



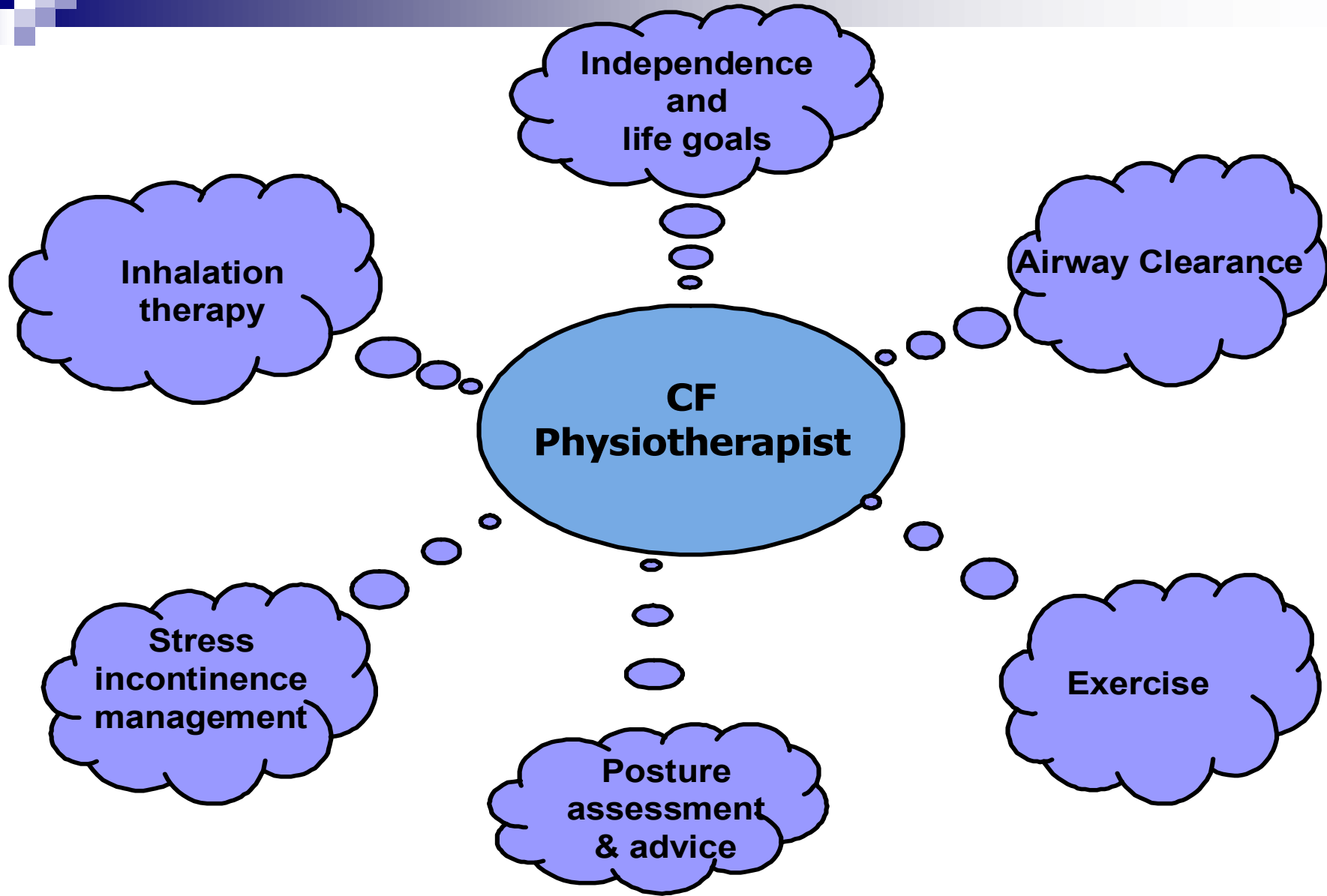
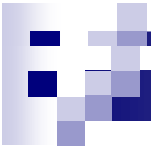
# Airway Clearance in Paediatric CF

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Ukraine July 2011







# Why Chest Physiotherapy?

- Integral part of the multidisciplinary approach to management of CF
- Great importance to have a physiotherapy routine BOTH at home and as an inpatient/outpatients

