Principes physiologiques des manœuvres de désencombrement

Gregory Reychler
Service de Pneumologie
Cliniques universitaires Saint-Luc
Bruxelles - Belgique

20e congrès de pneumologie de langue française
Lille, Grand Palais
du vendredi 29 janvier au dimanche 31 janvier 2016

PAS DE CONFLIT D'INTERET

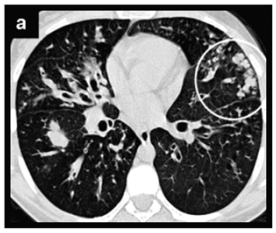
Physiologie donc physiopathologie…

Physiologie donc physiopathologie…

CF patient with improvement of lung function but deterioration of lung structure. The left panel shows HRCT scan at 10 yrs of age (FEV_1=86%, FVC=93, $FEF_{25-75\%}$=80). The right panel shows HRCT at 13 yrs of age (FEV_1=96, FVC=91, $FEF_{25-75\%}$=105).

de Jong, ERJ. 2004;23(1):93-97

Physiologie donc physiopathologie…



High-Resolution CT demonstrating lung abnormalities in a CF patient (16yo)

High-Resolution CT in a CF patient (15yo) (Personal data)

Robinson, Clin Chest Med. 2007;28:405-421

Peut-on réellement envisager de soigner une pathologie?

Arch Dis Child. 2011 Jul;96(7):648-52. Epub 2011 Feb 21.

Clinical predictors of admission in infants with acute bronchiolitis.

Marlais M, Evans J, Abrahamson E.

Table 1 Result of the logistic regression analysis for clinical predictors of admission in acute bronchiolitis

Clinical predictor	Result for admitted group*	Result for discharged group*	Missing data (%)	OR (95% CI)	p Value
Age at presentation (weeks)	13.9	26.4	0	0.96 (0.94 to 0.97)	<0.001
Respiratory rate (breaths/min)	54.6	46.9	2	1.07 (1.05 to 1.09)	<0.001
Heart rate (beats/min)	162.8	147.7	1	1.05 (1.03 to 1.06)	<0.001
Oxygen saturation (%)	96.4	98.4	2	0.76 (0.69 to 0.83)	<0.001
Temperature (°C)	37.4	37.7	3	1.37 (1.05 to 1.79)	0.02
Duration of symptoms (days)	2.9	4.9	2	0.82 (0.75 to 0.90)	<0.001
Presence of cough	96	98	6	0.33 (0.09 to 1.14)	0.079
Presence of wheeze	83	70	16	2.06 (1.23 to 3.45)	0.006
Decreased feeding	82	70	12	1.99 (1.21 to 3.28)	0.006
Oxygen required in ED	36	1	7	78.44 (18.82 to 326.88)	<0.001
Presence of coryza	98	95	19	2.51 (0.68 to 9.29)	0.167
Drowsiness	2	0	5	19.51 (2.49 to 152.58)	0.005
Increased work of breathing	94	65	6	9.32 (4.54 to 19.14)	<0.001
Abnormalities on auscultation	88	73	10	2.76 (1.58 to 4.82)	<0.001

*Results presented as mean for continuous predictors and % for binary predictors
ED, emergency department.

Marlais, Thorax 2011;96 (7):648-652

The Cochrane Collaboration
Working together to provide the best evidence for health care

Best match | Title | Date published

Currently sorted by: Best match

Search results: 17

Chest physiotherapy compared to no chest physiotherapy for cystic fibrosis
The lungs of people with cystic fibrosis produce excess mucus. This leads to repeated infection and tissue damage in the lungs. It is important to clear the mucus using drugs and chest physiotherapy (CPT). Physiotherapy clears mucus by various techniques or by using mechanical devices or both. Daily physiotherapy takes a lot of time and trouble. We ...

A comparison of usual chest physiotherapy to other methods of airway clearance in people with cystic fibrosis
Excess mucus is produced in the lungs of people with cystic fibrosis. This leads to recurrent infection and tissue damage. It is important to clear this mucus using drugs and various chest physiotherapy techniques. We aimed to compare the effects of different methods on lung function and patient preference. We looked for studies lasting over one week, ...

