

# Airway Clearance

Methods and Evidence

Presented by

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# Goals of Presentation

- To be aware of the many methods that your patient may be using and to understand the theory behind the selected method
- To enable you to teach an effective method of airway clearance
- When to refer to your local physiotherapist

# Mucous and airways

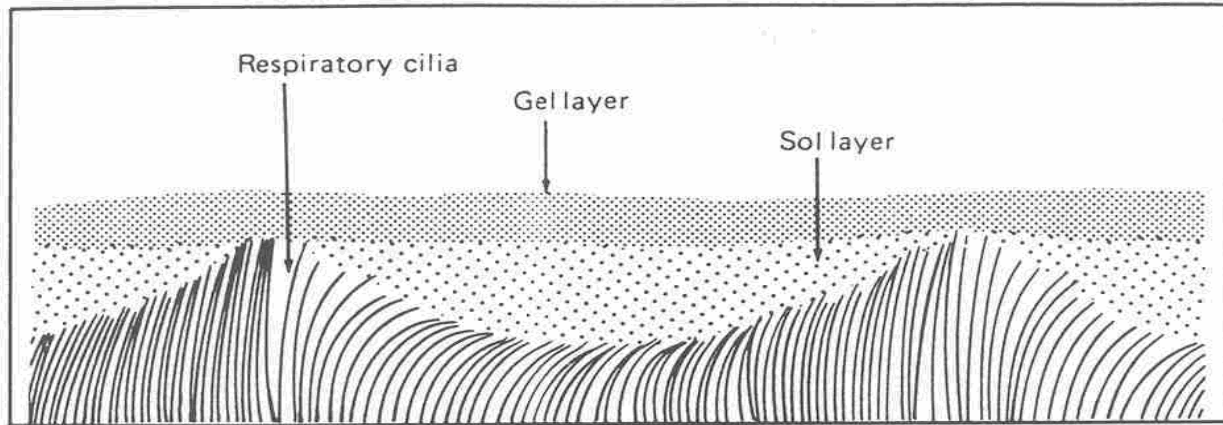
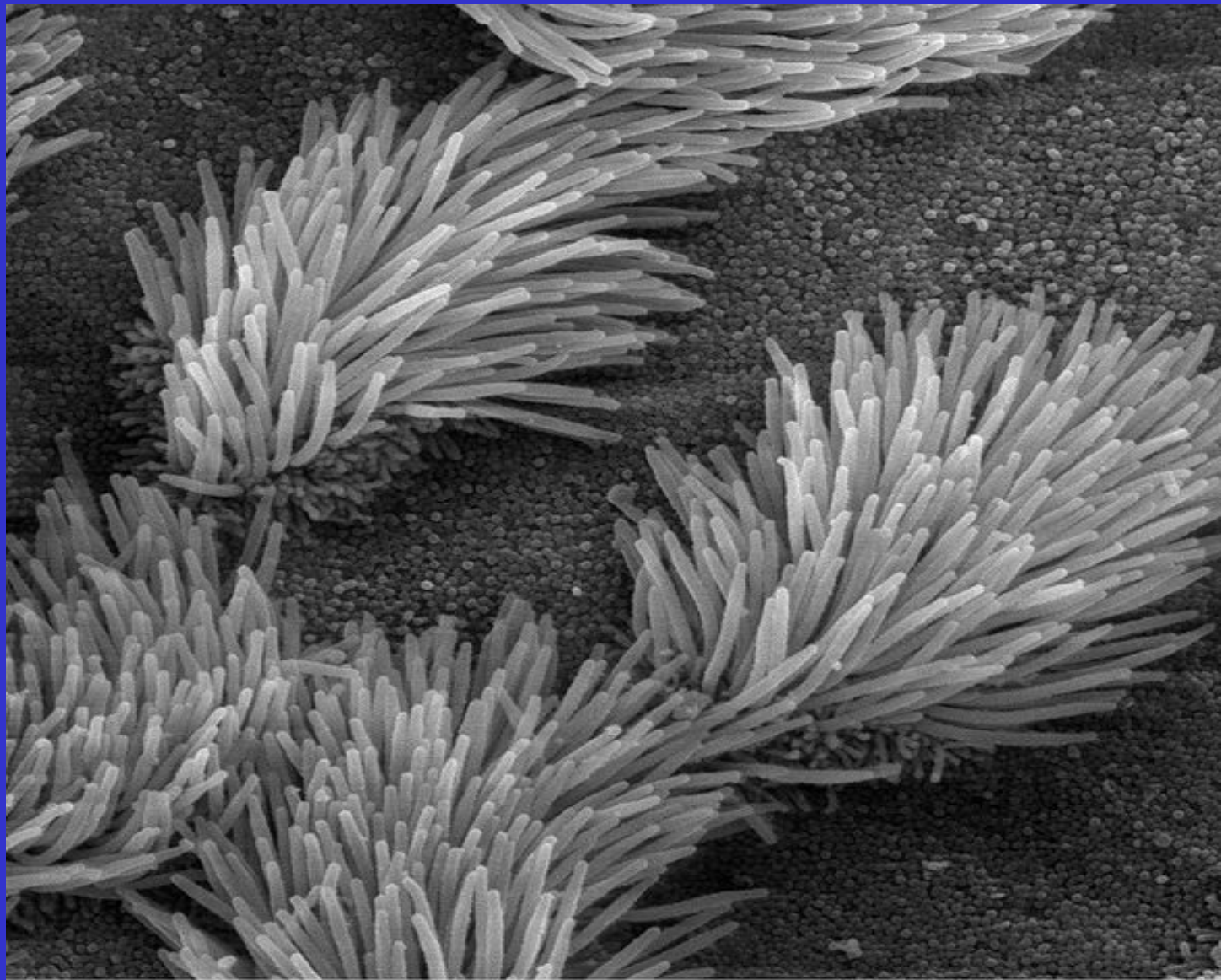