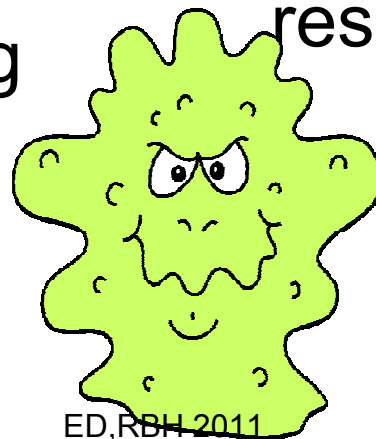
# Aims of airway Clearance

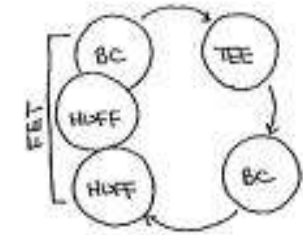
## Short term

- ↓ airway obstruction
- ↓ airway resistance
- ↓ mucus viscosity
- ↓ work of breathing
- ↑ gas exchange

## Long Term

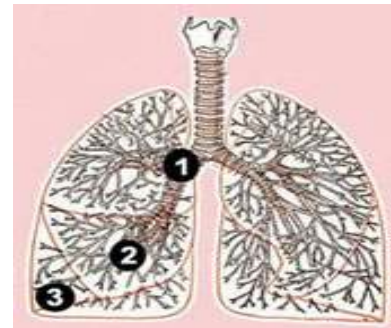
- Delay disease progression
- Maintain optimal respiratory function





# Airway Clearance Techniques

- Postural drainage/GAP and percussion (“Conventional Physiotherapy”)
- ACBT
- PEP
- Flutter
- Acapella
- HFCWO
- AD



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# Chest Physiotherapy

- To fit into daily life at home
- Effective at clearing sputum
- Individual
- Adaptable for age and disease severity
- Regularly reviewed by physiotherapist

# Which Airway Clearance Technique(ACT)?



# Babies and Toddlers

- Passive
- Chest percussion and MPD/GAP
- Age appropriate Exercise
- Blowing games





# Manual Techniques (Percussion & Shakes/Vibrations)

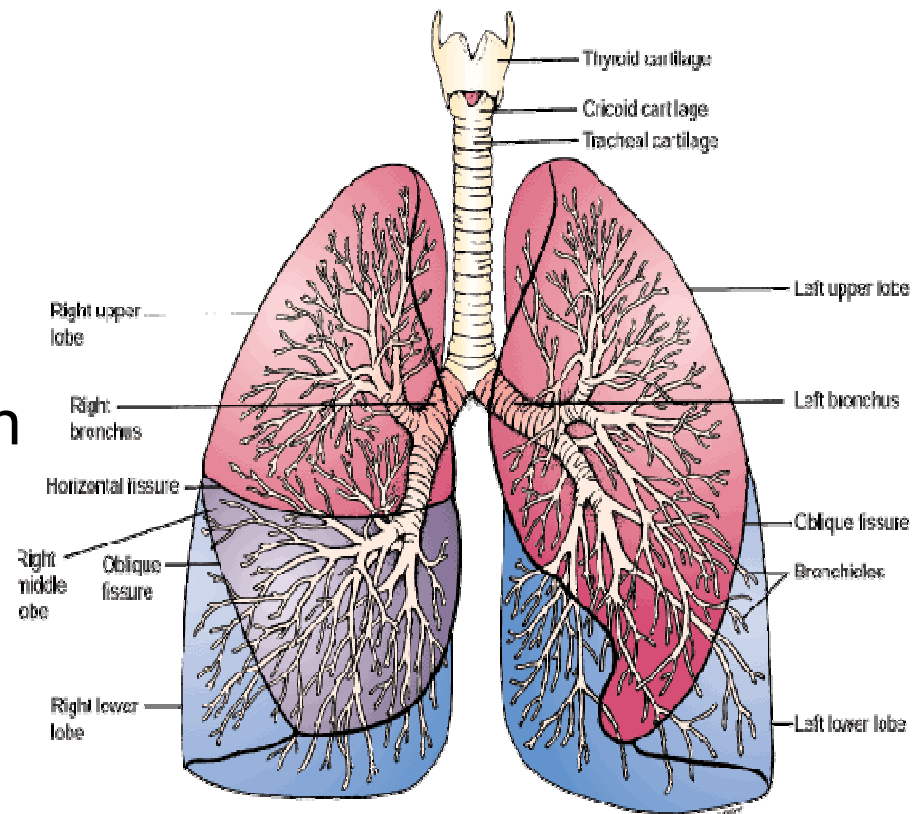
## Percussion:

