

What Clinicians Need To Know About Mucus Clearance

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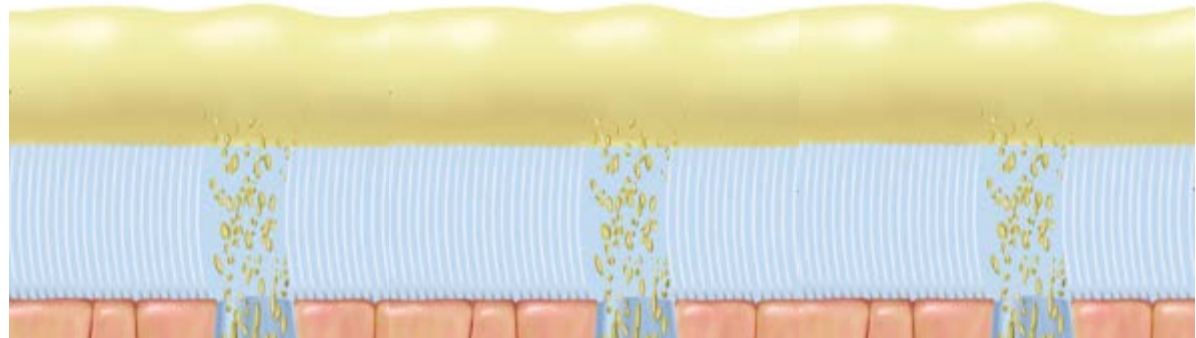
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Airway Clearance in Normal Lung

- Lungs are exposed to millions of particles each day
- Healthy lungs effectively clear secretions through the mucociliary mechanism
 - Inhaled particles are passed upward at a rate of 10 mm per minute toward the larynx and swallowed
- When the lower respiratory track is challenged, secretions are cleared by the cough reflex
- Cough, deep breathing and ambulation/exercise are the most natural and ideal ways to maintain normal lung hygiene



Aims of Airway Clearance Therapy (ACT)

- Clear the airways of secretions
- Improve ventilation by lung recruitment
- Lessen effects of infection
- Avoid the deterioration of lung parenchyma and advanced airway changes

Airway Clearance Therapy

Bronchodilators



Mucolytics



Airway Clearance Techniques



Inhaled Antimicrobials

Bronchodilators

- First step in airway clearance regimens
- Opens airways to facilitate secretion mobilization
- Reduces bronchospasm caused by inhaled medications
- MDIs and nebulizers are equivalent if used properly

Pharmacologic Mucociliary Agents

- *N-Acetylcysteine*
 - Breaks disulfide bonds
 - Reduces sputum viscosity
- Hypertonic Saline (3% and 7%)
 - Increases moisture content, induces cough reflex
- Dornase Alpha
 - Breaks down DNA to further liquefy secretions

Airway Clearance Techniques

- Forced Expiratory Technique
- Percussion and Postural Drainage (CPT)
 - Percussion
- Oscillatory Positive Expiratory Pressure (PEP)
 - Acapella
- High Frequency Chest Wall Oscillation (HFCWO)
 - Vest

Forced Expiratory Technique



- “Huff Cough”
- Forced exhalation through an open mouth and glottis
- Maximizes airflow and minimizes airway collapse
- Optimize airway clearance by moving secretions further up the airway
- Only 2-3 huffs at a time as may increase bronchospasm
- Recommended part of ALL airway clearance regimens

Active Cycle of Breathing Technique

- Repeated cycles combining the following:
 - Breathing control
 - Thoracic expansion exercises
 - Forced expiratory technique
- Gravity-assisted positions may enhance therapy
- Manual percussion and vibration can be applied