Chest physiotherapy for preventing morbidity in babies being extubated from mechanical ventilation
Active chest physiotherapy may not be helpful for all babies being taken off mechanical breathing support. Mechanical ventilation (machine-assisted breathing) increases a baby's lung secretions. Chest physiotherapy (tapping or vibrating on the chest) is thought to clear the baby's lungs, and is often done when taking the baby off the ventilator (extubation). ...

Chest physiotherapy for acute bronchiolitis in children younger than two years of age
Acute bronchiolitis is a frequent viral respiratory infection in children younger than two years old. Most children have a mild disease and do not require hospitalisation. Those who do need to be hospitalised sometimes have difficulties clearing phlegm, thick mucous respiratory secretions because of the infection. It has been proposed that chest physiotherapy ...

Not enough strong evidence about the effects of positive expiratory pressure (PEP) devices for chest physiotherapy for people with cystic fibrosis
Cystic fibrosis (CF) causes frequent respiratory infection and blocks the airways with mucus secretions. Chest physiotherapy is frequently used to try to clear these secretions out of the lungs. Positive expiratory pressure (PEP) devices provide pressure behind the mucus to try to push it out of the lungs. The review of studies found only weak evidence ...

Chest physiotherapy for pneumonia in adults
Pneumonia is one of the most common health problems affecting all age groups around the world. Antibiotics represent the mainstay of pneumonia

Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis.

Main E, Prasad A, Schans C
Centre for Nursing and Allied Health Professionals Research, Institute of Child Health, Level 7, Old Building, Great Ormond Street Hospital, London, UK, WC1N 3JH. Maine@gosh.nhs.uk

Abstract

BACKGROUND: Cystic fibrosis is an inherited life-limiting disorder, characterised by pulmonary infections and thick airway secretions. Chest physiotherapy has been integral to clinical management in facilitating removal of airway secretions. Conventional chest physiotherapy techniques (CCPT) have depended upon assistance during treatments, while more contemporary airway clearance techniques are self-administered, facilitating independence and flexibility.

OBJECTIVES: To compare CCPT with other airway clearance techniques in terms of their effects on respiratory function, individual preference, adherence, quality of life and other outcomes.

SEARCH STRATEGY: We searched the Cochrane Cystic Fibrosis and Genetic Disorders Group trials register which comprises references identified from comprehensive electronic database searches and handsearching of relevant journals and abstract books of conference proceedings. We also searched CINAHL from 1982 to 2002 and AMED from 1985 to 2002. Date of most recent search: January 2004.

SELECTION CRITERIA: Randomised or quasi-randomised clinical trials including those with a cross-over design where CCPT was compared with other airway clearance techniques. Studies of less than seven days duration were excluded.

DATA COLLECTION AND ANALYSIS: Two reviewers allocated quality scores to relevant studies and independently extracted data. If we were unable to extract data, we invited authors to submit their data. We excluded studies from meta-analysis when data were lost or study design precluded comparison. For some continuous outcomes, we used the generic inverse variance method for meta-analysis of data from cross-over trials and data from parallel-designed trials were incorporated for comparison. We also examined efficacy of specific techniques and effects of treatment duration.

AUTHORS' CONCLUSIONS: This review demonstrated no advantage of CCPT over other airway clearance techniques in terms of respiratory function. There was a trend for participants to prefer self-administered airway clearance techniques. Limitations of this review included a paucity of well-designed, adequately-powered, long-term trials.