- Produces oscillation
- ↓ Mucus viscosity
- In infants = 30 sec intervals to prevent hypoxia or bronchospasm
- Clothing/towel for comfort
- Precautions – CVS instability, reduced BMD

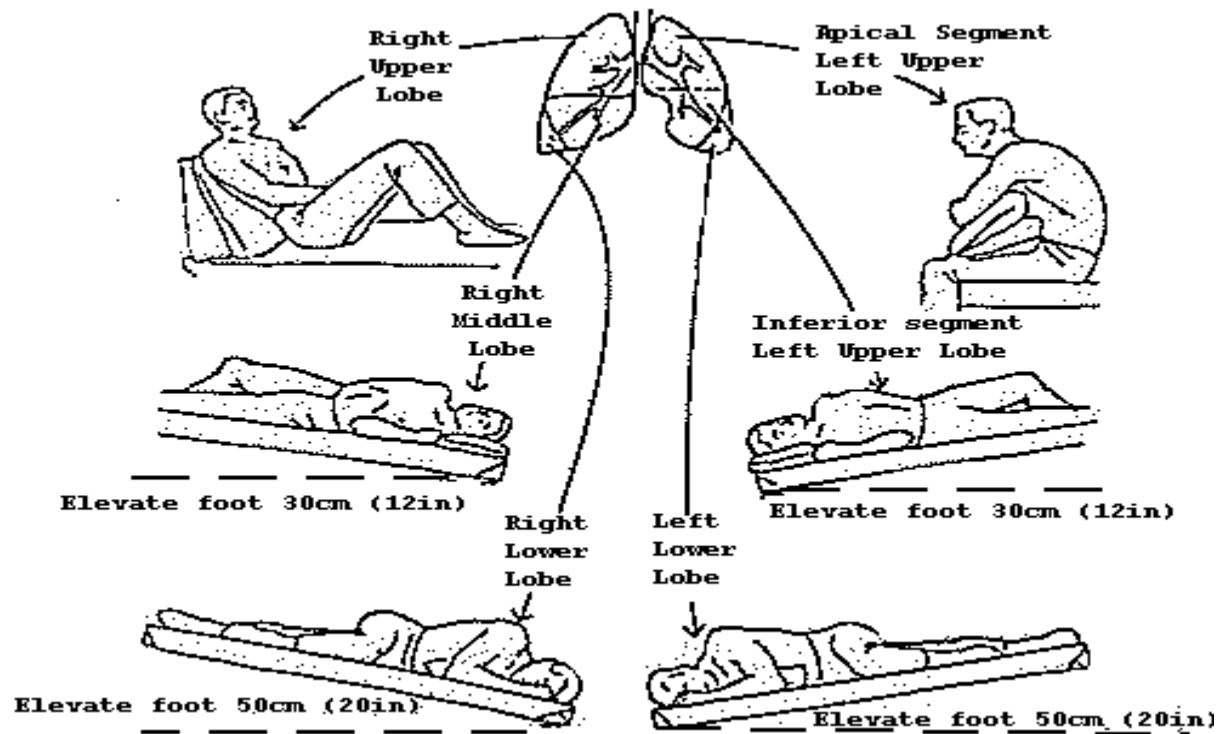


# Gravity Assisted Positioning

- Used with ACBT and Manual Techniques
- Based on anatomy of the bronchial tree (Nelson et al 1934)
  - ↑ Sputum clearance with gravity (Sutton et al 1983)
- **Precautions:** CVS instability, haemoptysis, uncontrolled GORD



