

Physiotherapy:current concepts and techniques

Myriam Vreys

CF- team

University Hospital Leuven

Belgium

Concepts:

- ▶ Pediatric lung physiology: overview
- ▶ Lung disease in children
- ▶ Impaired airway clearance
- ▶ Goal
- ▶ GEMS
- ▶ Techniques

Pediatric respiratory physiology:

- ▶ Birth
- ▶ 2 months: 24 million alveoli
- ▶ 3-9 months: motor development increases
- ▶ 4 years: collateral ventilation (?)
- ▶ 8 years



Lungdisease in CF

-Obstructive lung disease:

- Hyperinflation of the lower respiratory tract
- Causes of airflow obstruction
 - mucosal oedema
 - bronchospasm
 - accumulated secretions



Impaired airway clearance: airway obstruction

- increased airway resistance

 - bronchospasm

 - inflammation

- hypersecretion of mucus

 - acute process

 - chronic disorder

MUCUS

mucus produced by goblet cells in airway

chronic airway irritation → increased
numbers of goblet cells → larger
quantities of mucus

cilia move together in coordinated fashion to
move mucus up airways (movie)

RESULTS OF IMPAIRED AIRWAY CLEARANCE: CLEARANCE: a vicious cycle

Impaired airway clearance / gasexchange

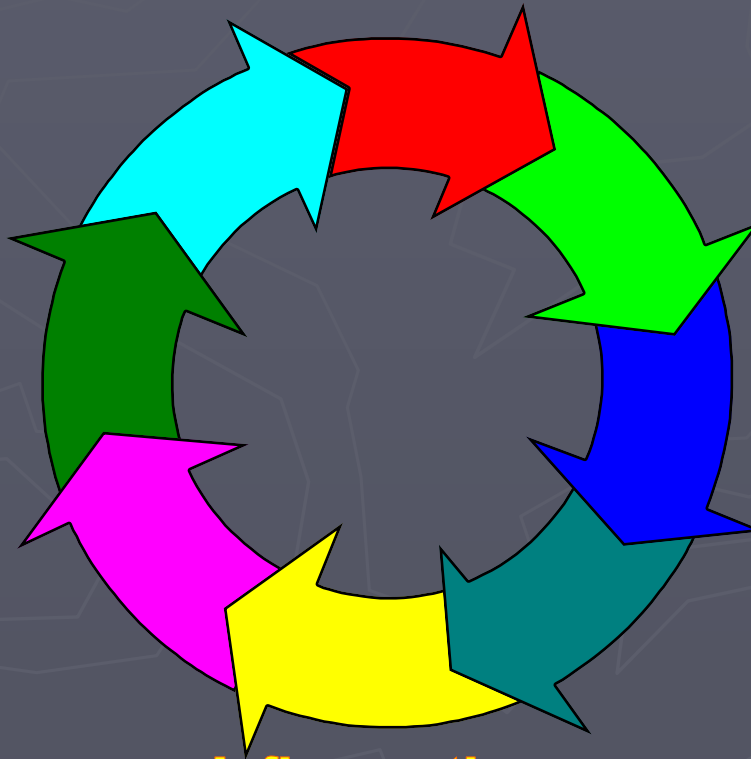
Mucus retention

Mucus plugging, obstruction, atelectasis

Lung damage

Lung infection

**Inflammation,
↑ mucus production**

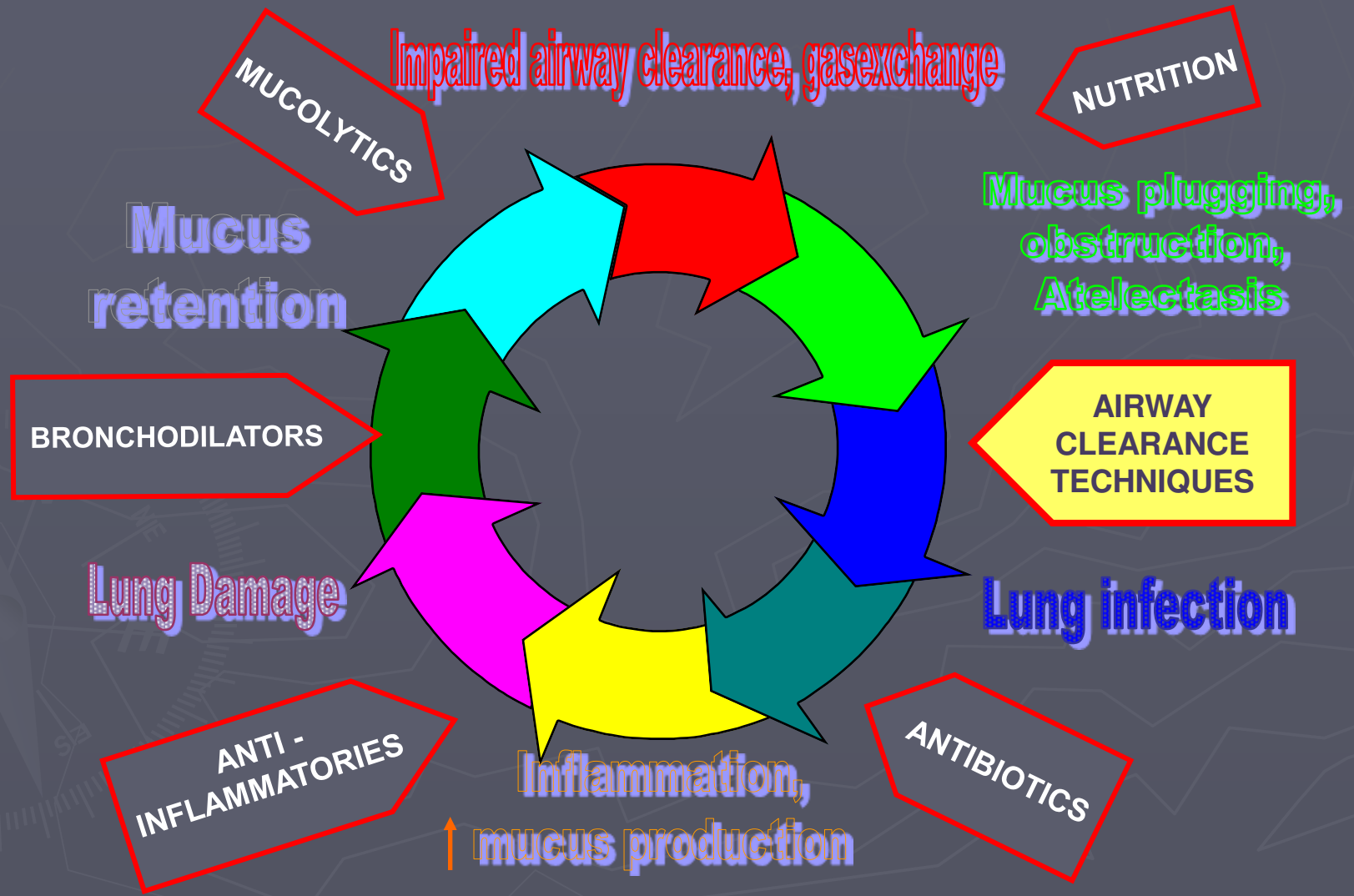


GOALS

- interrupt cycle of lung tissue destruction
- decrease infection and illness
- improve quality of life



GOALS: INTERRUPTING THE CYCLE



Purpose of ACT for the patient differs from the expectations of the professional.

For both CPT should be:

- effective
- efficient
- easy to use
- easy to teach
- able to be undertaken independently
- should improve lungfunction
- should not be uncomfortable
- should not increase hypoxemia
- flexible and adaptable to changing needs of the patient

GEMS

- ▶ “Chest physiotherapy is a dynamic process and we constantly have to ask which approach and which technique will fulfill the quality criteria.”

