

An Introduction to Postural Drainage & Percussion

Postural Drainage and Percussion (PD & P), also known as chest physical therapy, is a widely accepted technique to help people with cystic fibrosis (CF) breathe with less difficulty and stay healthy. PD & P uses gravity and percussion to loosen the thick, sticky mucus in the lungs so it can be removed by coughing. Unclogging the airways is critical to reducing the severity of lung infections.

PD & P is easy to perform using the techniques you will learn here. For the child with CF, PD & P can be performed by physical therapists, respiratory therapists, nurses, parents, siblings and even friends.

PD & P is sometimes used along with other types of treatments, such as inhaled bronchodilators and antibiotics. If ordered, bronchodilators should be taken **before** PD & P to open the airways, and aerosolized antibiotics should be taken **after** PD & P to treat the opened airways. Your doctor or therapist at your Cystic Fibrosis Foundation care center will recommend a routine for you or your child.

BECOMING FAMILIAR WITH THE LUNGS

Learning more about the respiratory system and its relationship to internal organs can help you to understand

why PD & P treatments are effective, and how each lung segment is drained.

Draining the Lung Segments

The goal of PD & P is to clear mucus from each of the five lobes of the lungs by draining mucus into the larger airways so that it can be coughed out. The right lung is composed of three lobes: the upper lobe, the middle lobe and the lower lobe. The left lung is made up of only two lobes: the upper lobe and the lower lobe.

The lobes are divided into smaller divisions called segments. The upper lobes on the left and right sides are each made up of three segments: **apical**, **posterior** and **anterior**. The left upper lobe includes the **lingual**, which corresponds to the middle lobe on the right. The lower lobes each include four segments: **superior**, **anterior**, **basal**, **lateral basal** and **posterior basal**.

Each segment of the lung contains a network of air tubes, air sacs and blood vessels. These sacs allow for the exchange of oxygen and carbon dioxide between the blood and air. It is these segments that are being drained. Note the position of each lung segment in Figure 1 below.

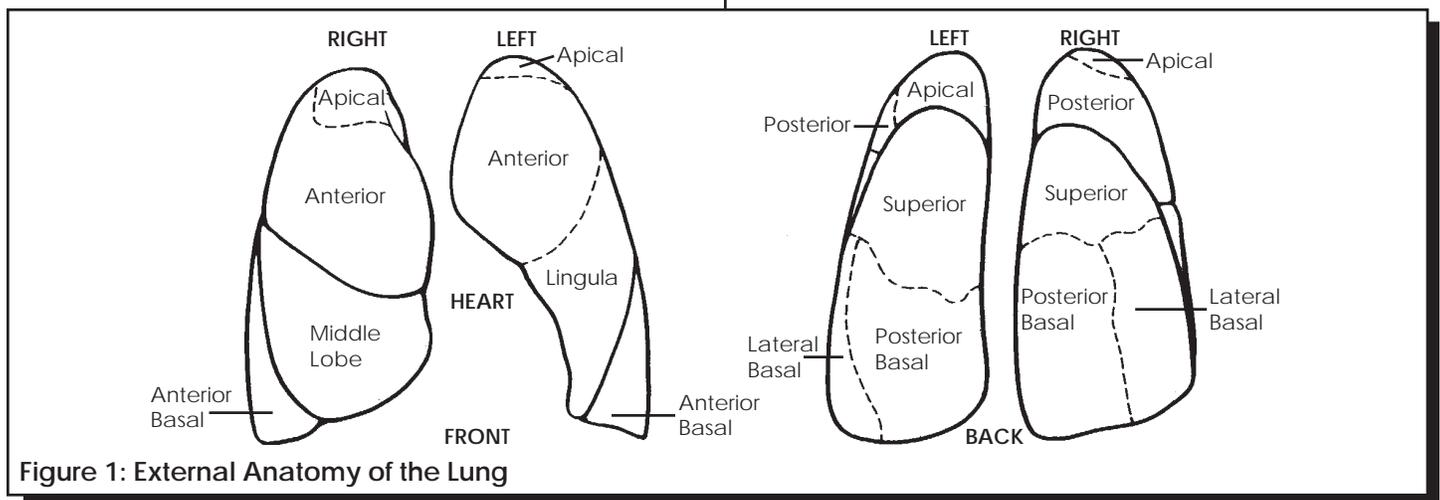


Figure 1: External Anatomy of the Lung

PERFORMING PD & P

The performance of PD & P involves a combination of techniques including: multiple bronchial drainage positions, percussion, vibration, deep breathing and coughing.