# Gravity Assisted Positions

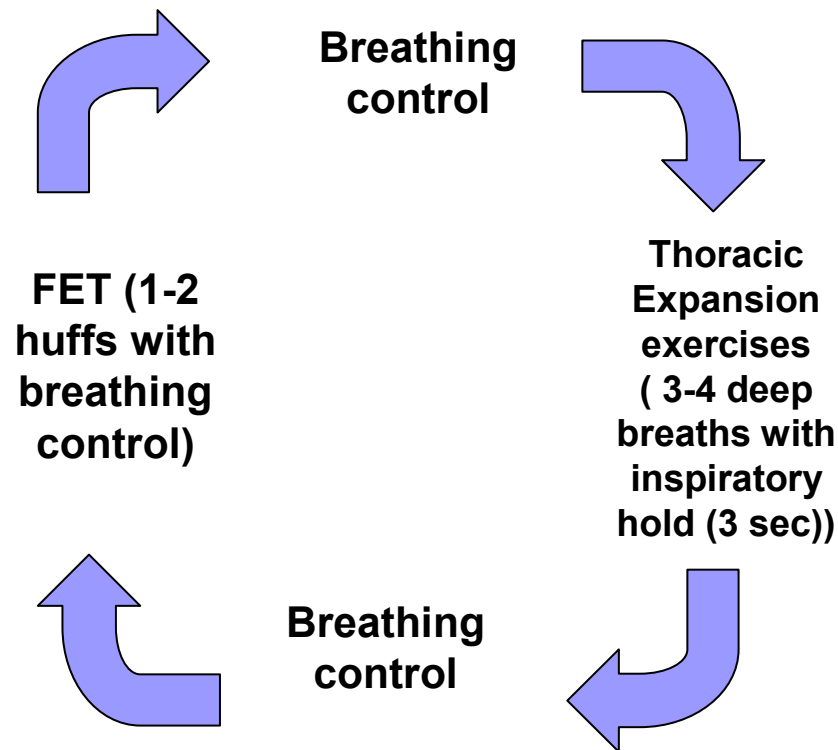


# Child

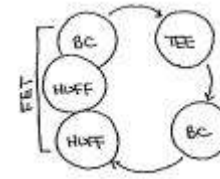
- Increase **ACTIVE** participation in physiotherapy
- Blowing games
- ACBT +/- Percussion/GAP/MPD
- Exercise



# Active Cycle of Breathing Technique (ACBT)

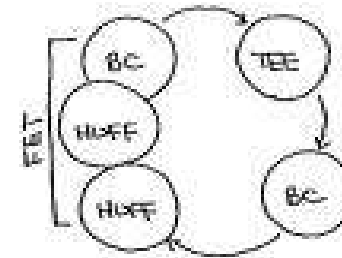


# ACBT



- **Aim:** To mobilise and clear excess bronchiole secretions
- **Flexible, free, tailored to the individual**
- **Originated in NZ as FET** (Thompson, 1968, NZJ Physiotherapy, 319-21)
- **Modified in UK to become ACBT** (Pryor, 1979, BMJ, 2, 417-8)
- **Principles of ACBT begun at age 2**

# ACBT



- CF pts never having done ACBT before were given it over 3 days – all showed a statistically significant increase in FEV<sup>1</sup>, FVC, PEF<sub>R</sub> and MEF<sub>50</sub> (Webber et al, 1986, British Journal of Disease of the Chest, 80, 353-59)
- 80 pts 6-18 yrs (7 month period) 3x sessions PT per day, randomised into: PD with clapping, PD with clapping and vibs, ACBT, Flutter  
Statistically significant increase in PFT in ACBT group (Orlik and Sands, 2001, Med Wieku, Rozwoj, 5, 3, 245-57)

