GROUPE HOSPITALIER DU HAVRE

Cliniques universitaires SAINT-LUC UCL BRUXELLES

22e CONGRÈS DE PNEUMOLOGIE DE LANGUE FRANÇAISE

IREC Institut de Recherche Expérimentale et Clinique

GRKR GROUPE DE RECHERCHE EN KINESITHERAPIE RESPIRATOIRE

Comment évaluer l'efficacité des techniques de désencombrement ?

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Université Catholique de Louvain

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22e CONGRÈS DE PNEUMOLOGIE DE LANGUE FRANÇAISE
ONCOLOGIE THORACIQUE - LE POUMON ET SON ENVIRONNEMENT

LYON
CENTRE
DES CONGRÈS
26 | 27 | 28
Janvier 2018

Déclaration de liens d'intérêts

J'ai actuellement, ou j'ai eu au cours des trois dernières années, une affiliation ou des intérêts financiers ou intérêts de tout ordre avec les sociétés commerciales suivantes en lien avec la santé.

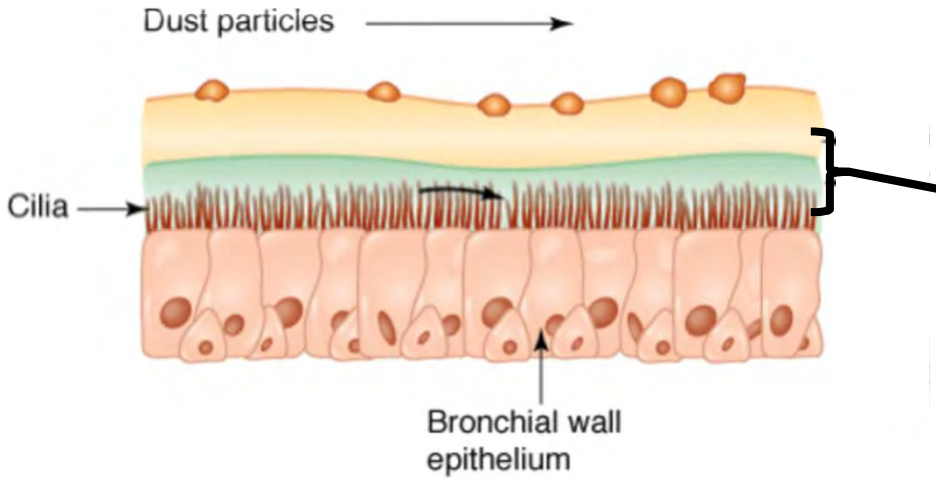
- **Liens d'intérêt :**

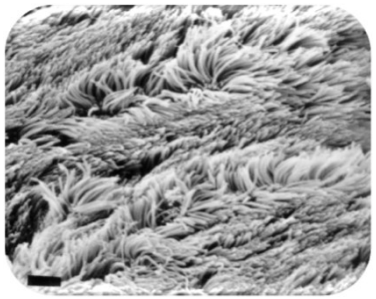
  Y. Combret: Absence de lien d'intérêt
  N.Audag: Resmed

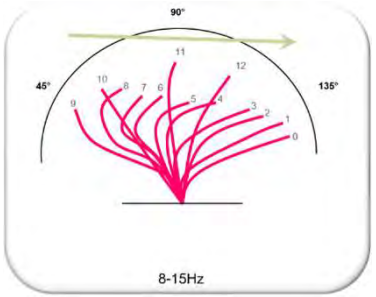
- **Liens d'intérêt en relation avec la présentation :**

  Absence de lien d'intérêt

PHYSIOLOGIE

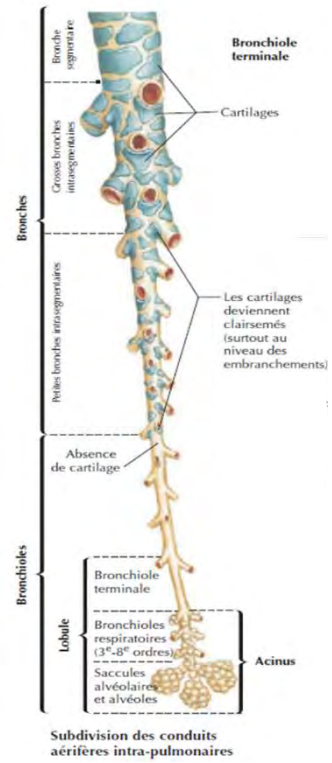




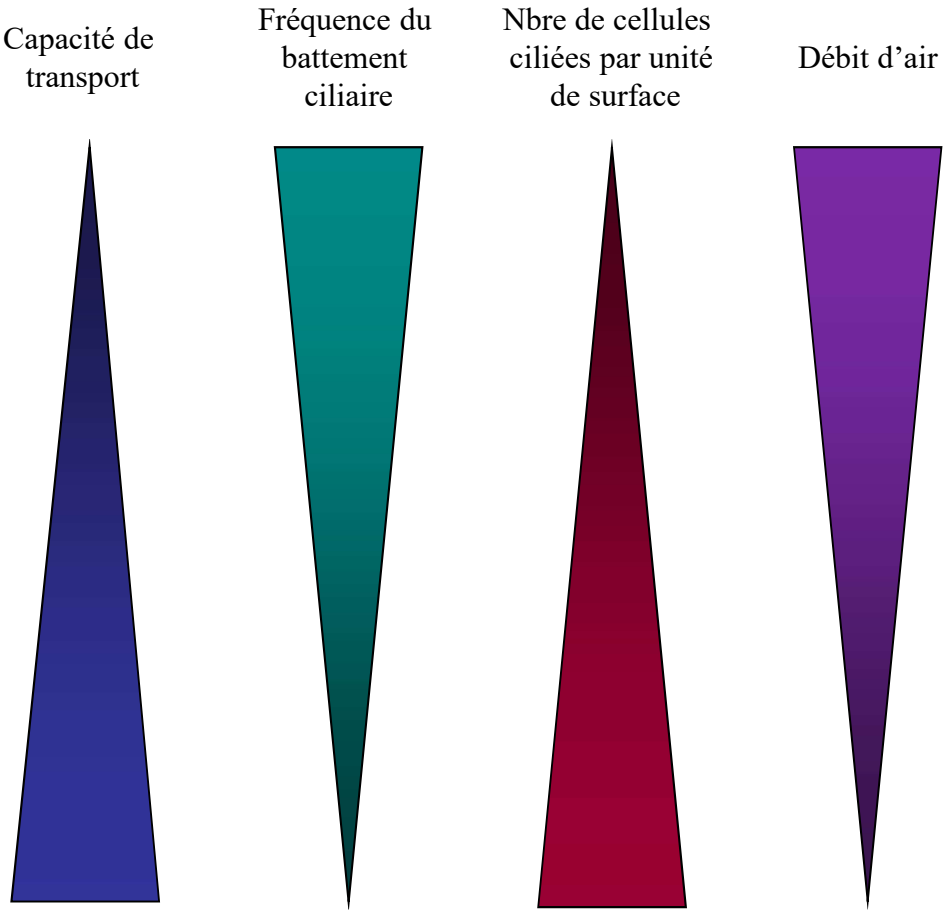


Puchelle et al. *MedSci*, 2005
De Turk et al. *Phys Ther, 2004*

PHYSIOLOGIE



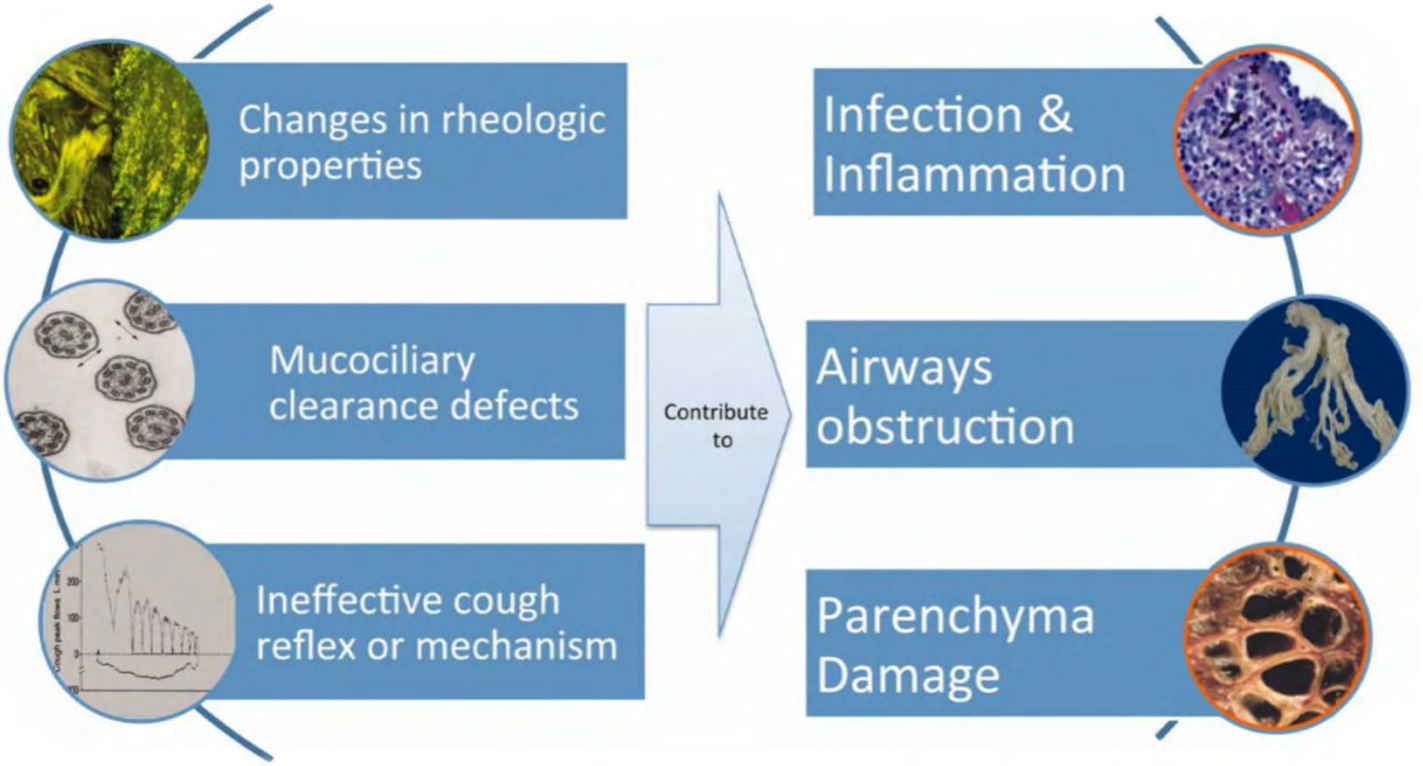
Subdivision des conduits aérifères intra-pulmonaires



Adapté de Reychler, 2015

Mucus et toux = protection et défense

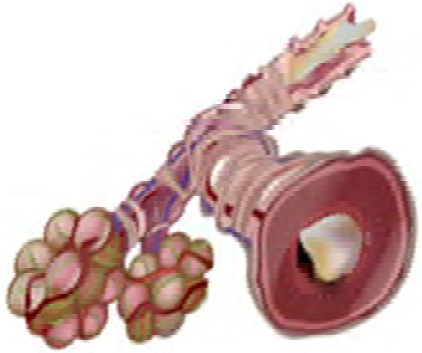
Mucus = obstruction = complications

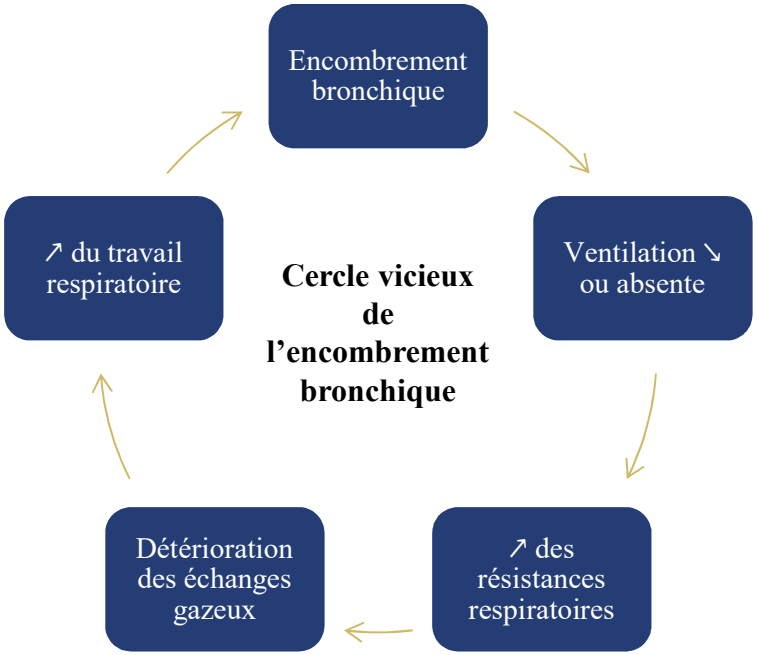


Volsko, *Respir Care*, 2013

DEFINITION

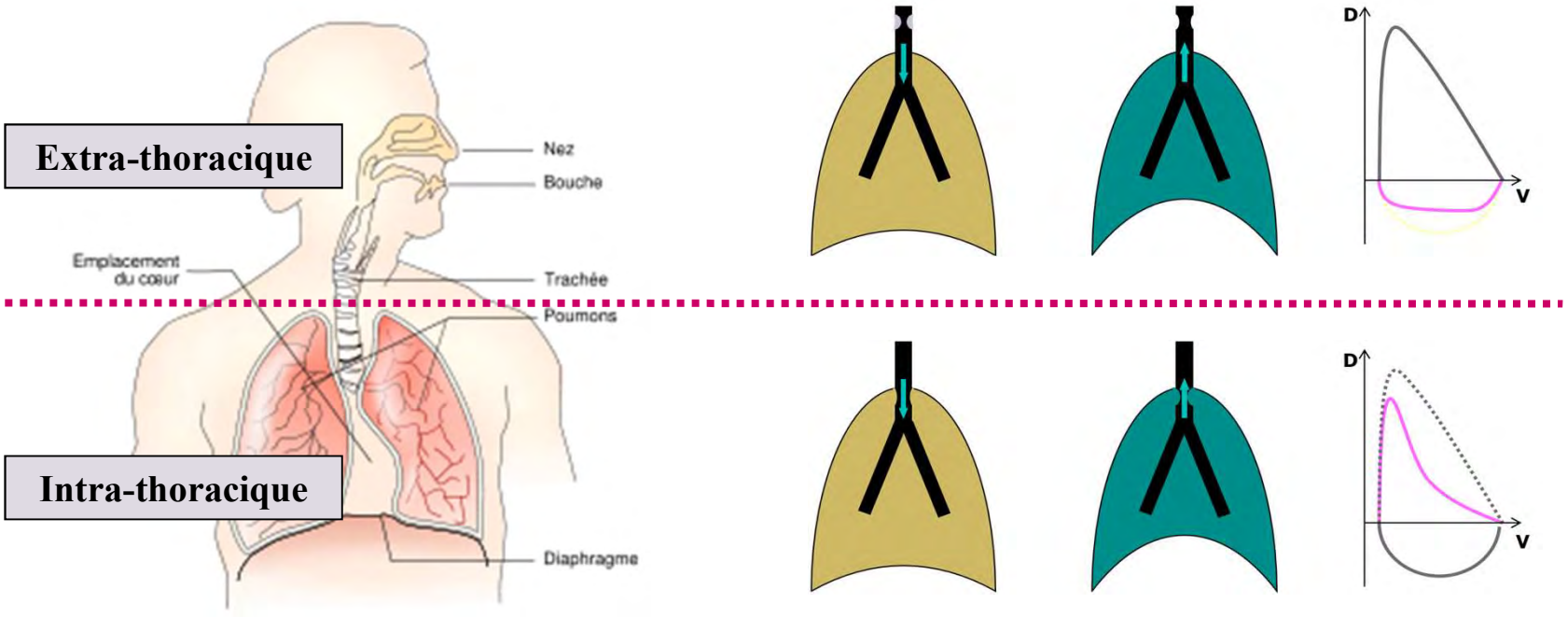
L'encombrement bronchique consiste en une accumulation de sécrétions au sein de l'arbre trachéo-bronchique, résultant d'un **déséquilibre** entre le statut sécrétoire (volume et propriétés rhéologiques des sécrétions) et les capacités d'épuration de ces sécrétions.