Although individual PD & P techniques will be further detailed, a brief summary of the complete treatment follows.

Once the person is in one of several prescribed bronchial drainage positions, the caregiver performs percussion on the chest wall. This treatment usually is given for a period of three to five minutes, sometimes followed by vibration over the same lung segment for approximately 15 seconds (or during five exhalations). The person is then encouraged to cough or huff vigorously to get rid of mucus, clearing the lungs.

It is important to know that for some infants, toddlers, children and adults, certain postural drainage positions may worsen heartburn and cause vomiting. Specifically, when some people lay with their heads down (lower than the stomach), they can get reflux. This is stomach acid (heartburn) or food coming up from the stomach. It can cause discomfort, wheezing or vomiting. Reflux may also lead to earlier lung infection or damage. If these things occur, tell your therapist and/or doctor. There are other positions or Airway Clearance Techniques (ACTs) that might be better. To learn more, go to the CF Foundation's Web site (www.cff.org) and read "An Introduction to Airway Clearance Techniques."

Description of PD & P Techniques

Postural drainage uses gravity to help move mucus from the lungs up to the throat. The person lies or sits in various positions so that the segment to be drained is uppermost on the patient's body. The segment is then drained using percussion, vibration and gravity. For a complete description of these positions, see diagrams on pages 5 through 8. Your CF care team may tailor these positions to yours or your child's needs.

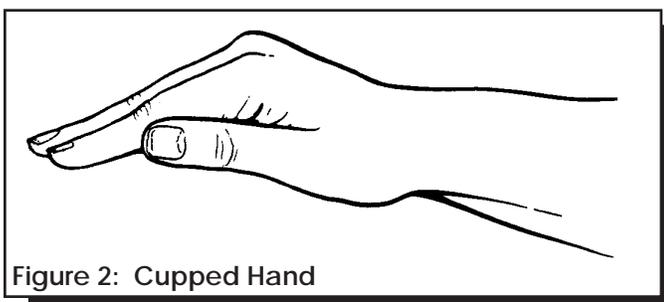


Figure 2: Cupped Hand

Percussion or clapping by the caregiver on the chest wall over the lung segment to be drained forces secretions into the larger airways. The hand is cupped as if to hold water but with the palm facing down as in Figure 2. The cupped hand conforms to the chest wall and traps a cushion of air to soften the clapping.

Percussion is done vigorously and rhythmically, but should not be painful or sting if the hand is cupped properly. Each percussion also should have a hollow sound. The majority of the movement is in the wrist with the arm relaxed, making percussion less tiring to perform.

Percussion should be done only over the ribs. Special attention must be taken to avoid percussing over the spine, breastbone, stomach and lower ribs or back to prevent trauma to the spleen on the left, the liver on the right and the kidneys in the lower back.

Various mechanical devices may be used in place of the traditional cupped palm method for percussion. Ask your doctor or therapist for advice.

Vibration gently shakes secretions into the larger airways. The caregiver places a hand firmly on the chest wall over the appropriate segment and tenses the muscles of the arm and shoulder to create a fine shaking motion. Then, the caregiver applies a light pressure over the area being vibrated. (The caregiver also may place one hand over the other, then press the top and bottom hand into each other to vibrate.) Vibration is done with the flattened hand, not the cupped hand, as in Figure 3. Exhalation should be as slow and as complete as possible.