# Older Child/Teenager



- Motivation
- Increasing Independence
- ACBT/Autogenic drainage
- Exercise

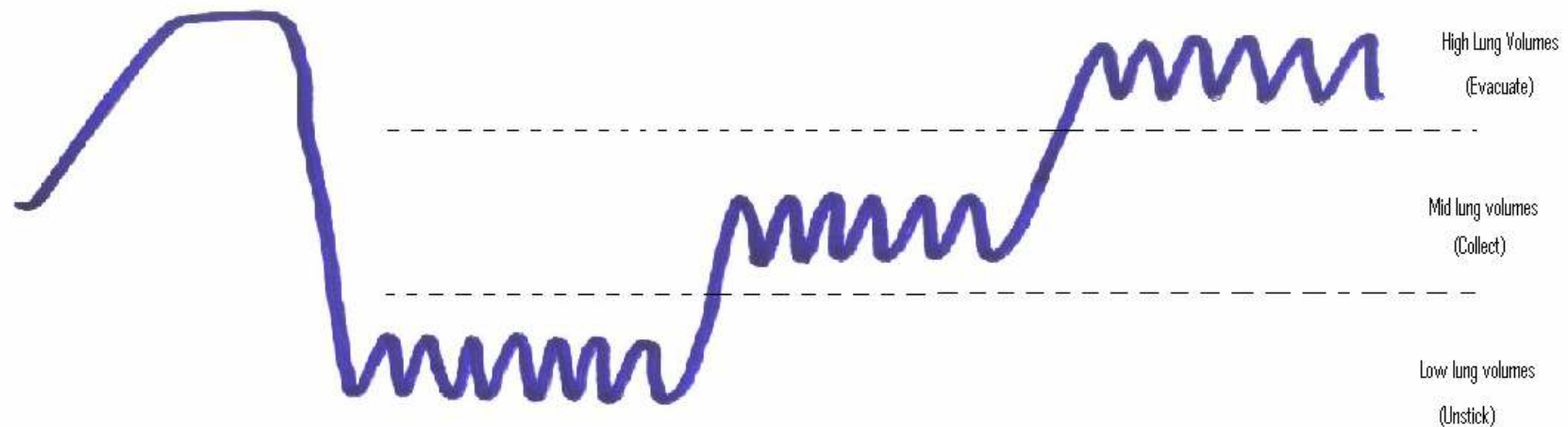


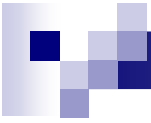
# Autogenic Drainage



- Originated in Belgium (Chevaillier, 1960's)
- Aims to reach highest possible expiratory airflow velocity whilst maintaining the lowest possible resistance
- 3 phase breathing regimen – moves mucus by sheering forces
  - Low lung volumes mobilise secretions
  - Mid lung volumes collect secretions
  - High lung volumes evacuate secretions
  - Now felt to be a more fluid regimen
- Modified in Germany (Lindeman, 1990)
- AD vs ACBT & PD 18 pts (18-25 years) RCT, 2 day crossover  
AD appeared to clear mucus more quickly from the lungs, no significant difference in PFTs between the groups (Miller et al, 1995,50,10, 1123-4)

# Autogenic Drainage (AD)





ED, RBH 2011

# High Frequency Chest Wall Oscillation (HFCWO)

## ■ PROS

- May Increase Adherence
- Short term- Inpatients ↑ sputum load
- Not appear to have adverse physiological effects (Osman 2010)

## ■ CONS

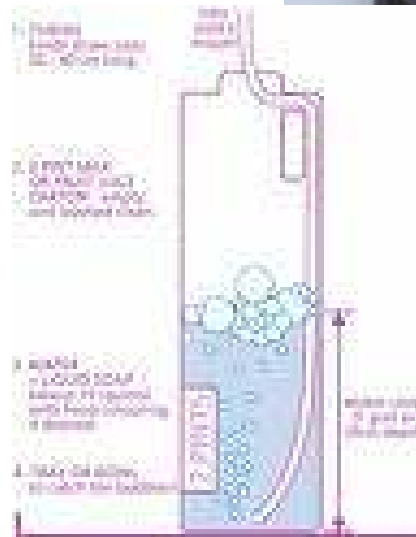
- Less sputum cleared with HFCWO than ACT (Osman, 2010)
- No evidence to suggest HFCWO more effective than current ACT
- Expensive- £6,500
- Must not be used without other forms of ACT (HILLROM)



# PEP

## (Positive Expiratory Pressure)

- Mobilises secretions via collateral ventilatory channels
- Valves Resistance
- Active expiration for 6-10 breaths
- Check pressure with manometer 10-20cmH<sub>2</sub>O
- Can be combined with AD, Postural drainage and manual techniques



\* Contraindications as all positive pressure devices

# Flutter

- Oscillatory PEP device
- During expiration the steel ball creates PEP and an oscillatory vibration of air within the airways
- Reduces visco-elasticity of mucus
- Mobilises secretions via collateral ventilatory channels and shearing forces
- Can be combined with ACBT
- Positional therefore best done in sitting