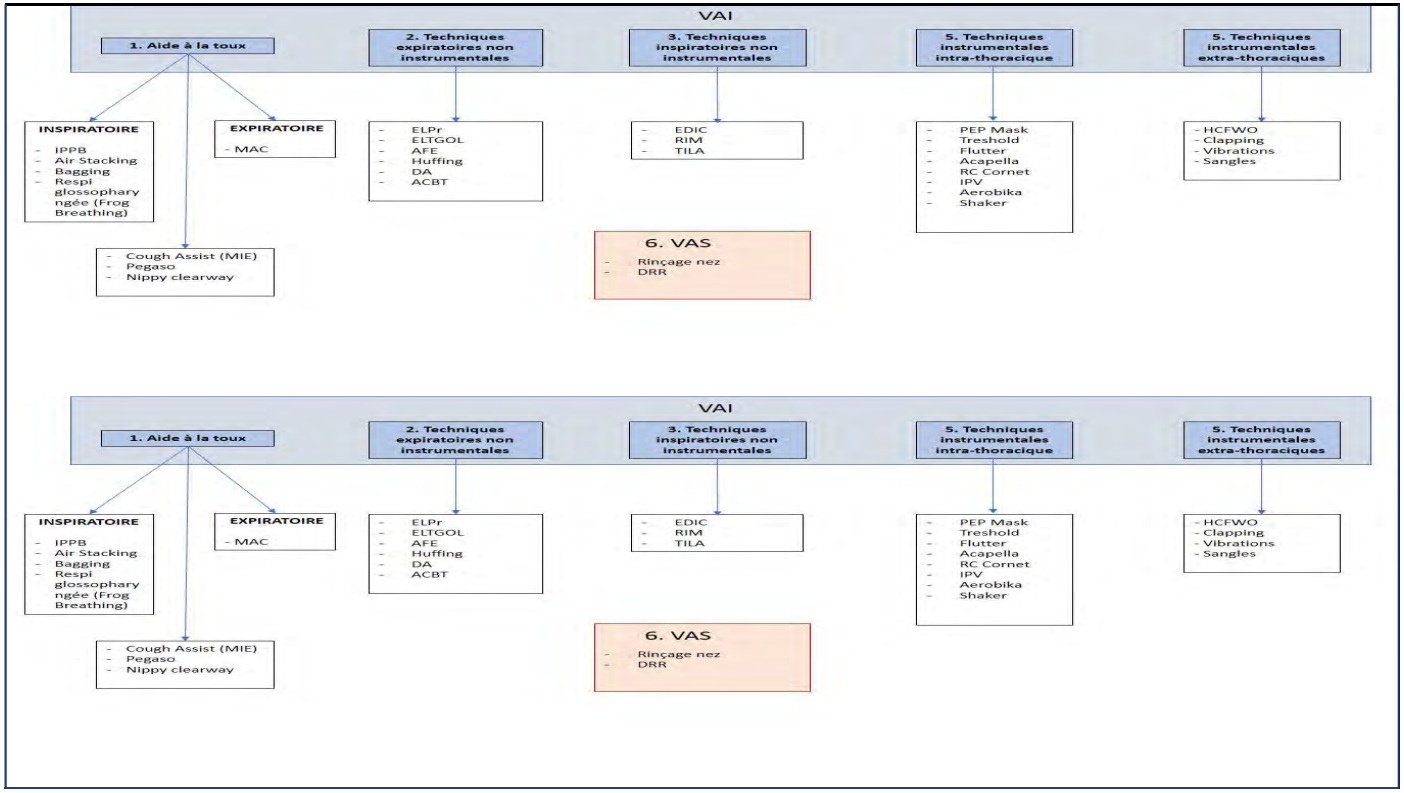
Recommandations JIKRI, 2000

DEFINITION

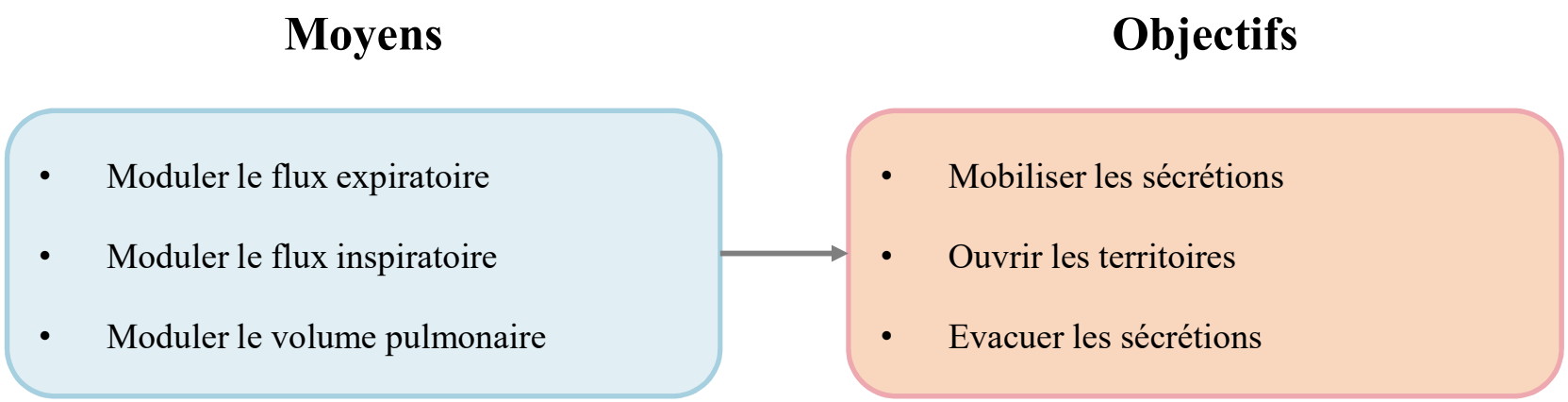


Adapté de Reychler, 2015

TECHNIQUES DE DESENCOMBREMENT



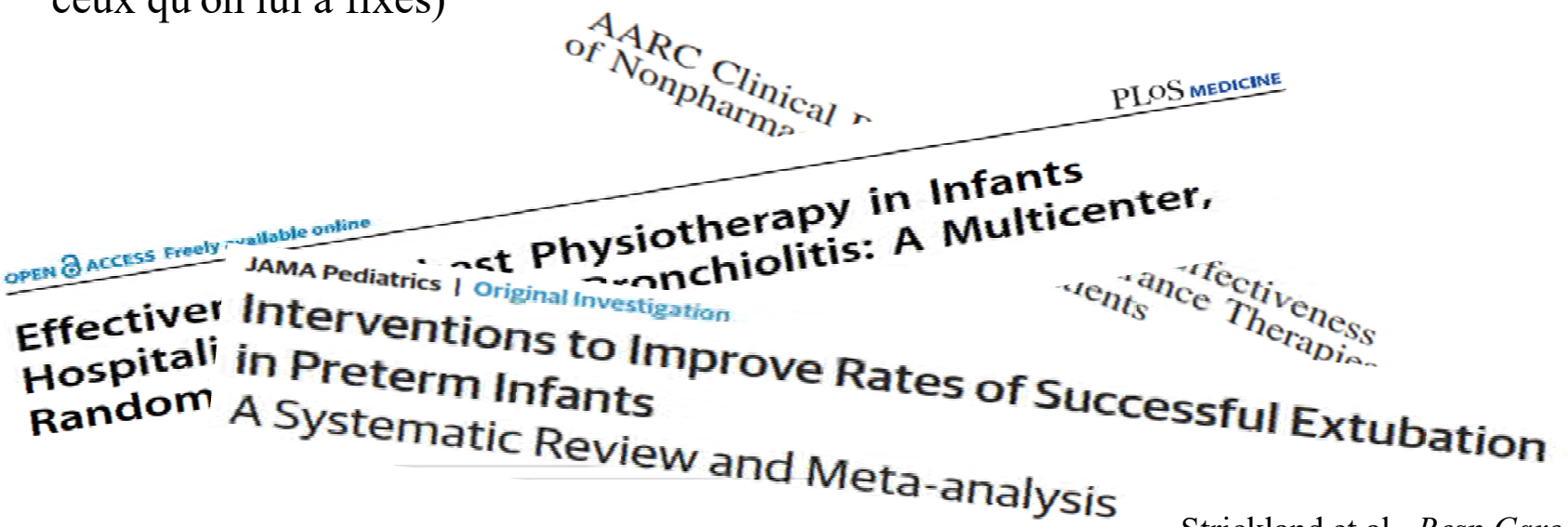
TECHNIQUES DE DESENCOMBREMENT



Fink, *Respir Care,* 2007

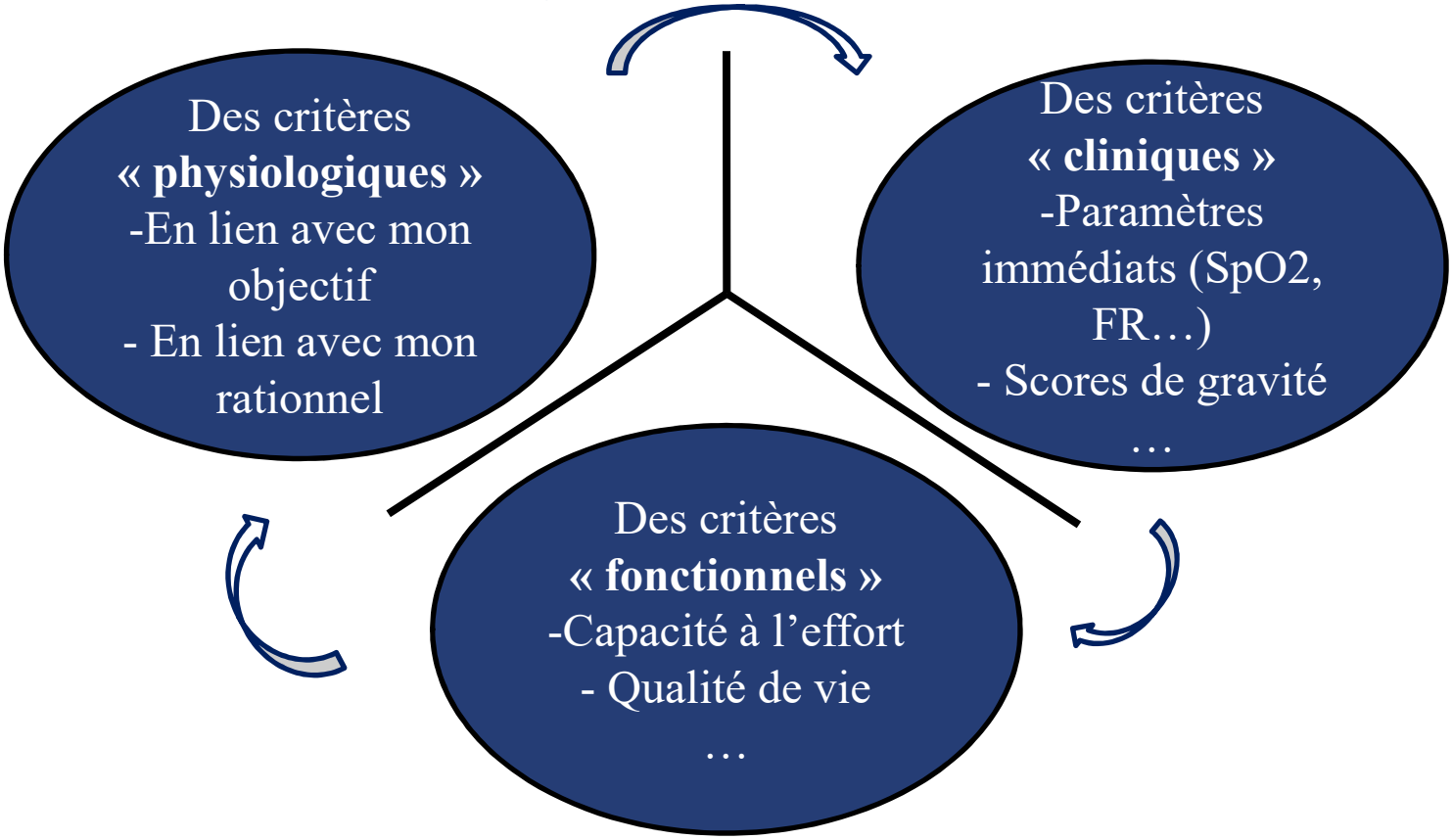
En préambule …

- Efficacité : nom féminin (latin *efficacitas, -atis*) ; L'**efficacité** est la capacité d'une personne, d'un groupe ou d'un système de parvenir à ses fins, à ses objectifs (ou à ceux qu'on lui a fixés)

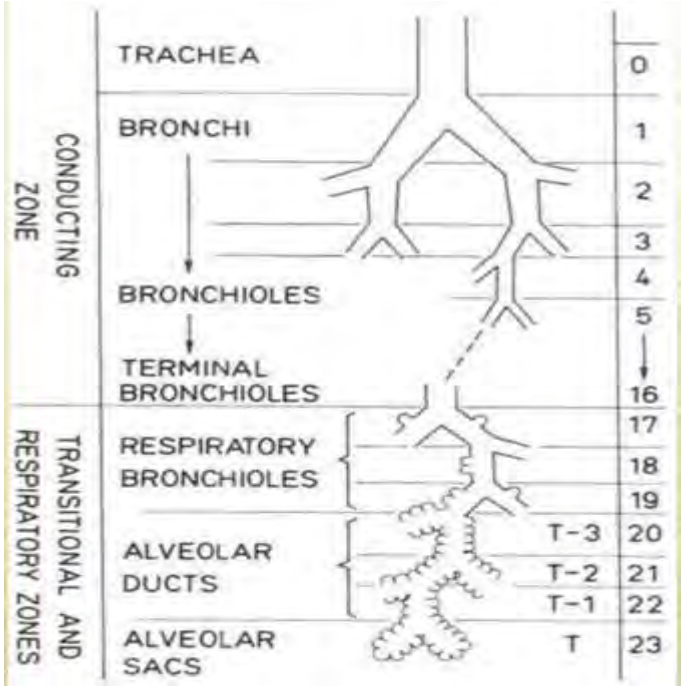


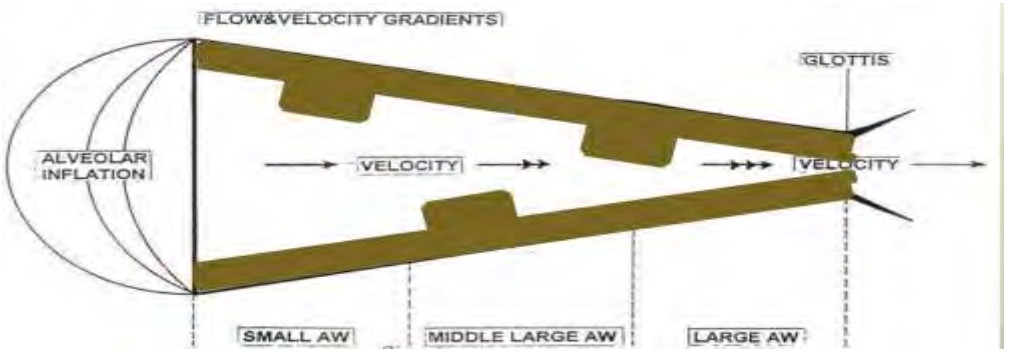
Strickland et al., *Resp Care*, 2013
Gajdos et al., *Plos Med*, 2010
Ferguson et al., *JAMA*, 2016

Différents types d'outcomes



Principe du désencombrement bronchique





W. Poncin, *Actualités en Ventilation*, 2016

Augmentation du débit expiratoire ?

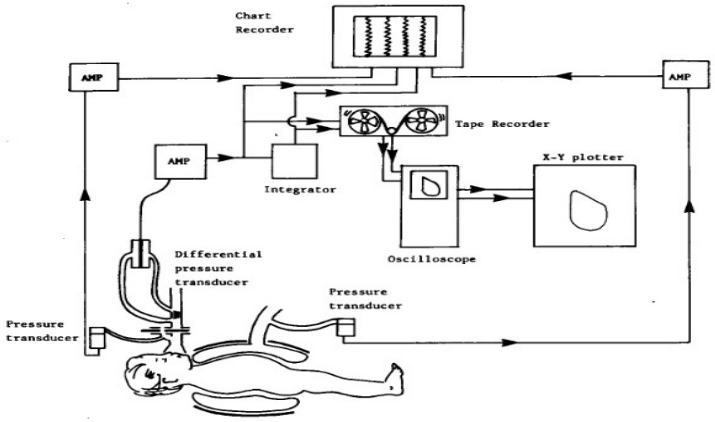


Fig. 1. Equipment used in passive and forced expiratory flow-volume studies. Body plethysmograph is not shown. AMP = amplifier. See text for details.

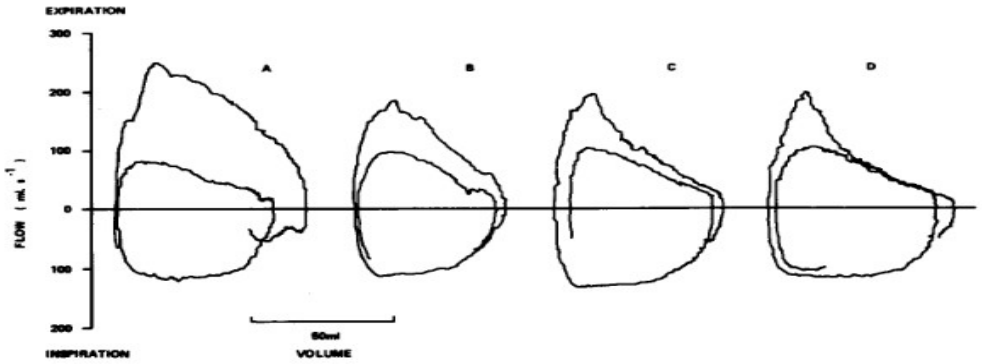


TABLE 3

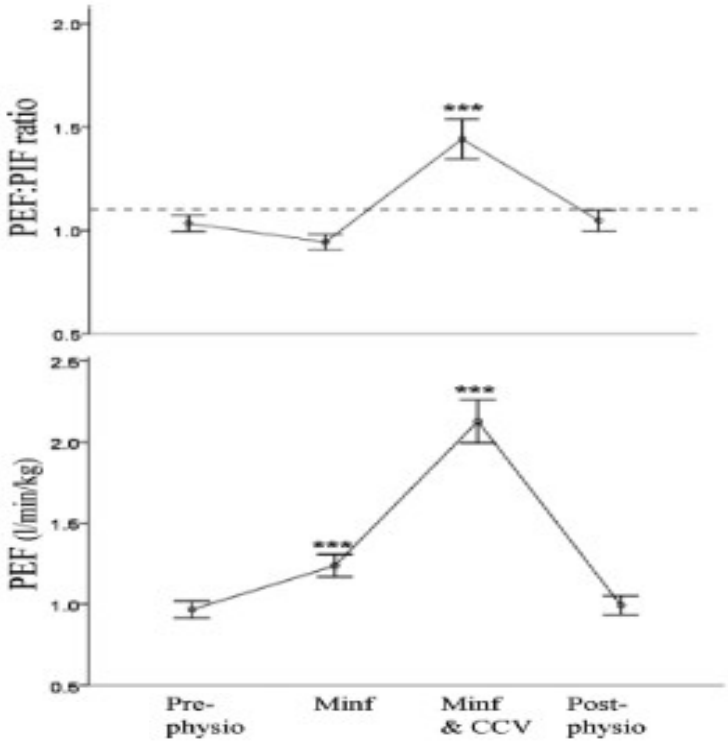
SHAPE OF STANDARDIZED PARTIAL FEFV CURVE AND CLINICAL DIAGNOSIS. ALL VALUES ARE PERCENTAGES.

Shape of FEFV Curve	Normal (%)	Bronchiolitis (%)	Bronchopulmonary Dysplasia (%)	Cystic fibrosis (%)
Convex (A)*	67	24	14	23
Straight (B)	17	18	14	50
Concave (C)	17	24	43	17
Concave (D)	0	35	29	0

* Curve shapes correspond to shapes shown in figure 2.

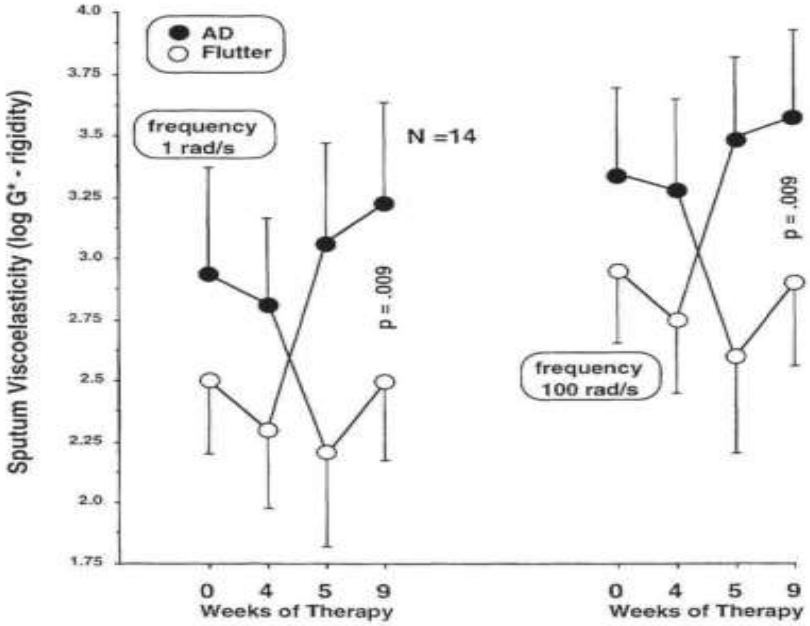
Le Souëf et al., *Am Rev Resp Dis*, 1988

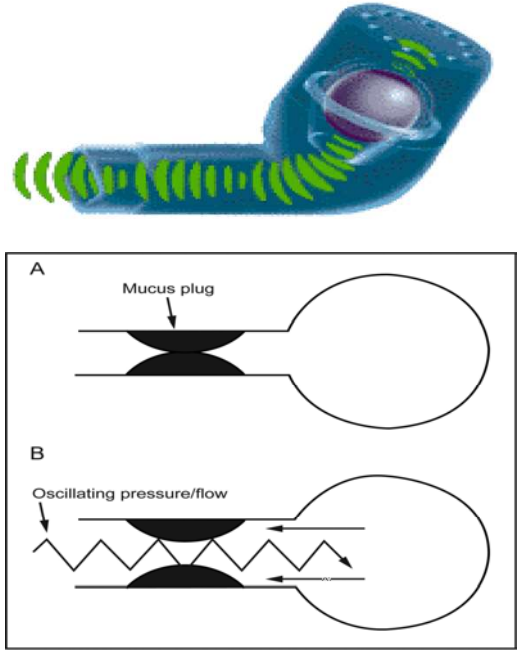
Compression manuelle pour mobiliser le mucus ?



Gregson et al., *Ped Crit Care Med*, 2012

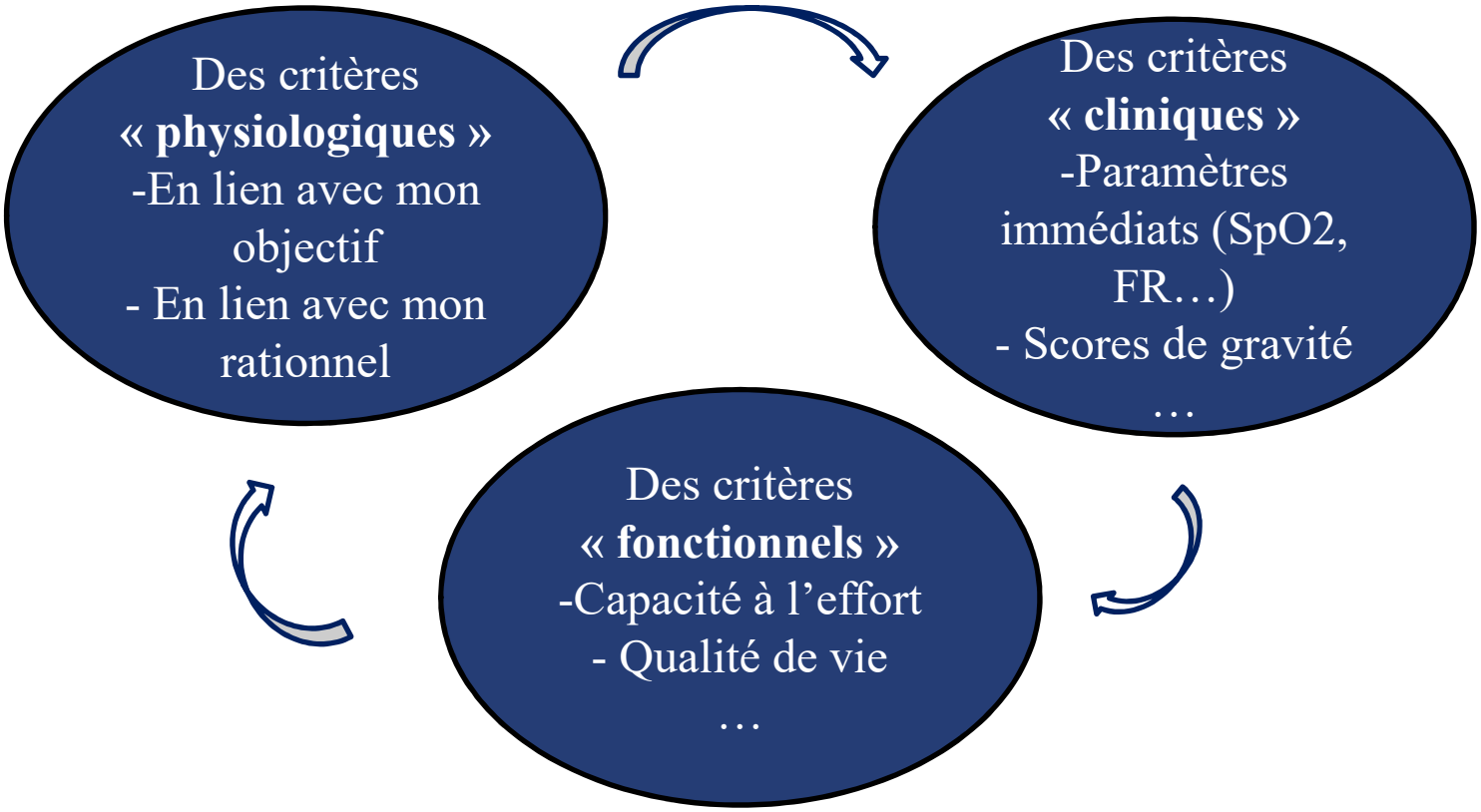
Modifications du mucus ?





