TRANSCUTANEOUS CO₂ AND O₂
(Adapted with permission, Guy’s and St Thomas’ NHS Trust nursing guideline)

INTRODUCTION
• In neonates requiring assisted ventilation, it is essential to monitor arterial partial pressure of oxygen (PaO₂) and carbon dioxide (PaCO₂) to ensure ventilation adequate
• Transcutaneous monitoring allows constant measurement (TcCO₂ and TcO₂)
• Use this guideline to set up and safely use transcutaneous monitoring equipment

Clinical indications
• Monitoring adequacy of arterial oxygenation and/or ventilation
• Nursing critically ill or unstable baby

Advantages
• Reduction in number of blood gas measurements
• Immediate recognition of need for ventilation adjustment

Potential problems
• Tissue injury (e.g. erythema, blisters, burns, and skin tears) as a result of failure to change site frequently enough (2–3 hrly) according to local protocol
• Inadequate measurement resulting from incorrect set-up

EQUIPMENT
• Transducer: insert at end position of rack for easy accessibility
• Membranes
• Electrolyte solution
• Adhesive fixation rings
• Recalibration machine

Probe placement and application of fixation rings
• Preferred sites:
  • if baby nursed prone: the back
  • if baby nursed supine: the chest
• Avoid bony surfaces: use soft tissues (e.g. abdomen, buttock, thigh) and avoid placing over liver as this can prevent accurate clinical assessment of liver size
• Ensure chosen site is clean and dry
• Peel adhesive protection layer off ring
• Place ring on chosen site pressing gently on centre of ring before running finger around outside. Ensure effective seal as this will affect accuracy of measurement
• Place three drops of contact fluid in centre of ring
• Remove transducer from module into ring and turn one-quarter clockwise to secure

CARE AND MONITORING
Temperature setting
• Keep transducer setting at 44°C for all babies. There is good correlation of TcO₂ with heat settings of 44°C but lower settings will result with under-reading of TcO₂ and difference is larger with increasing TcO₂

Alarm settings
• Limits may vary for treatment of PPHN
• TcO₂ upper 10.0 lower 5.5
Transcutaneous 2009-11

- TcCO₂ upper 7.0 lower 5.0

**Blood gas sampling**
- Take blood gas 20 min after commencing transcutaneous monitoring to allow comparison between monitoring values and arterial partial pressures of O₂ and CO₂ levels, as discrepancy can occur
- If transcutaneous monitoring values change suddenly, check contact is in place, before making ventilator changes. If any doubt about accuracy of values, check blood gas before making ventilator changes

**Changing measurement site**
- Babies <29 weeks: change 2-hrly
- Babies >29 weeks: 3-hrly
- Unscrew transducer before removing fixation rings
- Remove fixation rings when repositioning baby from supine to prone and vice versa to avoid pressure-sore from lying on rings
- Remove rings 12-hrly on babies <29 weeks and 24-hrly on babies >29 weeks

**Calibration of membrane**
See Figure 1-5

**Indications**
- Transducer membrane has been replaced
- Monitor displays 'calibration required'
- Measurement values in doubt
- Applying to a new baby
- Changing measurement site

*Ensure calibrator is turned off after use. Do not dispose of connecting tube. Contact technicians when calibrating gas empty*

**Changing transducer membranes** (see Figure 6-10)
- All staff responsible for ventilated babies can change transducer membranes

**Indications**
- When using a new transducer or if transducer has dried out
- For each new baby
- When membrane crinkled, scratched or damaged
- After 5 days continuous use

**Procedure**
- Wash and dry hands
- To remove O-rings, unscrew protective cap from transducer and hook O-ring remover under them
- Remove both clear plastic membranes with your fingers
- To ensure correct values, clean transducer head, including grove and rim, with absorbent paper to remove all old electrolyte solution
- Apply approximately two drops of electrolyte solution to transducer head
- Press transducer head downward into an unused membrane replacer until replacer reacts as far as it can and a click is heard
Figure: 1-5 Calibration of membrane; 6-10 Changing transducer membranes