

Diagnostic Non-Bronchoscopic Bronchoalveolar Lavage (NBBAL)  
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## **Introduction**

The purpose of this document is to outline the procedure of diagnostic non bronchoscopic bronchoalveolar lavage (NBBAL) utilised by the paediatric physiotherapists based at PICU at University Hospital of Wales. It is based on latest evidence and it will include indications, contraindications and technique.

## **Indications**

NBBAL has been reported as being an effective and reliable way of establishing the aetiology of pulmonary disease processes in intubated paediatric populations (Morrow et al 2006). It specifically samples fluid from the lower respiratory tract which is demonstrated by the presence of alveolar macrophages in the lavage fluid with diagnostic yields from 42% to 85% (Morrow and Argent 2001). Indications for diagnostic NBBAL include:

- Primary respiratory pathology
- Patients who demonstrate a clinical deterioration despite optimal management
- Patients for whom no pathogen has been identified

Within Cardiff PICU an NBBAL is done on the request of the PICU consultant, with informed consent from the parents / carers if possible.

They are predominantly carried out by the physiotherapy team on PICU within routine hours (8am – 4.30pm Monday – Friday). Outside of these hours they are carried out by trained senior nursing staff. The training is provided by the PICU physiotherapists.

## **Potential Complications / Adverse Effects**

Transient bradycardia due to a vasovagal response to catheter insertion and a need to increase the inspired oxygen by 5-10% to maintain oxygen saturations at >90% are the most commonly encountered side effects (ERS Taskforce 2000).

Hypoxia is mild and self limiting in most cases; however in some cases prolonged severe episodes of hypoxia, with the patient needing increased oxygen and ventilatory support have been reported. With repeated application of negative pressure through suctioning there is also a risk of loss of lung volume. There is a significantly greater risk of desaturation in patients with high oxygen indices and low PaO<sub>2</sub> / FiO<sub>2</sub> ratios (Morrow et al 2004).

The volume of saline used during the procedure could decrease the available surface for gaseous exchange and unretrieved saline could interfere with alveolocapillary oxygen exchange (Ridling et al 2003).

When performing a bronchoscopic bronchoalveolar lavage (BAL) there has been reports of fever and transient pulmonary infiltrates several hours after the procedure which may be related to infection spreading secondary to the BAL (ERS Task Force 2000). Although this risk may be reduced when performing a NBBAL due to the less invasive nature of this procedure.

Other complications that have been reported are acute pulmonary oedema, in patients with high pulmonary vascular pressure (Wagener 1987); changes in blood pressure; bronchial haemorrhage; pneumothorax; bronchospasm (Morrow et al 2006).

The risk of these complications can be reduced by ensuring that the patient is cardio-vascularly and respiratory stable, pre-oxygenating, ensuring adequate sedation and using correct suction pressures.

## **Precautions / Contraindications**

- Haemodynamic instability
- Pulmonary haemorrhage
- Pulmonary oedema
- Cor pulmonale with pulmonary hypertension
- Raised intracranial pressure
- Congestive cardiac failure
- Coagulopathy,
- Platelet count  $< 20 \times 10$
- Neonatal respiratory distress syndrome – care with washing out of surfactant
- Premature, small for gestational age – risk of intraventricular haemorrhage
- Inadequate sedation
- Bronchospasm

(Morrow et al 2006, ERS Task Force 2000).

Considering the effective diagnostic yield of the NBBAL it may be worth the risk of performing the procedure in certain high risk patients, where a clear diagnosis hasn't been made, despite the presence of contraindications. Consideration should be given to the risk / benefit ratio to the patient and how NBBAL findings would actually affect patient management. These patients however should have a thorough assessment and should be discussed with the consultant.

## NBBAL Equipment and Procedure

### Equipment

Number of the following equipment needed depends on the number of samples that are being done. However as standard 2 samples are taken for MC&S and virology therefore you need:

- 2 x sputum traps (universal container size)
  - 2 x white syringe adaptors
  - 2 x NBBAL suction catheters – appropriate size for ETT (ETT size x 2 = catheter size)
  - 2 x Y connectors
  - Catheter mount
  - Appropriate sized HME filter
  - 2 x syringes
  - 0.9 % NaCl aliquots – use **1ml/ kg** for each sample up to **10ml maximum** for each sample. This must be at room temperature.
  - Ayres T Piece / bagging circuit – appropriate size for weight of patient
  - Sterile towel
  - Appropriate PPE
  - Suction catheters
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- Prepare trolley and yourself adhering to hospital infection control policy. Place a clean field on to the trolley & assemble equipment as shown:



## Procedure

This is not a sterile procedure, but equipment should be prepared and dealt with in an as clean environment as possible to reduce contamination of samples. Assess patient as CVS and respiratory stable & consider contraindications / precautions. Ensure adequate sedation and analgesia. – note the patient must be muscle relaxed or adequately sedated to suppress their cough in order to enable obtaining samples from the alveoli.

- Prime the catheters with the 0.9% NaCl and attach the syringes to the catheters as shown below:



- Place catheter mount and HME filter into the bagging circuit as shown below:



- Ensure that you prepare yourself adequately by adhering to hospital infection control policy: gloves, apron, and eye protection.
- Perform ETT suction / respiratory physiotherapy if needed to clear secretions pre NBBAL.
- Position patient appropriately depending on whether samples are required for unilateral or diffuse lung pathology.
  - For diffuse lung pathology – place patient supine with head to left to aid insertion of the catheter into the right lower lobe.
  - If a unilateral sample is required either position the head in the opposite direction (i.e head to left to access right main bronchus and vice versa) or place the affected lung on the dependant side (lowermost).
- Pre oxygenate patient by manual inflation
- Connect the sputum trap to the suction unit as shown below:



- Place a clean disposable glove on and with this hand take the catheter (with syringe connected) out of its packet and introduce it through catheter mount, whilst continuing to manually inflate, until resistance is felt.



- Stop manual inflation & instil the NaCl, give 1 -2 breaths and then connect sputum trap to the catheter, stop manual inflation and apply suction as shown below:



- Note – only pull the catheter back a little whilst applying suction.
- Once sample has been collected, resume manual inflation. Keeping the sputum trap upright, remove and place on trolley.
- Re assess patient; if stable, repeat the process again for the second sample.
- To finish perform ETT suction +/- chest physiotherapy to clear remaining secretions.
- Observe closely – patient may need increase in FiO<sub>2</sub> / ventilation requirements particularly those with low oxygen ratios and pO<sub>2</sub>/FiO<sub>2</sub> ratios.
- Label samples and place in the appropriate envelopes – the first sample should go to MC&S.

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