App et al., *Chest*, 1998

Différents types d'outcomes



Volumes pulmonaires

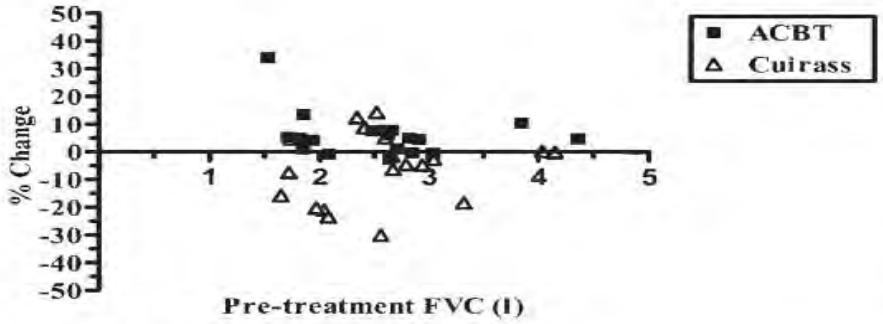


Fig. 2. Percent change in FVC following treatment.

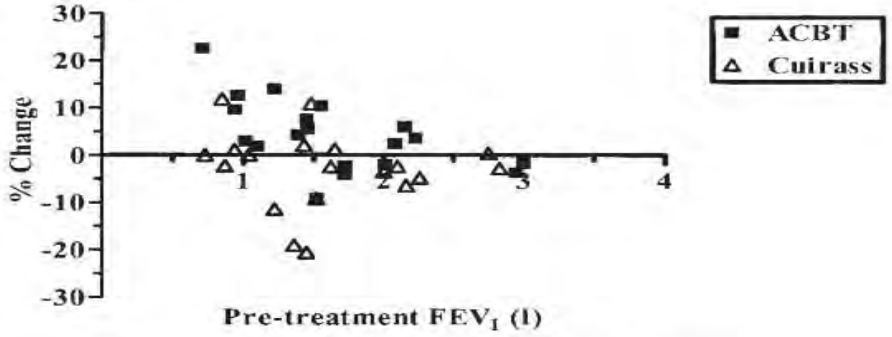
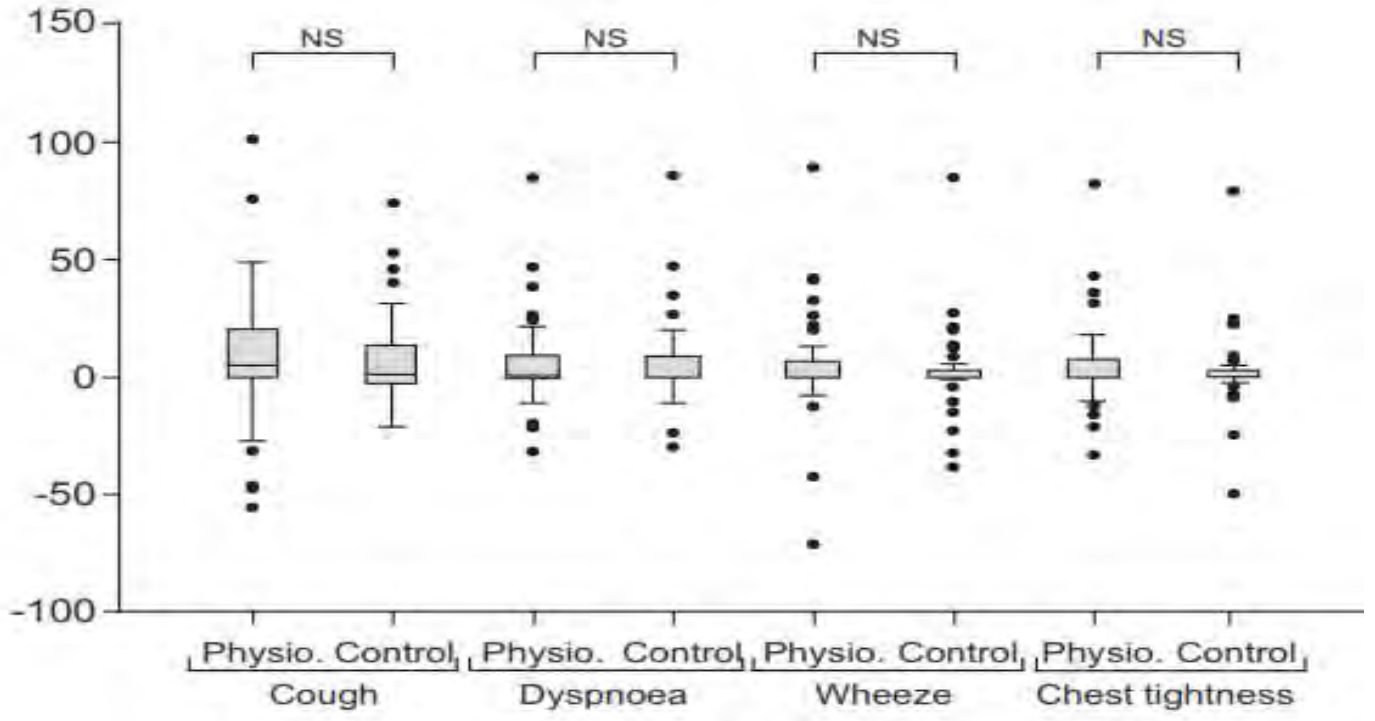


Fig. 3. Percent change in FEV_1 following treatment.

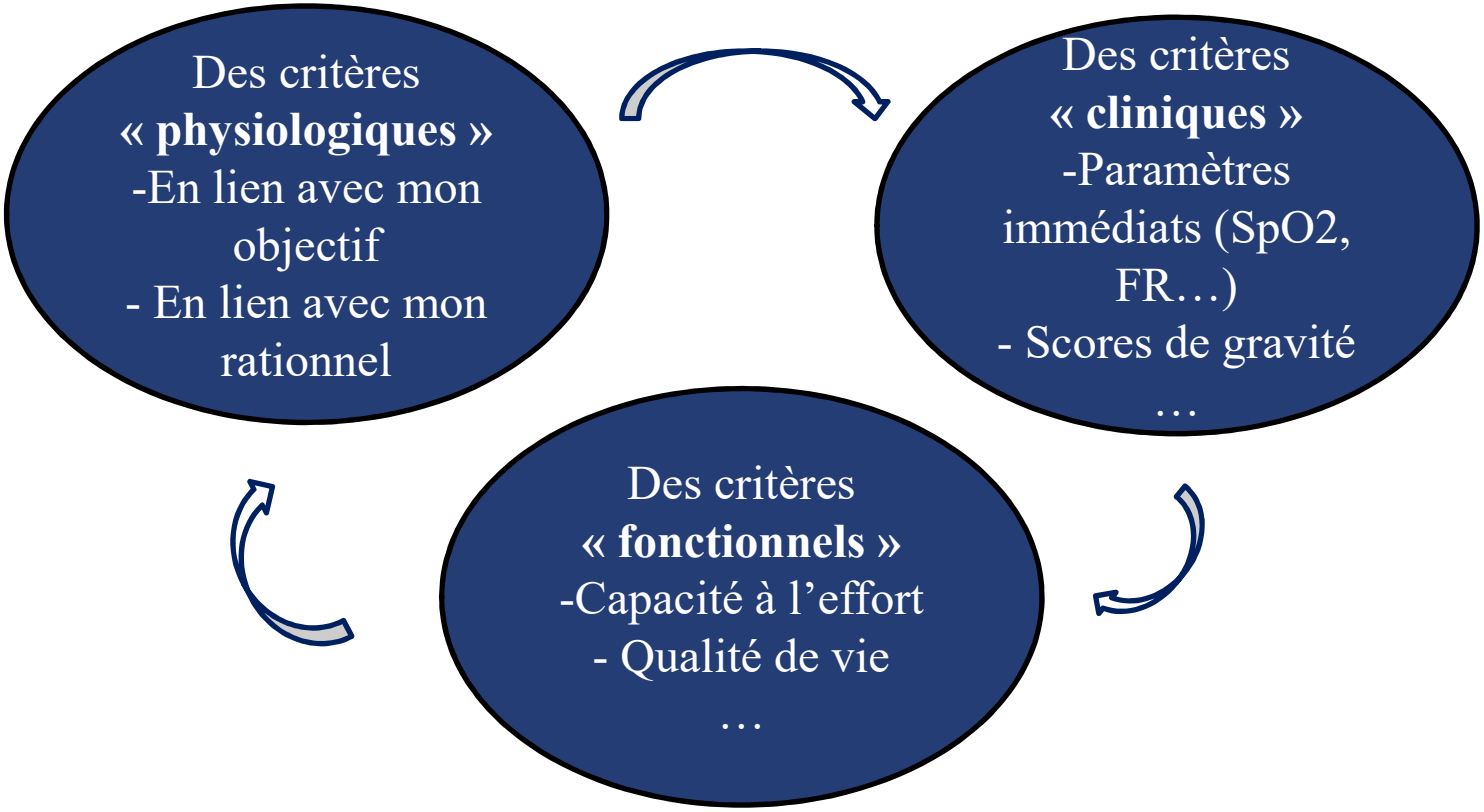
Philipps et al., *Ped Pulmonol*, 2004

Evaluation clinique subjective



Elkins et al., *Eur Respir J,* 2005

Différents types d'outcomes



Qualité de vie

Table 3 Primary Outcome measure results

	MCP arm			No MCP arm			Unadjusted analysis no MCP versus MCP			Adjusted analysis [a] no MCP versus MCP		
	N	Mean	SD	N	Mean	SD	Mean difference	95% CI	*p*-value	Mean difference	95% CI	*p*-value
SGRQ -Total score	186	63.88	19.05	186	63.52	19.68	−0.36	−4.31,3.59	0.8573	0.51	−2.67,3.69	0.753
Effect size							−0.02	−0.22,0.19		0.03	−0.14,0.19	
SGRQ -Symptom score	186	68.38	23.13	186	68.40	23.01	0.02	−4.68,4.73	0.9925	0.87	−3.50,5.25	0.695
Effect size							0.00	−0.20,0.21		0.04	−0.15,0.23	
SGRQ -Activity score	188	82.49	18.81	187	80.91	19.74	−1.58	−5.50,2.34	0.4279	−0.36	−3.76,3.04	0.836
Effect size							−0.08	−0.29,0.12		−0.02	−0.20,0.16	
SGRQ -Impact score	188	51.53	22.58	187	51.60	22.50	0.07	−4.51,4.65	0.9752	0.43	−3.29,4.14	0.822
Effect size							0.00	−0.20,0.2		0.02	−0.15,0.18	

[a] difference adjusted to take into account baseline value and hospital site.

Cross et al., *BMC Pulm Med*, 2012

Tolérance à l'exercice

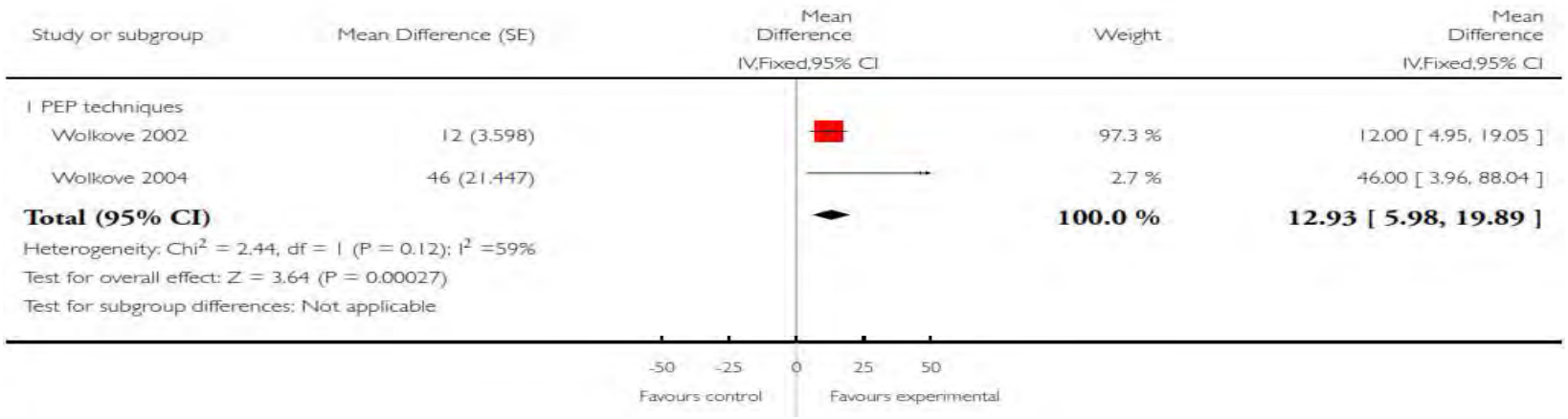
THE COCHRANE COLLABORATION®

Analysis 2.16. Comparison 2 Stable COPD: ACTs vs no ACTs (control), Outcome 16 Exercise tolerance, 6MWD (m) (short-term).

Review: Airway clearance techniques for chronic obstructive pulmonary disease

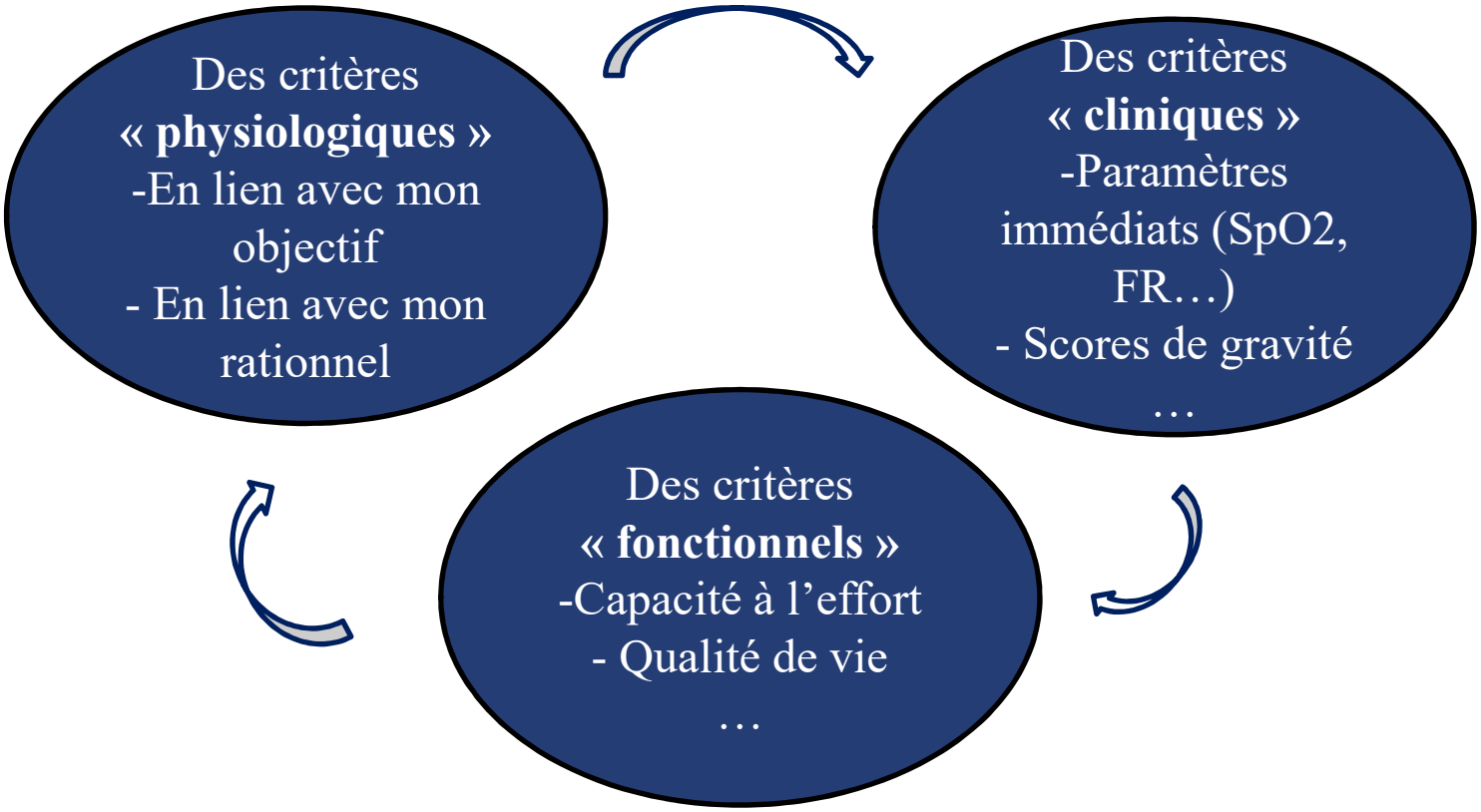
Comparison: 2 Stable COPD: ACTs vs no ACTs (control)

Outcome: 16 Exercise tolerance, 6MWD (m) (short-term)

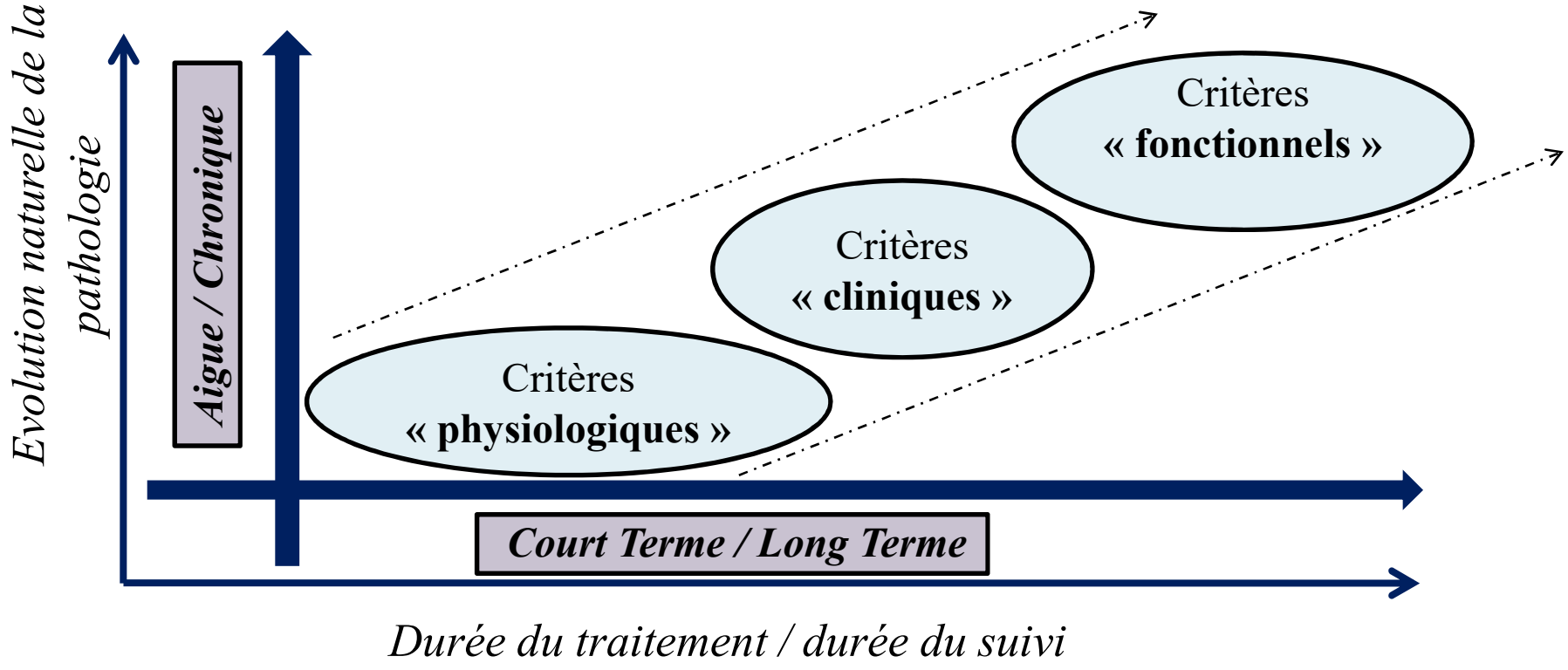


Osadnik et al., *Cochrane Database Syst Rev*, 2012

Synthèse


Des critères
« **physiologiques** »
-En lien avec mon objectif
- En lien avec mon rationnel
Des critères
« **cliniques** »
-Paramètres immédiats (SpO2, FR…)
- Scores de gravité
…
Des critères
« **fonctionnels** »
-Capacité à l'effort
- Qualité de vie
…

