



**Supporting information leaflet (6):  
Chest Physiotherapy: Lung Volume  
Recruitment Techniques and Cough  
Augmentation (Assisted Cough Techniques)**



## **Introduction**

For many people with a neuromuscular disorder, muscle weakness can affect the breathing muscles. This means it is difficult to:

- take in a large breath (inhalation)
- clear your chest using controlled breaths out (exhalation)
- cough

This leaflet helps explain some of the Lung Volume Recruitment Techniques and Assisted Cough Techniques that your physiotherapist has taught you.

### **Lung Volume recruitment:**

The term, lung volume recruitment (LVR), refers to the amount of air our lungs can take in (or recruit). In order to take a breath in and out, we use our respiratory muscles, diaphragm and abdominal (tummy) muscles. In some neuromuscular conditions, it is not only the muscles of our arms, legs and body that are weaker, but the muscles that help us breathe, i.e. our respiratory muscles.

If we have weak respiratory muscles, we are not able to open up our rib cage fully and take in a full (maximal) breath. If we are not able to take in a full breath our lung volume is low and we therefore have less air to breathe out. This is a problem when we need to cough as we need to have a good volume of air in to breathe out quickly in the form of a cough to remove any obstructions in our airways.

Everyone's lungs and airways produce mucous that lubricates the airways. When we have a cold or respiratory tract infection, our body produces more mucous to try and clear the infection. For example, we have to blow our noses more often, or perhaps feel the need to cough and clear our chest. This is a natural defence mechanism and works well to help us remain healthy. However, for people with a muscle

weakness condition, this natural defence mechanism can cause problems. When we start to produce more mucous, we are not able to cough and clear it because we are not able to take in a deep enough breath to force the air back out with a cough.

If we have mucous in our chest that we cannot spit out (expectorate) this mucous can become infected and lead to a chest infection or pneumonia. Therefore it is important that you use Lung Volume Recruitment and Assisted Cough techniques to help clear the infection. You may also need medical treatment and antibiotics.

## The cough process

In order to cough effectively we need to have four components of the cough that all work well together;

- good inspiratory muscles to take air in
- a compliant chest wall (“springiness” of the rib cage)
- a strong glottis (voice box)
- strong muscles to force the air out

When we cough, we automatically take a deep breath in, close the glottis at the back of the throat and tighten our tummy muscles. This action means that we build up pressure in our tummy, which forces the air out of our lungs, when we open our glottis (voice box).

In some neuromuscular conditions, it can be difficult to fully close the glottis (voice box) and if the air leaks through we are not building up the back pressure to cough out forcefully. Sometimes we have difficulty timing everything involved in cough production and if the cough process is not coordinated, the technique will be poor and ineffective.



If we are producing an ineffective cough, the respiratory muscles will fatigue as we need to cough more often and this makes it difficult to clear any mucous. The good news is, there are ways in which we can assist a more effective cough and the first part of this is to get more air into the lungs using the Lung Volume Recruitment technique.

## **Lung Volume Recruitment technique:**

We can help push more air into the lungs with use of an **ambu bag**. There are various ways to do this and there is no “best” way as each person is different. The more you get used to doing this, the better you become.

It may not always be the same person who helps you with this technique. Different people may each have a slightly different way of assisting the air into your lungs. Some people may do it more quickly whilst others will push on the ambu bag more slowly giving you the same intake of air but over a longer period of time. This in itself is a good thing as it tends to mirror the way in which we breathe naturally. Sometimes we take in a big breath quickly whilst other times we breathe more slowly. However, you will know when the technique is effective by the way in which you cough. If you are able to clear your secretions with an effective cough then you are taking in the air you need.

When you are getting used to this, you may feel a little anxious but remember it is you who is in control. Developing a good relationship with your caregiver is essential as it is only you who can say if you need air to be pushed into your lungs at a faster or slower pace. It will also depend on how you feel as some days you may prefer it one way and other days may be different. Always speak to your carer before you start the technique to make sure you both know what to expect.

In order to deliver a bigger breath we need the following equipment:

1. An ambu bag



2. Mouthpiece or mask



3. Nose clips



## When to use Ambu Bag

If you have an ineffective cough, we recommend you use the ambu bag up to four times a day. Try to use it first thing in the morning to clear any secretions that may have gathered overnight and again last thing at night before you go to bed.

We would also recommend that you use the ambu bag before meals. However if you have any swallowing difficulties (e.g. there is risk you will inhale food into the lungs), it may be more suitable to use after eating.

You can use the ambu bag more often if you need to cough or if you have a chest infection. However, please avoid over-using it as you can become fatigued.

## How to use the ambu bag

We recommend an ambu bag with a one way valve fitted. Clearly mark the ambu bag with a notice 'Not to be used for resuscitation'.

- You are best sitting up, but you can also lie down with your head slightly raised. You should support your head against a headrest. If you are in a wheelchair, make sure that the brakes are on and that your chair is positioned against a wall particularly during assisted cough.
- If you can, use the nose clip as this prevents air from escaping.

- Take a deep breath in and hold.
- Immediately have the carer place the mouthpiece into your mouth and make sure there is a good seal. If you cannot use the mouthpiece, you can use a mask which the carer will place over your nose and mouth and hold firmly to prevent air escaping.
- Your carer will then gently squeeze the ambu bag and take a second deep breath.
- Repeat again if possible. Keep breathing in until your lungs are full. You may feel a stretch in your chest – this is normal.
- Exhale or cough as desired.
- Maintain eye contact with your carer throughout the process so that you can use your eyes to tell them if you want to stop and have a break.

**This technique should not cause dizziness or chest discomfort – in the event of these symptoms occurring, stop treatment and take a rest.**

When your lungs are full, you will be able to breathe out longer, this lets the mucous move into the upper airways where you can cough or spit it out.

Each person has a different level of tolerance; some may feel they want three or four breaths with the ambu bag and others may only need one or two. After the long breaths out, try to cough. Once you have coughed effectively, complete the treatment with a few more assisted breaths in.

Care of the ambu bag: Please refer to the manufacturers instructions on how to look after your ambu bag and mask or mouthpiece. If you have a chest infection it is a good idea to change everything more frequently than if you are using it for maintenance techniques.

## **Assisted cough techniques:**

An effective cough is dependent on the force of the breath out. If your muscles are weak and you are unable to force the breath out quickly, you may want to ask a carer to help you.

After filling your lungs with as much air as you can, hold your breath. Your carer should place their hands on your side at the lower end of your rib cage. Next, cough out and as you cough, your carer should push quickly into your sides to help you cough the air out more quickly. Sometimes a double thrust (i.e. two pushes) is required and the timing of this takes a little practice.

An alternative hand position is at the front of the chest with the carers hands placed underneath the collarbone. Your physiotherapist will show your carers how to do this effectively. Alternating the hand position may be useful to avoid pressure on the same area all the time particularly if you have a chest infection and are needing to use the assisted cough technique more often.

## **Conclusion**

This information leaflet is intended to be used to remind you of the techniques your physiotherapist has taught you. If you have any questions or require further information on chest physiotherapy, contact your respiratory physiotherapist or **Marina Di Marco, Principal Neuromuscular Physiotherapist**



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