Cochrane Database Syst Rev. 2005 Jan 25;(1)

Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient

Julia Bott, Sharron Blumenthal, Maria Buxton, Sheric Ellum, Caroline Falconer, Rachel Garrod, Alex Harvey, Tracey Hughes, Melanie Lincoln, Christine Mikelsons, Catherine Potter, Jennifer Pryor, Lesley Rimington, Frances Sinfield, Catherine Thompson, Pamela Vaughn, John White

On behalf of the British Thoracic Society Physiotherapy Guideline Development Group, a subgroup of the British Thoracic Society Standards of Care Committee, and the Association of Chartered Physiotherapists in Respiratory Care, a clinical interest subgroup of the Chartered Society of Physiotherapy

Thorax 2009;64(Suppl I):i1–i51

American Association for Respiratory Care

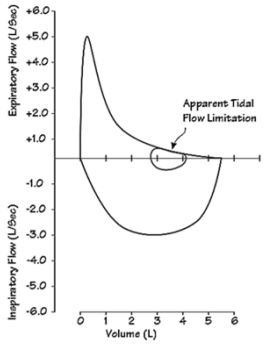
Recommendations Supported by Low-Level Evidence

1. Incentive spirometry is not recommended for routine, prophylactic use in postoperative patients.
2. Early mobility and ambulation is recommended to reduce postoperative complications and promote airway clearance.
3. ACT is not recommended for routine postoperative care.

Recommendations Supported by Low-Level Evidence

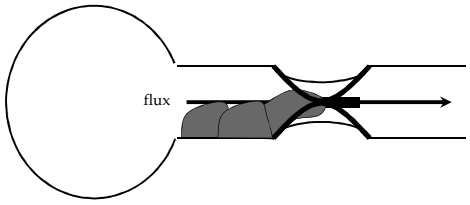
1. CPT is not recommended for the routine treatment of uncomplicated pneumonia.
2. ACT is not recommended for routine use in patients with COPD.
3. ACT may be considered in patients with COPD with symptomatic secretion retention, guided by patient preference, toleration, and effectiveness of therapy.
4. ACT is not recommended if the patient is able to mobilize secretions with cough, but instruction in effective cough technique (eg, FET) may be useful.

Respir Care 2013;58(12):2187–2193



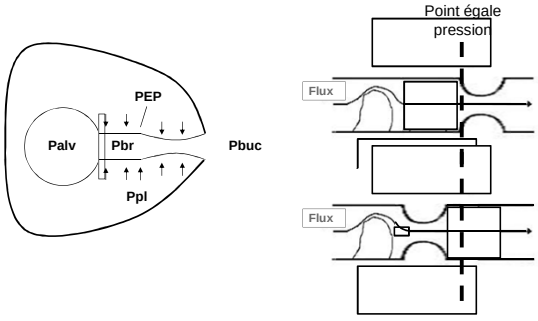
MODULATION DU FLUX EXPIRATOIRE

Une histoire de flux…



Flux = Débit / Section

Compression dynamique des voies aériennes



Mécanisme d'action

Mucus clearance by two-phase gas-liquid flow mechanism: asymmetric periodic flow model

CHONG S. KIM, ANTONIO J. IGLESIAS, AND MARVIN A. SACKNER
Pulmonary Division, University of Miami School of Medicine at Mount Sinai Medical Center, Miami Beach, Florida 33140

two phases. The greater the difference in airflow velocity, the faster the liquid movement. However, our results indicate that LLTS is mainly governed by the absolute value of the higher airflow, not by the difference between the expiratory and inspiratory flow rate. Our results further show that when the expiratory flow rate is kept constant above the inspiratory flow rate, LLTS remains unaffected regardless of the magnitude of the inspiratory flow rate until the inspiratory flow rate approaches within 10% difference from the expiratory flow rate.

J Appl Physiol 62(3):959-971,1987

A chaque technique son flux…

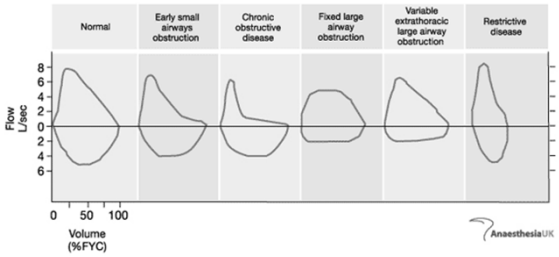
TABLE 1 Effects of physiotherapy interventions on peak flow rate respiratory volumes and stimulation of cough