\* Contraindications as all positive pressure devices

# Acapella

- Oscillatory PEP device
- Magnet and rocker design creates oscillatory vibration of air
- Mobilises secretions via collateral ventilation and shearing forces
- Reduces visco-elasticity of mucus
- Can be combined with ACBT, postural Drainage positions and manual techniques



\* Contraindications as all positive pressure devices



# Does Airway Clearance Work?

- ❑ 'Chest Physiotherapy versus no Chest Physiotherapy in CF – A Cochrane Systematic Review' – Van der Schans, Prasad, Main, 2000
  - ☹ No 'Gold Standard' technique
  - ☹ Most studies compare to PD and percussion (defined as conventional physio)
  
- ❑ Cochrane review (2002) 29/78 studies included.
  - ☺ No advantage of conventional physiotherapy over other ACTs in terms of lung function.
  
- ❑ Difficulty with research as no true control groups





# Which is the Best ACT in CF?

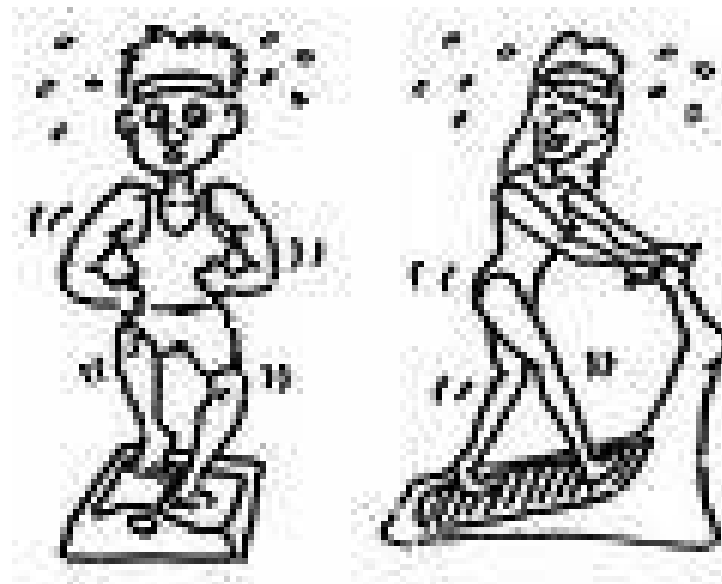
Adult study:

- RCT, 1 yr, 75 pts, age 17-63 (median 27)
- ACBT, AD, Cornet, Flutter and PEP (all in sitting)
- FEV<sup>1</sup> primary outcome measure
- FVC, MEF<sub>25</sub>, RV/TLC%, BMI, exercise capacity (modified shuttle), QOL,
- No statistically significant difference between groups in primary (FEV<sup>1</sup> P=0.35) or secondary outcome measures
- Greater consideration should be given to pt preference when choosing an ACT

Pryor et al, 2006, Journal of Cystic Fibrosis, 5, 1, abstract 347



# Exercise

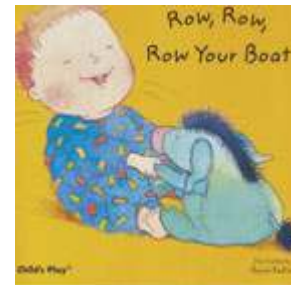




# What are the benefits of exercise?

- Mobilisation of secretions
- Improved cardiovascular fitness
- Improved body image
- Slows decline in lung function
- Reduced sensation of breathlessness
- Maintenance of bone mineral density
- Increased Quality of Life
- Increased Muscle strength

# Physical Handling Activities



# Older Children





# Order of Medications with Physiotherapy

1. Bronchodilator/combination inhaler  
(straight before physio or before  
Hypertonic Saline)
2. Hypertonic Saline
3. **Physio**
4. Steroid Inhaler
5. Nebulised Antibiotic



# Chest Physiotherapy

- To fit into daily life at home
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# Thank you

Any questions?







# Abbreviations

- CF – Cystic Fibrosis
- GAP – Gravity Assisted Positioning
- MPD/PD – Modified Postural Drainage/Postural Drainage
- ACBT –Active Cycle of Breathing technique
- FET – Forced expiration technique
- PEP-Positive expiratory Pressure
- HFCWO- High frequency chest wall oscillation
- AD –Autogenic Drainage
- ACT –Airway clearance techniques
- RCT –Randomised control trial