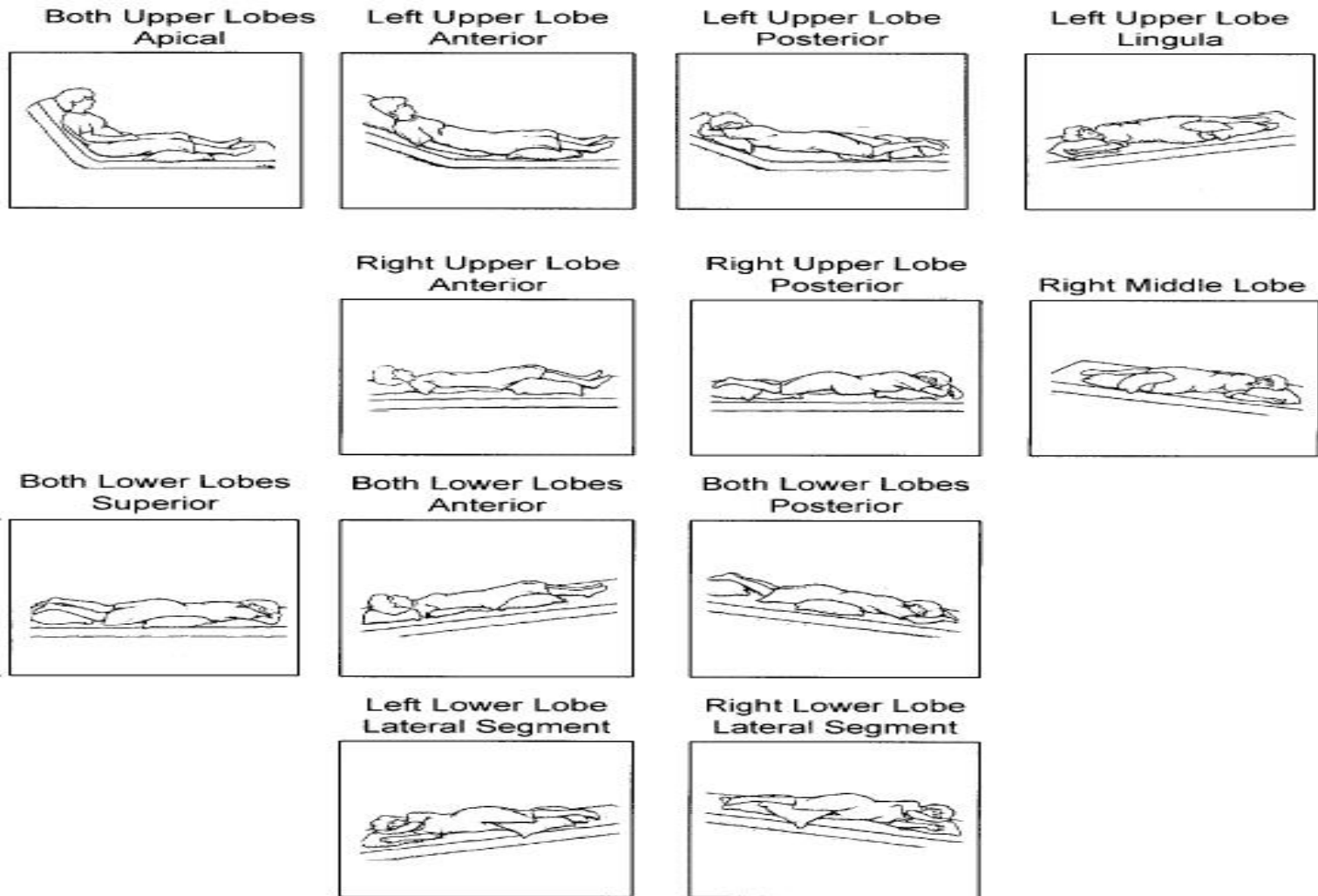
Percussion and Postural Drainage

- Percussion of the outer chest wall with either cupped hand or hand-held percussor
- Sessions last 15-30 minutes
- Pros:
 - Gold standard for over 40 years
 - Can localize treatment to target areas
 - Inexpensive and portable for travel
- Cons:
 - Time consuming
 - Requires skilled caregiver
 - Technique varies between providers



Percussion and Postural Drainage

- Positioning is important to allow for gravity-assisted drainage
- Percussion of each segment should be 2-3 minutes



Options for Handheld Percussion

- Percussion may be performed with either a cupped hand, adult-sized face mask or a pneumatic handheld percussor
- Decision of which to use should be based on provider education and access to equipment



Setup of Pneumatic Percussor

- 1) Plug percussor pressure hose into oxygen pressure inlet in wall.
- 2) Ensure patient has either gown or other barrier between device and patient's skin. This will help prevent skin breakdown.
- 3) Avoid percussing over EKG leads, g-tubes or other medical appliances.
- 4) Turn knob on percussor to initiate vibrations. Continue turning knob to increase frequency.
- 5) Move percussor over each lobe of patient's chest based off chest X-ray (concentrate on areas of consolidation/atelectasis) in a circular motion.
- 6) Administer treatment for 3-5 minutes over each area of the lung.
- 7) If limited/targeted treatment is indicated, duration should be no less than 10 minutes.



Oscillating Positive Expiratory Pressure (PEP) Devices

- Multiple flow operated oscillatory devices
 - Acapella Choice (green)
 - Aerobika (white)
- Combines techniques of PEP with high-frequency oscillation
- Sessions last 10-15 minutes
- Pros:
 - Highly portable
 - Relatively inexpensive/easy
- Cons:
 - Requires patient effort
 - No compatible with trach



Oscillatory PEP Technique

- Slowly inhale beyond a normal breath but not completely and hold for 2-3 seconds.
- Place the device in mouth with lips closed around the stem and cheek, as stiff as possible.
- Exhale through device at a reasonably fast, but not too forceful, speed.
- Exhale just beyond a normal breath in a consistent effort (like blowing out candles on a birthday cake).
 - Do **NOT** empty lungs completely.
- Repeat for 10 breaths, suppressing the urge for cough as tolerated.
- Take a deep breath in and forcefully exhale through the device to RV.