Intervention	Subjects n	PEFR L·s⁻¹	PIFR L·s⁻¹	PEFR/PIFR	Vt L	Vt L	Coughs stimulated
Vibration	17¶	1.58±0.73	1.06±0.27	1.51	1.78±0.87	2.44±1.06	0.7±1.0
Percussion	18	0.83±0.14***	0.84±0.10	0.99	0.91±0.37***	1.03±0.50	0.5±0.9
PEP	18	0.44±0.15***	0.96±0.20	0.47	1.64±0.40	1.96±0.57	0.5±0.6
Flutter®	17¶	1.13±0.30#	1.05±0.27	1.15	1.62±0.52	1.81±0.57	0.4±0.7
Acapella®	18	0.59±0.08***	0.96±0.27	0.64	1.55±0.46	1.68±0.50	0.8±1.0
TLCrelax	15°	0.66±0.16	1.01±0.40	0.73	1.79±0.66	2.24±0.79	0

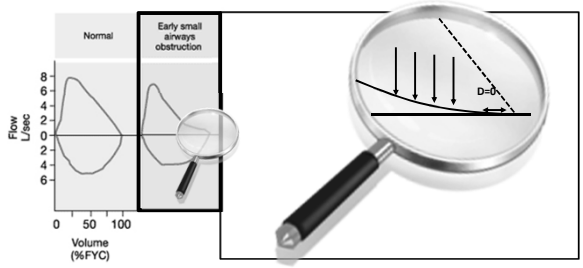
Data are presented as mean±SD of means of each subject, unless otherwise stated. PEFR: peak expiratory flow rate; PIFR: peak inspiratory flow rate; *Vt*: inspiratory volume; *Vt*: expiratory volume; PEP: peak expiratory pressure; TLCrelax: total lung capacity positive expiration. ¶: data lost due to technical difficulties (data from different interventions lost in different subjects); °: data only collected from stated number of subjects. p-values are significantly different from vibration. ***: p<0.001, #: p=0.002.

McCarren B., *Eur Respir J* 2006; 27: 1204–1209

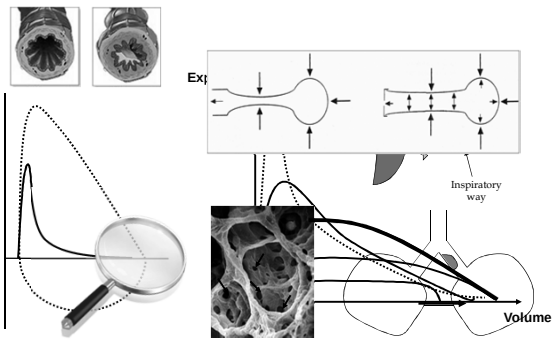
Situations ou signes cliniques



Situations ou signes cliniques



Pression expiratoire positive



PULMONARY FUNCTION

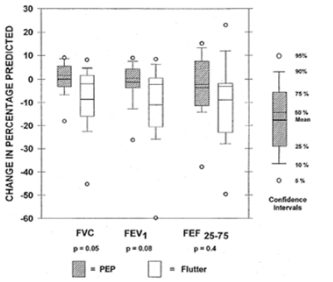
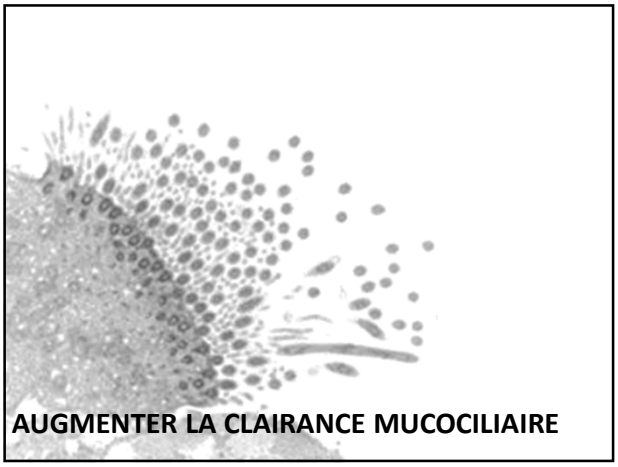


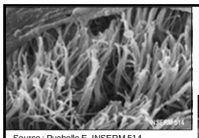
Figure. Comparison of change in percentage predicted for pulmonary function parameters over 12-month period between group "A," who was performing positive expiratory pressure, and group "B," who was performing flutter.