Synthèse


Evolution naturelle de la pathologie
Aigue / Chronique
Critères « physiologiques »
Critères « cliniques »
Critères « fonctionnels »
Court Terme / Long Terme
Durée du traitement / durée du suivi


SHORT TERM
LONG TERM

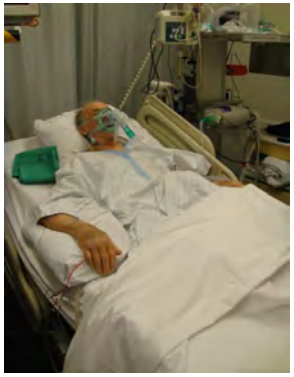
Impression patient

Etat général du patient

Paramètres vitaux

Sécrétions

Rx thorax



Auscultation

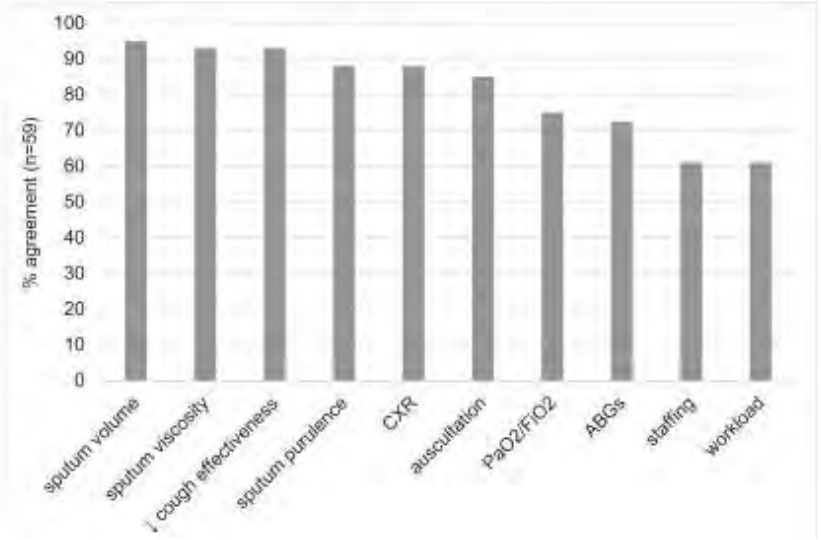
Examens complémentaires

Effets indésirables

SpO2
PaCO2/PaO2

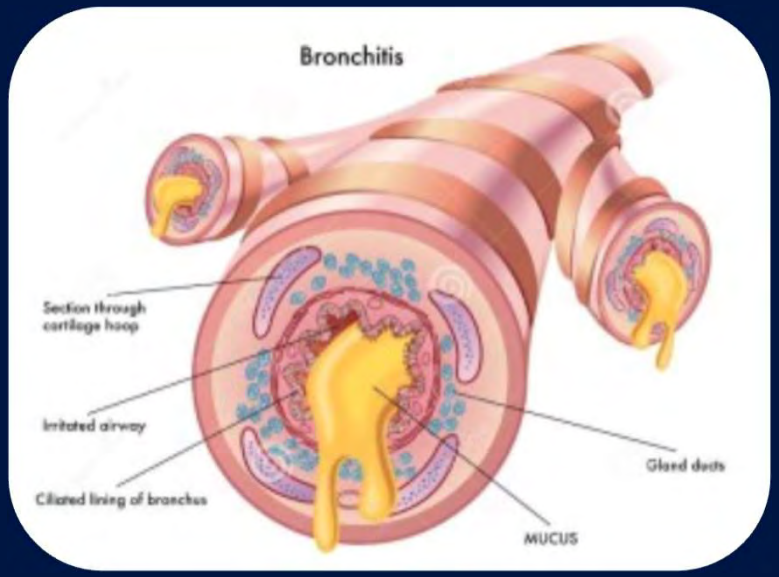
Questionnaires

A survey of clinicians regarding respiratory physiotherapy intervention for intubated and mechanically ventilated patients with community-acquired pneumonia. What is current practice in Australian ICUs?



The most frequent clinical reasoning rationale reported to undertake respiratory physiotherapy treatment for intubated patients was facilitation of sputum clearance.

Van der lee et al., *J Eval Clin Pract*. 2017



Evaluation des sécrétions

VA encombrées

↓

Techniques de désencombrement

↓

Expectorations

Amélioration désencombrement = ↗ sécrétions

BTS guidelines, *Thorax*, 2010

Chest physiotherapy compared to no chest physiotherapy for cystic fibrosis (Review)

THE COCHRANE COLLABORATION®

Primary outcomes

1. Expectorated secretions (mucus, sputum, phlegm)
2. Mucus transport rate (assessed by radioactive tracer clearance)
3. Pulmonary function tests (post-intervention objective change from baseline compared to control)

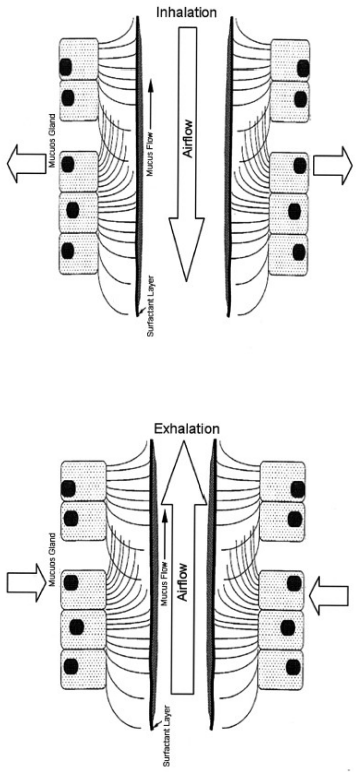
Key results

Summarising the findings of these eight studies, we found that methods of clearing the airways have short-term benefits for moving mucus. Three studies measured sputum which had been coughed up and found those people using chest physiotherapy coughed up more sputum; four studies measured radioactive tracer clearance and found increased clearance with chest physiotherapy. Only one study reported an improvement in lung function in some of the treatment groups; but three other studies who reported this outcome did not find any significant effect from chest physiotherapy. At present there is no clear evidence of long-term effects in chest clearance, quality of life or survival with chest physiotherapy.

Warnock et Gates, *Cochrane Database*, 2012

Table 5. Studies of Forced Exhalation Technique, Directed Cough, and Autogenic Drainage

First Author	Patients (no.)	Disease(s)	Treatment(s)	Regimen	Results	p
Lorin[42]	17	CF	Postural drainage	20 min	More sputum than baseline	< 0.001
Bateman[43]	10	COPD	CPT	20 min/d	More sputum than control	< 0.01
Bateman[8]	6	COPD	CPT	20 min	More sputum than control	< 0.05
de Boeck[9]	9	CF	CPT	Once a day for 2 d	More tracer cleared than with cough alone	< 0.001
Mortensen[45]	10	CF	Postural drainage plus FET	20 min	Postural drainage plus FET cleared radiotracer better than did control at 30 min	< 0.01
App[37]	17	CF	Autogenic drainage vs vibratory PEP	Twice a day for 2 weeks	Cough clearance and FEV_1 similar to vibratory PEP	NS
Lannefors[46]	9	CF	Postural drainage, FET, and exercise	20-min postural drainage and FET	No difference in radiotracer clearance between FET and PEP or exercise	NS
Sutton[47]	10	CF, bronchiectasis	Postural drainage and FET	30-min postural drainage and FET	Better clearance of radiotracer than control period	< 0.01
Sutton[14]	10	CF	FET, FET with postural drainage, and directed cough	30-min sessions	Sputum weight greater with all than with control. FET with postural drainage had greater sputum weight than FET alone.	< 0.01
Pryor[17]	10	CF, bronchiectasis	Directed cough or FET	30-min directed cough or 30-min FET	Greater clearance with FET than with directed cough	< 0.01
Oldenburg[48]	8	Chronic bronchitis	Directed cough plus exercise	1 cough/min times 5 min and exercise for 40 min	Better clearance than with rest	< 0.03
Rossman[49]	6	CF	Postural drainage, postural drainage with percussion, postural drainage with PT, vibratory PEP, and directed cough.	40 min	All better than cough control Directed cough equivalent to all therapies	< 0.05
Miller[35]	18	CF	Autogenic drainage vs active cycle of breathing technique with postural drainage	One CPT method on each study day. Monitored for 6 hours each day. Mucus movement quantified via radioaerosol clearance. Sputum collected during and for 1 hour after CPT.	Greater mucus clearance with autogenic drainage than active cycle of breathing technique with postural drainage	< 0.05



Fink et al., *Respir Care*, 2007

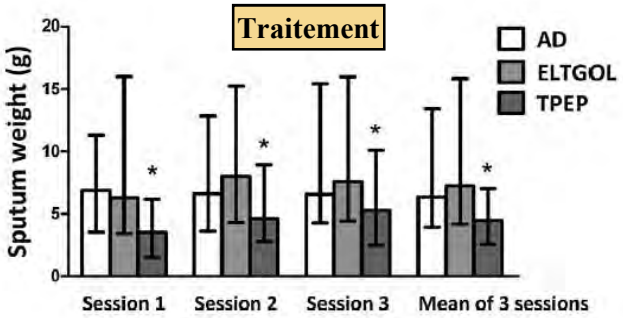


Fig. 2. Wet sputum expectorated during three physiotherapy sessions and mean values. Bar graphs express medians and ranges. *$P < 0.02$. AD, autogenic drainage; ELTGOL, slow expiration with glottis opened in lateral posture; TPEP, temporary positive expiratory pressure.

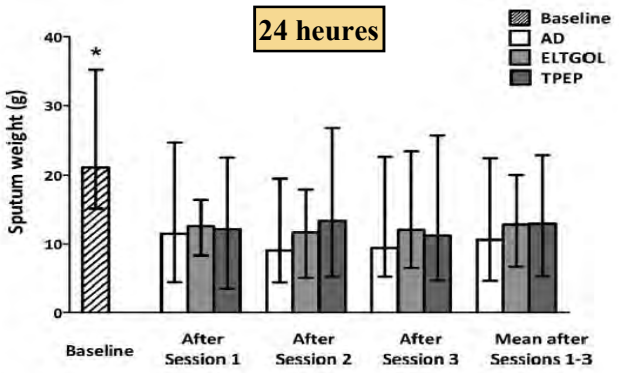
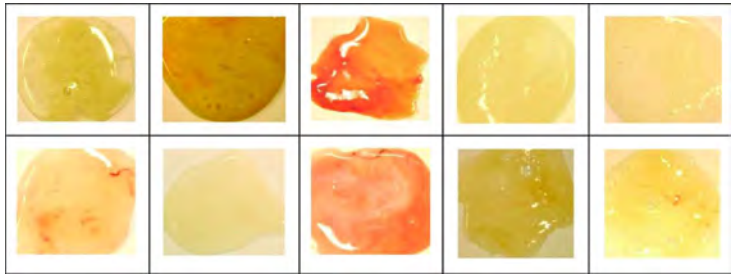


Fig. 3. Wet sputum expectorated spontaneously at baseline and during the 24-hour period following three physiotherapy sessions (excluding during treatment), and mean values. Bar graphs express medians and ranges. The amount of sputum collected over the 24-hour period after each physiother-

The main mechanism to improve mucus clearance is the generation of expiratory flow exceeding inspiratory.

Slow expiratory ACTs enhance mucus clearance during treatment sessions, and reduce expectoration for the rest of the day inpatients with bronchiectasis.

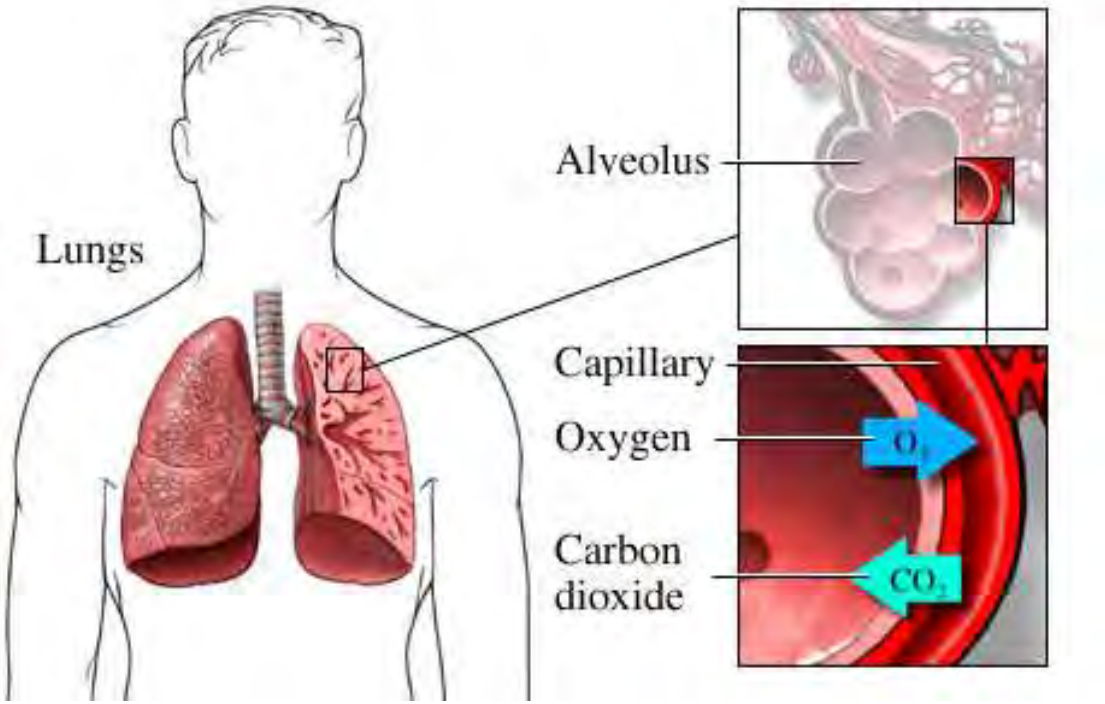
Herrero-Cortina et al., *Physiotherapy*, 2015



- ★ **Volume**
- ★ **Rhéologie**
- ★ **Timing**
- ★ **Coloration**
- ★ **Origine**
- ★ **Séché/humide**
- ★ **Bactériologie**

Reychler et al., *Respir Care,* 2016
Stockley et al., *Thorax,* 2001

SpO_2, PaO_2, $PaCO_2$



Désencombrement

↓

Augmentation territoires ventilés

↓

↗ oxygénation (PaO2-SpO2)
↗ élimination CO2 (PaCO2)

Effect of intrapulmonary percussive ventilation on expiratory flow limitation in chronic obstructive pulmonary disease patients

Table 1 Characteristics of the 25 patients included in the study

Male/Female	15:10
Age (y) *	63 ± 8
FEV_1 (%predicted) *	33.4 ± 6.7
Body mass index	26 ± 3
SAPS II *	35.6 ± 4.9
Ventilation time (d) *	8.0 ± 3.0
Reason for initiating mechanical ventilation (n, numbers)	
Acute-on-chronic COPD, n	19
Pneumonia, n	1
Heart failure, n	1
Postoperative respiratory failure, n	2
Miscellaneous, n	2

FEV_1 indicates forced expiratory volume in 1 second; SAPS II, new acute physiologic score [19].
* Values are means ± SD.

Table 2 Effect of IPV on the expiratory flow limitation, the airway occlusion pressure, the gas exchange, the RR, and heart rate in COPD patients *

	Before IPV	After IPV	*P*
EFL (%)	65.4 ± 18.2	34.4 ± 24.2	<.05
P0.1 (cm H_2O)	3.9 ± 1.6	2.8 ± 1.1	<.05
pH	7.39 ± 0.01	7.40 ± 0.01	<.05
$Paco_2$ (kPa)	7.35 ± 0.5	7.0 ± 0.3	<.05
Pao_2 (kPa)	8.3 ± 0.4	8.8 ± 0.4	<.05
HCO3- (mmol/L)	33 ± 3	33 ± 3	NS
RR (breaths/min)	22.6 ± 2.3	21.4 ± 1.7	<.05
HR (beats/min)	83 ± 15	85 ± 14	NS
Spo_2 (%)	90 ± 2	93 ± 3	<.05

HR indicates heart rate; Spo_2, pulse oximetry.
* Values are mean ± SD.

Vargas et al., *Crit Care*, 2009

Effectiveness of Airway Clearance Techniques in Children Hospitalized With Acute Bronchiolitis

TABLE 3—Length of Hospital Stay and Mean Differences of Wang Score, SaO_2, and HR Between the Groups Over All Hospitalization Days

	Bouncing	AAD	IPV	$P_{B\text{-}AAD}$	$P_{B\text{-}IPV}$	$P_{AAD\text{-}IPV}$
Hospital stay (days) ± SD	4.5 ± 1.9	3.6 ± 1.4	3.5 ± 1.3	0.05	0.03	1.00 NS
Wang (T0–T20) ± SD	0.2 ± 0.3	0.5 ± 0.5	0.7 ± 0.5	0.04	<0.01	0.03
Wang (T0–T80) ± SD	0.5 ± 0.4	0.8 ± 0.6	0.9 ± 0.5	0.03	<0.01	0.77 NS
HR (T0–T20) ± SD	5 ± 10	3 ± 10	4 ± 13	0.68 NS	0.86 NS	0.94 NS
HR (T0–T80) ± SD	6 ± 10	8 ± 8	7 ± 10	0.65 NS	0.93 NS	0.86 NS
SaO_2 (T0–T20) ± SD	0 ± 1	−1 ± 1	−1 ± 1	0.07 NS	0.10 NS	0.98 NS
SaO_2 (T0–T80) ± SD	−1 ± 3	0 ± 1	0 ± 1	0.91 NS	0.87 NS	0.99 NS

NS, not significant.
Hospital stay: ANCOVA for bouncing versus AAD or IPV and AAD versus IPV.
Wang score, HR, and SaO_2: Tukey's post hoc test for bouncing versus AAD or IPV and AAD versus IPV.

Van Ginderdeuren et al. *Pediatric Pulmonology,* 2017

Table 2. Raw Data

Patient	Atelectasis Score		Static Compliance (mL/cm H_2O)		S_{pO_2} (%)		f (breaths/min)		Treatment Duration (d)	Weight (kg)	Age
	Before*	After	Before	After	Before	After	Before	After			
CPT 1	2	2	1.9	1.9	93	95	44	52	5	4.5	4 mo
CPT 2	2	2	2.1	1.5	92	93	36	32	7	3	2 mo
CPT 3	2	2	2.4	3	95	95	42	48	8	5	3.5 mo
CPT 4	1	4	36.4	34.6	91	92	18	14	4	56	14 y
CPT 5	3	3	7	8.3	93	93	24	28	7	16	3 y
CPT Mean	2.0	2.6	10.0	9.9	92.8	93.6	32.8	34.8	6.2	16.9	–
IPV 1	3	1	2	2.8	91	92	36	33	2	3	3 mo
IPV 2	2	0	3.5	4	93	93	26	28	2	10	22 mo
IPV 3	3	3	2.3	3	92	95	44	42	4	4	4 mo
IPV 4	1	0	1.3	1.6	94	95	38	36	2	3.8	7 wk
IPV 5	2	1	7.6	6.6	93	99	26	28	3	7.8	14 mo
IPV 6	2	1	6.5	7.2	90	93	36	33	2	8	18 mo
IPV 7	3	0	7.7	8.3	94	94	24	25	7	16	3 y
IPV Mean	2.3	0.9	4.4	4.8	92.4	94.4	32.9	32.1	3.1	7.5	–

f = respiratory rate
*Values labeled "Before" were obtained after the first treatment. Values labeled "After" were obtained after the last treatment, when the patient exited the study.
S_{pO_2} = oxygen saturation measured via pulse oximetry.
CPT = chest physiotherapy
IPV = intrapulmonary percussive ventilation

Deakins and Chatburn. *Respir Care*, 2002

Effect of Intrapulmonary Percussive Ventilation on Mucus Clearance in Duchenne Muscular Dystrophy Patients: A Preliminary Report

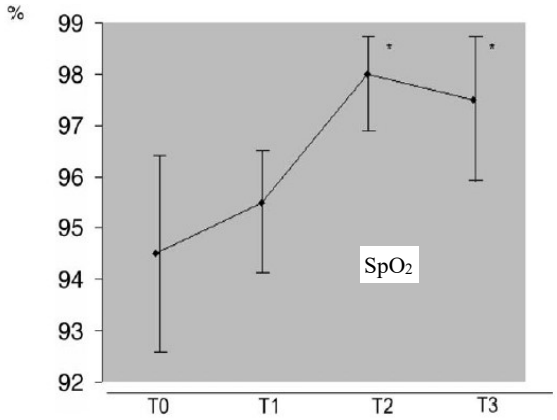
Table 3. Other Measurements From the 5 Hypersecretive Patients*

Measurement	IPV+ (n = 38 treatments)			IPV− (n = 37 treatments)		
	T0	T1	T2	T0	T1	T2
HR (beats/min)	107.8 ± 14	101.8 ± 12.1†	104.7 ± 14.2	107.5 ± 12.8	105.6 ± 10.9	103.4 ± 11.8
f (breaths/min)	23.7 ± 8.3	24 ± 9.4	23.5 ± 7.8	24.1 ± 8.7	24.9 ± 9.6	24.9 ± 9.6
S_{pO_2} (%)	97.4 ± 1.8	97 ± 1.5	97 ± 1.4	96.9 ± 1.6	96.7 ± 1.4	96.9 ± 1.6
P_{ETCO_2} (mm Hg)	28.7 ± 7.9	27.7 ± 7.5	28.1 ± 7.9	28.1 ± 8.5	28.5 ± 7.8	28.0 ± 7.7
R_{aw} (mm Hg/s/L)	4.7 ± 1.6	3.9 ± 1.6†	4.0 ± 1.6	4.4 ± 1.8	4.4 ± 1.7	4.1 ± 1.6
PEF (L/min)	55.3 ± 23.4	60.7 ± 22.9†	65.1 ± 22.9	54.9 ± 24.5	59.6 ± 23.8†	59.3 ± 22.4

There was no significant variation in SpO2, which indicates that the patients were stable for the duration of the study and that there was no obvious interaction between the 2 sequences.

