



# WHAT IS BREATH STACKING?

HOW TO KEEP YOUR  
LUNGS HEALTHY

Physical Medicine and Rehabilitation Program

When you have weakness or paralysis of your respiratory or breathing muscles, you are unable to fully inflate your lungs. As a result your lungs, chest wall and ribs stiffen over time. You can also develop areas in your lungs of collapse because the little air sacs, particularly at the base of the lungs, are not being inflated. Breathing muscle weakness also results in a weak cough so you cannot clear mucous secretions effectively. The combination of all these factors can lead to a chest infection.

## **HOW TO KEEP YOUR LUNGS HEALTHY**

A special technique called Breath Stacking (BS) is used to help prevent lung and chest wall stiffness and to keep your lungs clear of secretions.

Another technique can be added to Breath Stacking to improve the strength of your cough. It is called an Assisted Cough (AC). Together these techniques are Breath Stacking with Assisted Cough or BSAC.

The techniques are easy to learn and use. Doing BSAC daily will help prevent pneumonia or a serious lung infection.

## THE BENEFITS OF BSAC

- ◆ Keep your lungs clear of infection
- ◆ Keep the air sacs open in your lungs
- ◆ Keep your chest wall flexible which allows you to take bigger breaths on your own
- ◆ Keep your lungs clear of mucous plugs. Mucous plugs are very thick secretions that can get stuck in your airways making it very difficult for you to breathe
- ◆ Improve your ability to cough
- ◆ Increase the strength of your voice.

## HOW DO I KNOW IF I NEED BREATH STACKING?

You have likely had a Breathing or Pulmonary Function Test as ordered by the Respirologist. On the Rehab Unit, your physiotherapist tests your breathing using a spirometer. From these tests we learn how strong your breathing muscles are. We look at two important values:

1. Vital Capacity (VC). This test measures how much air you can blow out. Your VC must be more than 1.5 litres (L) for an effective cough.
2. Peak Cough Flow (PCF) – This measures the strength of your cough and is measured in litres per minute (L/ min). Your PCF should be greater than 300L/min to keep your lungs free of secretions.

Your physiotherapist will assess your breathing and determine whether you need to do breath stacking alone or breath stacking with an assisted cough (BSAC).

## BREATH STACKING EQUIPMENT

This equipment consists of an ambu bag or resuscitation bag, a connector tube, two one-way valves, mouthpiece and nose clip. The one-way valve is used to help build up volume in your lungs by allowing air to get in but not out.

Some people require a scuba-type mouthpiece or a mask to do Breath Stacking. Your Physiotherapist will determine what is right for you.

If you have a tracheostomy, an attachment can be used to connect to the ambu bag. .

### **Please Note:**

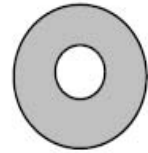
**This equipment set up should never be used for emergency breathing.**

**Please see the equipment diagram on next page.**

**Please also note that the term “safety catcher” is used. This is the one-way valve that is closest to the mouth.**

## Equipment

Inside the safety catcher is a small rubber disc.



Remove the small rubber disc from the safety catcher only.

Then, connect the safety catcher to the one-way valve as shown below:

