Transcutaneous Oximetry Testing Practicum

Stacy Handley, BSN, ACHRN, CHT

Hyperbaric Medicine Service
Training Guidelines for TCOM Module
Radiometer Transcutaneous Oximetry Monitor

Learning Objectives:

I. Trainee will be able to demonstrate a working knowledge of tcPO2 technology.
- A. Describe the principles of transcutaneous oximetry including
  1. Function of the electrode; read oxygen tension in tissue
  2. Physiological effect of the heating element; vasodilatation
- B. Recite the applications for tcPO2 including
  1. Screen small/large vessel disease
  2. Evaluate healing potential/ correction of hypoxia
  3. Screen hyperbaric therapy candidates
  4. Mapping for successful amputation

II. Trainee will demonstrate a working knowledge of a tcPO2 monitor and its ancillary equipment.
- A. Describe the operating functions of the monitor, including settings
  1. Power
    a. Plug machines into the wall
    b. Push power button on machine located on both the front and back of monitor
  2. Settings and trouble shooting
    a. Confirm 45°C for electrode
    b. Confirm proper barometric pressure reading
    c. Error codes; refer user manual
- B. Explain the calibration procedure
  1. Calibrate
  2. Push CALIBRATE button on machine
  3. As each electrode states ready on monitor, you can begin using
  4. If it states error, then trouble shoot per user manual
- C. Describe proper procedure for maintaining the membrane and electrode
  1. Explain how to change the membrane
  2. State frequency of membrane changes (2 weeks and prn)
  3. Describe how to disinfect cables with Tor-HB for 10 minutes(avoid electrode contact)

III. Trainee will demonstrate knowledge of tcPO2 test consistent with current industry standards.
- A. Verbalize the anatomy of the most common tcPO2 sites
  1. As close to the wound as possible
  2. Optimal sites are calf, ankle and dorsum of foot
  3. Avoid bony areas, tendons, major vessels
  4. Skin characteristics; avoid edematous or broken skin areas
  5. Place electrodes as close to Peri-wound as possible
  6. Reference site; left chest, mid- clavicular. 2nd intercostal space
- B. List steps of site preparation
  1. Remove excess hair with razor
  2. Remove loose dry skin(stratum corneum) with packing tape; 5-10 pats until loose, dry, dead cells are removed from pre-selected electrode sites
  3. Cleanse skin to remove oils and dirt with 5 sweeps of alcohol prep pads
  4. Allow to fully dry
- C. Explain the effects of common testing errors on tcPO2 values obtained
  1. Strained positioning of patient
  2. Patient talking
  3. Cooler room temperature
  4. Inconsistent electrode temperature with serial readings

5. Inconsistent electrode placement with serial readings
6. Inadequate time for electrode equilibration
7. Inadequate oxygen flow supplied during physiologic challenge
8. Improper adhesion of electrode to skin surface(air leak)
9. Recent fluid shifts for patient (dialysis; wait at least 6 hours after or mid point between exchanges)
10. Smoking or caffeine intake 2 hours prior to test
11. Nicotine patch on patient

IV. Trainee will be able to describe how to obtain the subject's consent for the tcPO2 procedure.

A. Explain the planned procedure; plan for one hour
B. Explain the risks involved; skin redness, irritation, burn
C. Explain the benefits; assess for tissue hypoxia and responsiveness to oxygen
D. Pre-screen to avoid nicotine or caffeine 2 hrs prior, dialysis on same day, O2 use 30 minutes prior, or current fever

V. Trainee will be able to inspect and gather the equipment needed to conduct a tcPO2 study.

A. Gather Equipment
   1. TCOM monitor
   2. Non-rebreather mask with tubing
   3. Packing tape
   4. Ruler for photo
   5. Razor
   6. Patient label
   7. Camera
   8. Patient chart
   9. Wound supplies
   10. Timer
   11. Fixation rings
   12. Contact solution
   13. Alcohol preps
   14. Membrane kit
   15. Calculator for RPI
   16. Oxygen source
B. Explain patient preparation considerations
   1. Ensure comfortable room temperature for patient; offer blanket
   2. Position of comfort for breathing on bed; supine, legs extended, head elevated 30-45 degrees
C. Explain how to perform a comprehensive tcPO2 study that will identify baseline tcPO2 values and tcPO2 responses to two physiological challenges
   1. Normobaric air (baseline) ; leave electrode on site for 10-20 minutes until values equilibrate on the monitor
   2. Normobaric 100%oxygen challenge; use non-rebreather mask, record values every minute for the first 5 minutes and again at 10 minute
D. List the anticipated normal air tcPO2 values
   1. Chest (65-90 mmHg)
   2. Lower Extremity > 50 mmHg
E. Explain how to calculate a Regional Perfusion Index (RPI)
   1. Using only room air values; divide each 'Extremity' site by the 'Reference' site
   2. Example: 20mmHg Foot site and 78mmHg Chest Ref site; 20÷78 =.25 RPI
F. List a range of values that that might result in acceptance of a patient for HBO treatment
   1. Regional Perfusion Index values-
      a. .4 or below = healing highly unlikely in primary amputation
      b. .8 or greater= healing probable
      c. .4-.8= no supporting data
   2. Peri-wound air values-
      a. 40mmHg or > sufficient to support healing in diabetics

b. 30mmHg or > may be sufficient to support healing in non-diabetics

3. Peri-wound oxygen values-
   a. 1 ATA oxygen challenge (normobaric; sea-level) –
      Values starting on Air in the teens (hypoxic) but rise above 100mmHg within 10 minutes on Oxygen suggest hyperbaric treatment candidacy.
   b. In-chamber oxygen challenge a 2 ATA -
      Values must rise above 200mmHg to suggest hyperbaric treatment candidacy.
   c. Modern thinking: For in-chamber values just short of 200mmHg, consider increasing pressure (i.e.2.2 ATA) enough to reach 200mmHg but no greater than 2.5 ATA.

