Quand les mains du kinésithérapeute ne suffisent plus : quels appareils et quand ?

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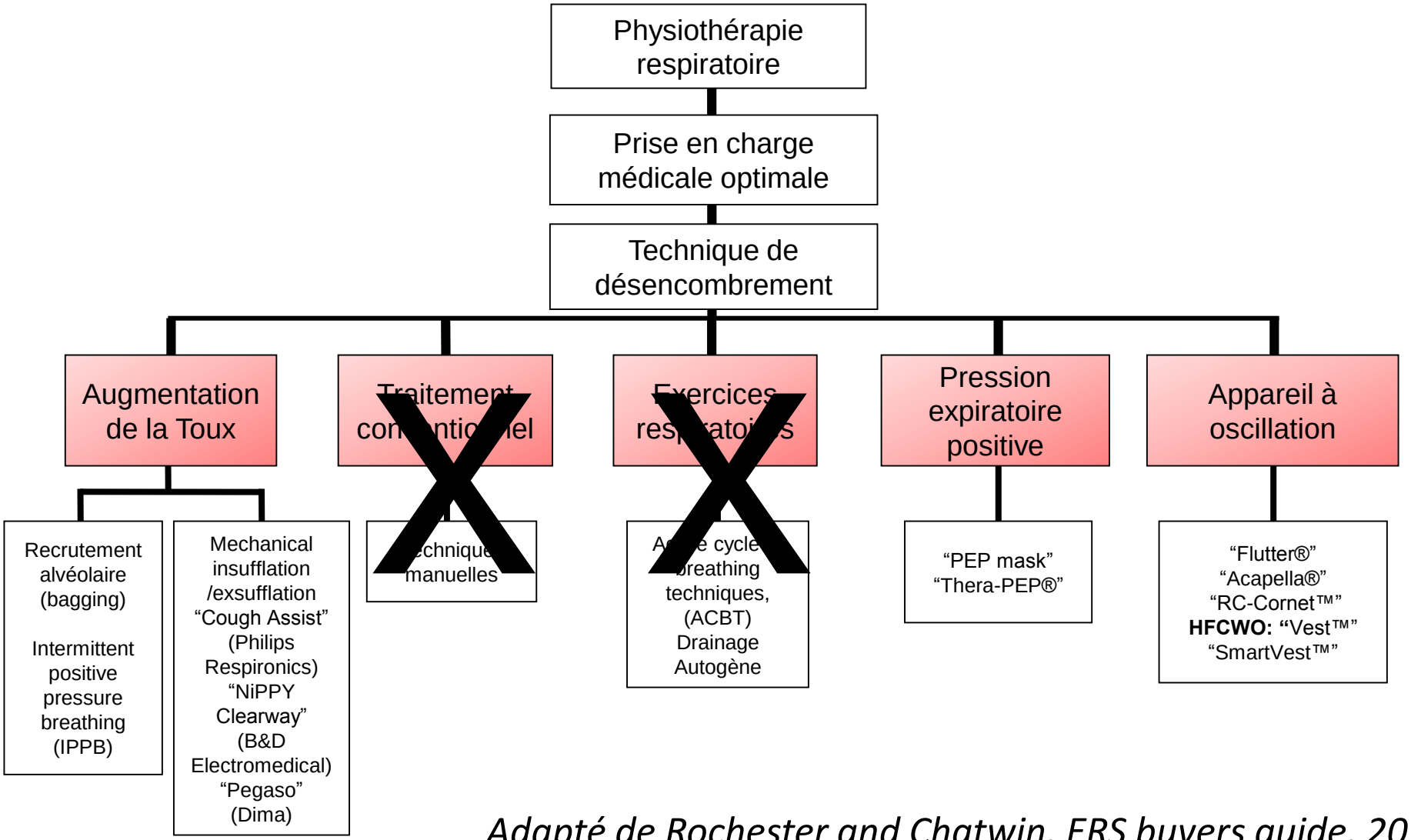
Méthodes de désencombrement