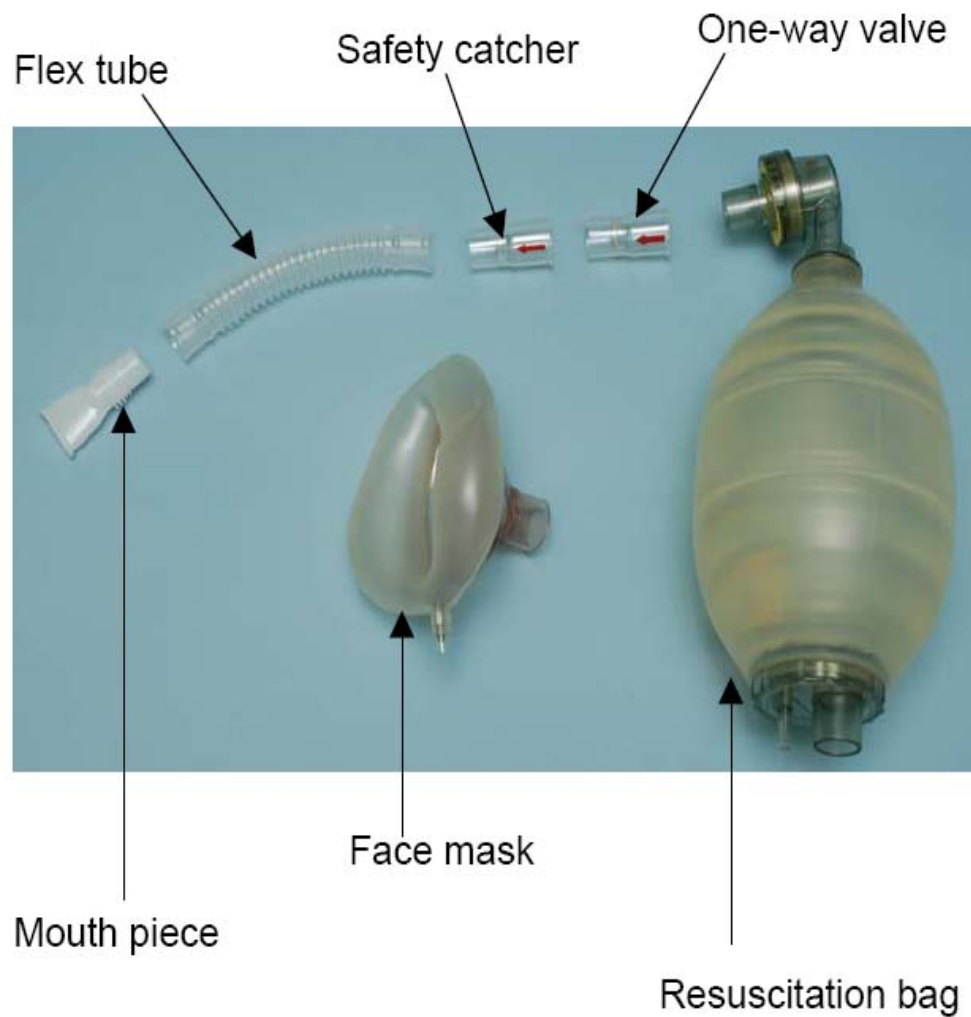


Photo from the Hamilton Health Sciences

## HOW TO DO BREATH STACKING

Some people can do BS independently and some need a helper to squeeze the ambu bag.

1. With the mouthpiece in your mouth, take an easy breath in as you squeeze the bag.
2. Continue to breathe in and squeeze the bag until your lungs are full and you cannot hold any more air. If you are doing this with a helper, the “bagger” will feel resistance when squeezing the bag once your lungs are full.
3. Hold for a count of five. Now release the air.

**You have now done one repetition of breath stacking. You need to do five repetitions each time and do breath stacking at least four times per day.**

### LVR with Resuscitation Bag



**LVR = lung volume recruitment**  
Photo from the Ottawa Rehab Centre

## ASSISTED COUGH

If you have had a spinal cord injury at the level of L1 or above, this affects the strength of your stomach and breathing muscles. This is also true for individuals with a progressive neuromuscular disease such as ALS and Muscular Dystrophy. These muscles help you to take a big breath in and to generate enough force for a good cough. To help your stomach muscles produce this force, an assisted cough (AC) is needed.

There are different types of assisted coughs but the most common is the Abdominal or Heimlich-type maneuver. Your physiotherapist will teach you the type of assisted cough that best suits your needs.

The Abdominal Thrust is done by a helper who places the heel of the hand at the level of your belly button or umbilicus, avoiding the rib cage. See diagram on page 8 to explain how to landmark properly.

An inward and upward thrust is given at the end of BS **just before you cough** to drive the diaphragm upwards and produce enough force and pressure to help you clear secretions.

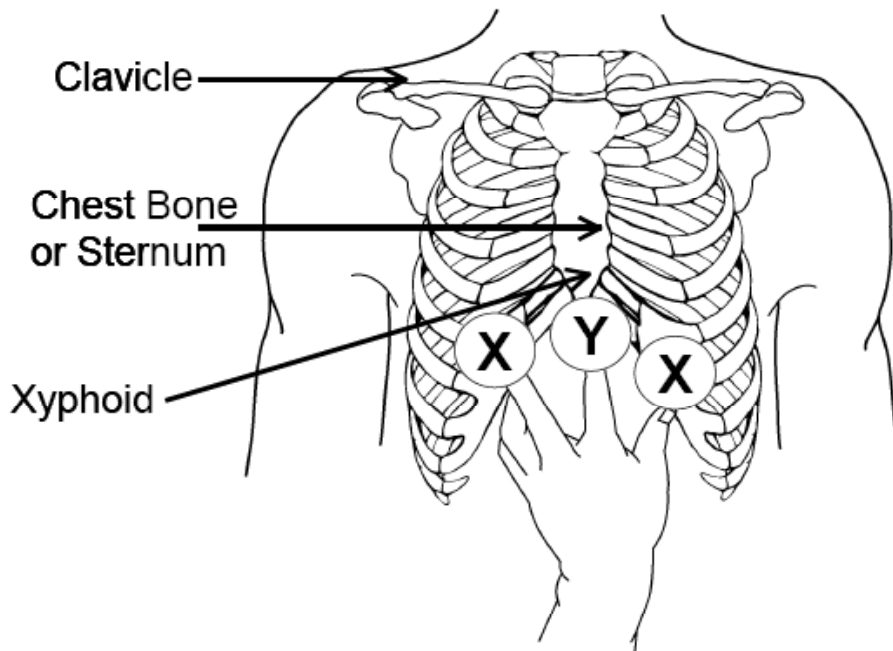
You can do a self-assisted cough by applying a thrust using your hands clasped together at the level of your navel. Another way to increase the strength of your cough is to sit straight and tall as you BS and then pull quickly into flexion or a slouched position as you cough. Ask your physiotherapist for more information.