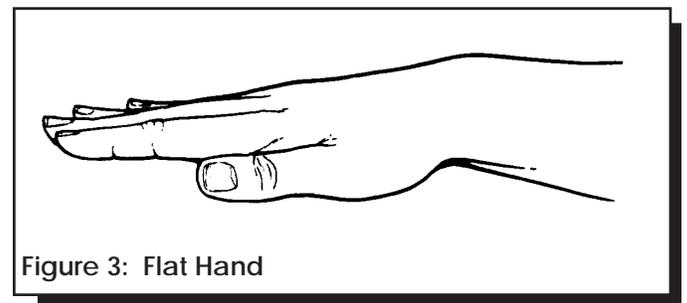


Figure 3: Flat Hand

Deep breathing moves the loosened mucus and may stimulate coughing. Diaphragmatic breathing/belly breathing or lower chest breathing is used to encourage deep breathing to move air into the lower lungs. The belly moves outward when the person breathes in and sinks in when he or she breathes out.

Coughing is essential in clearing the airways. A forced but not strained exhalation, following a deep inhalation, may stimulate a productive cough. The mucus can then be

coughed out. To increase the cough's effectiveness while decreasing the strain to the person, coughing may be assisted by supporting the sides of the lower chest with the hands or elbows.

Huffing

At the end of each drainage position, the person can take a deep breath, and then expel it quickly in a "huff." This "huff" forces the air and mucus out, making the cough more effective.

Timing of PD&P

Generally, each treatment session can last for 20 to 40 minutes. PD & P is best done before meals or one and a half to two hours after eating to minimize the chance of vomiting. Early morning and bedtime sessions usually are recommended. The length of PD & P and the number of treatment sessions may need to be increased if the person is more congested. The recommended positions and durations of treatment are prescribed by the CF doctor or therapist.

ENHANCING PD & P FOR THE PERSON AND CAREGIVER

Both the person and the caregiver should try to be comfortable during PD & P. Before beginning PD & P, the person should remove tight clothing, jewelry, buttons and zippers around the neck, chest and waist. Light, soft clothing, such as a T-shirt, may be worn and an extra towel or layer of clothing can be used to lessen any sting from percussion. **Do not perform PD & P on bare skin.** The therapist or caregiver should remove rings and other bulky jewelry such as watches or bracelets. An ample supply of tissues or a place to cough out the mucus should be provided.

Performing PD & P Comfortably and Carefully

If the head down position is recommended, the person's head should be well supported. The person can bend at the hips and knees to allow for both a stronger cough and a more comfortable position.

The caregiver should not lean forward when treating the person, but should remain in an upright position to protect his or her back. To achieve this, the table on which the person lies should be positioned at a comfortable height for the caregiver.

Purchasing Equipment

Equipment such as drainage tables, electrical and non-electrical palm percussors and vibrators may be helpful and can be purchased from medical equipment stores. Older children and adults may find percussors useful when performing their own PD & P, but younger children may be frightened by the noise of a percussor.

Ask your doctor or therapist at your CF care center for recommendations on equipment.

Tips for Achieving the Proper Positions

To enable you to perform PD & P more frequently and effectively, select a method of achieving the proper bronchial drainage angles that is easy to set up. Some people use a firm padded board or table. These tilt boards, or drainage tables, can be elevated at one end by placing blocks on the floor. Tables that adjust to various angles or heights can be constructed or bought.

Pillows, sofa cushions, bundles of newspapers under pillows for support, cribs with adjustable mattress heights/tilts, foam wedges and bean bag chairs work for many families. Infants can be positioned with or without pillows in the caregiver's lap.

Making PD & P More Enjoyable

An additional benefit of PD & P is that it promotes a special time together. On a regular basis, PD & P offers a specific time for you to enjoy each other's company.