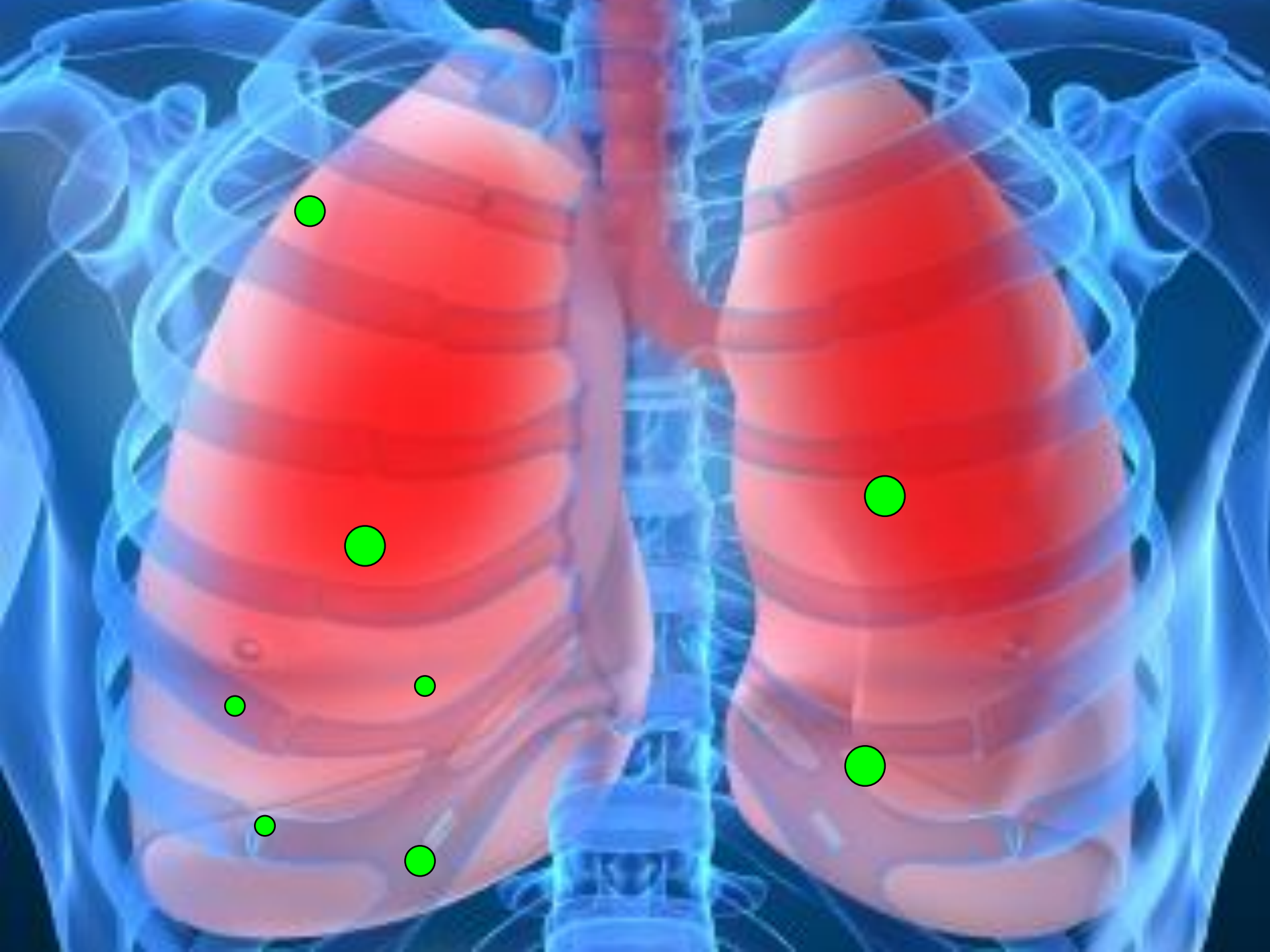


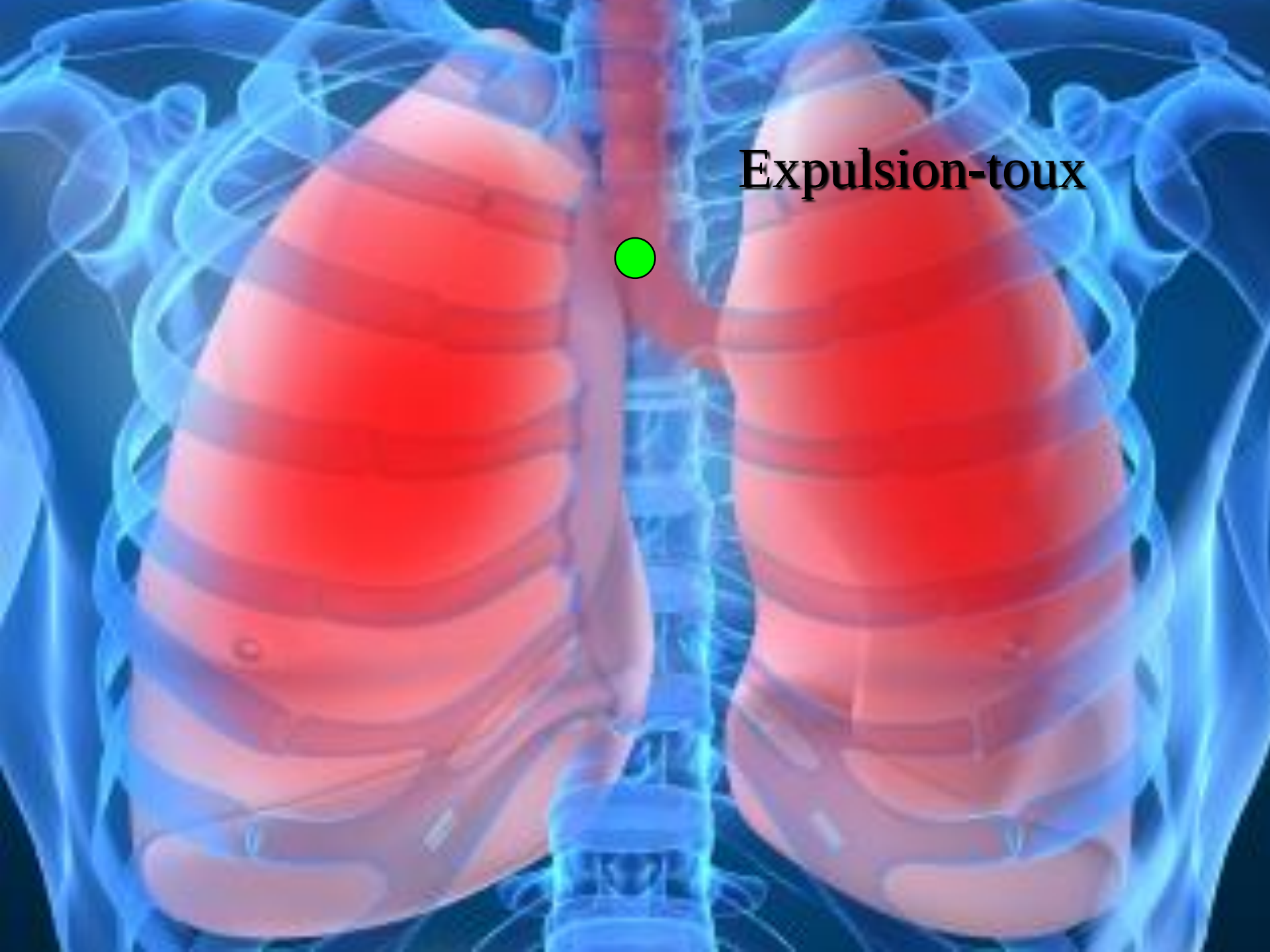
Adapté de Rochester and Chatwin, ERS buyers guide, 2012