Toussaint et al. *Respir Care*, 2003

Efficacité de la kinésithérapie respiratoire chez des enfants intubés ventilés atteints de bronchiolite aiguë



T0: baseline

T1: suction

T2: CP + suction

T3 :1h after T2

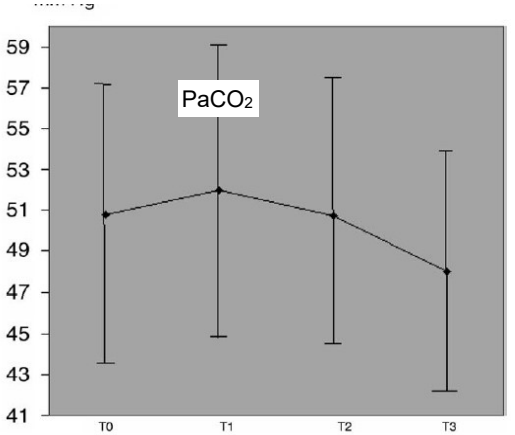


Tableau 3
Résultats des relevés aux différents temps

	T0 : relevé de base	T1 : aspiration simple	T2 : KR + aspiration	T3 : 1 h. après KR
SpO_2 (%)	94,5 ± 3,8	95,5 ± 9,9	98 ± 5,3 [a]	97,5 ± 10,5 [a]
$TcPCO_2$ (mm Hg)	50,9 ± 12	52 ± 13	50,7 ± 13	48 ± 13
VTI (ml)	55,4 ± 16	59,6 ± 17	66,3 ± 19 [a]	63,6 ± 20 [a]
VTE (ml)	53,15 ± 16	59,1 ± 17	66,1 ± 20 [a]	62,3 ± 21 [a]

[a] $p < 0,05$ (comparaison à la valeur T0).

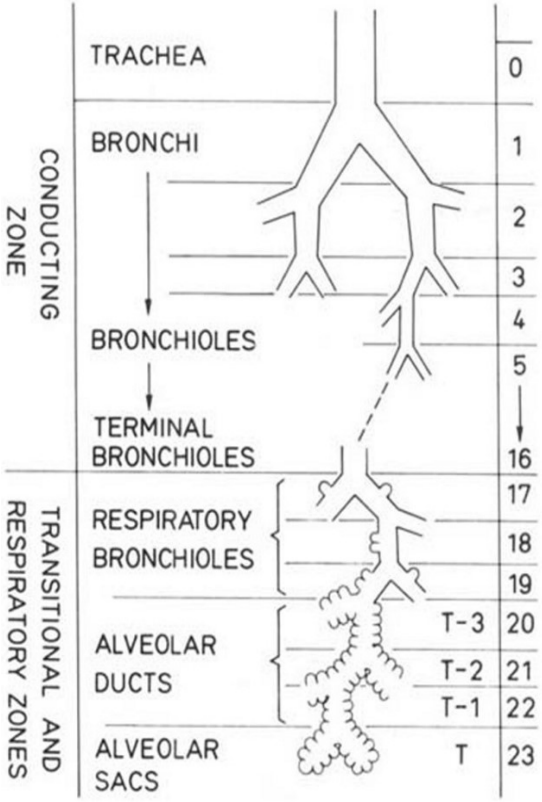
Bernard-Narbonne et al. *Arch Pediatr*. 2003

Simples à mettre en place (SpO_2)
Fiabilité
Moment d'évaluation
Désencombrement Espace mort
Consensus niveau SpO_2

Table 15-1 SUMMARY OF OBSERVATIONAL STUDIES SHOWING THE POTENTIAL BENEFITS OF LOWER SPO_2 TARGETING

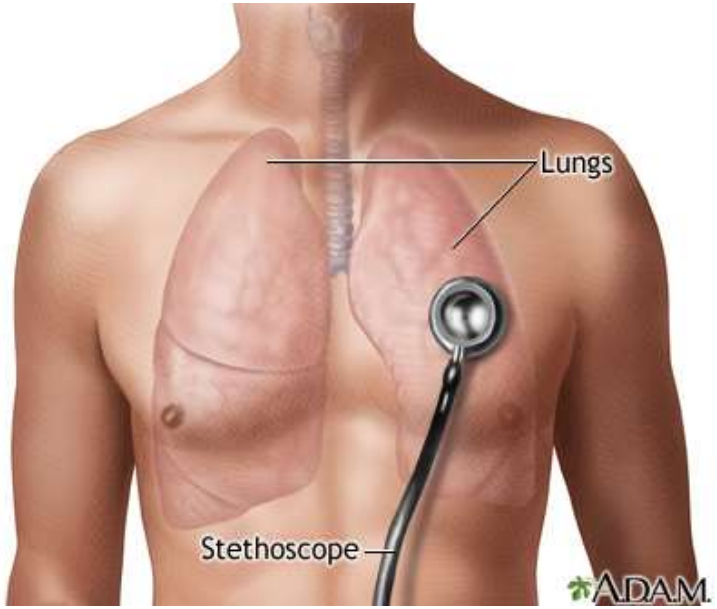
Reference	Study Group	SpO_2 Ranges Compared	Survival	Chronic Lung Disease	ROP (stage 3-4)	ROP (treatment)
Tin et al, 2001[104]	≤27 weeks	Low: 80-90% High: 94-98%	53% 52%	18% 46% $P < 0.01$		6% 27% $P < 0.01$
Sun, 2002[105]	≤1500 g	Low: ≤95% High: >95%	83% 76%	27% 53% $P < 0.01$	10% 29% $P < 0.01$	4% 12% $P < 0.01$
Chow et al, 2003[106]	500-1500 g	Low: 85-93% High: 90-98 %	88% 81%		2.5% 12.5% $P < 0.01$	0-1.3% 4.4% $P < 0.01$
Anderson et al, 2004[107]	≤1500 g, >2 weeks old	Low: ≤92% High: >92%			2.4% 5.5% $P < 0.01$	1.3% 3.3% $P < 0.01$

ROP, retinopathy of prematurity.



Bancalari et al. *Elsevier*, 2012

Auscultation



Désencombrement

↘ sécrétions

↗ territoires ventilés

↘ Bruits respiratoires

↗ murmures vésiculaires

The Addition of Mechanical Insufflation/Exsufflation Shortens Airway-Clearance Sessions in Neuromuscular Patients With Chest Infection

Auscultation. Air entry was evaluated before and after treatments via auscultation while on NIV. All auscultation was verified by a physiotherapist blinded to the intervention. The physiotherapist has worked as a respiratory physiotherapist for more than 10 years and has worked with ventilated adults and children for more than 9 years. Air entry was compared right to left in the upper, middle, and lower zones. If any added sounds were present, these were recorded and classified as wheeze or crackles: one point was given to decreased air entry in one of the 6 areas auscultated, and one point for crackles. A maximum of 12 points indicated very poor air entry, with a large volume of sputum present. A low score indicated good air entry, with no secretions.

- → Auscultation is the best marker of air entry and the presence of secretions;
- → In this study, auscultation assessment was made by a highly experienced respiratory physiotherapist;
- → They recognize that such experience may not be available in all centers.

Chatwin et al., *Respir Care*,2009

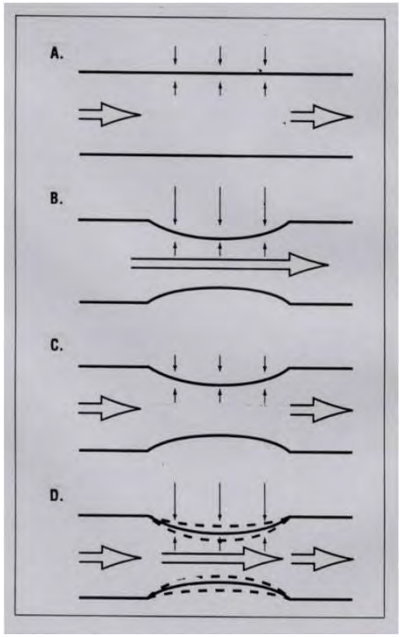


Table 5. Session Results on Wang Clinical Severity Score*

	Percent Change T0 to T30			Percent Change T0 to T150		
	Control	New CPT Method	*P*	Control	New CPT Method	*P*
Wang clinical severity score	13.3	−22.5	.004	−8.6	−3.2	.47
Wheezing	1.1	−60.7	.001	−12.2	−20.8	.62
Respiratory rate	31.5	0	.11	3.9	11.5	.60
Retraction	3.3	−16.7	.18	−16.7	11.7	.19
General condition	NA	NA	NA	NA	NA	NA
S_{pO_2} (%)	−0.7	−0.66	.98	−0.13	1.2	.36
Heart rate (beats/min)	5.2	−4.7	.02	2.5	−1.66	.34

* Positive values indicate worsening of clinical condition. Negative values indicate improvement of clinical condition.
CPT = chest physiotherapy
NA = not applicable

Postiaux et al., Respir Care, 2011

Table 1. Levels of Experience According to the National Health Service Agenda for Change Pay Grades

Pay Grade	Job Title
Band 5	Physiotherapist
Band 6	Specialist Physiotherapist
Band 7	Highly Specialist Physiotherapist
Band 8a	Clinical Specialist Physiotherapist
Band 8c	Consultant Physiotherapist

Table 1. L
S

Pay Grade
Band 5
Band 6
Band 7
Band 8a
Band 8c

Table 6. Levels of Agreement on Palpable Fremitus in All Lung Zones

Palpable Fremitus	Agreement Between ICU and Research Clinicians		
	%	Kappa (95% CI)	*P*
Upper zone			
Left	80.3	0.53 (0.31–0.74)	<.001
Right	93.0	0.84 (0.71–0.98)	<.001
Middle zone			
Left	93.0	0.63 (0.33–0.93)	<.001
Right	88.8	0.66 (0.45–0.88)	<.001
Lower zone			
Left	93.0	0.41 (−0.02 to 0.83)	<.001
Right	91.6	0.36 (−0.03 to 0.75)	<.001

Table 2. Standardized Terminology for Breath Sounds, Abnormal and Adventitious Lung Sounds Used by the Research and ICU Clinician During Their Assessment of the 6 Lung Zones

Breath sound
Present
Absent
Abnormal and adventitious lung sounds
Inspiratory wheeze (present/absent)
Expiratory wheeze (present/absent)
Inspiratory crackle (present/absent)
Expiratory crackle (present/absent)
Bronchial breathing (present/absent)
Pleural rub (present/absent)

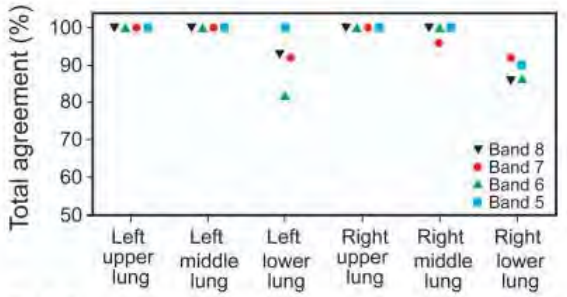


Fig. 1. Percentage agreements between the research clinician and ICU clinicians, of variable experience, on the presence or absence of breath sounds during auscultation in all lung zones.

Berry et al. *Respir Care*, 2016

Echelles & questionnaires

Echelles | Questionnaires | Confort

Techniques de désencombrement

Compliance

Evolution

Dyspnée

Adhérence

Préférence

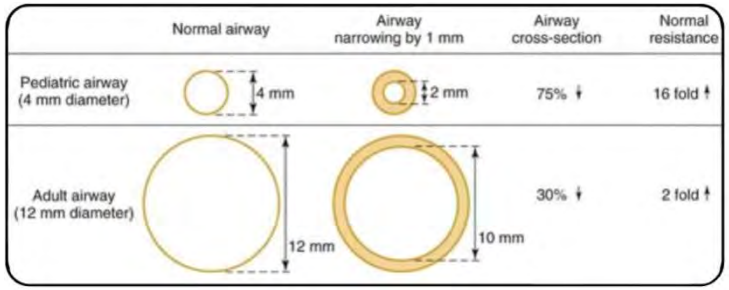
Anxiété patient

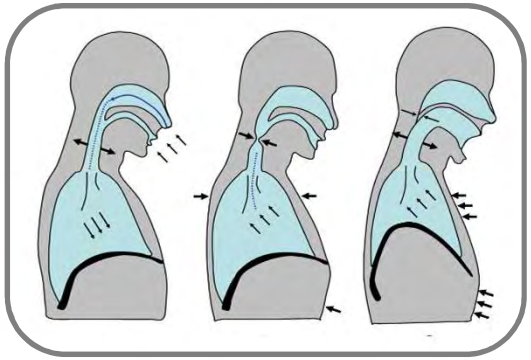
Toux

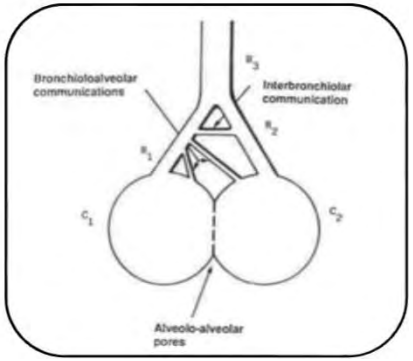
Confort

Qualité de vie

Fonction respiratoire


Normal airway
Airway narrowing by 1 mm
Airway cross-section
Normal resistance
Pediatric airway (4 mm diameter)
4 mm
2 mm
75%
16 fold
Adult airway (12 mm diameter)
12 mm
10 mm
30%
2 fold




Bronchiolo-alveolar communications
Interbronchiolar communication
Alveolo-alveolar pores

Chest physiotherapy compared to no chest physiotherapy for cystic fibrosis (Review)

THE COCHRANE COLLABORATION®

A randomised crossover trial of chest physiotherapy in non-cystic fibrosis bronchiectasis

Primary outcomes measures

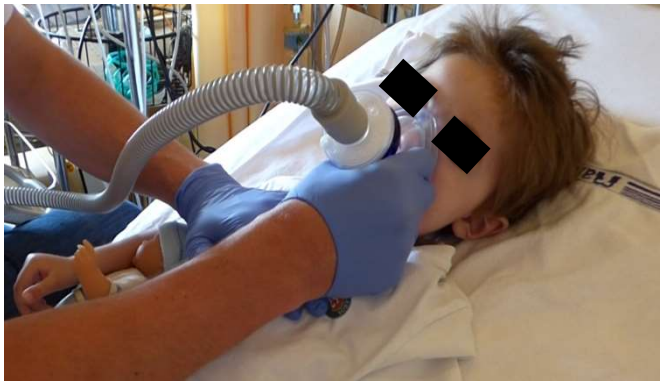
- Pulmonary function tests
  - forced expiratory volume in one second (FEV1)
  - forced vital capacity (FVC)
  - forced expiratory flow between 25% and 75% expired FVC (FEF25−75) dem 25-75

Secondary outcomes

- Total lung capacity (TLC) and functional residual capacity (FRC)
- Maximum inspiratory pressure(MIP)
- Maximum expiratory pressure (MEP)

&

- Peak Cough Flow
- Resistance
- Ventilators parameters



Murray et al. *ERJ Express*, 2009
Warnock and Gates, *Cochrane Database Syst Rev*, 2012

Mucociliary clearance techniques for treating non-cystic fibrosis bronchiectasis: Is there evidence?

Snijders, *Int J immunopath* , 2015

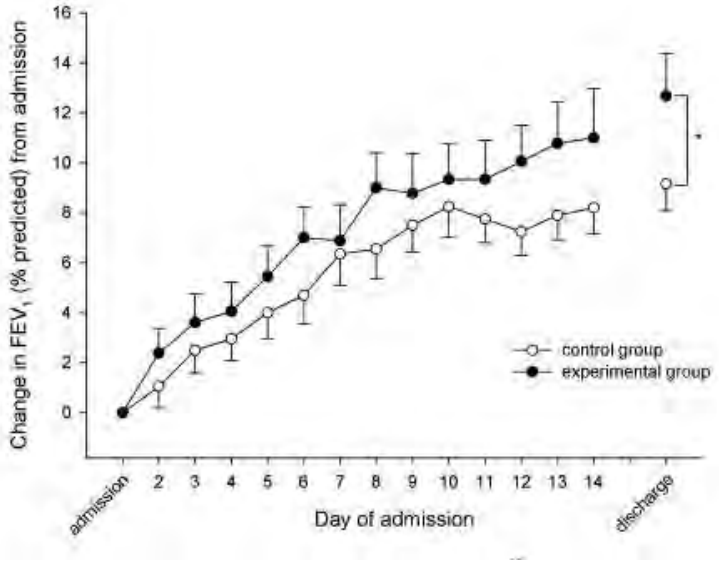


Table 2 Pulmonary function at baseline, post exercise and post-physiotherapy in 12 participants with CF

	Bicycle	Trampoline	Billard
FVC (l)			
Baseline	3.13±0.88	2.98±0.77	3.10±0.83
Post exercise	3.12±0.83	3.01±0.77	3.08±0.81
Post-physiotherapy	3.14±0.82	3.07±0.76	3.13±0.82
FEV_1 (l)			
Baseline	2.39±0.71	2.22±0.66	2.30±0.68
Post exercise	2.34±0.74	2.23±0.66	2.29±0.67
Post-physiotherapy	2.36±0.66	2.27±0.65	2.30±0.65

Data are mean ± SD. FVC denotes forced vital capacity, FEV_1 denotes forced expiratory volume in 1 s

Short-Term Effect of Different Physical Exercises and Physiotherapy Combinations on Sputum Expectoration, Oxygen Saturation, and Lung Function in Young Patients with Cystic Fibrosis

Kriemler, *Lung*, 2016

Comparison of Three Cough-Augmentation Techniques in Neuromuscular Patients: Mechanical Insufflation Combined with Manually Assisted Cough, Insufflation-Exsufflation Alone and Insufflation-Exsufflation Combined with Manually Assisted Cough

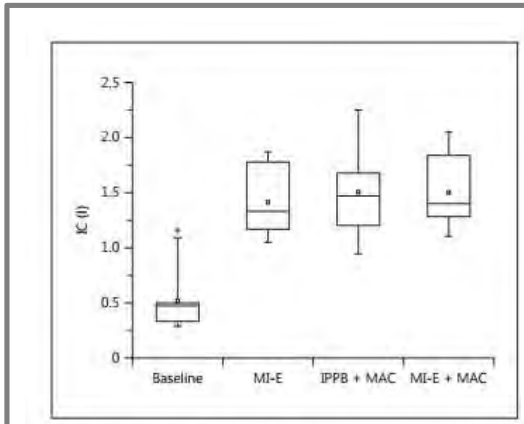


Fig. 1. IC at baseline and with the three cough-assist techniques: MI-E, IPPB + MAC and MI-E + MAC. The boxplots indicate the 25th percentile, the median and the 75th percentile, and the whiskers indicate the 5th and 95th percentiles. Means are represented by small squares. Friedman test, $p < 0.0001$. $^{+}$ Different from the other conditions, Wilcoxon test.

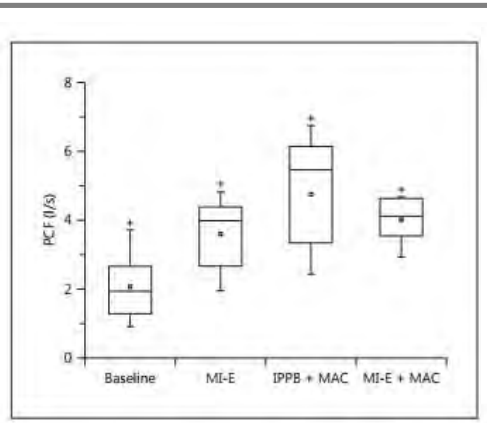


Fig. 2. PCF at baseline and with the three cough-assist techniques: MI-E, IPPB + MAC and MI-E + MAC. The boxplots indicate the 25th percentile, the median and the 75th percentile, and the whiskers indicate the 5th and 95th percentiles. Means are represented by small squares. Friedman test, $p < 0.0002$. $^{+}$ Different from the other conditions, Wilcoxon test.