Fig. 9-29 Respiratory cilia are bathed in the sol portion of the mucus layer above them. Their power strokes allow mucus movement by the viscous gel layer, always in the same direction. (From Martin DE and Youtsey JW: Respiratory anatomy and physiology, St Louis, 1988, Mosby)



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# Clearance problems

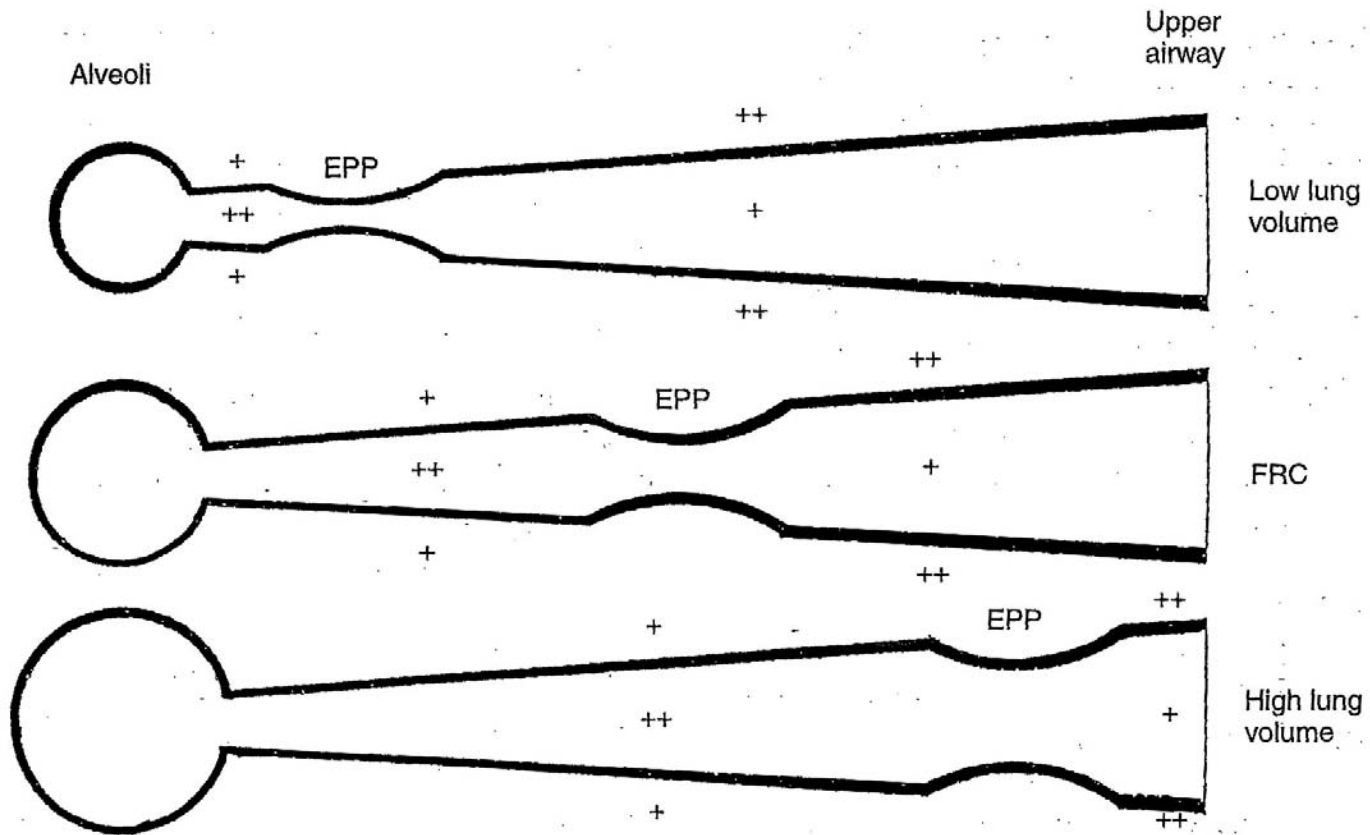
- Neuromuscular
  - Spinal injuries, Motorneurone disease, Muscular dysyrophies, Multiple Sclerosis
- Cilia dysfunction
  - Cystic Fibrosis (CF)
- Mucous viscosity and volume
  - CF / bronchiectasis, Chest infection, chronic bronchitis
- Ineffective cough from lung damage and musculoskeletal anomalies
  - COPD, Kyphoscoliosis