S. Gürsli- Norway

No standard physiotherapy will suit everyone

Cystic Fibrosis Pulmonary Guidelines: Airway Clearance Therapies

Patrick A Flume MD, Karen A Robinson MSc, Brian P O'Sullivan MD, Jonathan D Finder MD,
Robert L Vender MD, Donna-Beth Willey-Courand MD, Terry B White PhD,
Bruce C Marshall MD, and the Clinical Practice Guidelines for Pulmonary Therapies Committee

"GEMS" or

Gentle

Efficient

Motivating

Self-supporting

Patients spent a lot of time on treatment.
The approach allows patients to participate,
understand and adhere with treatment.

AIRWAY CLEARANCE TECHNIQUES

- conventional methods
 - Cough
 - Upper airways
- newer therapies
- therapy adjuncts

COUGH

- natural response
- only partially effective
- frequent coughing leads to “floppy” airways
- may be suppressed by patient



Upper airways



Rinsing the nose

- ▶ Before starting airway clearance it is very important to clean the upper airways
- ▶ Rinsing
- ▶ Blowing the nose
- ▶ (Movie 2 + 3)



“CONVENTIONAL” CHEST PHYSIOTHERAPY (CCPT)

= “the use of gravity assisted positions, deep breathing exercises with or without chest clapping, chest shaking or chest vibrations, and coughing when secretions reach the upper airways.”

- can be used with infants
- requires caregiver participation
- technique dependent
- time consuming (to be effective: 1h!)
- physically demanding (cave desaturation, discomfort, pain, GOR)
- requires patient tolerance
- effectiveness debated

Newer therapies

- ▶ FET
- ▶ Autogenic drainage
- ▶ AAD
- ▶ Bouncing
- ▶ PEP
- ▶ Flutter
- ▶ Exercise

FORCED EXPIRATORY TECHNIQUE (FET)

- "Huff"
 - three second breath hold
 - open glottis
 - prevents airway collaps
 - effective technique for "floppy" airways
 - easy to learn
- used in addition to other techniques

AUTOGENIC DRAINAGE (AD)

(Jean Chevallier, 1970's)