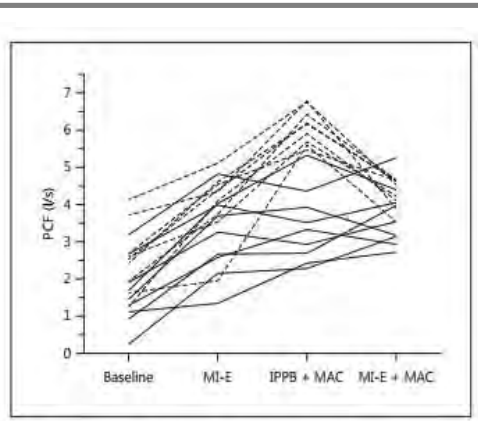


Fig. 6. Individual PCF values with the three cough-assist techniques: MI-E, IPPB + MAC and MI-E + MAC. The dotted lines represent patients in whom facemask pressure became transiently positive during mechanical exsufflation due to the flow induced by the combined patient cough effort and MAC.

Lacombe et al., *Respiration,* 2014

Table 4. The median (IQR) before and after suction lung function parameters for patients who experienced an increase in dynamic compliance following suction (n = 17).

	Before suction	After suction	p value
Dynamic compliance (ml/cmH_2O/kg)	0.54 (0.44–0.75)	0.55 (0.47–0.84)	< 0.001*
Inspiratory dynamic resistance (cmH_2O/l/s)	40.4 (27.2–69.3)	39.0 (24.6–69.0)	0.03*
Expiratory dynamic resistance (cmH_2O/l/s)	65.6 (33.1–98.8)	66.1 (35.4–103.0)	0.42
% Tracheal tube leak	2.3 (–3.1–10.34)	3.5 (0–10.5)	0.41
Total respiratory rate (breaths per minute)	59.5 (43–71)	62 (40.5–74.5)	0.23
Spontaneous expired tidal volume (ml/kg)	2.1 (0.8–3.7)	2.6 (0.8–3.5)	0.93
Mechanical expired tidal volume (ml/kg)	6.19 (4.78–7.80)	6.22 (4.79–8.31)	0.03*
Total minute volume (l/kg)	0.24 (0.21–0.3)	0.28 (0.23–0.35)	< 0.001*

*$p < 0.05$

Morrow et al. *Aust J Physiother*. 2006

Effects of sputum on pulmonary function

G M COCHRANE, B A WEBBER, S W CLARKE

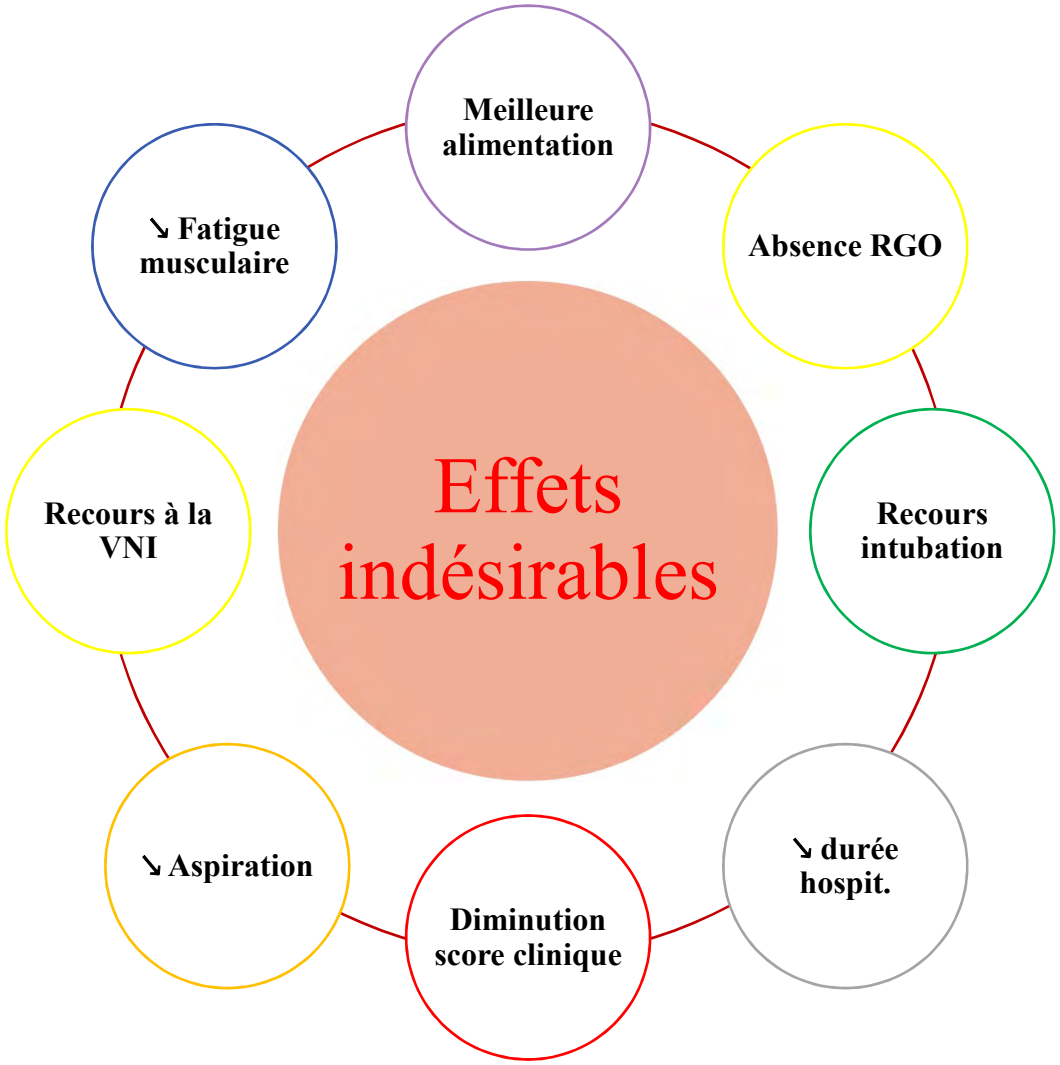
British Medical Journal, 1977, **2**, 1181-1183

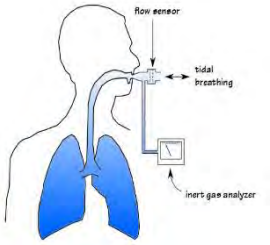
Summary

The specific airways conductance (SGAW) of 23 patients with copious sputum production and airflow obstruction was measured before and after physiotherapy to determine the effect of bronchial secretions on pulmonary function. Chest physiotherapy to remove these secretions had the effect of reducing airflow obstruction, as measured by SGAW.

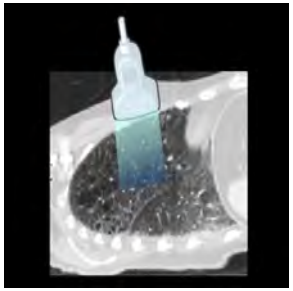
These findings suggest that sputum has a detrimental effect on pulmonary function and that physiotherapy can reduce airways obstruction.

Cochrane et al. BMJ 1977


Effets indésirables
Meilleure alimentation
Absence RGO
Recours intubation
↘ durée hospit.
Diminution score clinique
↘ Aspiration
Recours à la VNI
↘ Fatigue musculaire



Lung Clearance Index



Echographie

Impédancemétrie

Simulation

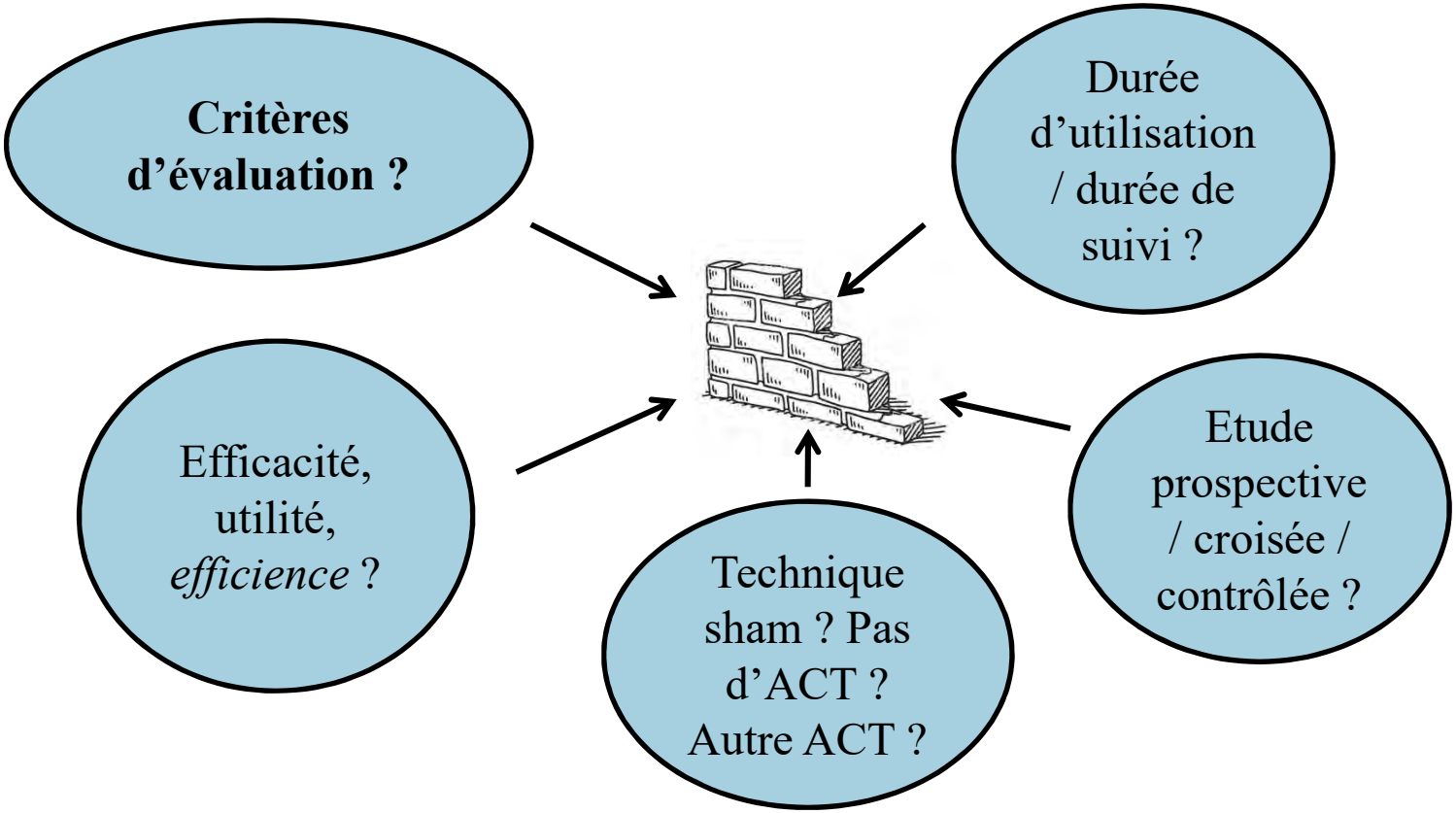

EXPERIENCE


60
98
108
84
70


Sibelmed

Comment évaluer l’efficacité des techniques de désencombrement au long cours ?

Réflexions à mener



Quels critères ? (CF)

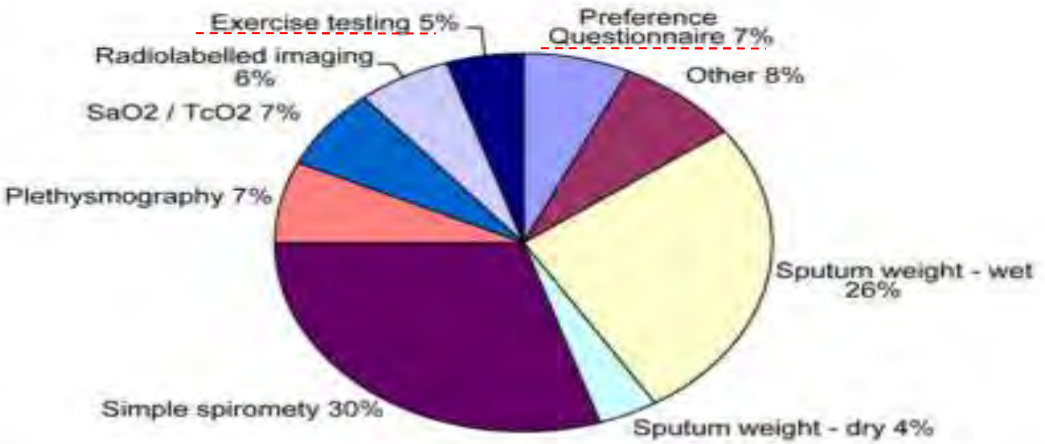


Figure 1 Frequency of outcome measures in 40 studies of ACT in CF. (Adapted from Prasad and Main[12].)

Homnick, *Paediatr Respir Rev*, 2007

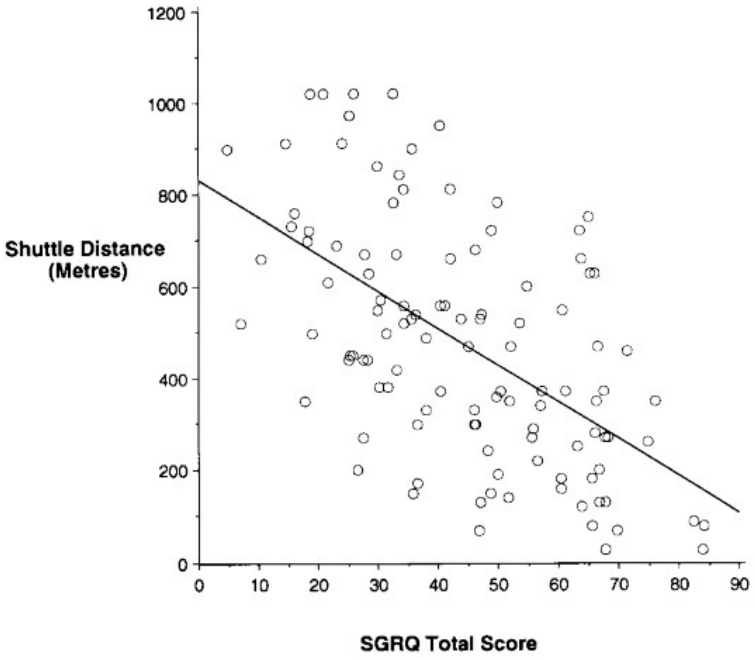
Quels critères ? (Patients hospitalisés hors CF)

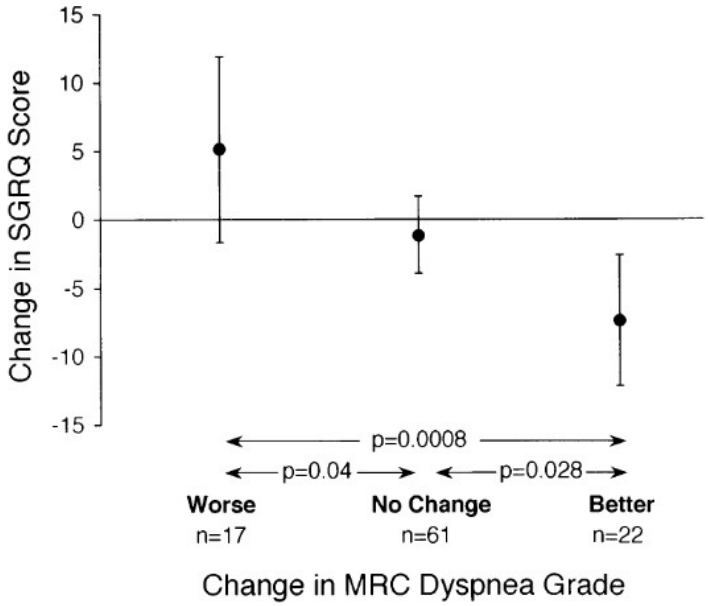
Table 7. Numbers of Studies Reporting Key Outcomes, by Quality Rating

Outcome	Number of Studies		
	Good Studies	Fair Studies	Poor Studies
Stay	2	9	5
Pulmonary function	1	3	11
Sputum weight/volume	1	2	8
Oxygenation	2	4	4
Gas exchange	0	5	3
Pulmonary complications	1	2	4
Duration of ventilation	1	4	0
Heart rate	0	1	4
Dyspnea	1	0	3
Harms of airway clearance techniques	0	1	2
Mean arterial pressure	1	1	1
Breathing frequency	0	1	3
Exercise tolerance	0	0	2
Quality of life	0	0	2
Need for ventilation	1	3	0
Hospital readmission (time to exacerbation)	1	1	1
Total	12	37	53

Andrews et al., *Resp Care*, 2013

Qualité de vie





Wilson et al., *Am J Respir Crit Care Med*, 1997

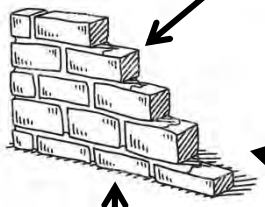
Suivi au long terme

- **Qualité de vie** (SGRQ, CFQ-R, LCQ …)
- **Préférences du patient** (auto-questionnaires, fatigabilité, flexibilité …)
- Exacerbations / Hospitalisations
- Tolérance à l'exercice (6MWT, ISWT …)
- Coûts

Quelques questions

Critères d'évaluation ?

Durée d'utilisation / durée de suivi ?



Efficacité, utilité, *efficience* ?

Etude prospective / croisée / contrôlée ?

Technique sham ? Pas d'ACT ? Autre ACT ?

ACT en cours d'exacerbation

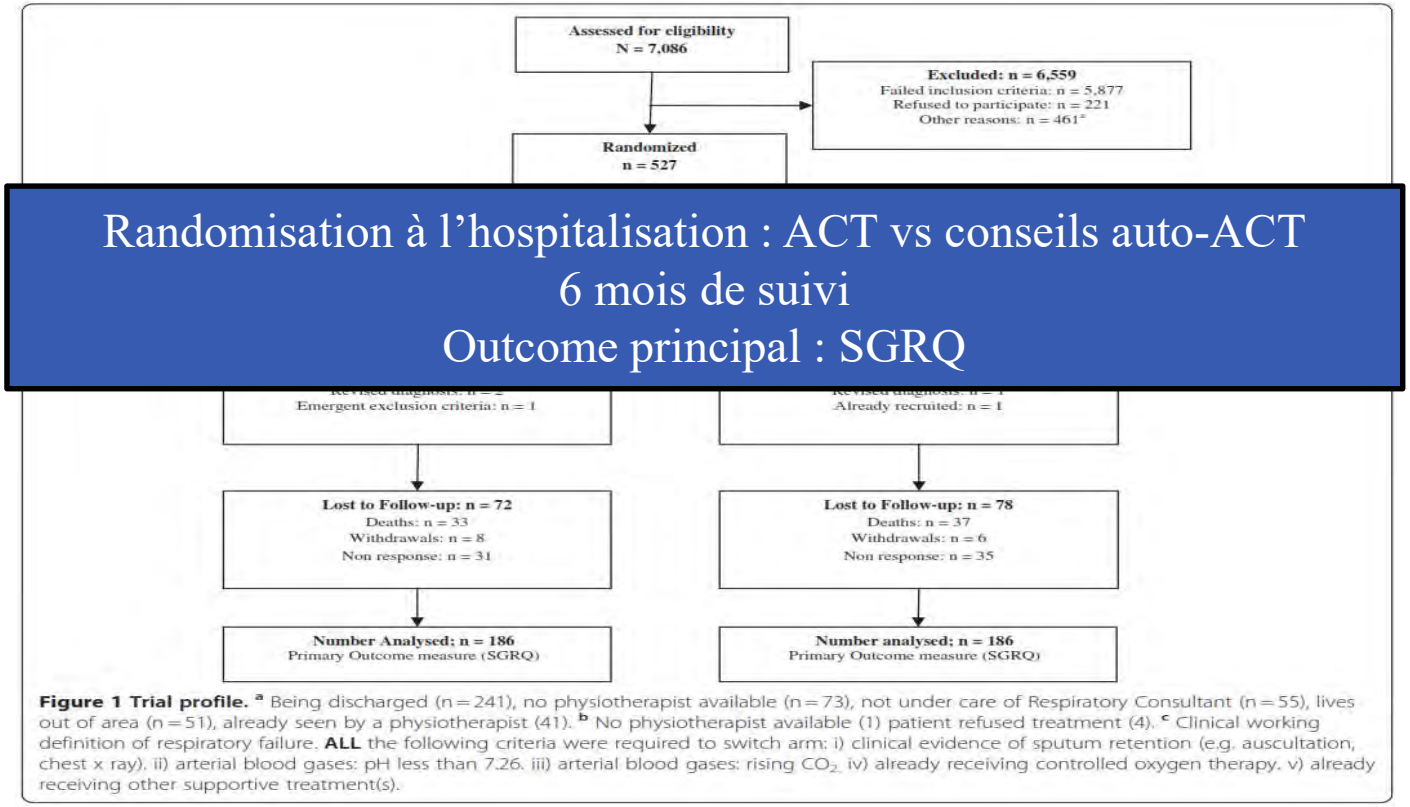


Figure 1 Trial profile. [a] Being discharged (n = 241), no physiotherapist available (n = 73), not under care of Respiratory Consultant (n = 55), lives out of area (n = 51), already seen by a physiotherapist (41). [b] No physiotherapist available (1) patient refused treatment (4). [c] Clinical working definition of respiratory failure. **ALL** the following criteria were required to switch arm: i) clinical evidence of sputum retention (e.g. auscultation, chest x ray). ii) arterial blood gases: pH less than 7.26. iii) arterial blood gases: rising CO_2. iv) already receiving controlled oxygen therapy. v) already receiving other supportive treatment(s).