# Methods used for Clearance

- Directed Cough
- Assisted cough
- Postural Drainage, positioning and manual techniques (percussions, shaking)
- Active cycle of breathing and Forced Expiration Technique
- Autogenic Drainage
- Exercise

# FET and ACBT

- FET developed by Physiotherapist Bernice Thompson in Christchurch.
- Jennifer Pryor took this technique to Britain and did further research with Barbara Webber and developed the Active Cycle of breathing



**Figure 8.7** Greater pressures outside the airways (pleural pressure) than inside, caused by huffing. The equal pressure point (EPP) at different lung volumes moves towards the mouth as lung volume increases. *FRC = functional residual capacity.*

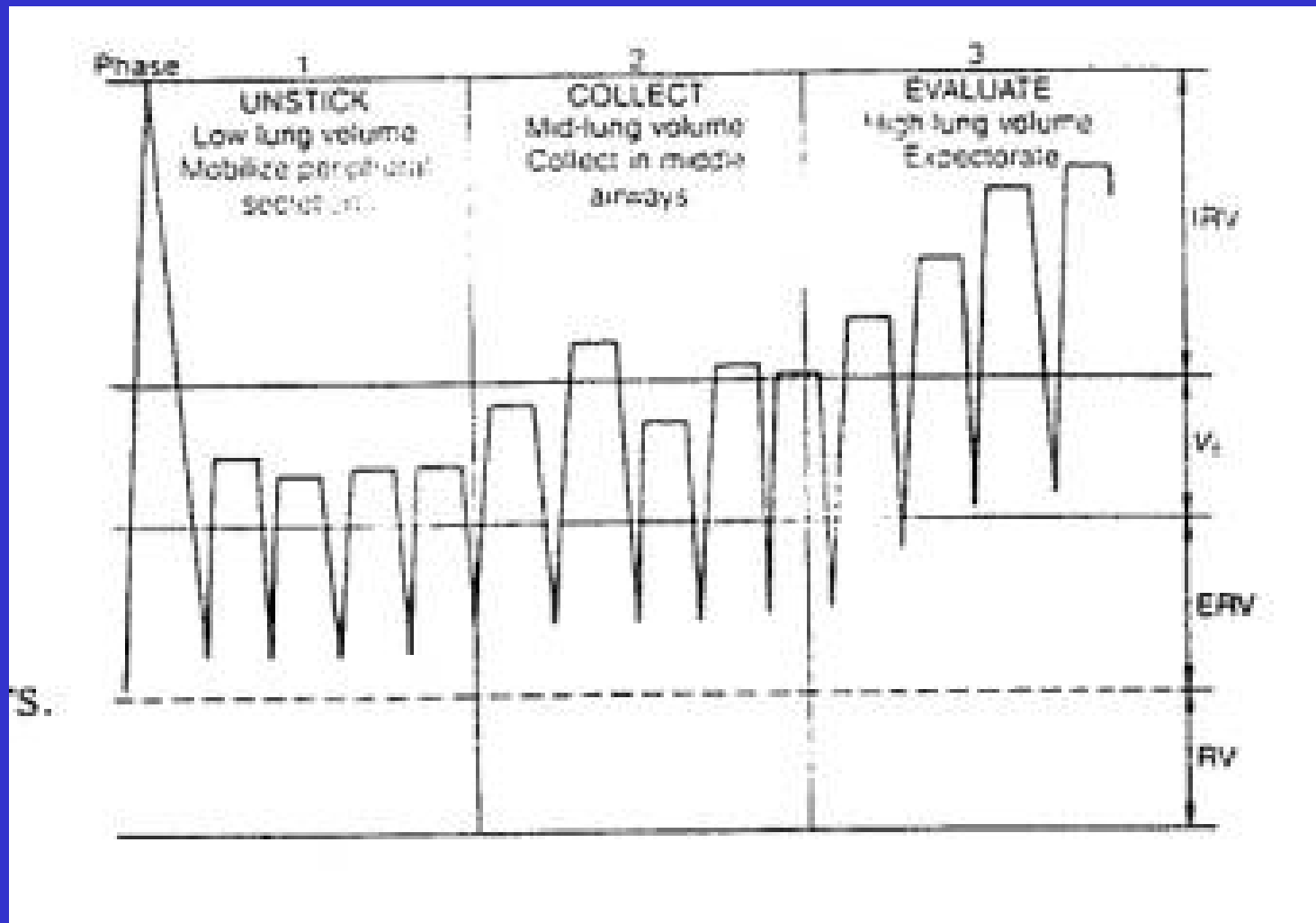
# FET, Pryor and Webber

- Effective in clearance of secretions (Pryor et al 1979)
- Improves Lung Function. (Webber et al 1986)
- Does not increase airflow obstruction (Thompson &Thompson 1968, Pryor and Webber 1979)
- Recommended by ACCP for patients with COPD and CF. Huffing should be taught as an adjunct to other methods of sputum clearance

# Autogenic Drainage

- Like ACBT it creates high airflow in different generations of bronchi without allowing airway collapse.
- Can take 30 to 45 mins to complete the sequence

# Autogenic Drainage



# Exercise

- Proven long term benefits in people with Chronic Lung Disease (GOLD).
- Reduced breathlessness
- Reduced hospitalisation
- Improved QOL
- Improved exercise endurance and strength
- Improved survival
- No studies found cf exercise with ACT

# Pharmacological Assistance

- **Mucolytic (Bromhexine hydrochloride)**
  - **Bisolvin.** Over the counter tablet/syrup costs just under \$23 for 50 8mg tablets. Usual dose 16mg 3 times daily for 7 days then 8mg TID