To enhance the quality of the time you spend with your caregiver or child doing PD & P, do one of the following:

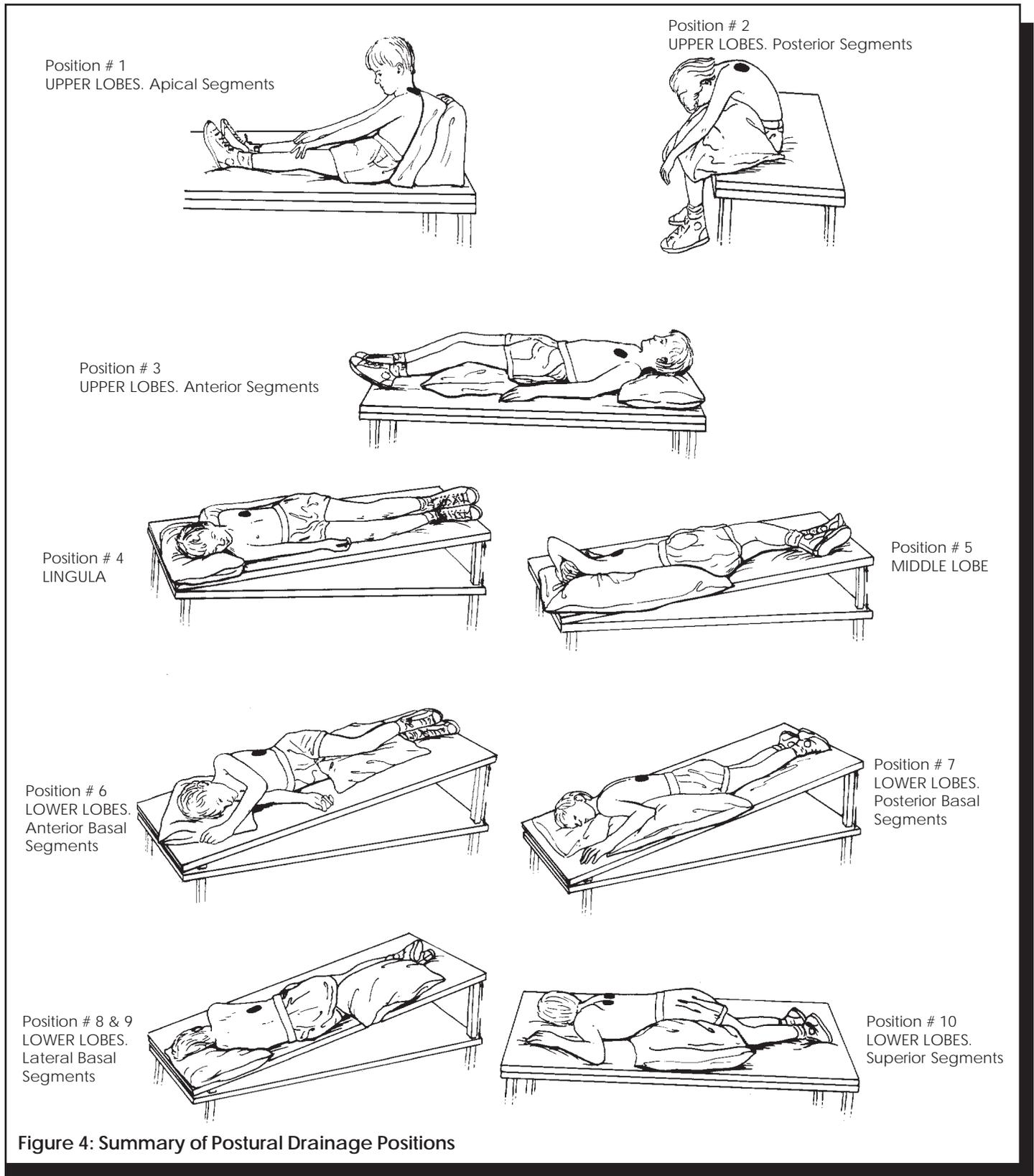
- Schedule PD & P around a favorite TV show.
- Play a favorite tape of songs or stories.
- Spend time playing, talking or singing before, during and after PD & P.
- For kids, encourage blowing or coughing games during PD & P, such as blowing pinwheels or coughing the deepest cough.
- Ask willing and capable relatives, friends, brothers and sisters to perform PD & P occasionally. This can provide a welcome break from the daily routine.
- Minimize interruptions.