Randomisation à l'hospitalisation : ACT vs conseils auto-ACT
6 mois de suivi
Outcome principal : SGRQ

Cross et al., *BMC Pulm Med*, 2012

Qualité de vie

Table 3 Primary Outcome measure results

	MCP arm			No MCP arm			Unadjusted analysis no MCP versus MCP			Adjusted analysis [a] no MCP versus MCP		
	N	Mean	SD	N	Mean	SD	Mean difference	95% CI	*p*-value	Mean difference	95% CI	*p*-value
SGRQ -Total score	186	63.88	19.05	186	63.52	19.68	−0.36	−4.31,3.59	0.8573	0.51	−2.67,3.69	0.753
Effect size							−0.02	−0.22,0.19		0.03	−0.14,0.19	
SGRQ -Symptom score	186	68.38	23.13	186	68.40	23.01	0.02	−4.68,4.73	0.9925	0.87	−3.50,5.25	0.695
Effect size							0.00	−0.20,0.21		0.04	−0.15,0.23	
SGRQ -Activity score	188	82.49	18.81	187	80.91	19.74	−1.58	−5.50,2.34	0.4279	−0.36	−3.76,3.04	0.836
Effect size							−0.08	−0.29,0.12		−0.02	−0.20,0.16	
SGRQ -Impact score	188	51.53	22.58	187	51.60	22.50	0.07	−4.51,4.65	0.9752	0.43	−3.29,4.14	0.822
Effect size							0.00	−0.20,0.2		0.02	−0.15,0.18	

[a] difference adjusted to take into account baseline value and hospital site.

Cross et al., *BMC Pulm Med*, 2012

Outcomes fonctionnels

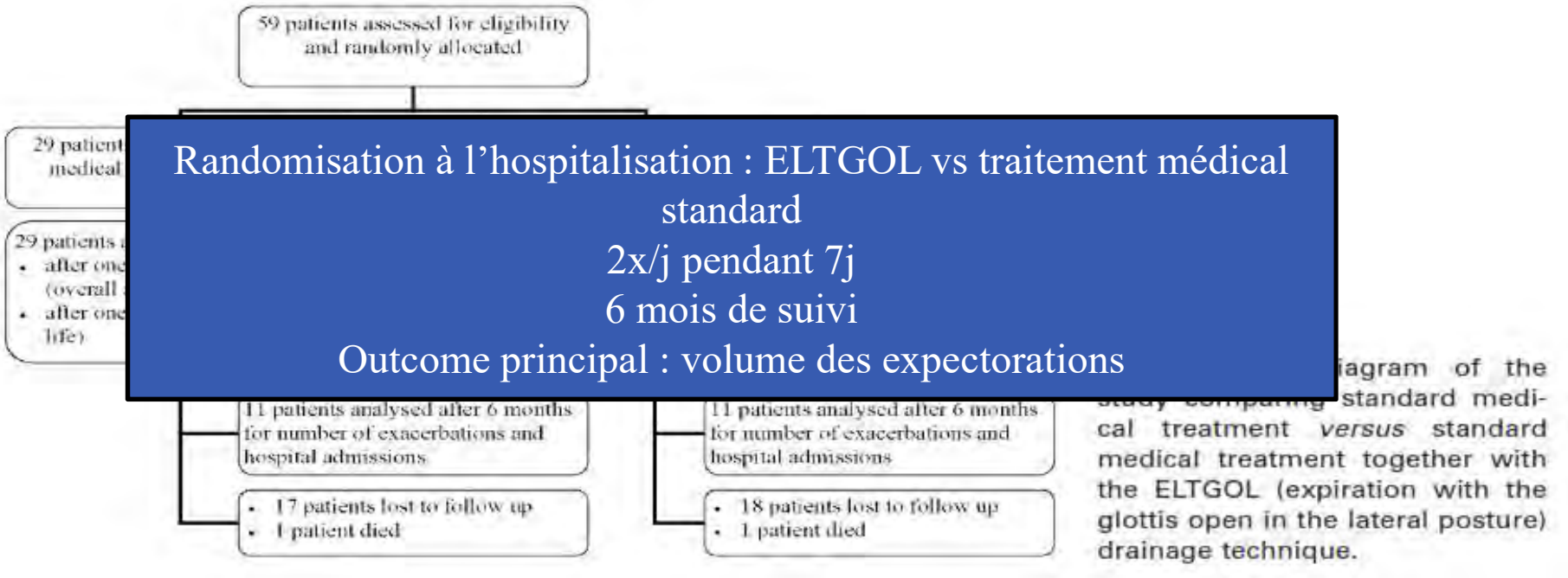
Table 4 Secondary Outcome Measures results

	MCP arm			No MCP arm			Unadjusted analysis no MCP - MCP			Adjusted analysis [a] no MCP - MCP		
	N	Mean	SD	N	Mean	SD	Mean difference	95% CI	*p*-value	Mean difference	95% CI	*p*-value
BCSS	175	5.60	2.96	179	5.66	2.84	0.06	−0.55,0.66	0.8577	0.01	−0.54,0.56	0.978
Days in hospital [b]	258	15.95	16.49	264	16.98	18.04				1.07 [c]	0.91,1.24	0.4209
EQ-VAS	167	51.29	20.97	173	52.25	19.65	0.96	−3.37,5.29	0.6630	2.65	−2.35,7.65	0.297
EQ-5D Score	209	0.48	0.33	207	0.45	0.35	−0.03	−0.10,0.04	0.3720	−0.01	−0.07,0.06	0.886

[a] difference adjusted to take into account baseline value and hospital site.
[b] analysed with a negative binomial regression model.
[c] Incidence Rate Ratio (IRR).

Cross et al., *BMC Pulm Med*, 2012

ELTGOL en exacerbation



Randomisation à l'hospitalisation : ELTGOL vs traitement médical standard
2x/j pendant 7j
6 mois de suivi
Outcome principal : volume des expectorations

iagram of the standard medi-cal treatment *versus* standard medical treatment together with the ELTGOL (expiration with the glottis open in the lateral posture) drainage technique.

Kodric et al., *Respirology*, 2009

Réadmissions et réexacerbations ?

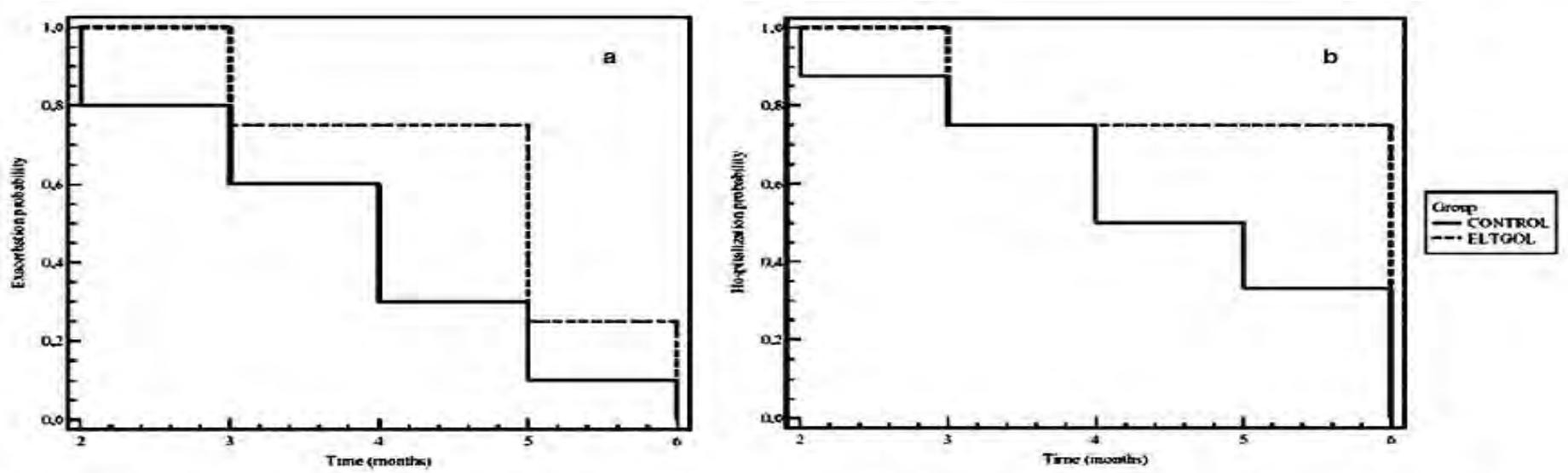
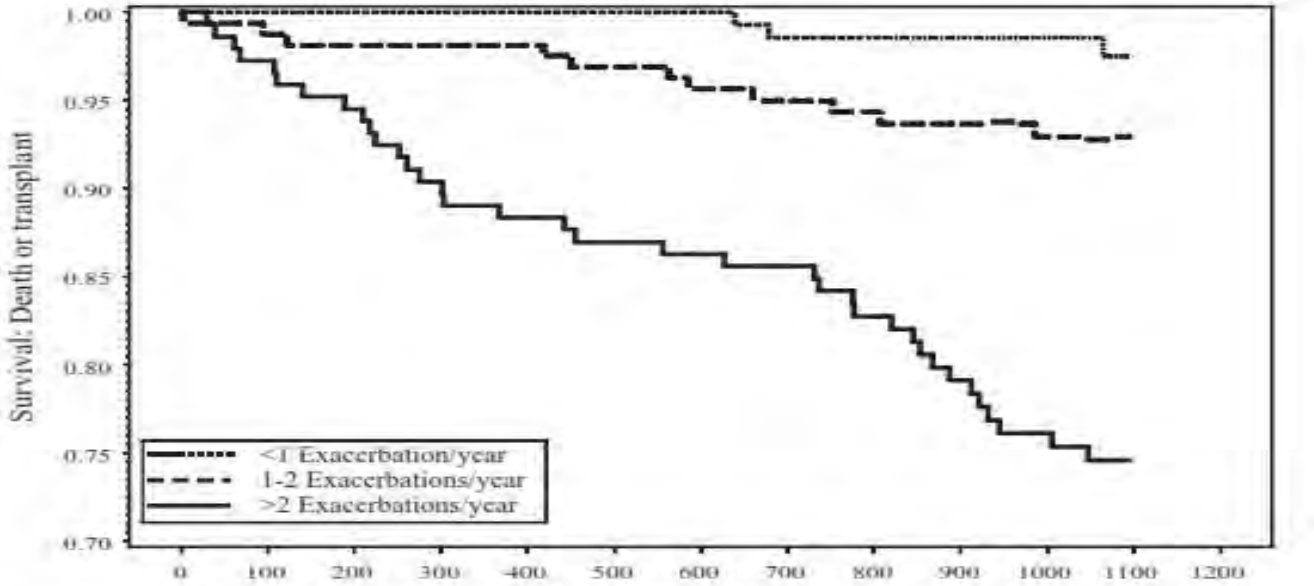


Figure 3 Survival curve (time-to-event) analysis for exacerbation (a) and hospitalization (b) for the two groups.

Kodric et al., *Respirology*, 2009

Changement de paradigme

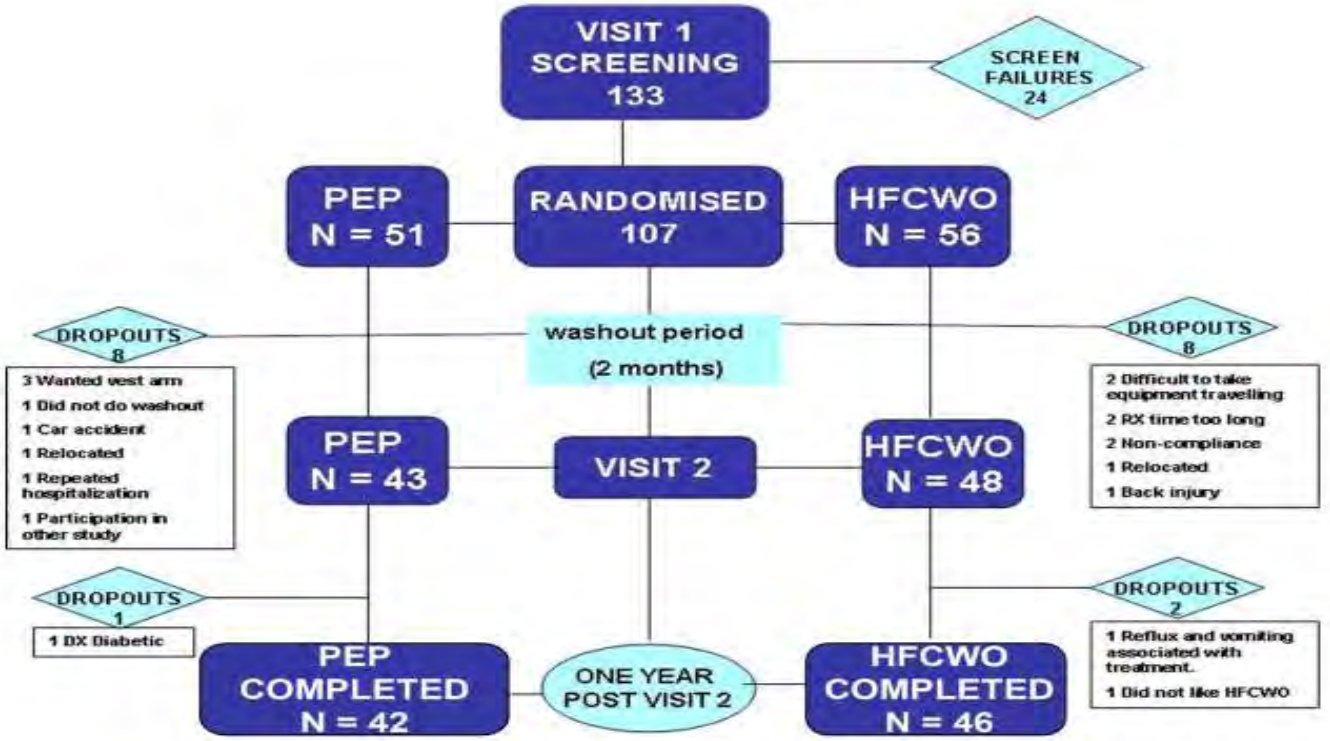


# at risk						
<1 /year	140	140	140	140	128	107
1-2 /year	160	157	157	152	141	122
>2 /year	146	138	129	125	116	100

De Boer et al., *Thorax*, 2011

Désencombrement bronchique régulier

Désencombrement
2x / j pendant 1 an



Mc Illwaine et al., *Thorax*, 2013

Exacerbations

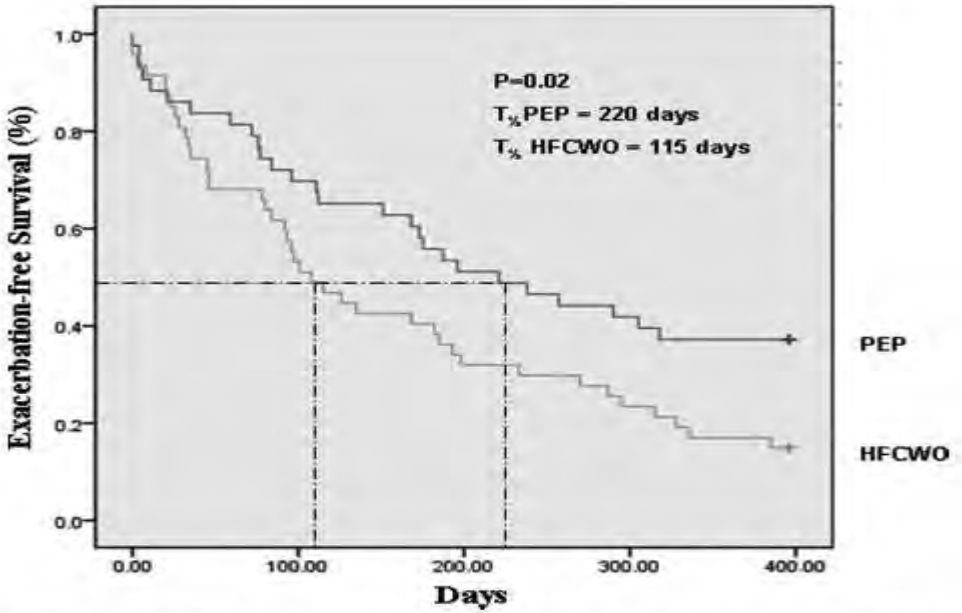


Figure 2 Kaplan–Meier plot of time to first pulmonary exacerbation (PE). $T_{½}$ refers to time when 50% of subjects have experienced their first PE. HFCWO, high frequency chest wall oscillation; PEP, positive expiratory pressure.

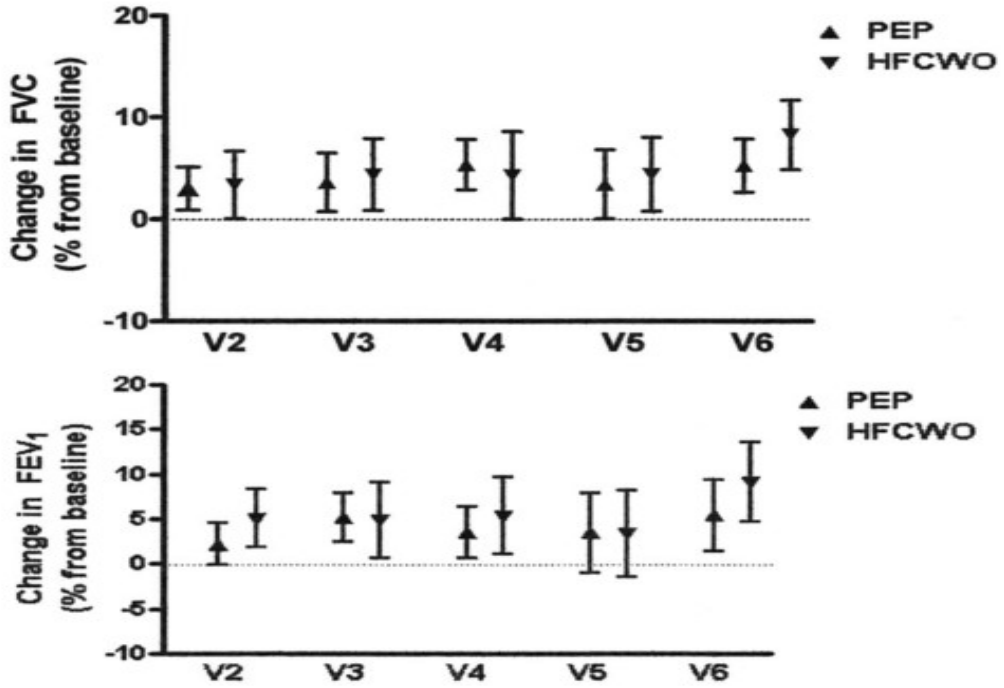
Table 2 Pulmonary exacerbations (PEs) reported for the two study groups

	PEP	HFCWO	p Value
Number of PEs requiring antibiotics	49 Median1.00 (0.00, 2.00)	96 Median 2.00 (1.00, 3.00)	0.007*
Number of PEs requiring intravenous antibiotics	6 Median 0.00 (0.00, 0.00)	19 Median 0.00 (0.00–1.00)	0.258
Median length in days of intravenous antibiotics per treatment	14.5 (13, 17)	14 (9.5, 15)	0.484
Number of PEs requiring oral/ inhaled antibiotics	43 Median 1.00 (0.00, 2.00)	77 Median 2.00 (1.00, 3.00)	0.025*

*Significantly different at the p=0.05 level.
Data are presented as median (25%, 75% percentiles)
HFCWO, high frequency chest wall oscillation; PEP, positive expiratory pressure.

Mc Illwaine et al., *Thorax*, 2013

Lien avec les volumes pulmonaires ?

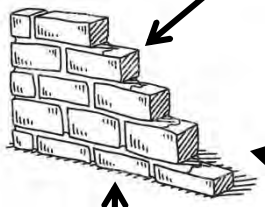


Mc Illwaine et al., *Thorax*, 2013

Quelques questions

Critères d'évaluation ?

Durée d'utilisation / durée de suivi ?



Efficacité, utilité, *efficience* ?

Etude prospective / croisée / contrôlée ?

Technique sham ? Pas d'ACT ? Autre ACT ?