  - Acts by dissolving the mucopolysaccharide fibres in sputum to decrease viscosity.

# Pharmacological Assistance

- Hypertonic Saline
- Approximately 7% saline cw 0.9%.
- Theory is that it draws more moisture into the airway making the sputum less viscid

# Postural Drainage

- A Study compared head down tilt to modified PD with no tilt
- Sample size 20 infants
- Marked increase in gastro-oesophageal reflux in prone with tilt, supine and right side lying in both groups

Button et al 2004

# Postural Drainage / Head Down Tip

- Head down tip not recommended for many patients as it increases GOR and this worsens Chronic Lung Disease (Brenda Button)
- Other effects
  - Head aches and sinus pain
  - Increased intra-cranial pressure in the elderly
  - Desaturation

# Exercise

Elizabeth Dean

- Upright and mobilising is best. More movement better sputum clearance and reduced SOB
- Recumbent patients need to be turned through 360 degrees because of ventilation perfusion being gravity dependent

# Mechanics of Cough

1. Approx 2.5 litres inspired
2. Epiglottis closes and vocal cords shut to entrap the air.
3. Abdominal muscles contract forcefully pushing against diaphragm. The internal intercostals also contract forcefully
4. Pressure increases in the lungs to around 100mm Hg
5. Epiglottis and vocal cords suddenly open widely so that the air under pressure explodes out of the lungs

# Assisted and Directed Cough

- Neuromuscular weakness (eg Spinal injuries, MS)
  - decreases strength of cough.
- Applying manual pressure to the upper abdomen or lower thoracic cage can improve peak cough expiratory flow.

# Most commonly used devices

- PEP
- High frequency Oscillation therapy
- Acapella
- Flutter
- Cough-assist machine
- Manual Hyper-inflation
- Humidification
- Suction
- IPPB, BIPAP and CPAP