Stratégies de désencombrement

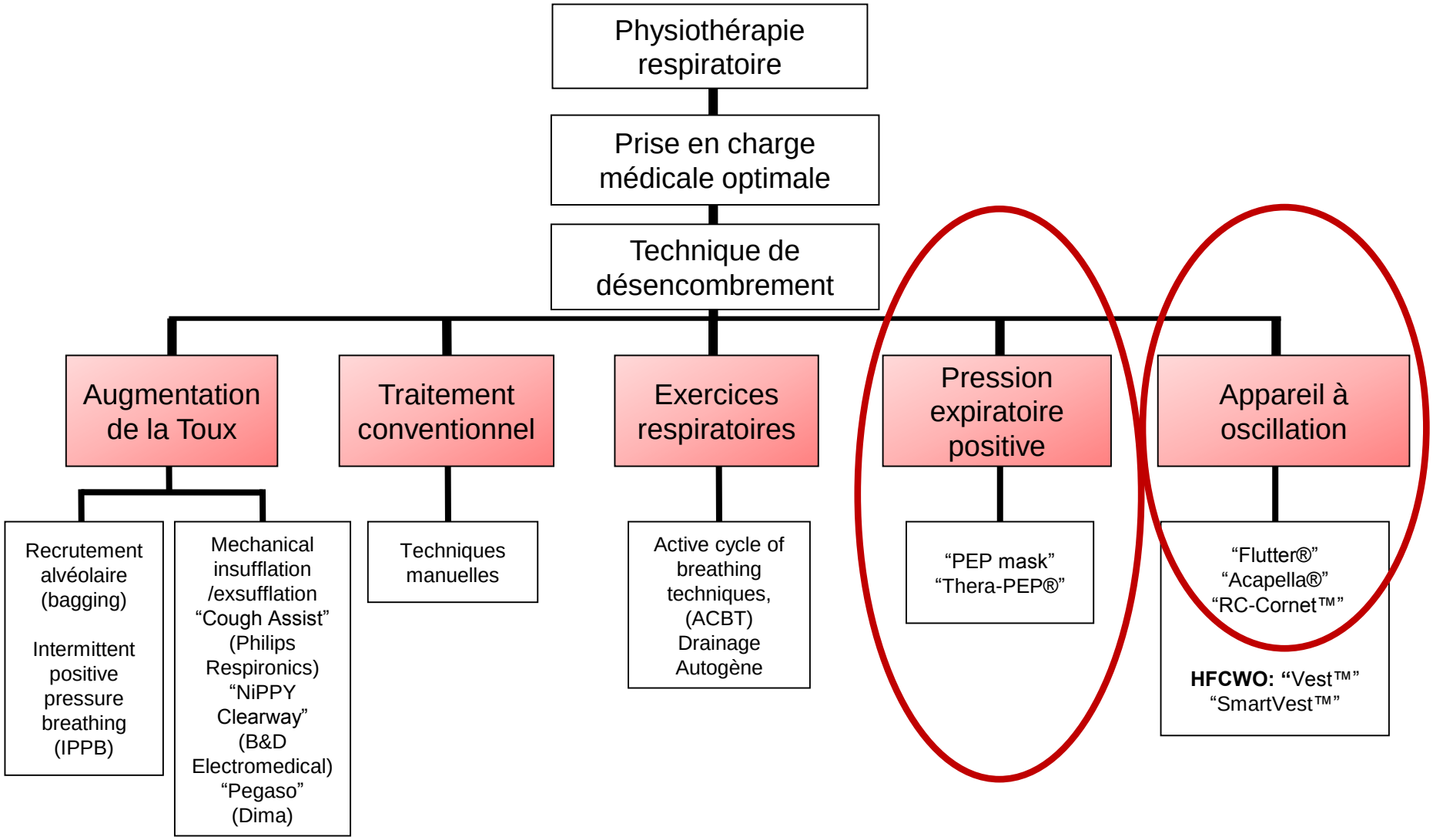
Pourquoi utiliser des techniques instrumentales?

Objectifs		Principes
Ventilation alvéolaire	⇨	volume
		↓↑
désencombrement	⇨	Débit