High Frequency Chest Wall Oscillator (HFCWO)

- Wraps around the chest wall to provide pressure and frequency oscillation
 - Creates “mini-coughs”
- Sessions last ~20 minutes
- Pros:
 - Requires minimal patient effort
 - Reliable and consistent therapy
 - Offers patient independence
- Cons:
 - Not easily portable
 - Patient comfort/different body types



HFCWO/Vest Technique

- The pressure is set high in the low-frequency range and low in the high-frequency range.
- Modify the pressure in each frequency according to effectiveness and toleration.
- Important to adjust the pressure to assure effective compressions, but not *too* much pressure causing discomfort and/or labored breathing.

Frequency (Hz)	Pressure	Time
6	10	5 minutes
8	10	5 minutes
10	10	5 minutes
16	6	5 minutes
18	6	5 minutes
20	6	5 minutes

Vest Setup

Once the device is plugged in, this screen will appear. Press the up arrow to access the "Normal" menu.

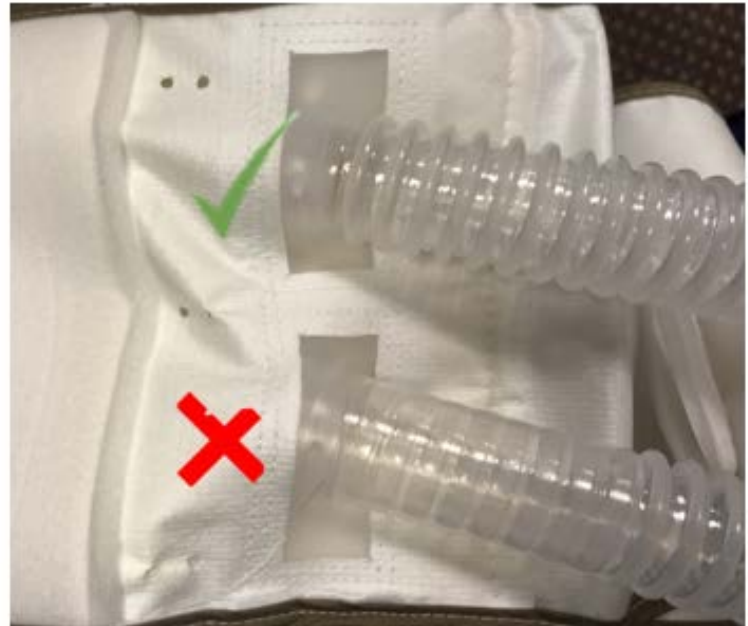


Vest Setup

Wrap the vest around the patient so it's snug, but not too tight to prevent skin irritation. Avoid wrapping over any medical devices.

Insert the tubing in each of the rubber ports on the vest, away from the seam.

Ensure the tubing is inserted all the way so the smooth end of the tubing is no longer visible.



Vest Setup



Previous settings will remain programmed. Press the ON button to inflate, then press ON again to begin therapy.

The time should be set for 10-30 minutes. The machine will automatically turn off once the time is up.

Disconnect the hoses and unstrap the vest

Note: Vest therapy will effect EKG readings due to the high frequency oscillations – remember to notify the team members the readings are due to therapy, not a change in patient condition

Documentation

Ventilator Ventilator Oxygen Inhalation Therapy **Hyperinflation/Airway...**

Accordion Expanded **View All** 1m 5m 10m 15m
3/23/20
1900

Hyperinflation / Airway Clearance Tx

\$ Delivery Source	Vest
Interface	
\$ Treatment Device	
Duration (min)	15
Position	Semi fowlers
Positive Pressure	5
Negative Pressure	
Frequency (Hrtz)	10
Chest Site	Modified bilateral
SpO2	99
Pre-Treatment Pulse	85
Pre-Treatment Respirations	20
Pre-Treatment Breath Sounds Right	Coarse
Pre-Treatment Breath Sounds Left	Coarse
Pre-Treatment Location Specific	
Post-Treatment Pulse	87
Post-Treatment Respirations	18
Post-Treatment SpO2	98
Post-Treatment Breath Sounds Right	Improved
Post-Treatment Breath Sounds Left	Improved
Post-Treatment Location Specific	
Cough	Productive
Sputum Amount	Moderate
Sputum Color	White
Sputum Consistency	Thick
Treatment Tolerance	Tolerated well

\$ Delivery Source

Vest

Select Single Option: (F5)

- Bed
- Cough assist
- PEP Device
- Percusser
- Vest**
- Oscillatory PEP
- Hand Clapping-Initial
- Hand Clapping-Subsequent
- MetaNeb
- Neb with Pentamidine
- MMI
- EzPap

Airway clearance is documented under the Hyperinflation/Airway Clearance tab in Epic.

Choose the correct delivery source and document in the rows as shown.