three phases

unsticking

collecting

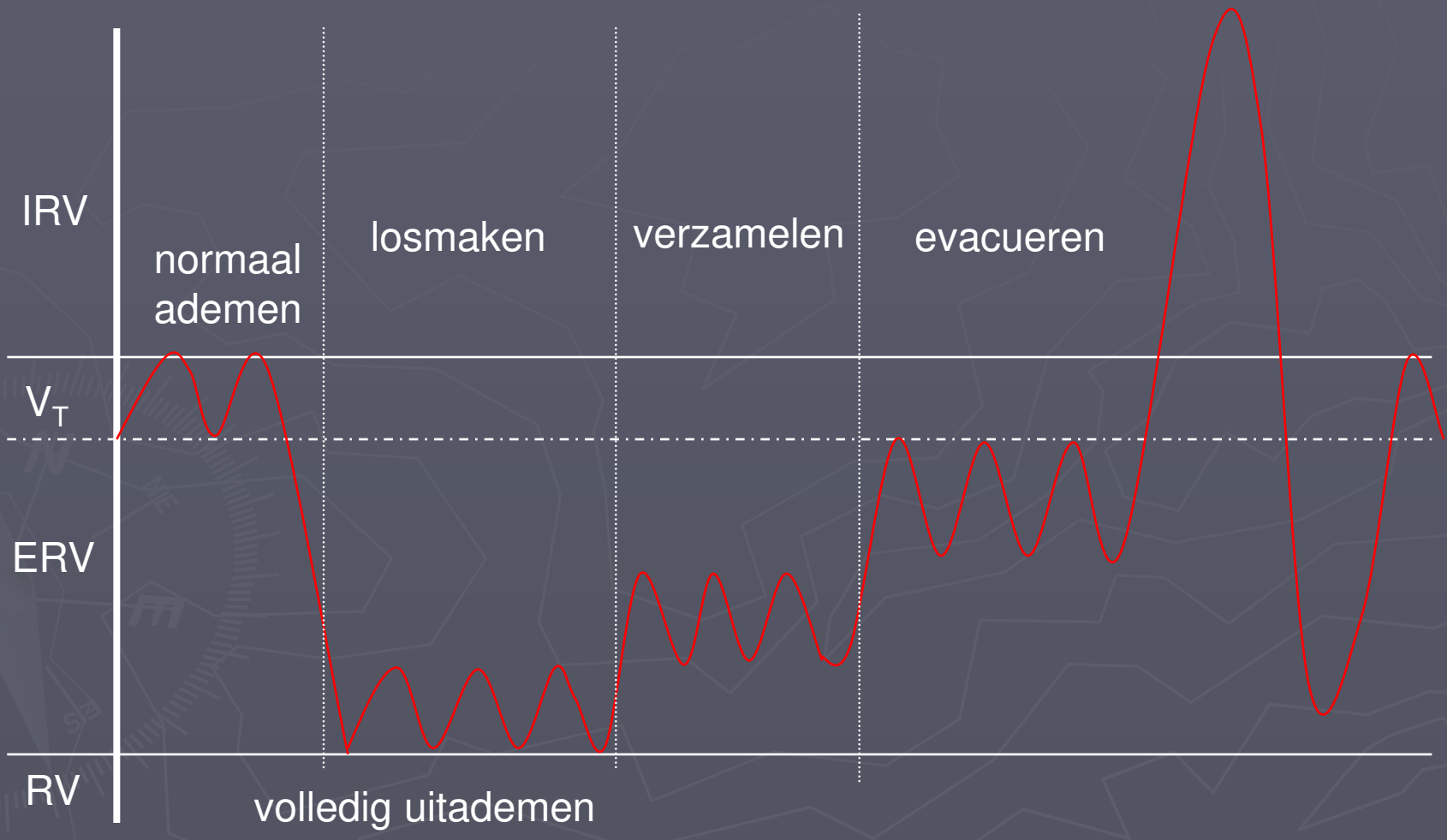
evacuating

may be performed independently

harder to teach and to learn than other techniques

may be difficult for very sick patients to perform

Hoest of huff



IRV

normaal
ademen

losmaken

verzamelen

evacueren

V_T

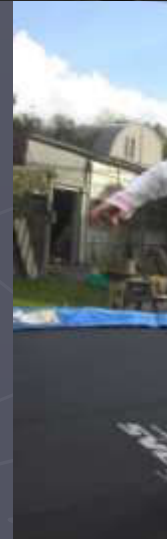
ERV

RV

volledig uitademen



Combination AAD-bouncing in infants and toddlers



Bouncing



PEP therapy



What is a PEP mask?

- ▶ PEP= Positive Expiratory Pressure
- ▶ Facemask
- ▶ 2-way valve
- ▶ Range of coloured resistors
- ▶ (manometer)



Principles of a PEP mask

- ▶ Device used with other ACT
- ▶ Ketchup bottle theory
- ▶ Keeps the airways open during expiration allowing more mucus to be secreted

Assembly of the mask



Correct sitting position



Correct position: side lying



- ▶ No postural drainage: risk of GER

Pressure

- ▶ Choose the appropriate resistor
- ▶ The smaller the diameter, the higher the resistance
- ▶ Right choice = patient can keep up with pressure of 15 cm H₂O during 2 minutes
- ▶ **BEWARE:** very high resistance - low expiratory flow- no expectoration