Conclusion: Flutter was not as effective in maintaining pulmonary function in this group of patients with CF compared with PEP and was more costly because of the increased number of hospitalizations and antibiotic use.

McIlwaine, *J Pediatr* 2001;138:845-50

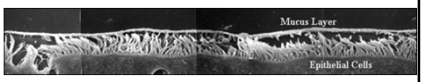


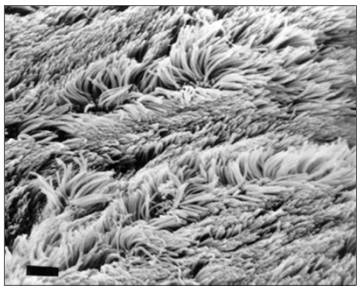
AUGMENTER LA CLAIRANCE MUCOCILIAIRE

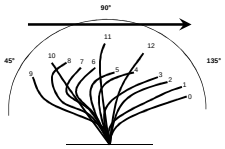


Source : Puchelle E, INSERM 514

Battement ciliaire







≈10-15Hz

Efficacité de la kinésithérapie basée sur la fréquence des vibrations

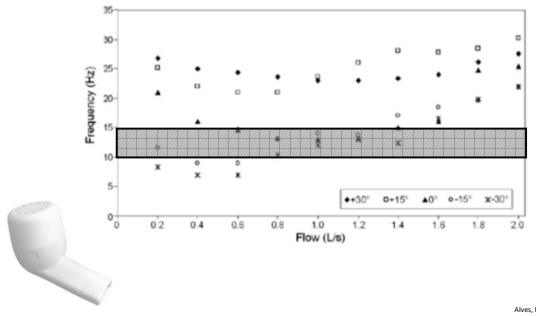
TABLE 2 The frequency of oscillation of the physiotherapy interventions as determined by frequency spectral analysis

Intervention	Frequency Hz
Vibration	8.4±0.4 (7.3–10.0)
Percussion	7.3±0.3 (6.5–8.0)
Flutter®	11.3±1.5 (7.5–13.7)***
Acapella®	13.5±1.7 (10.0–18.3)***

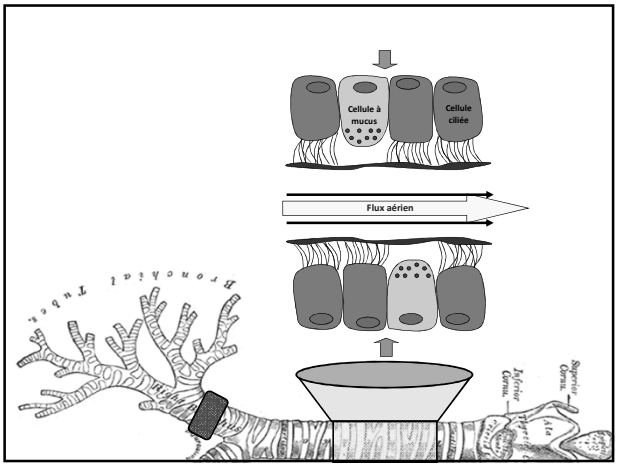
Data are presented as mean±SD of means of each subject. p-value is significantly different from vibration. ***: p<0.001.