Identifying ways that make PD & P more enjoyable at all ages can help you keep a regular routine and get maximum health benefits.

SUMMARY OF POSTURAL DRAINAGE POSITIONS

Lung segments are drained using gravity as the patient lies or sits in different positions. Percussion and vibration are performed on the front, back and sides of the person's chest and are followed by deep breathing and coughing.

Figure 4 summarizes all positions used for bronchial drainage. Details and explanations are provided for people of all ages on pages 5 through 8 of this brochure.



INSTRUCTIONS FOR POSTURAL DRAINAGE POSITIONS

The following diagrams describe the drainage positions necessary to drain each lung segment. In the diagrams, shaded areas on the chest indicate the location of the segment that is to be drained in each position.

The maneuvers vary slightly with the person's age. Here, the diagrams illustrate the first PD position for 1) an infant with the caregiver holding the infant on his or her lap, 2) an older child or adult who performs PD & P independently (assistance may be needed to treat some positions) and 3) a child or adult with the caregiver assisting with PD & P. The remaining diagrams illustrate a caregiver giving PD & P to a child, and can be adapted for infants and adults.

Instructions are shown using a drainage table, but alternatives are available. Pillows may be used for added comfort, but should not lessen the angle necessary for drainage. If the person tires easily, the sequence of positions can be varied, but all segments should be treated regularly.

Please remember to percuss and vibrate only over the ribs. Avoid percussing and vibrating over the spine, breastbone, stomach and lower ribs or back to prevent trauma to the spleen on the left, the liver on the right and the kidneys in the lower back. Do not percuss or vibrate on bare skin.

INFANT

Position # 1: UPPER LOBES

Apical Segments

Lean the infant back from a sitting position at a 30 degree angle on a pillow in your lap. Percuss and vibrate over the muscular area between the collarbone and the top of the shoulder blade. Percuss and vibrate on both the **left** and **right** sides.

* Infant shown without T-shirt for illustration purposes only.

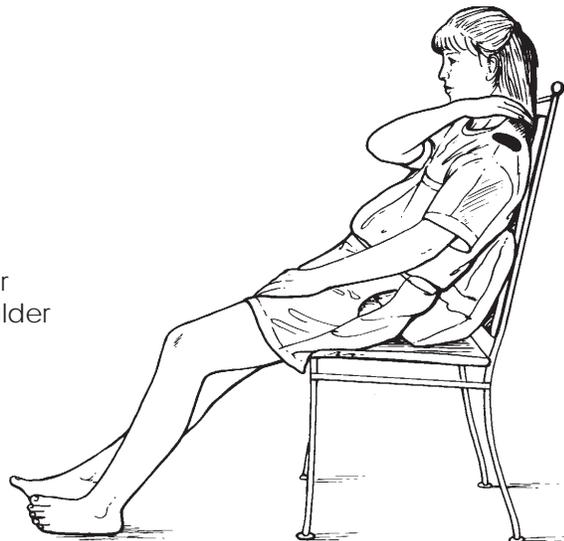


ADULT

Position # 1: UPPER LOBES

Apical Segments

Sit on a chair and lean backward on a pillow at a 30 degree angle. Percuss and vibrate over the muscular area between the collarbone and the top of the shoulder blade on both the **left** and **right** sides of the chest.