Advantages and disadvantages

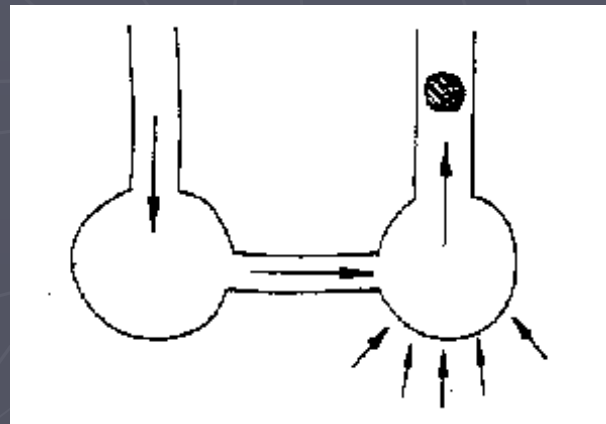
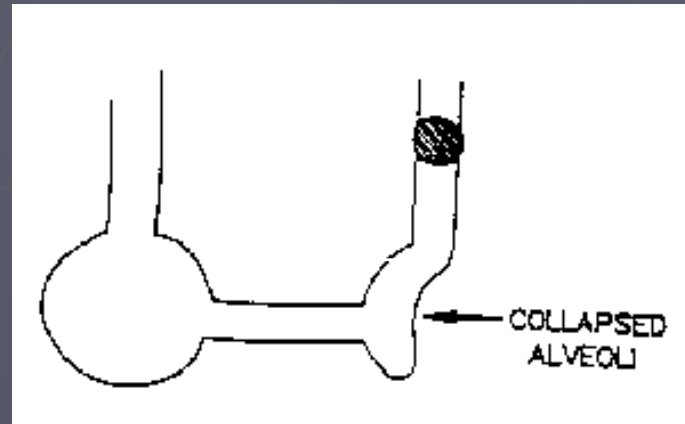
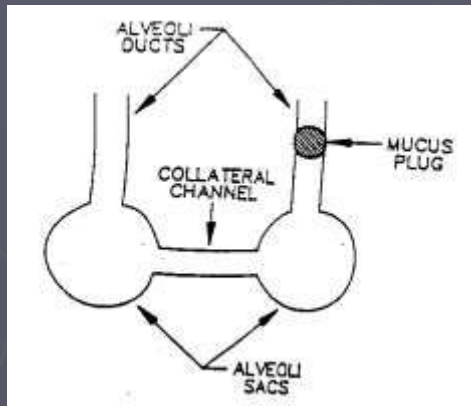
Pro:

- ▶ Easy to use after proper instructions
- ▶ Position independent
- ▶ Maintains pulmonary function better than flutter, FVC, FEV1 (Mc Illwaine et al, 2001)
- ▶ Active patient cooperation
- ▶ Improved compliance

Con:

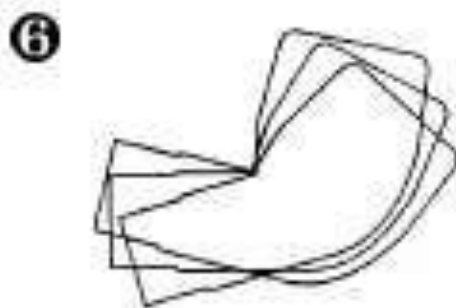
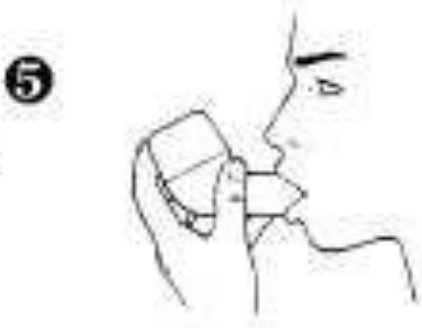
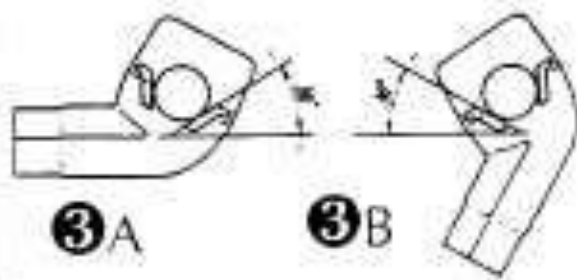
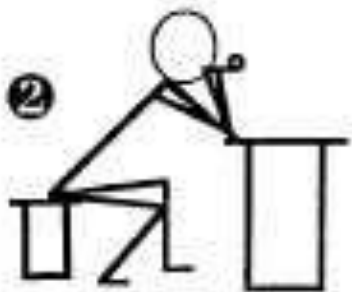
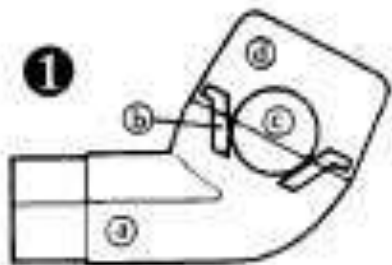
- ▶ Maintenance
- ▶ Cost