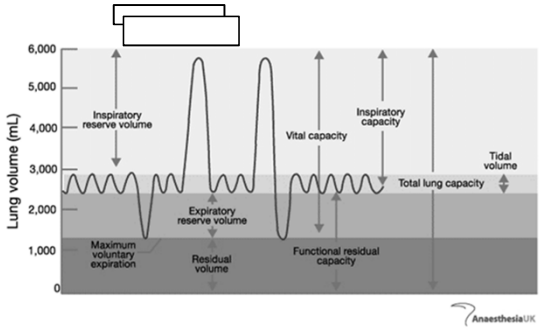
McCarren B., Eur Respir J 2006; 27: 1204–1209

Utilisation optimale des appareils



Alves, Respir Care 2008





MODULATION DU VOLUME PULMONAIRE

Breathing at low lung volumes and chest strapping: a comparison of lung mechanics

N. J. DOUGLAS, G. B. DRUMMOND, AND M. F. SUDLOW
Departments of Medicine, Anaesthetics, and Respiratory Medicine, University of Edinburgh, Edinburgh EH3 9YW, Scotland

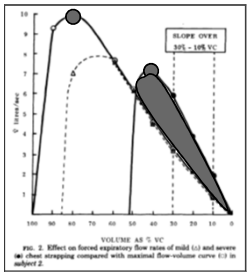
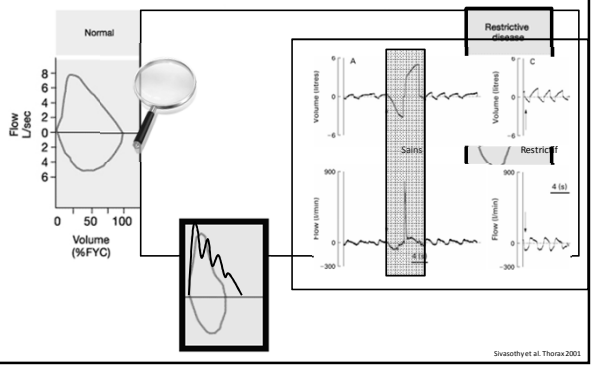


FIG. 2. Effect on forced expiratory flow rates of mild (△) and severe (●) chest strapping compared with maximal flow-volume curve (○) in subject 2.

- Diminution du débit de pointe
- Lors d'obstruction des petites voies aériennes, la déflation améliore les débits distaux

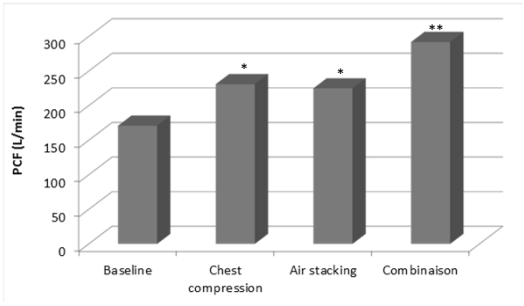
J Appl Physiol 1981;50(3):650-657

Situations ou signes cliniques



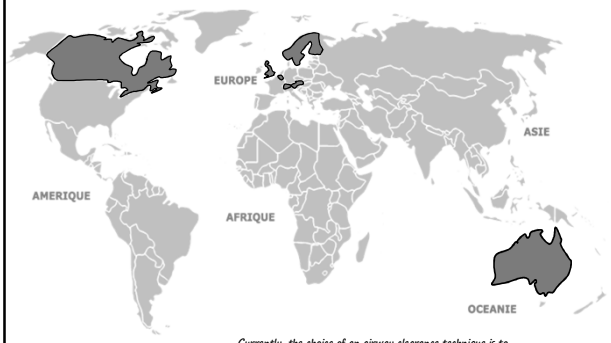
Sivasothy et al. Thorax 2001

Aide à la toux



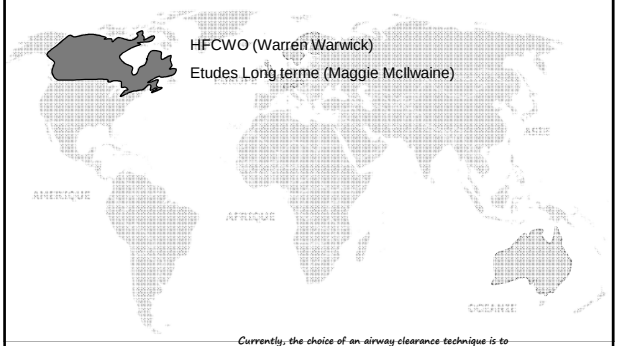
28 DMD patients (20 ± 4 years, FVC of 29 ± 12%, weight of 56 ± 17 kg)

Brito M et al. J Bras Pneumol. 2009;35(10):973-979



Currently, the choice of an airway clearance technique is to some extent led by geographical therapeutic trends and therapists' personal experiences rather than robust long term scientific data.