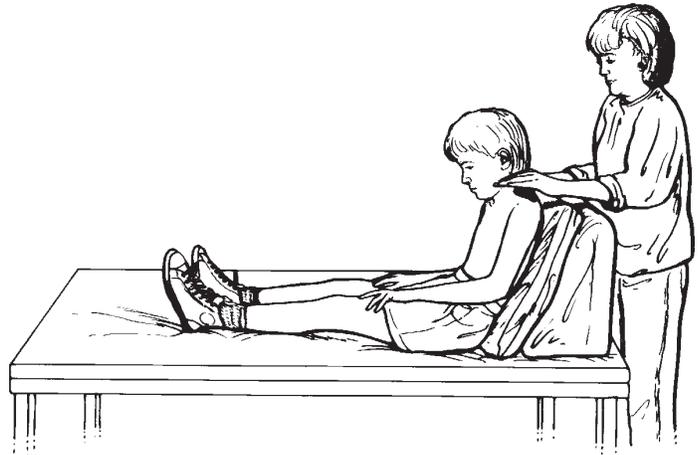


CHILD

Position # 1: UPPER LOBES

Apical Segments

The child sits on the flat drainage table and leans on a pillow at a 30 degree angle against the caregiver. Percuss and vibrate over the muscular area between the collarbone and the top of the shoulder blade on both the **left** and **right** sides.



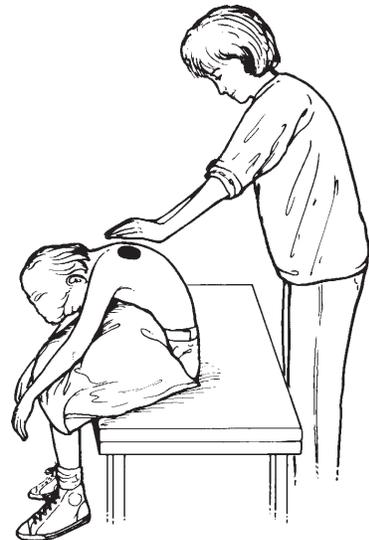
* Child shown without T-shirt for illustration purposes only.

CHILD

Position # 2: UPPER LOBES

Posterior Segments

The child sits on the flat drainage table and leans forward over a folded pillow at a 30 degree angle. Stand behind the child and percuss and vibrate on the upper back on the **left** and **right** sides of the chest.



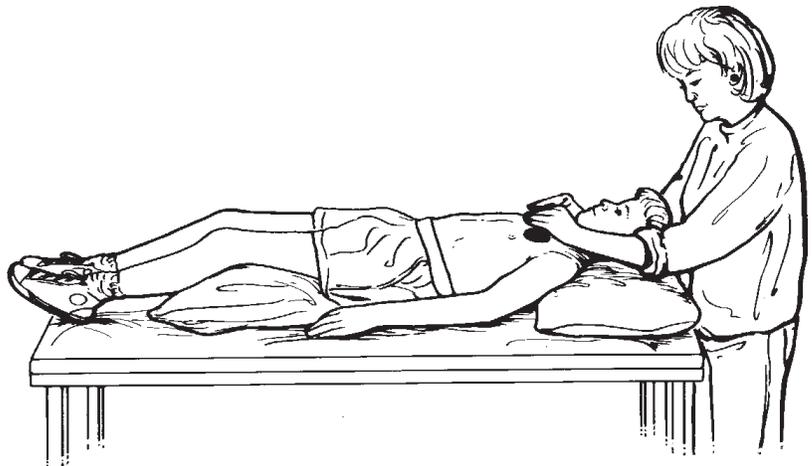
* Child shown without T-shirt for illustration purposes only.

CHILD

Position # 3: UPPER LOBES

Anterior Segments

The child lies on his or her back on a flat drainage table. Percuss and vibrate between the collarbone and nipple on both the **left** and **right** sides of the chest.



