimal.

REFERENCES:

1. Abdelaziz MM, Wali SO, Hamad MMA, et al. *Pulmonary Embolism: a diagnostic approach.* Annals of Thoracic Medicine June 2006; 1(1): 31-40.

2. *Technegas Generator, Technegas Easy Breather Accessory – User Instruction Manual.* Cyclopharm.