Ammani Prasad, 2000

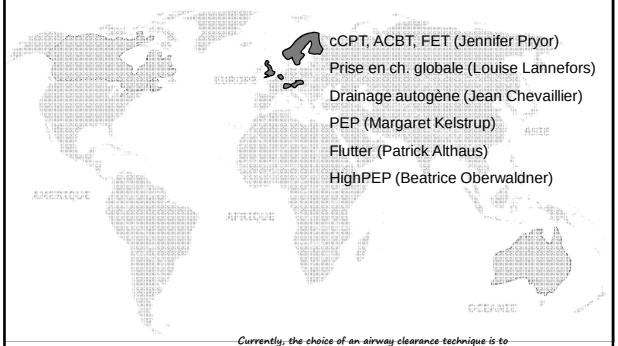


HFCWO (Warren Warwick)

Etudes Long terme (Maggie McIlwaine)

Currently, the choice of an airway clearance technique is to some extent led by geographical therapeutic trends and therapists' personal experiences rather than robust long term scientific data.

Ammani Prasad, 2000



cCPT, ACBT, FET (Jennifer Pryor)

Prise en ch. globale (Louise Lannefors)

Drainage autogène (Jean Chevaillier)

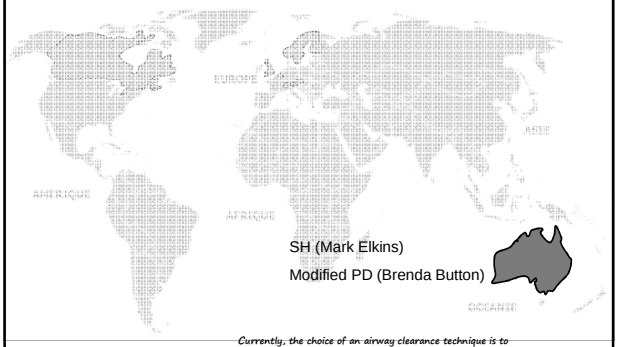
PEP (Margaret Kelstrup)

Flutter (Patrick Althaus)

HighPEP (Beatrice Oberwaldner)

Currently, the choice of an airway clearance technique is to some extent led by geographical therapeutic trends and therapists' personal experiences rather than robust long term scientific data.

Ammani Prasad, 2000



SH (Mark Elkins)

Modified PD (Brenda Button)

Currently, the choice of an airway clearance technique is to some extent led by geographical therapeutic trends and therapists' personal experiences rather than robust long term scientific data.

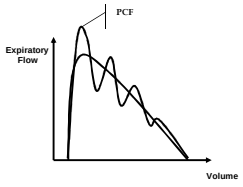
Ammani Prasad, 2000

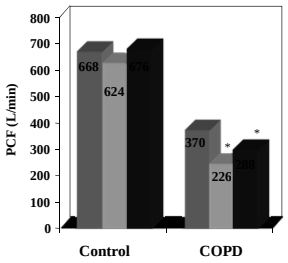
Take home message

- MODIFIER NOS HABITUDES!!!!
- Comprendre les principes sous-jacents aux différentes techniques de désencombrement et contrôler leur efficacité
- Maîtriser la physiopathologie
- Choix de la technique en fonction de la situation clinique

Effect of manually assisted cough and mechanical insufflation on cough flow of normal subjects, patients with chronic obstructive pulmonary disease (COPD),

- 8 COPD vs 9 healthy control





Cough manually assisted

Cough mechanically assisted

Adapted from Michel Toussaint

Sivasothy et al. Thorax 2001