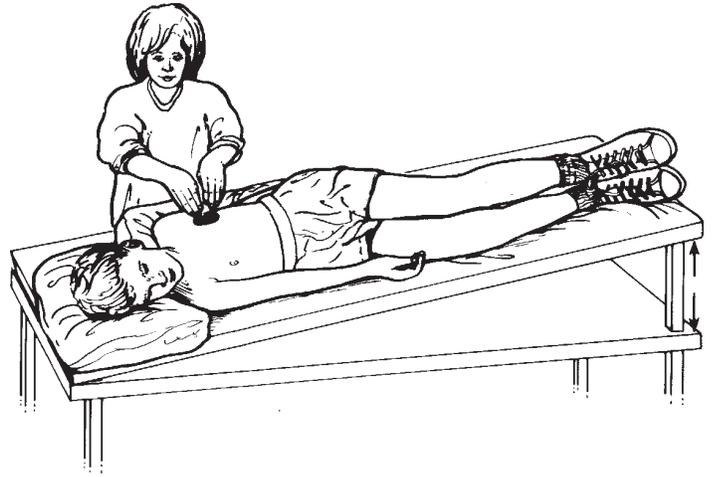
* Child shown without T-shirt for illustration purposes only.

CHILD

Position # 4: LINGULA

Elevate the foot of the table 14 inches (about 15 degrees). The child lies head down on the right side and rotates 1/4 turn backward. A pillow may be placed behind the child (from shoulder to hip) and the child may flex his or her knees. Percuss and vibrate just outside the **left** nipple area. For females with tenderness around the breasts, percuss and vibrate with the heel of hand under the armpit and fingers extended forward beneath the breasts.

* Child shown without T-shirt for illustration purposes only.

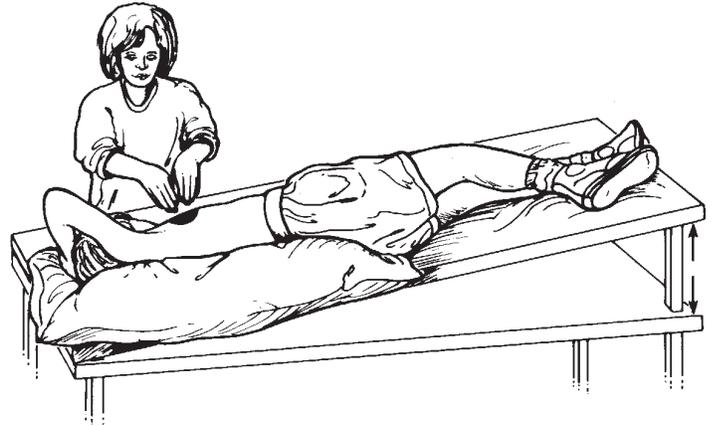


CHILD

Position # 5: MIDDLE LOBE

Elevate the foot of the table 14 inches (about 15 degrees). The child lies head down on the right side and rotates 1/4 turn backward. A pillow may be placed behind the child (from shoulder to hip) and the child may flex his or her knees. Percuss and vibrate just outside the **right** nipple area. For females with tenderness around the breasts, percuss and vibrate with the heel of hand under the armpit and fingers extended forward beneath the breasts.

* Child shown without T-shirt for illustration purposes only.



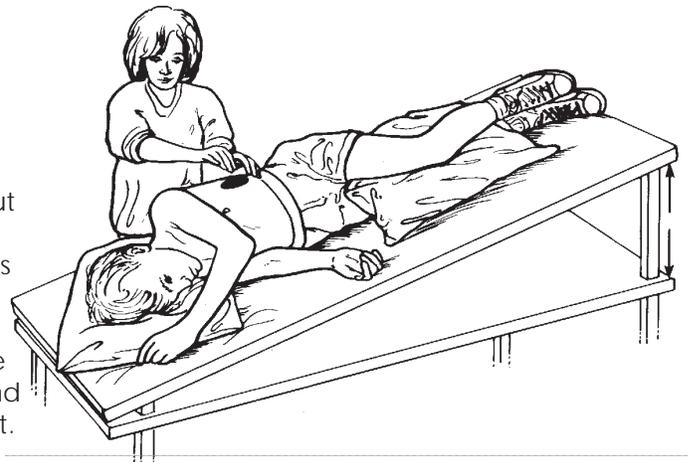
CHILD

Position # 6: LOWER LOBES

Anterior Basal Segments

Elevate the foot of the drainage table 18 inches (about 30 degrees). The child lies on his or her right side with the head down and a pillow behind the back. Percuss and vibrate over the lower ribs on the **left** side of the chest, as shown in the diagram. To drain the right side of the chest, the child lies on his or her left side with the head down and a pillow behind the back. Percuss and vibrate over the lower ribs on the **right** side of the chest.