Hyperbaric Medicine Service

Transcutaneous Oximetry Assessment

Patient Name: Suzy Q | Date: today | HBO #: 123456 | Photo: ☑

Interpreting Physician: Dr Lindsie Cone | Clinician: Stacy Handley, BSN, CHT, ACHRN

Pulse Oximetry: 97 % | Patient on: N/A L of O2 | BP: 144/90 | P: 84 | R: 22 | T: 98.7 F

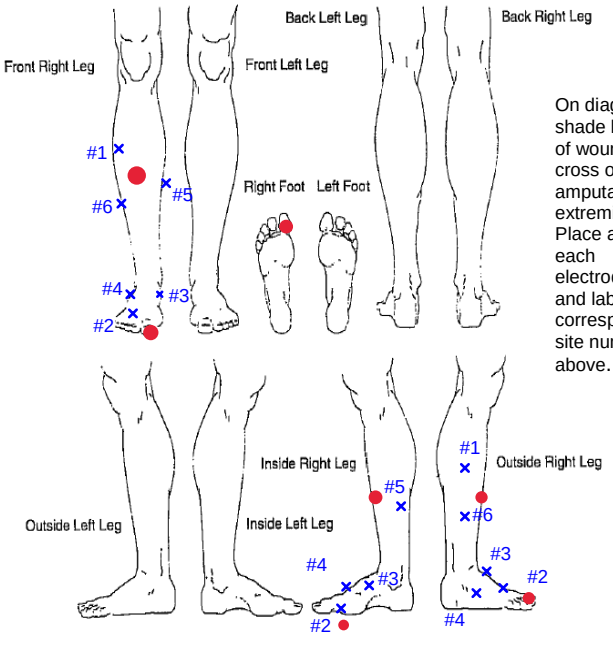
Diabetic: Yes (No) | Dialysis: Yes (No) | *If yes, last tx* | Smoker: (Yes) No | *If yes, last use* 4hrs ago

Reference Site: 63 **mmHg on Room Air** | **Reference Site Location:** Chest ☑ Arm ☐

	Site 1	Site 2	Site 3
Location Description:	R proximal lateral lower leg	R distal dorsal foot	R medial dorsal foot
RPI:	0.66	0.90	0.68
Baseline Measurement on Air:	42 mmHg	57 mmHg	43 mmHg
1 Min on 100% O_2:	64 mmHg	67 mmHg	50 mmHg
2 Min on 100% O_2:	86 mmHg	81 mmHg	59 mmHg
3 Min on 100% O_2:	105 mmHg	88 mmHg	66 mmHg
4 Min on 100% O_2:	126 mmHg	92 mmHg	70 mmHg
5 Min on 100% O_2:	138 mmHg	94 mmHg	72 mmHg
10 Min on 100% O_2:	164 mmHg	95 mmHg	73 mmHg

	Site 4	Site 5	Site 6
Location Description:	R lateral dorsal foot	R distal medial lower leg	R distal R lower leg
RPI:	0.85	0.73	0.70
Baseline Measurement on Air:	54 mmHg	46 mmHg	44 mmHg
1 Min on 100% O_2:	75 mmHg	72 mmHg	75 mmHg
2 Min on 100% O_2:	107 mmHg	95 mmHg	99 mmHg
3 Min on 100% O_2:	137 mmHg	118 mmHg	119 mmHg
4 Min on 100% O_2:	158 mmHg	132 mmHg	133 mmHg
5 Min on 100% O_2:	169 mmHg	143 mmHg	148 mmHg
10 Min on 100% O_2:	184 mmHg	166 mmHg	157 mmHg

RPI= Extremity site divided by reference site on air. **ABI**: 0.9



On diagram, shade location of wound, cross out amputated extremities. Place an X on each electrode site and label with corresponding site number above.

Interpretation:

Reference and extremity sites are all WNL (>40mmHg) on air. Sites 1,4,5,& 6 rose to 100mmHg or > with oxygen challenge. Sites 2 & 3 failed the 02 challenge. Site 3 was selected for inchamber TCOM test. While site 3 is just 43mmHg on air, the site successfully responds to the chamber at 2.2 ATA.

Physician Signature: Type text here

Site # 3 Room Air 43 mmHg

In-Chamber TCOM

Record values every 10 mins up to 200mmHg:

2.0 ATA	140	mmHg
2.1 ATA	187	mmHg
2.2 ATA	220	mmHg
2.3 ATA		mmHg
2.4 ATA		mmHg
2.5 ATA		mmHg

ATA x 14.7-14.7=psig

Revised 11/2022