Protocol for performing chest clearance techniques by nursing staff

Rationale

The main indications for performing chest clearance techniques (CCT) are to assist in the removal of thick, tenacious secretions not removed by suction alone and where there is lobar collapse, due to mucous plugging. The intention is to remove airway obstruction, reduce airway resistance, enhance gas exchange, and reduce the work of breathing (Wallis and Prasad 1999). Chest clearance techniques, when performed effectively and correctly can help to improve an infant's respiratory function and aid recovery. However, incorrect, inappropriate or ineffective CCT may be a useless intervention or even harmful, potentially inducing bronchospasm, pulmonary hypertension or destabilising a sick infant (Wallis and Prasad 1999). Chest clearance techniques should only be performed when indicated, never as a routine procedure, in order to promote the concept of minimal handling (Wallis and Prasad 1999).

Practice

- Assessment

It is vital that a full and thorough assessment of the infant is undertaken prior to any chest clearance technique. The infant's condition must be assessed in relation to any special risks or considerations. Potential contraindications may include:

- Any sick, unstable baby
- Prematurity under 30 weeks, weight under 1.5 kg and in the first week of life.
- Any coagulation or bleeding problem.
- IVH within the last 24 hours.

Agreement for all chest clearance techniques must be obtained from medical staff.

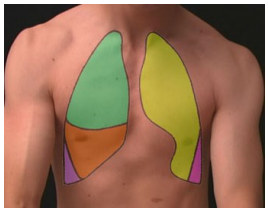
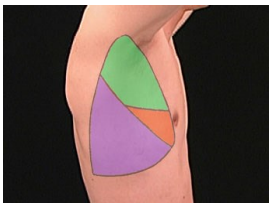
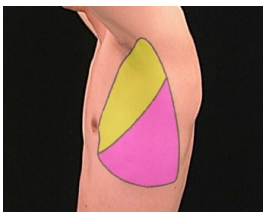
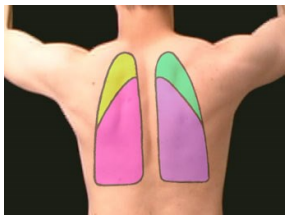
- Auscultation

You should listen for breath sounds initially and then listen for any added breath sounds. Breath sounds may be difficult to distinguish in the preterm infant. Palpation of the chest may also be useful to assess the presence of secretions.

Auscultation requires you to listen to the:

1. left and right apex region (position the stethoscope on the front of the infant above the nipple line)
2. left and right lateral region (position the stethoscope below the nipple line along the mid-axillary line)
3. left and right posterior region (position the stethoscope on the back of the infant below the level of the scapulae – you should be able to do this without changing the infant's position)

The pictures below show the surface anatomy of the lung fields and demonstrate where to position the stethoscope for assessment of all the lobes.

Following auscultation, try to think about the sounds you hear and whether they are normal or abnormal. (See appendix on breath sounds).

Treatment

Preparation

Wash hands and gather equipment. Consider pre-oxygenating the infant by 10-20%. Select appropriate size suction catheters (catheter size should be double the number of the endotracheal tube/tracheostomy), 0.9% sodium chloride and syringe, non-sterile gloves and a waste bag. Set suction pressures to 10-15kPa (usually 10-12 kPa for premature infant and 12-15 kPa for term infants). Ensure bag valve mask or Neopuff is turned on and nearby ready to use. Provide containment for the infant during the procedure. Additional analgesia/ paralysis may be needed to avoid destabilisation of the infant. (See separate pain protocol.) Ideally CCT should be a two-person procedure.

Chest wall percussion

Instil saline, if required, (0.1-2ml, ideally not more than 0.5ml/kg). Use small (size 00) mask to perform percussive movements (at a rate of about 1 every 2-3 seconds) by occluding the stem with your finger. This may be used just in one particular area e.g. if focal

consolidation in a particular lobe, or it may be performed more generally. Throughout the entire procedure, it is imperative that the head of the infant is supported and contained to prevent intraventricular haemorrhage (Argent and Morrow 2004).