# Mechanical In-ex sufflation

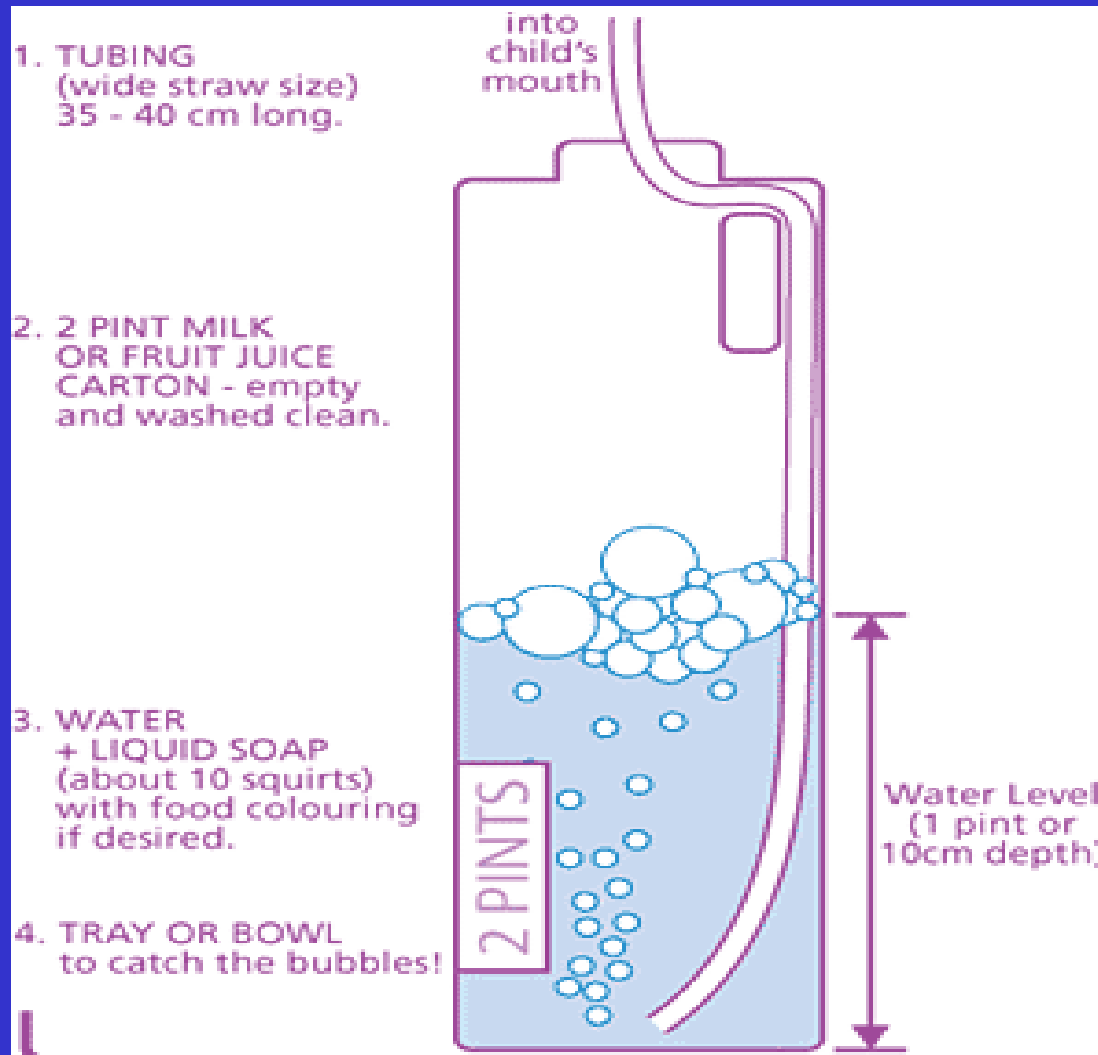


- The Cough Assist machine
- These are becoming more common

# Positive Expiratory Pressure (PEP)

- In airflow obstructed patients it is thought that breathing out against a resistance splints the airway open allowing improved mucociliary clearance.
- Increased gas pressure behind secretions via collateral ventilation
- PEP device commonly used here is a Therapep
- Adding oscillation to this PEP (with flutter acapella or cornet) is thought to enhance this clearance

# Bubble PEP



# Funding

- Equipment is not funded and is a big expense to the patient for a treatment that has not been proven to be more effective than Active cycle of breathing.
  - Flutter costs approx \$200 (can only be used in sitting)
  - Acapella \$126 (can be used with positioning)
- However they are quicker and easier to use and they suit some patients and may improve compliance

# High frequency Chest wall oscillator



# ACCP Recommendation

- In patients with CF devices designed to oscillate gas in the airway either directly or by compressing the chest wall can be considered as an alternative to chest physiotherapy.

# Summary

- Active Cycle of breathing taught well is very effective
- Bubble PEP can be set up easily. It is effective for all age groups and should be trialed before purchasing more expensive options
- Don't forget exercise
- Refer to a physiotherapist if the above techniques are not working
  - Repeated infections
  - Producing more than 20 mls sputum per day
  - Complaining of continued difficulty clearing secretions.

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