Expulsion-toux

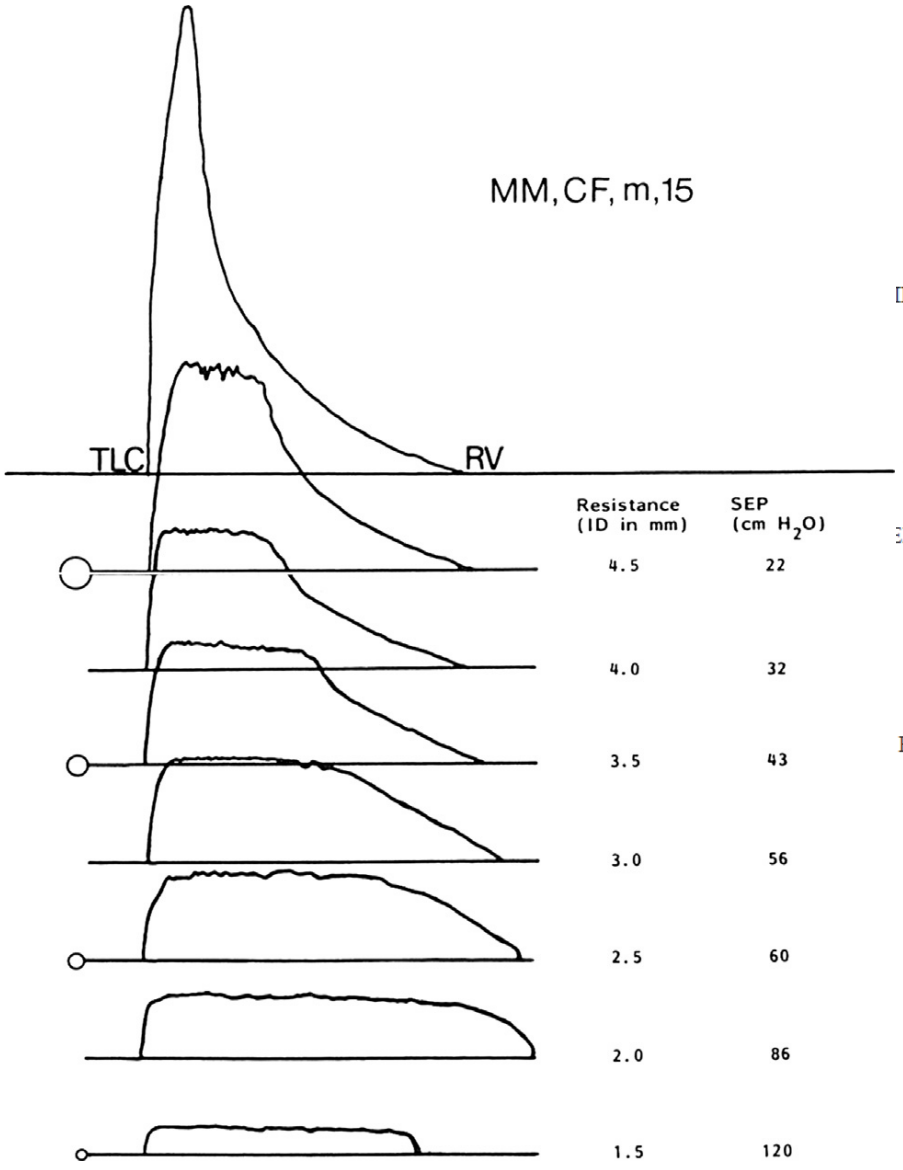
Méthodes de désencombrement

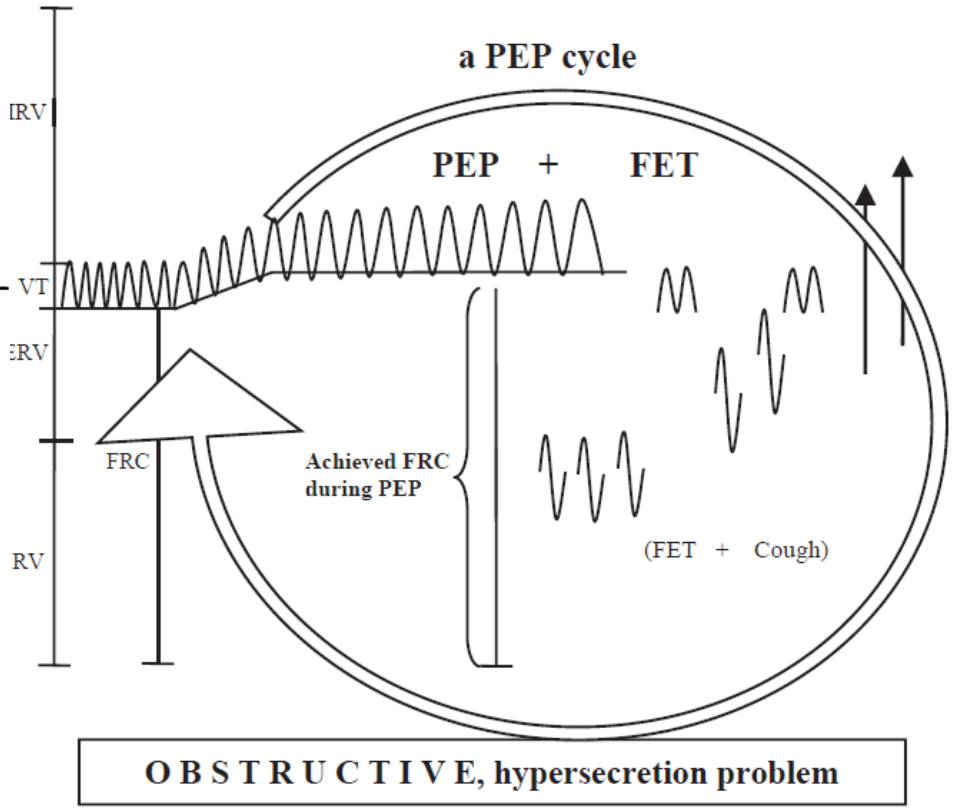


Pression Expiratoire Positive et Oscillations

Quels appareils

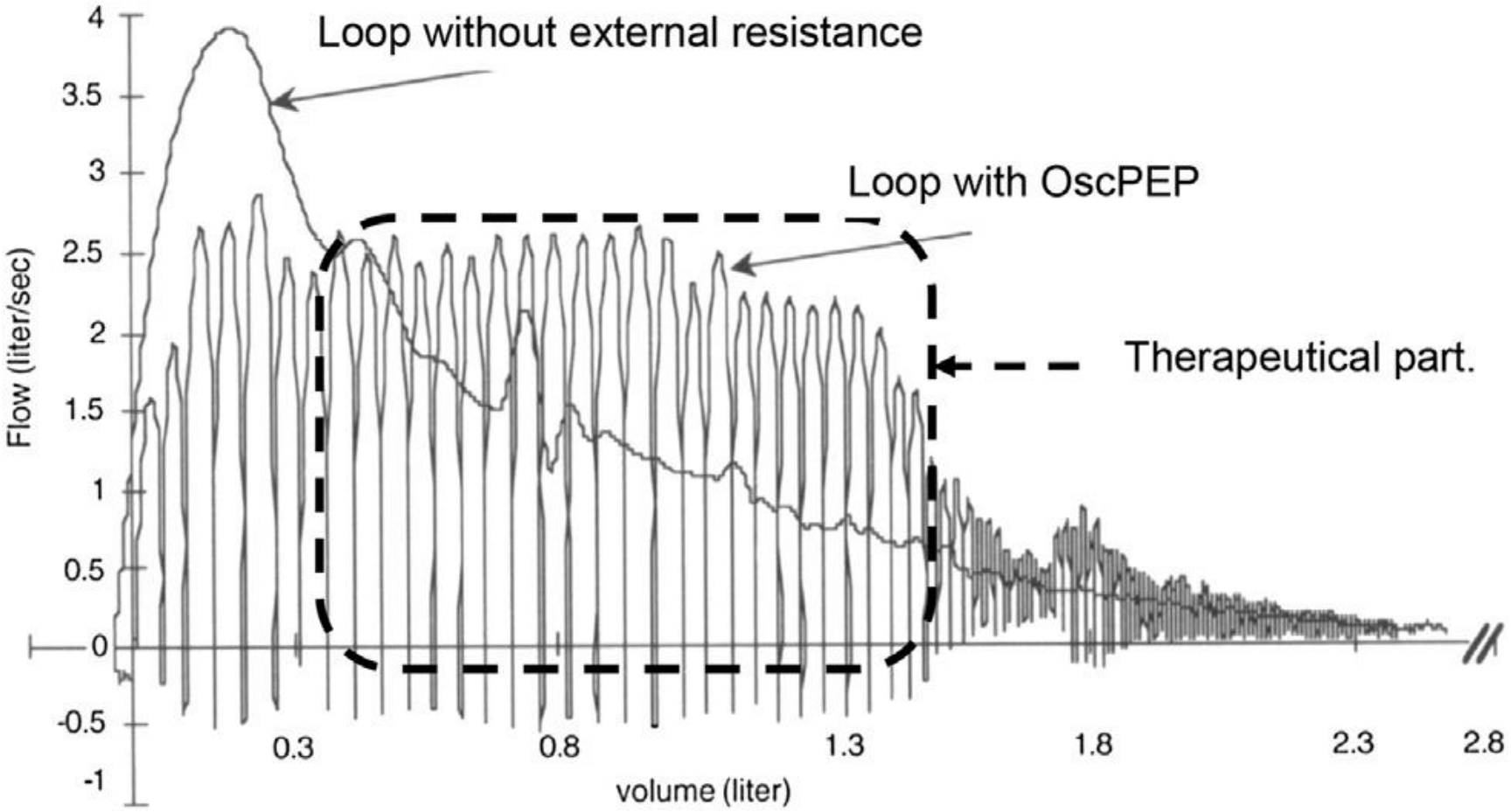