Principles of PEP



Flutter





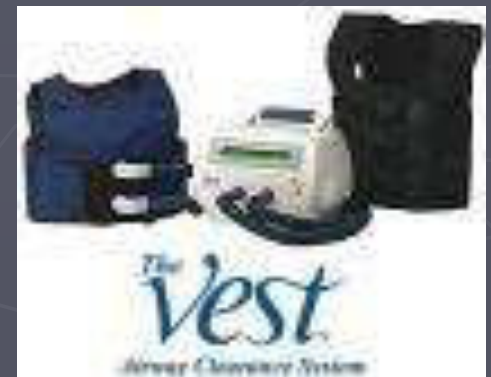
Flutter

- ▶ Action: loosens mucus through expiratory oscillation; positive expiratory pressure splints airways
- ▶ Used independently
- ▶ Technique dependent
- ▶ Portable
- ▶ May not be effective at low airflow
- ▶ Time required: 10 - 15 minutes



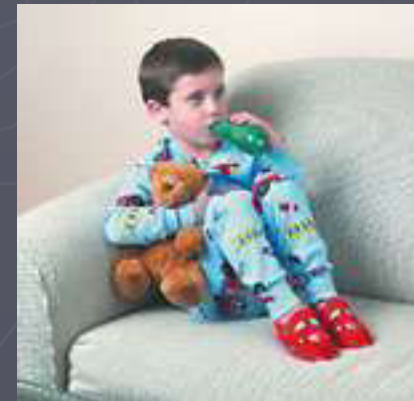
ABI Vest (HFCWO)

- ▶ Action: applies High Frequency Chest Wall Oscillation to entire thorax; moves mucus from peripheral to central airways
- ▶ Used independently or with minimal caregiver supervision
- ▶ May be used with aerosolized medications
- ▶ Technique independent
- ▶ Portable (?)
- ▶ Time required: 15-30 minutes



Acappella

- ▶ Combines Flutter and PEP-therapy
- ▶ Mobilisation of secretions
- ▶ Disadvantage: no mask, so pressure is not guaranteed



EXERCISE

- recommended for most patients
- training
 - ability to exercise related more to muscle mass than tot pulmonary function
 - improves oxygen uptake by muscle cells

-many patients limited by physical disability

= **additional!!** (Baldwin et al, Resp Med, 1994 and Bilton et al, Resp Med, 1992)



Guidelines CFF

Cystic Fibrosis Pulmonary Guidelines: Airway Clearance Therapies

Patrick A Flume MD, Karen A Robinson MSc, Brian P O'Sullivan MD, Jonathan D Finder MD, Robert L Vender MD, Donna-Beth Willey-Courand MD, Terry B White PhD, Bruce C Marshall MD, and the Clinical Practice Guidelines for Pulmonary Therapies Committee

RESPIRATORY CARE • APRIL 2009 VOL 54 NO 4

Recommendations:

2. In general, there is no ACT that has been demonstrated to be superior to others. Level of evidence, fair; grade of recommendation, B.

3. For the individual, one form of ACT may be superior to the others. The prescription of ACT should be individualized based on factors such as age, patient preference, and adverse events, among others. Level of evidence, fair; grade of recommendation, consensus recommendation, B.

4. Aerobic exercise is recommended for patients with cystic fibrosis as an adjunctive therapy for airway clearance and its additional benefits to overall health. Level of evidence, fair; net benefit, moderate; grade of recommendation, B.