Chest wall vibrations

Treat the relevant side i.e. you will only be able to effectively treat the side opposite to the direction that the infant's head is facing Place your hand on the side that you are treating with your fingers across the infant's chest and your thumb wrapped around the back of the infant so that your palm is against the side of the infant's chest. Apply pressure to the infant's chest wall and then vibrate your hand applying pressure in the direction towards the opposite nipple (to mimic the natural movement of the infant's chest wall muscles). The pressure should be applied during the expiratory phase of breathing. As you start to withdraw the suction catheter, it can be beneficial to deliver chest wall vibration to improve expiratory flow and improve secretion clearance. This should be performed on every 4^{th} or 5^{th} expiration and no more than 5 times in total. Again, the head of the infant must be supported and contained throughout.

Chest clearance techniques other than chest wall percussion and vibration should only be performed by qualified physiotherapists or medical personnel (Wong and Fok 2003).

Suction (See separate suction protocol)

Following treatment, repeat auscultation and assess changes. Document chest clearance and suction. Discuss infant's position with medical staff, in order to optimize chest clearance following CPT.

The key to CPT is that it is performed effectively and appropriately. In most situations, CPT will only need to be performed once or twice a day. However, treatment decisions are always made on an individual basis and CPT may be performed more frequently if it is thought to be appropriate by a senior doctor. Suction may then be performed in between these times as deemed necessary.

References

- Argent, A.C. and B.M. Morrow. 2004. What does chest physiotherapy do to sick infants and children? *Intensive Care Medicine* 30:1014-1016.

- Wallis, C. and A. Prasad. 1999. Who needs chest physiotherapy? Moving from anecdote to evidence. *Archives of Disease in Childhood* 80: 393-397.

- Wong, I. and T.F. Fok. 2003. Randomised comparison of two physiotherapy regimens for correcting atelectasis in ventilated pre-term neonates. *Hong Kong Physiotherapy Journal* 21: 43-50.

Appendix.

Breath sounds – try to think about the quality, tone, location and volume of the breath sound

1. Normal breath sounds - Breath sounds are categorised according to their location, pitch, intensity, and inspiratory to expiratory ratio. As air travels through the bronchial tree and pulmonary branches turbulent breath sounds are produced. When there are no obstructions to the airways, normal air movement occurs and normal breath sounds are heard. Obstruction from airway constriction, fluid or hyper-expansion will produce abnormal breath sounds;
2. Absent breath sounds – caused by any condition that limits the flow of air into the lungs so that breath sounds become inaudible;
3. Reduced breath sounds – caused by any condition that limits the flow of air into the lungs so that breath sounds become diminished or quieter than normal sounds;
4. Bronchial breath sounds - Loud, high-pitched hollow, echo type sounds with a gap between the inspiratory and expiratory phases of respiration. The expiratory sounds are longer than the inspiratory sounds and may indicate that an area of consolidation exists;
5. Harsh/tracheal breath sounds – these sounds are high pitched, tubular and hollow with a pause between inspiration and expiration. They are heard over the trachea on the front and can indicate atelectasis, pneumonia or fluid infiltration.

Added breath sounds – these are extra sounds on top of the breath sound

1. Coarse crackles/rales - Rales or crackles are low pitched, loud, longer lasting (than fine crackles) sounds that are discontinuous and occur when fluid or mucus collects in the peripheral portions of the lung. As the alveoli collapse, the walls of the alveoli stick together so that the alveolar walls are forced to pop open and a clicking, bubbling, rattling, popping sound or crackle is heard, during inspiration;
2. Fine crackles/rales – as above but high pitched, soft and very brief;
3. Wheezes – continuous noises that are present when an airway is partially obstructed due to secretions or mucosal swelling, normally heard on expiration but may be heard on inspiration;
4. Rhonchi – a coarse rattling sound somewhat like snoring, usually caused by secretions in the bronchial airways.