Diagram from Hamilton Health Sciences

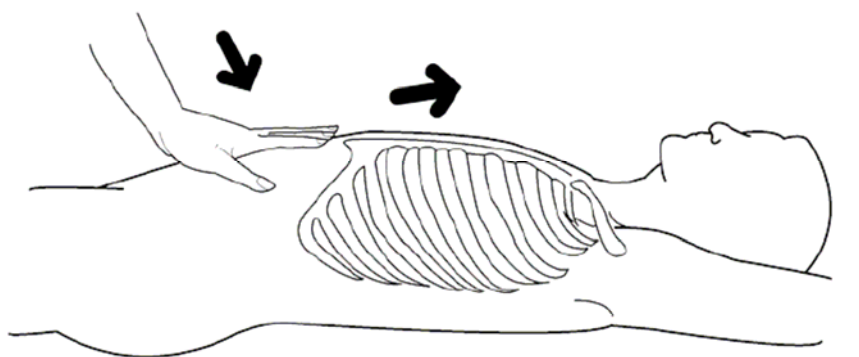
**Y = Position of Index Finger**

**X = Position of Thumb and Middle Fingers.**

**Plant the heel of the hand at the belly button.**



The diagram below shows the direction of the thrust for an abdominal thrust assisted cough.



The arrows show the direction of movement.

## HOW TO DO BREATH STACKING WITH ASSISTED COUGH

**This can be done with one or two people.**

1. The bagger squeezes the bag to give you successive breaths each time you breath in. The bagger can use one or two hands to squeeze the bag. The bagger gives you air until your lungs are full.
2. HOLD the air.
3. The bagger landmarks for the assisted cough and will tell you when to cough. The assisted cough is given just prior to your cough.
4. If secretions are present, continue BSAC until your lungs are clear.

### IMPORTANT FACTS

- ◆ If you normally use an inhaler, take it before BSAC.
- ◆ To keep your lungs healthy and prevent a chest infection, do BSAC morning and evening.
- ◆ It is a good idea to do breath stacking just before a meal so that the assisted cough is not pushing on a full stomach.
- ◆ If you have a chest infection, breath stacking can be done as often as every 10 minutes.

Breath stacking can be done with a mouthpiece or mask. It can also de done through a tracheostomy tube without a cuff, or with the cuff deflated.

## CLEANING AND TESTING EQUIPMENT

The breath stacking valve and mouthpiece should be cleaned at least once per week. If you have cold or chest infection you may need to clean the equipment more often.

Disconnect the mouthpiece and valve closest to it and wash in mild soap and water. Rinse in warm water.

A solution of one part vinegar to two parts water can be used to disinfect the equipment by soaking for 30 minutes. Rinse in warm clean water and let them air dry on a towel. **Do not use a hairdryer to dry the equipment.**

## TO TEST YOUR RESUSCITATION BAG FOR LEAKS

- ◆ Cover the top outlet of the bag and then squeeze the bag with your other hand.
- ◆ No air should leak from the bag, and the bag should **NOT** deflate .If this happens or you hear a leak, then the bag needs to be replaced.

## RESOURCES

The Ottawa Hospital Rehabilitation Centre:  
[www.rehab.on.ca](http://www.rehab.on.ca)

Hamilton Health Sciences: [www.hhsc.ca](http://www.hhsc.ca)

Health care providers who provide care to those who have spinal cord injury or neuromuscular disease have written this booklet. At the time of printing, this information was accurate to the best of our knowledge. The information may change due to the rapid changes in health care. It is not intended to replace medical/health advice from your health care providers.

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