RCT

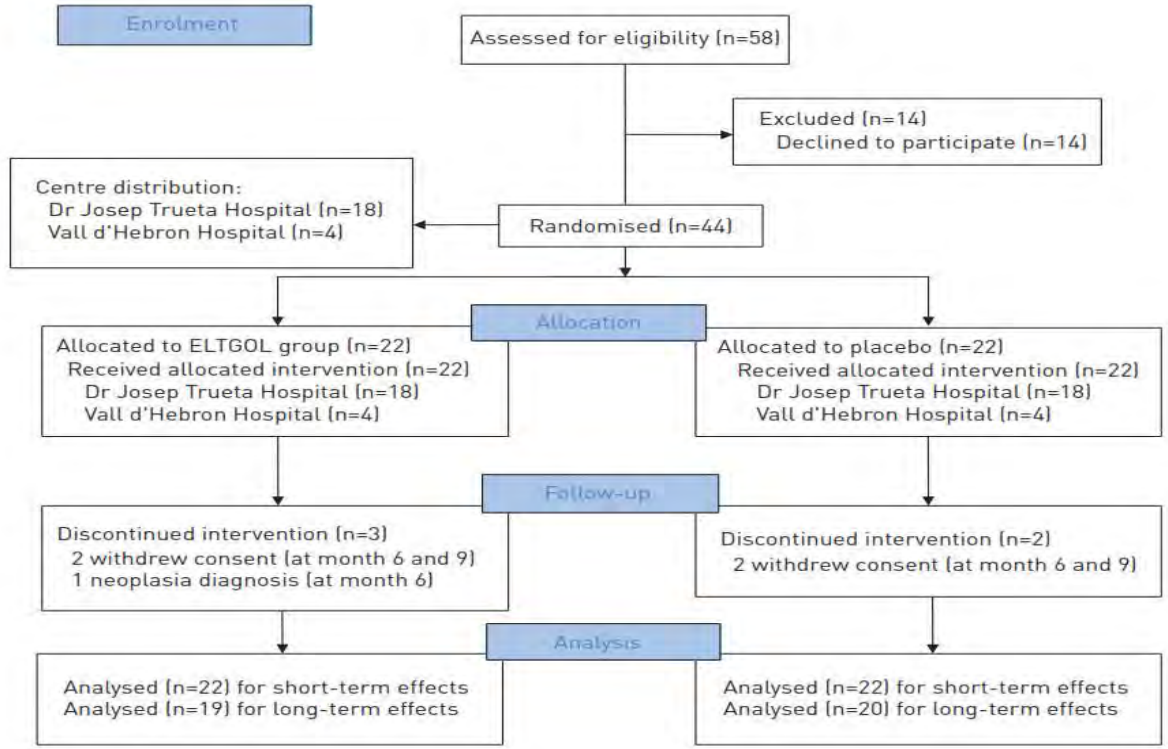


FIGURE 1 Trial profile.

Munoz et al., *Eur Respir J*, 2018

Volume de mucus

TABLE 2 Sputum volume obtained during the study

	Sputum volume mL		p-value
	ELTGOL group	Placebo group	
Baseline 24-h	20 (15–40)	15 (15–20)	0.061
Visit 2 overall 24-h	40 (23.75–60)	12.5 (0–20)	<0.001
During intervention	12.27±11.93	0	
24 h later	30 (20–45)	12.5 (0–20)	<0.001
Difference between visit 2 and baseline[+]	17.5 (10–26.25)	−5 (−11.25–0)	<0.001
Month 12 overall 24-h	35 (30–50)	15 (10–20)	<0.001
During intervention	10.83±5.21	0	
24 h later	25 (20–40)	15 (10–20)	0.001
Difference between month 12 and baseline[#]	10 (−5–25)	0 (−10–3.75)	0.015
Difference between month 12 and visit 2[¶]	−5 (−30–5)	5 (5–10)	0.019

Data are presented as mean±SD and median (interquartile range); differences are expressed as median (95% confidence interval). Unpaired t-test values of the differences in the overall 24-h sputum volume between visit 2 and baseline[+], month 12 and baseline[#], month 12 and visit 2[¶] in the ELTGOL group (p=0.001, p=0.026, p=0.09, respectively) and in the placebo group (p=0.008, p=0.106, p=0.261, respectively).

Munoz et al., *Eur Respir J*, 2018

Impact fonctionnel

TABLE 3 Quality of life, pulmonary function, dyspnoea scale, exercise capacity and inflammatory markers between the groups at the beginning and the end of the study

	ELTGOL			Placebo			p-value#
	Baseline	Month 12	Between-group differences	Baseline	Month 12	Between-group differences	
SGRQ total score	40.2±13.7	33.7±15.7	−6.8 (−15.1–1.5)+	35.0±9.9	47.6±12.8	11.4 (6.9–15.9)+	<0.001
LCQ total score	14.5±3.4	16.2±3.2	1.96 (0.2–3.8)+	15.7±2	13.7±2.1	−2 (−2.8– −1.2)+	<0.001
Exacerbations	2 (1–3.25)	1 (0–2)	−0.8 (−1.5– −0.1)¶	1(0.75–2.25)	2 (1–3)	0.35 (−0.5–0.35)¶	0.042
FEV_1% predicted	58.1±22.9	57.9±25	−0.4 (−3.5–2.8)+	64.6±21.1	61.3±21	−2.5 (−4.7– −0.2)+	0.262
FEV_1 L	1.6±0.8	1.6±0.8	−0.004 (−0.1–0.03)+	1.5±0.4	1.5±0.4	−0.1 (−0.2–0.004)+	0.407
mMRC	1 (0–1.25)	1 (0–1)	0 (−0.5–0)¶	1 (1–1.25)	1 (1–2)	0.5 (0–0.5)¶	0.127
6MWT m	417.8±67	423.5±84.9	2.3 (−16.7–21.2)+	382.9±76.9	377.8±57.3	−2.6 (−29.3–24.1)+	0.746
ESR mm	22.3±26.5	17.1±17.5	9 (7–23)+	25.5±22.3	23.9±17.6	24 (7.3–34.5)+	0.863
Leukocytes $\times 10^3\ \mu L^{-1}$	6.9±2	7.5±2	0.03 (−0.8–0.9)+	7.5±2.2	7.7±2.7	0.6 (−0.2–1.3)+	0.641
Neutrophils %	59.7±8.7	60±8.9	−1.6 (−6.6–3.3)+	58.5±8.4	57.9±12.1	−1.4 (−6–3.2)+	0.945
CRP $mg \cdot dL^{-1}$	0.7±0.9	1.7±2.7	0.7 (−0.7–2.2)+	0.6±0.5	0.7±0.6	0.06 (−0.3–0.4)+	0.619
Fibrinogen $mg \cdot dL^{-1}$	425.5±69	468.6±1000.5	43.9 (−31.3–119)+	449.6±930.5	492.6±125.2	59.3 (−13.8–132.3)+	0.756

Munoz et al., *Eur Respir J*, 2018

Crossover

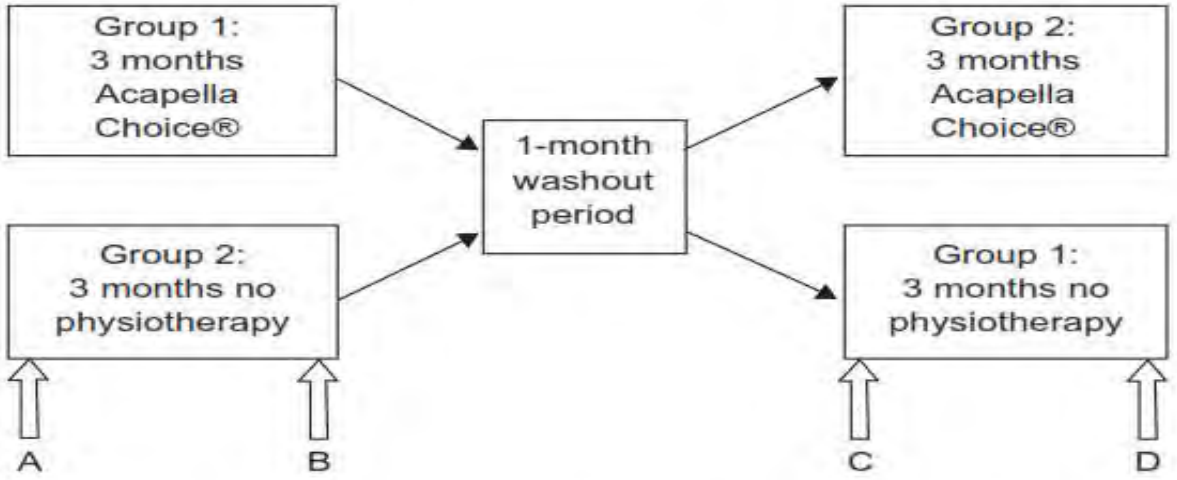


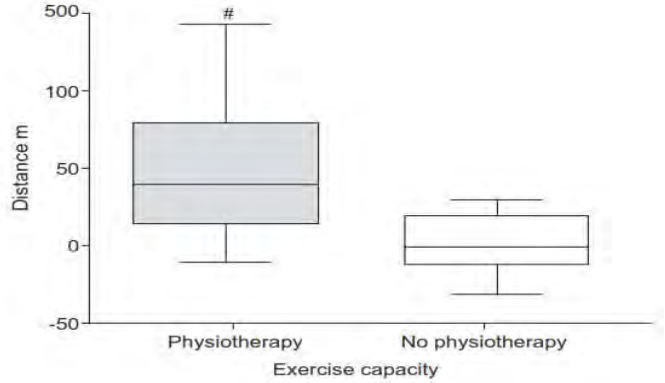
FIGURE 1. Study protocol. Assessments were performed at the start and end of each treatment period. A, B, C and D represent the assessment time-points. Acapella Choice®: Smiths Medical ASD Inc., Weston, MA, USA.

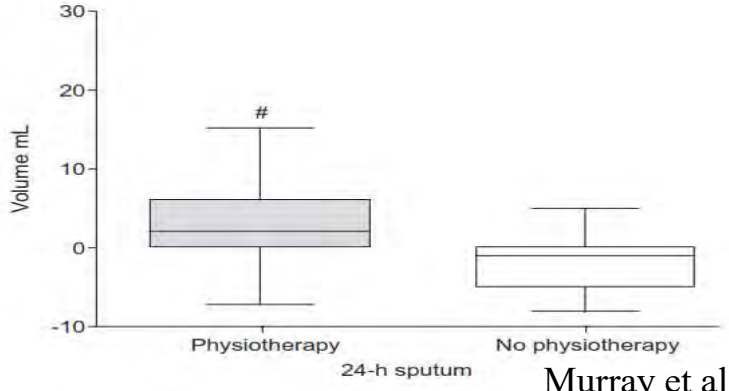
Murray et al., *Eur Respir J*, 2009

Résultats

TABLE 3 Treatment differences

Outcome	Twice daily physiotherapy	No regular physiotherapy	p-value
Total LCQ score improvement	1.3 (-0.17–3.25)	0 (-1.5–0.5)	0.002
24-h sputum volume mL	2 (0–6)	-1 (-5–0)	0.02
FEV_1 L	-0.01 (-0.06–0.08)	-0.01 (-0.1–0.11)	0.7
FVC L	-0.01 (-0.09–0.28)	0.06 (-0.08–0.21)	0.9
$FEF_{25-75\%}$ $L \cdot s^{-1}$	-0.02 (-0.17–0.16)	0.04 (-0.1–0.34)	0.6
MIP cmH_2O	-1 (-9–7)	5.5 (-10–12.5)	0.7
MEP cmH_2O	5 (-11–25)	8.5 (-3.7–19.7)	0.7
Exercise capacity m	40 (15–80)	0 (-10–20)	0.001
Sputum bacterial load $cfu \cdot mL^{-1}$	-1×10^3 (-2.78×10^6–1.74×10^7)	1×10^3 (-6.5×10^7–6.4×10^6)	0.72
Total SGRQ score improvement	7.8 (-0.99–14.5)	-0.7 (-2.3–0.05)	0.005
Exacerbations n	5	7	0.48





Murray et al., *Eur Respir J*, 2009

Spécificité liée au design

TABLE 2 Patient characteristics at entry to each study phase

Characteristic	Start of study#	End of washout period¶	p-value
Total LCQ score+	16.3 (14.1–17.9)	15.9 (13.8–19.4)	0.5
24-hr sputum volume mL	5 (1.25–15)	5 (1–13.1)	0.3
FEV_1 L	1.68 (1.25–2.31)	1.72 (1.19–2.10)	0.8
FEV_1 % pred	75.7 (48.3–98.1)	68.4 (53–107.1)	
FVC L	2.64 (1.9–3.65)	2.82 (1.75–3.5)	0.6
FVC % pred	79.5 (68.2–95.4)	81.6 (66.1–95.4)	
FEV_1/FVC	0.63 (0.57–0.77)	0.62 (0.56–0.82)	0.7
FEV_1/FVC % pred	87.1 (77.6–104.4)	97.0 (76.1–120)	
$FEF_{25–75\%}$ $L \cdot s^{-1}$	0.95 (0.64–1.54)	1.09 (0.54–1.84)	0.96
$FEF_{25–75\%}$ % pred	47.5 (21.9–64.8)	44.8 (24.8–96.4)	
MIP cmH_2O	43.5 (33.2–72.5)	48 (32.5–61.5)	0.2
MIP % pred	58.5 (37.2–77.2)	51.7 (31.1–63)	
MEP cmH_2O	68.5 (58.5–95.2)	67 (51–109)	0.3
MEP % pred	60.9 (41.9–83.4)	51.3 (38.3–55.7)	
Exercise capacity m	220 (120–405)	210 (137.5–357.5)	1.0
Sputum bacterial load $cfu \cdot mL^{-1}$	3.8×10^6 (3.9×10^5–3.8×10^7)	1.1×10^6 (1×10^3–1.1×10^8)	0.6
Total SGRQ score§	41.1 (24.6–44.8)	40.4 (18.0–52.5)	0.6

Murray et al., *Eur Respir J*, 2009

Inconvénient potentiel

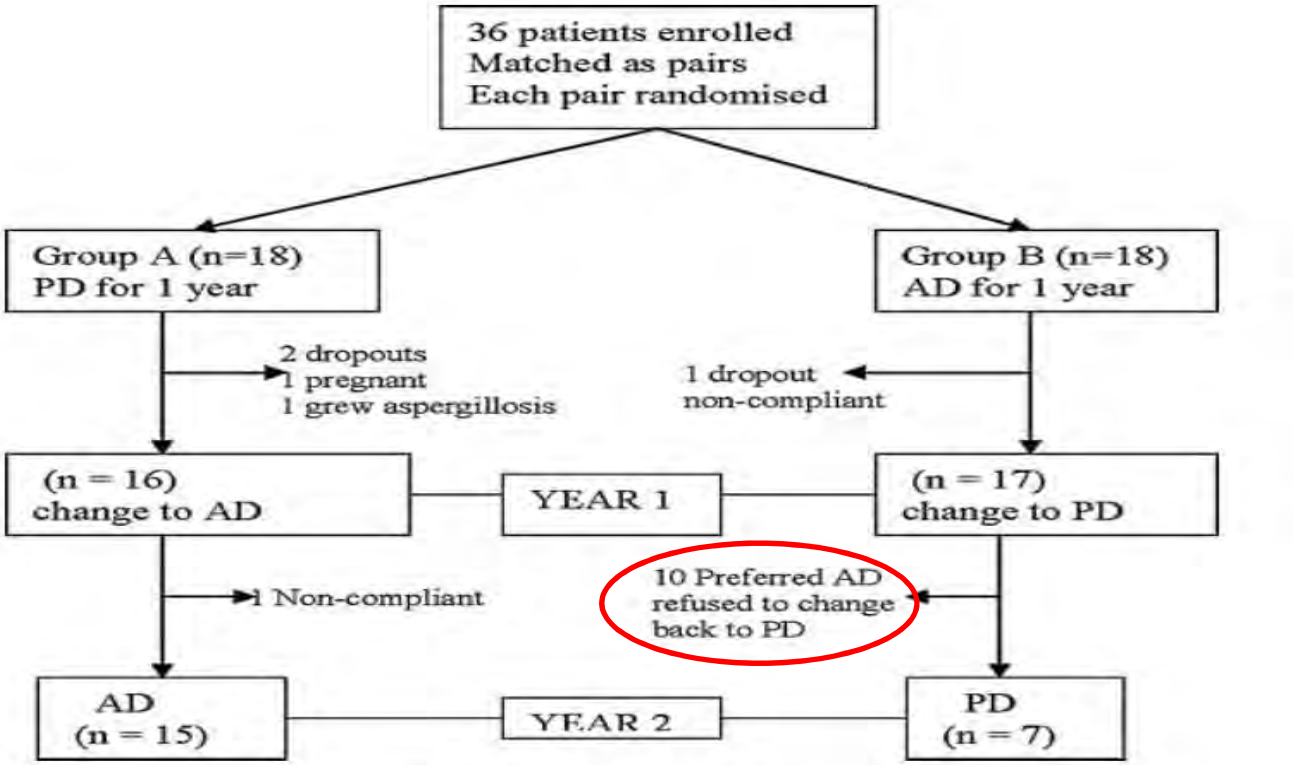


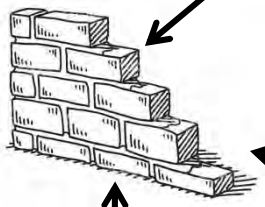
Fig. 1. Flow diagram of study.

Mc Illwaine et al., *Pediatr Pulmonol*, 2010

Quelques questions

Critères d'évaluation ?

Durée d'utilisation / durée de suivi ?



Efficacité, utilité, ***efficience ?***

Etude prospective / croisée / contrôlée ?

Technique sham ? Pas d'ACT ? Autre ACT ?

Limites du désencombrement bronchique

- Temps important
- « Coût élevé » (dispositifs, accessibilité…)
- Fatigue
- Compliance au traitement (51-74% enfants, 50% adolescence, 30% adultes)
- Perception du patient

Volsto, *Respir Care*, 2013

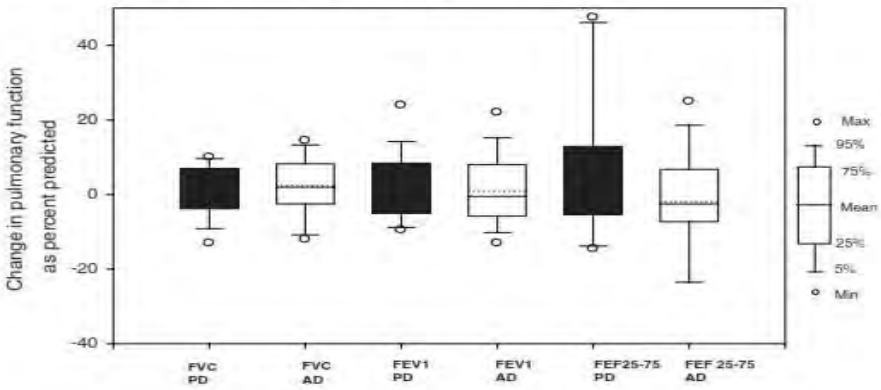
Préférences du patient

TABLE 3— Pulmonary Function Results for Year 1 Comparing Groups A and B

	Group A PD N = 16	Group B AD N = 17	Sig
FVC	0.47 ± 1.65	2.35 ± 1.87	NS
FEV_1	2.09 ± 2.20	0.97 ± 2.25	NS
$FEF_{25-75\%}$	5.63 ± 4.55	−1.91 ± 3.75	NS
Hospital admissions	1.00 ± 0.32	0.76 ± 0.18	NS
Shwachman score change	7.53 ± 9.01	3.12 ± 6.24	NS
Huang score change	−0.88 ± 4.86	2.32 ± 4.31	$P = 0.04$

Results are expressed as mean and standard deviation.

TABLE 2— Regression Slopes for Pulmonary Function for Year 1 Comparing PD to AD



Mc Illwaine et al., *Pediatr Pulmonol*, 2010

Temps de traitement

Table 3 Treatment time, comfort, flexibility and adherence in the two study groups

Self-reported measure	PEP	HFCWO	p Value
Treatment time (min)	20 (15, 20)	30 (20, 35)	<0.001
Comfort 1–5	5 (4, 5)	5 (4, 5)	0.474
Independence 1–5	4 (3, 5)	4 (3, 5)	0.427
Flexibility 1–5	5 (4, 5)	4 (3, 5)	<0.001
Mean number times per day	1.75	1.76	0.962
Mean number of misses per week	0.5	0.5	

Data are presented as median (25%, 75% percentiles).
HFCWO, high frequency chest wall oscillation; PEP, positive expiratory pressure.

Mc Illwaine et al., *Thorax*, 2013

Coût pour le patient et QDV

Table 4
Predictors of Higher Treatment Burden: Multivariate Linear Regression Results **

	Adjusted*	
Level of Activity	**Parameter**	**p**
≥2 nebulized medications	-9.61	.0024
≥2 inhaled medications		NS
≥3 oral medications		NS
≥30 minutes for ACT	-12.72	.0001

*Adjusted for age, gender, FEV1, adjusted R-squared = 0.198

**Using ≥2 inhaled medications and ≥3 oral medications were not significant predictors were dropped from the model during stepwise selection.

Sawicki et al., *J Cyst Fibros*, 2009

Take-Home messages

Take-Home messages

- Critères fonctionnels objectifs (et subjectivité du patient)
- Prise en compte des limites (coût, temps …)
- Spécificités liées à la pathologie
- Temps d'administration du traitement & design


Merci de votre attention
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