* Child shown without T-shirt for illustration purposes only.

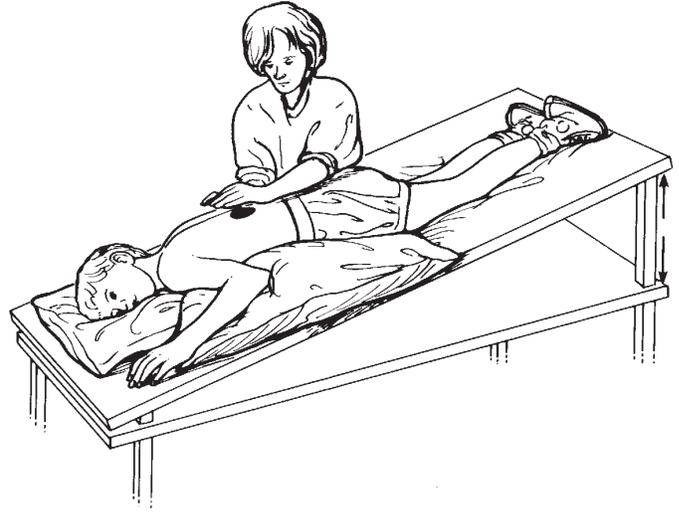


CHILD

Position # 7: LOWER LOBES

Posterior Basal Segments

Elevate the foot of the drainage table 18 inches (about 30 degrees). The child lies on his or her abdomen, head down, with a pillow under the hips. Percuss and vibrate on both the **left** and **right** sides of the spine. Do not percuss or vibrate over the spine or lower ribs.



* Child shown without T-shirt for illustration purposes only.

CHILD

Position # 8 & 9: LOWER LOBES

Lateral Basal Segments

Elevate the foot of the table 18 inches (about 30 degrees). The child lies on his or her left side, head down, and leans 1/4 turn forward toward the table. The child can flex his or her upper leg over a pillow for support. Percuss and vibrate over the uppermost portion of the lower ribs to drain the **right** side, as shown in the diagram. To drain the **left** side, the child lies on his or her right side in the same position. Percuss and vibrate over the uppermost portion of the lower **left** ribs.



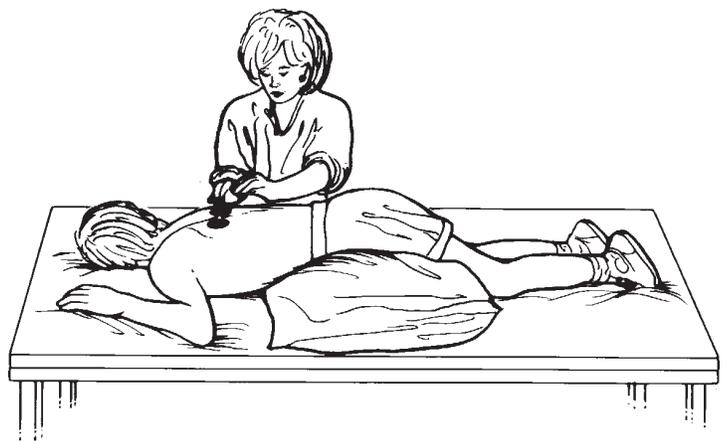
* Child shown without T-shirt for illustration purposes only.

CHILD

Position # 10: LOWER LOBES

Superior Segments

The child lies on his or her abdomen on a flat drainage table with two pillows under the hips. Percuss and vibrate over the middle part of the back at the bottom of the shoulder blade on both the **left** and **right** side of the spine. Do not percuss or vibrate over the spine.



* Child shown without T-shirt for illustration purposes only.