Hi-PEP et syndrome obstructif





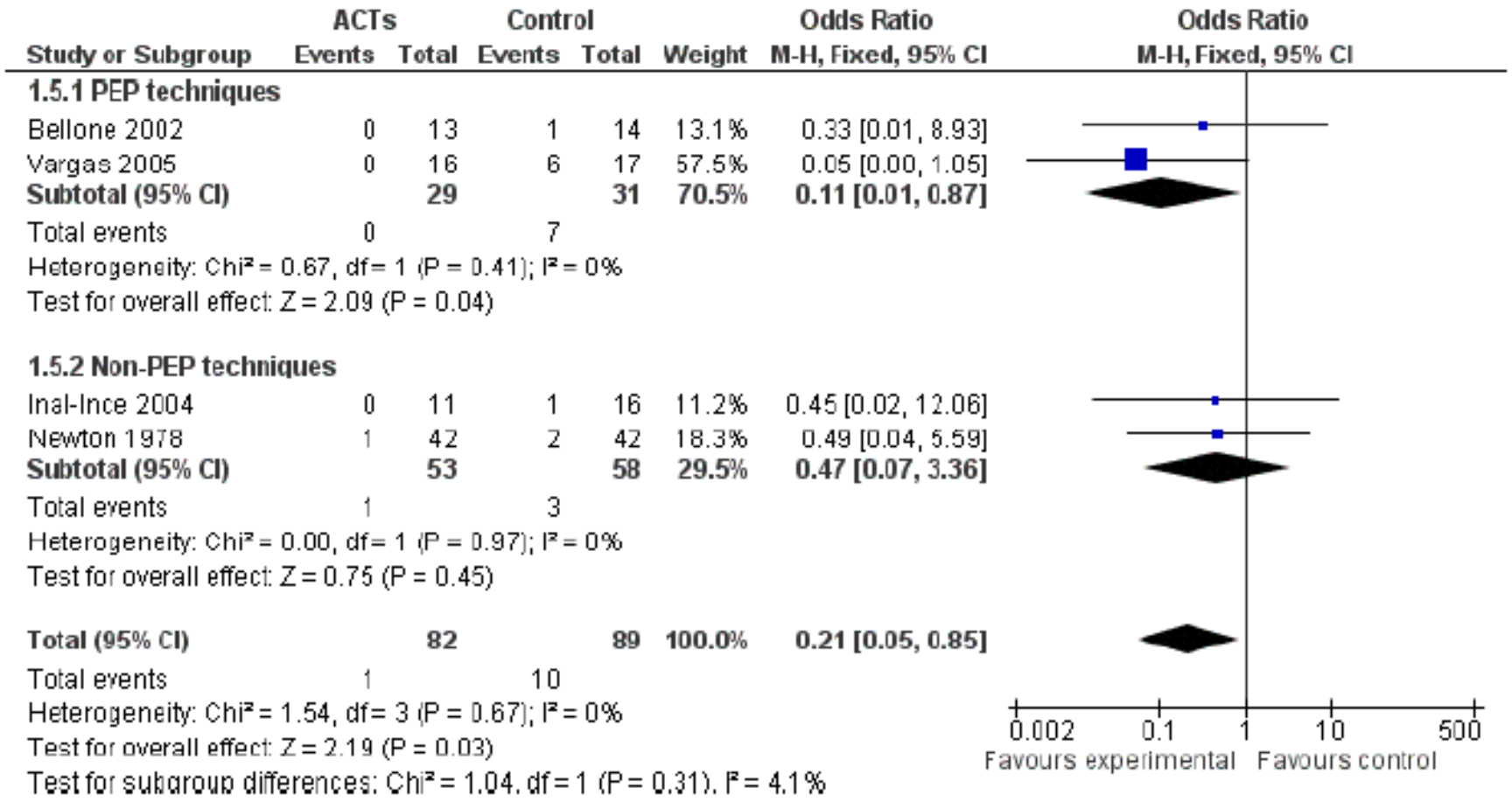
Fagevik Olsén; Resp Medi 2015

Oscillation - PEP et désencombrement



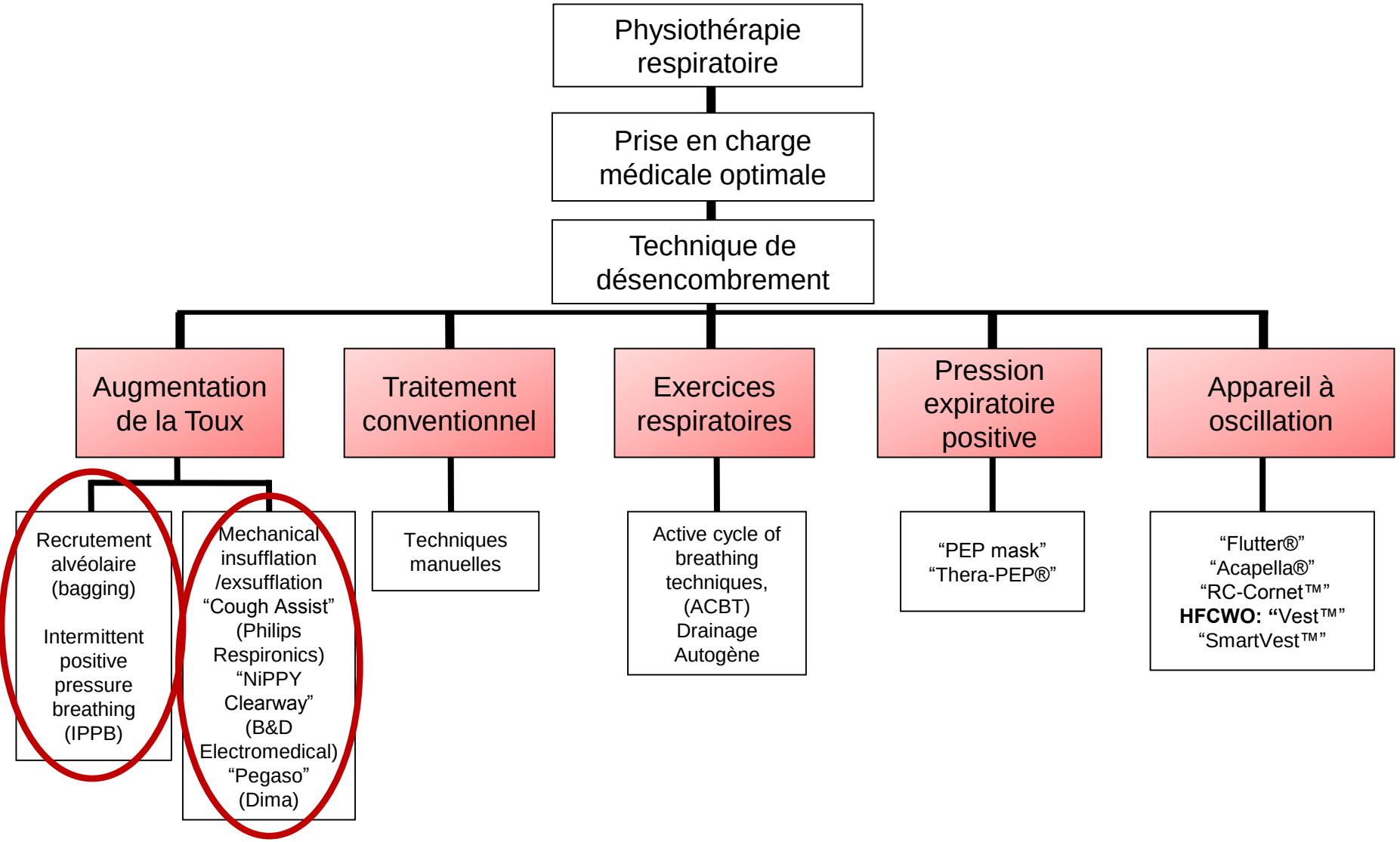
Fagevik Olsén; Resp Medi 2015

