GUIDELINE FOR PERFORMING CHEST PHYSIOTHERAPY TECHNIQUES BY NEONATAL NURSING STAFF

Rationale
The main indications for performing chest physiotherapy techniques 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 (Lauwers et al 2020). Chest physiotherapy techniques, when performed effectively and correctly can help to improve an infant’s respiratory function and aid recovery. However, incorrect, inappropriate or ineffective chest physiotherapy techniques may be a useless intervention or even harmful, potentially inducing bronchospasm, pulmonary hypertension or destabilising a sick infant (Honey, Melkuhn and Xanthidis 2015). Chest physiotherapy techniques should only be administered when indicated, never as a routine procedure or without assessment.

Practice
Assessment
It is vital that a full and thorough assessment of the infant is undertaken prior to any chest physiotherapy techniques. The infant's condition must be assessed in relation to any special risks or considerations. Agreement for all chest physiotherapy techniques must be obtained from medical staff. Potential contraindications may include:

- Any baby who is cardiovascularly unstable
- <1.5kg in the first 2-4 days of life
- Within 24-48 hours of intraventricular haemorrhage
- Frank unexplained haemoptysis
- Unstable rib fractures
- Severe clotting problems
- Haemodynamically unstable
- Surgical emphysema

(Hough 2008)
**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 and to determine whether chest physiotherapy and/or suction is indicated. Auscultation requires you to listen to the:

- left and right apex region (position the stethoscope on the front of the infant above the nipple line)
- left and right lateral region (position the stethoscope below the nipple line along the mid-axillary line)
- 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 for more information about breath sounds).

![Lung Fields Images]

**Preparation**

- Wash hands and gather equipment
  - percussor/face mask;
  - appropriate size suction catheters where the catheter size should be double the number of the endotracheal tube/tracheostomy
  - 0.9% sodium chloride and syringe, if required
  - non-sterile gloves
  - a waste bag;
- Prepare Neopuff and bag valve mask for use, ensuring gas flow is turned on;
- Set suction pressures to 10-15kPa (usually 10-12 kPa for premature infant and 12-15 kPa for term infants) and ensure appropriate length of suction tubing to reach patient;
• Consider pre-oxygenating the infant by 10-20%;
• Inform parents, if present and explain procedure. They may wish to provide containment hold or finger hold to their baby;
• Prepare infant, ensuring good containment/head support and consider use of a thin sheet or muslin to protect against skin trauma during percussion.

Chest physiotherapy should, ideally, be a two-person procedure. The key to all chest physiotherapy techniques is to perform them effectively and appropriately. In most situations, chest physiotherapy techniques will only need to be performed once or twice a day. However, treatment decisions are always made on an individual basis and chest physiotherapy techniques 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.

**Positioning**

Positioning may be an effective way to change air flow, lung compliance and mobilise secretions, without the application of hands on chest clearance techniques. The overly compliant thorax of the premature infant may result in reduced ventilation of the lower area of the dependent lung if they remain in one position for a period of time. The use of small tilts and quarter turns may be used to adjust the position of unstable infants who do not tolerate a full regular turn. The chosen position may be determined by discussion with medical staff or the physiotherapist, following assessment of the infant, auscultation and evaluation of chest x-ray. When a particular position is recommended to improve air flow, compliance and secretion removal, the infant’s position should be adjusted from time to time to prevent alveolar collapse in another region of the lung.

**Saline**

Use of saline is generally not supported in literature and may only be required when suction alone fails to yield any secretions. If saline instillation is deemed necessary, this should be 0.1-0.2ml/kg up to a maximum of 0.5ml and it should be instilled before the application of chest physiotherapy techniques and then suction. The saline should be warmed in the incubator prior to use but should not be left in the incubator following suction. Following this process, repeat chest auscultation and assess changes.
**Chest wall percussion**

Use a small (size 00 or 35mm) face mask or chest percussor to perform percussive movements (at a rate of about 1 every 2-3 seconds). If using a face mask, the stem should be occluded with your finger.

Percussion should be delivered with moderate vigour to a maximum of two areas, each lasting approximately 1-2 minutes (term babies may tolerate 2-3 minutes). However, 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. Percussion may be administered 4-8 hourly to targeted areas avoiding the sternum, spine and other organs. 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) and to avoid the risk of lethal shaken baby injury (Williams & Sunderland 2002). If possible, chest physiotherapy techniques should be a two-person procedure.

**Chest wall vibrations**

Chest wall vibrations are rarely indicated in the preterm population but may be helpful to remove secretions in the term infant. 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. This should be performed on every 4th or 5th expiration and no more than 5 times in total. Again, the head of the infant must be supported and contained throughout.

**Documentation**

Following any chest physiotherapy techniques, document the techniques used and record information regarding the secretions obtained from suction.
References


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.