Making physiotherapy work

- ▶ A day in a life of a CF patient (regarding physiotherapy)
- ▶ Adherence
- ▶ Team

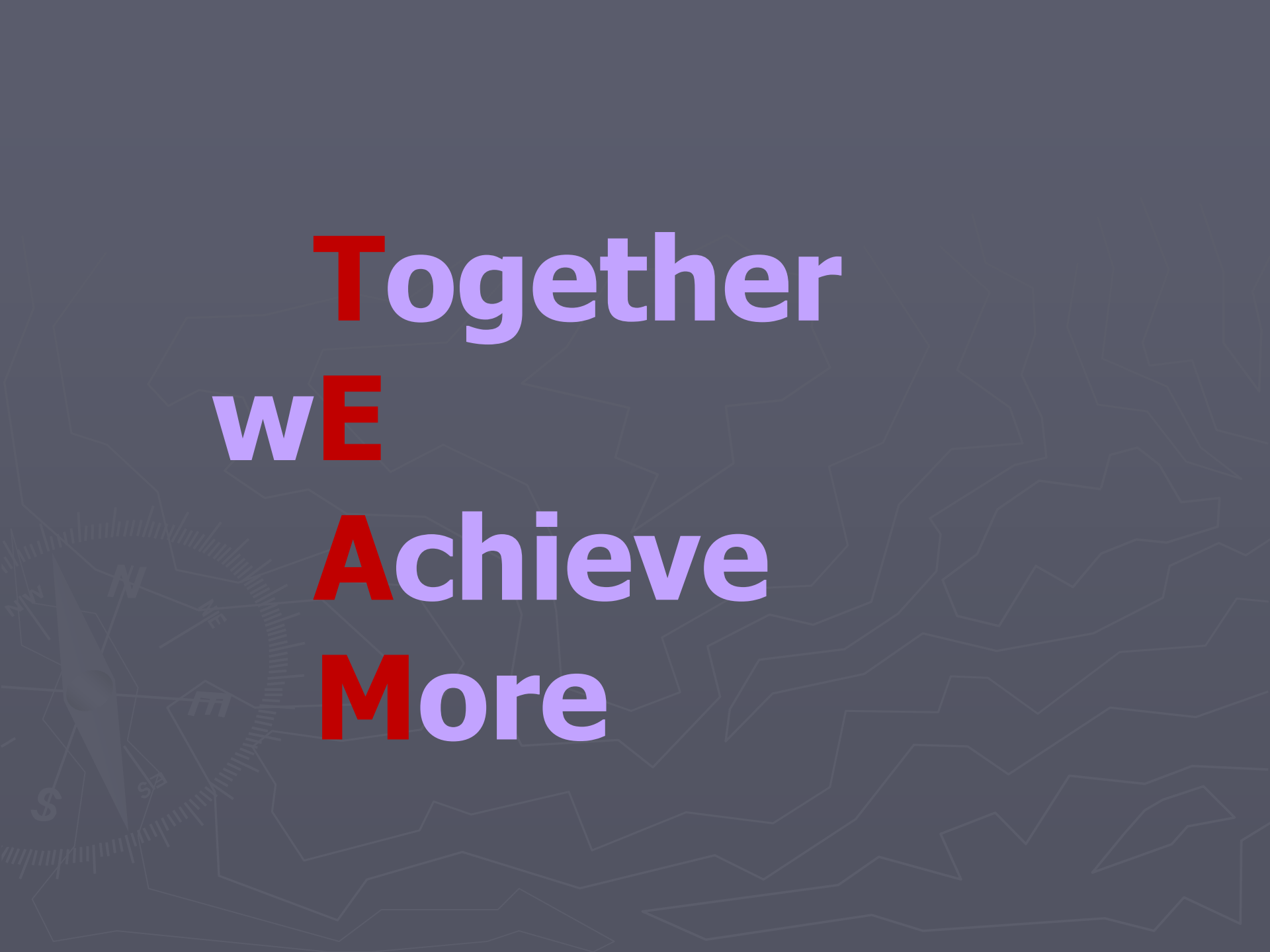
Cf-care is the work of a
team





TEAMWORK

When the best and the brightest come together, the possibilities are endless.

The background is a dark grey color. On the left side, there is a faint, light grey compass rose with a needle pointing towards the top-left. On the right side, there is a faint, light grey line graph with several peaks and valleys. The text is centered in the middle of the image.

Together
wE
Achieve
More



**Every child is first of all a normal child, with his development, expectations and dreams...
Give them the space to do so...**