Désencombrement et besoin d'augmenter la ventilation mécanique

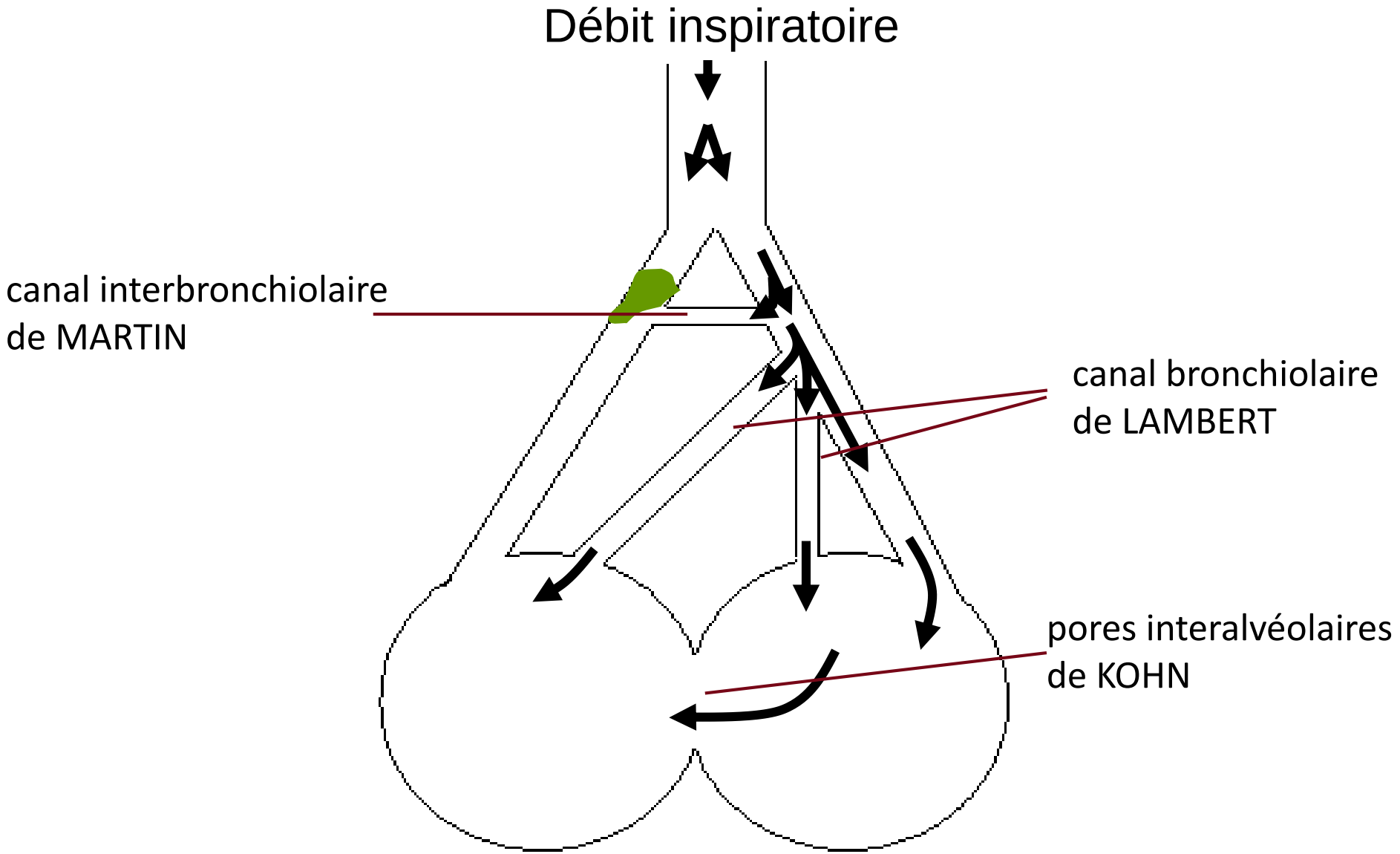


Osadnik CD 2012

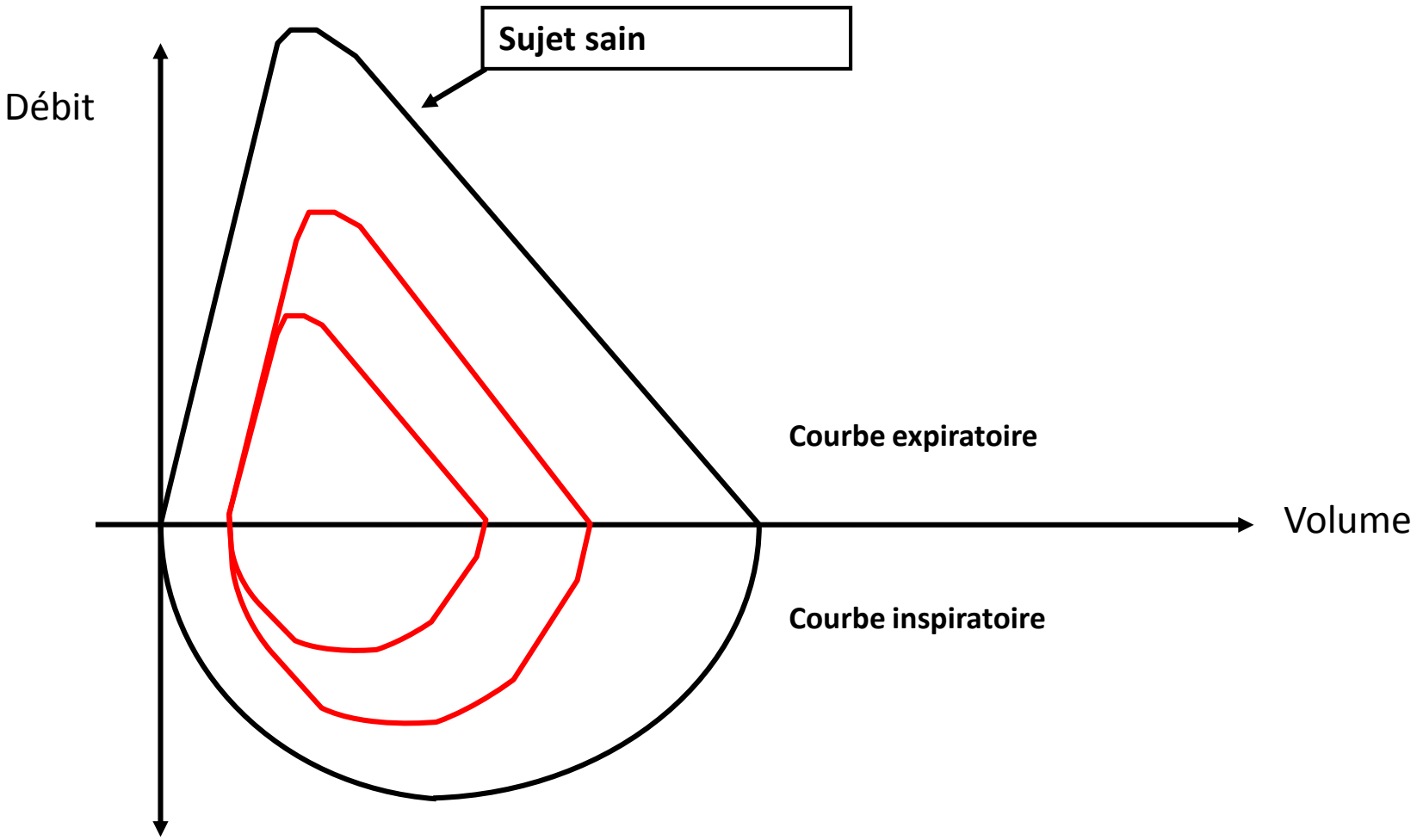
Méthodes de désencombrement



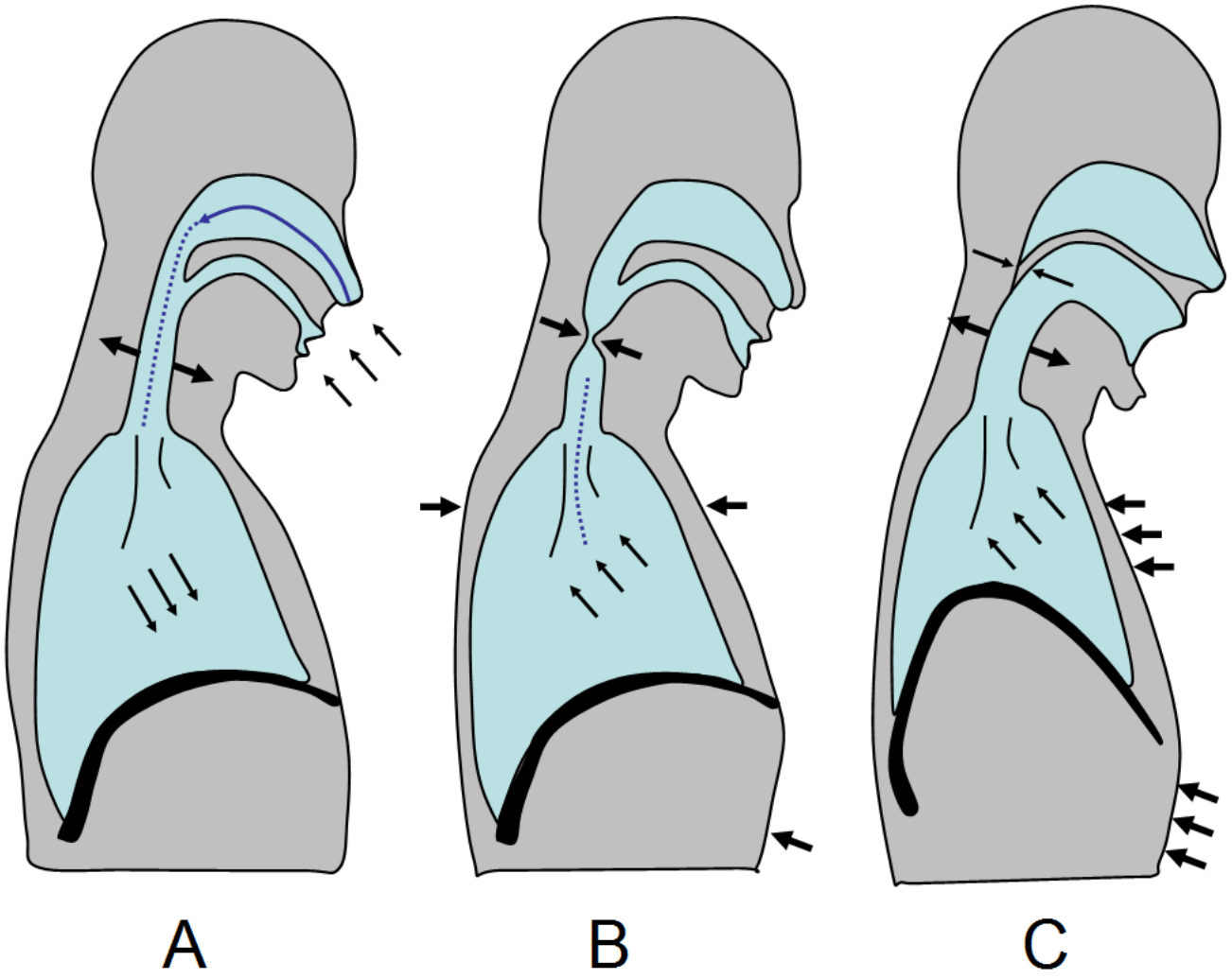
Ventilation collatérale



