

RESPIRATORY PROBLEMS AND MANAGEMENT

Section 2: Respiratory problems and management
Transcutaneous monitoring (TCM)
Date created: June 2006
Date revised: Dec 2013
Review date: Dec 2016

Neonatology Clinical Care Unit Guidelines
King Edward Memorial/Princess Margaret Hospitals
Perth Western Australia
Authorisation & review by
Neonatal Coordinating Group

TRANSCUTANEOUS MONITORING (TCM)

To measure the partial pressure of transcutaneous oxygen (O₂) and carbon dioxide (CO₂) in infants requiring frequent analyses of arterial O₂ and CO₂ to assess the adequacy of their respiratory support and to provide monitoring that may alert carers to a change in condition. The transcutaneous oxygen/carbon dioxide (tcpO₂/tcpCO₂) transducer heats the skin, effectively increasing local blood perfusion so that O₂ and CO₂ can diffuse to the skin surface more easily.

INCLUSION CRITERIA (CONTINUOUS TCM):

- All admissions requiring ventilation (particularly on HFOV or HFJV) / CPAP for the first 4 days.
- All surgical infants for the first 4 hours postoperatively until medical review
- All surgical infants *requiring respiratory support postoperatively* for the first 24 hours until medically assessed as stable for intermittent TCM
- All infants with a pneumothorax (+/- ICC)
- For the first 4 hours post extubation

INCLUSION CRITERIA (INTERMITTENT TCM) i.e. once per shift for 4 hours:

- All infants continuing to require respiratory support after the first 4 days of mechanical ventilation.
- All surgical infants continuing to require respiratory support and medically assessed as stable for intermittent TCM.

KEY POINTS

- Due to the lack of keratin, all infants born < 27 weeks and < 2 weeks of age must have their transducer temperature set down at 41 °C, and the transducer rotated between 2 sites at 2 *hourly intervals* to avoid causing skin burns.
- TCM measurements should not replace arterial blood gas monitoring. However, TCM can be used to substantially reduce the frequency of arterial sampling and to observe trends in arterial blood gases following changes to ventilation. To validate correlation it is preferable for TCM to be *in situ* prior to blood gas sampling.
- Very high or low PaCO₂ values may compromise an infant's neurological outcome and are often a sign that ventilatory management needs review.
- A rising CO₂ may be an indicator of:
 - Pneumothorax
 - Deterioration (collapse, consolidation, oedema, sepsis)
 - Accidental extubation
 - Need for endotracheal suction.

EQUIPMENT

- TCM module & cable.
- Calibration gases.
- Remembraning kit.
- Fixation ring.
- Contact fluid.

1. TEMPERATURE

Set the transducer temperature according to the infant's age.

- 41°C for infants born <27/40, and < 2 weeks of age.
- 43 - 44°C for all other infants. A higher transducer temperature results in a better correlation as well as a shorter time delay from the change in arterial blood gas and its detection by the transducer. However, higher temperatures may increase the risk of skin burns.

2. TIMER

Adjust the transducer site timer on the monitor. This is usually set at 4 hours, however an individual assessment must be made on each infant's skin and gestation and often site rotation needs to occur 2 to 4 hourly. The site timer helps guard against the risk of skin burn by ensuring the transducer is used at one site for no longer than a predetermined time.

For infants <27wks and < 2wks of age the timer should be set at 2 hours so that the site is rotated every 2 hours.

3. REMEMBRANE

- The membranes last approximately 1 week before a change is required. Change the membrane on the transducer if calibration has failed twice.
- Inspect the transducer carefully, ensuring there are two O rings and no visible bubbles. If bubbles are noted, repeat the remembraning procedure.

4. CALIBRATION

Calibration is required when:

- Remembraned.
- The transducer operating temperature has been changed.
- The **tc CAL REQUIRED** message appears on the monitor screen.
- The accuracy of the measurement is in doubt.
- A new monitoring period is to commence.
- The monitoring site has been changed.

5. POSITIONING THE TRANSDUCER

- Select a site for the transducer. Clean the skin with an alcohol wipe if vernix is present and allow to dry. Sites used include the abdomen, chest and back, avoiding any bony prominences. The anterior thigh can also be used. Optimum measurement is obtained from a site that has high blood flow and capillary density, thin epidermis (avoid the nipple).
- Apply the fixation ring and instil several drops of contact fluid ready to attach the transducer. After attachment wait for the readings to stabilise.
- Ensure good positioning of the cable, with no kinks or tension on the cable. Ensure the infant is not positioned on the cable.

- Remove the transducer from the infant when the specified monitoring time has elapsed. Prolonged continuous monitoring at one site may cause skin irritation, reddening, blistering or burns.
- Remove the fixation ring **very carefully** particularly in preterm infants to reduce the incidence of epidermal stripping and/or bruising.
- Use standard precautions when decontaminating equipment between infants.