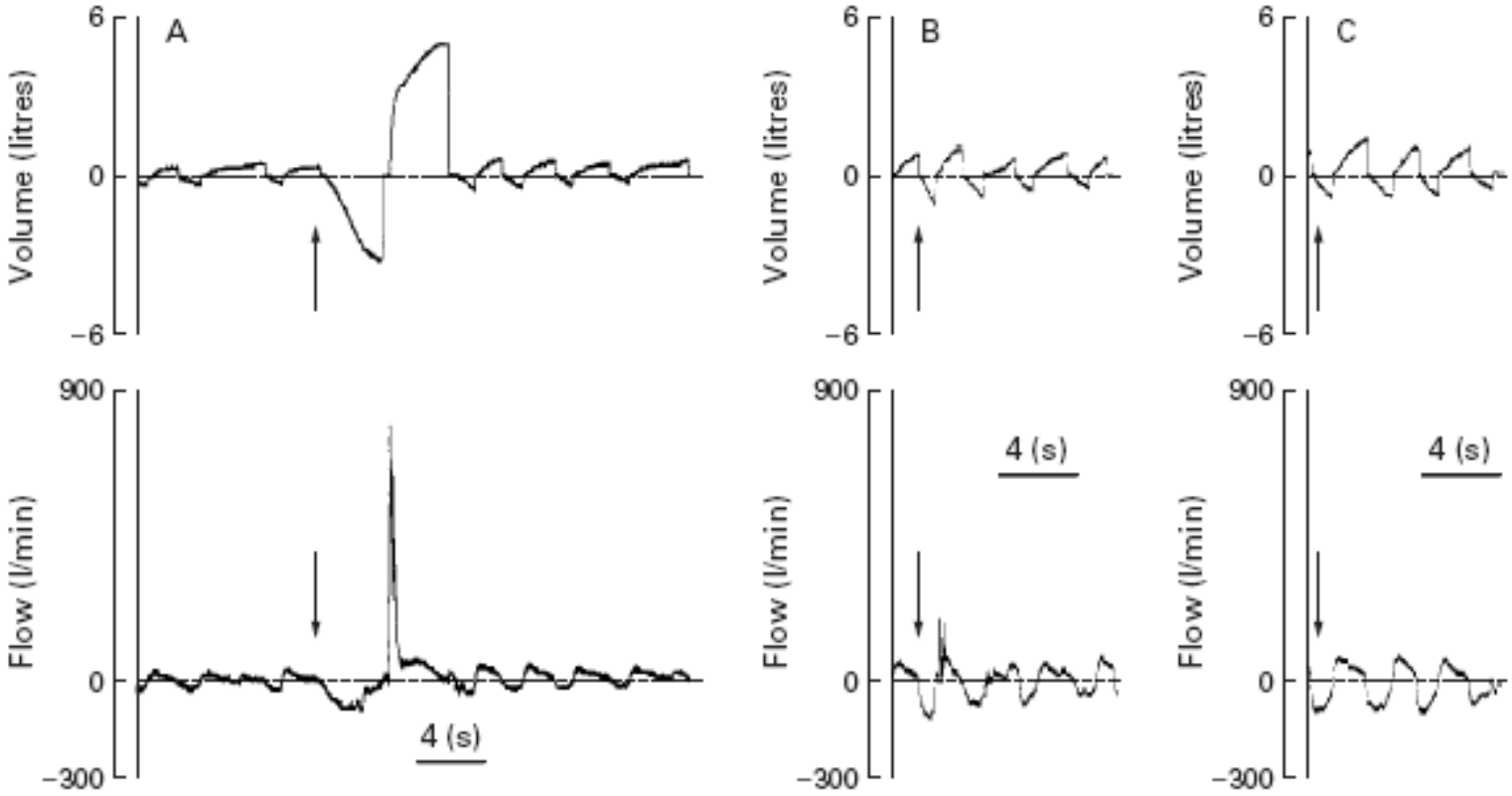
Courbe débit/volume dans le syndrome restrictif



Les 3 phases de la toux



La toux



Sujet Normal

BPCO

Maladie neuromusculaire

P Sivasothy, Thorax 2001

Quels appareils

Chez les patients obstructifs

BPCO et désencombrement instrumental

hanges in Lung Volumes, Gas Exchange, Dyspnoea and Quality of Life Scales, and Muscle Strength and Biochemical Parameters Before and After Treatment in the Three Groups.

	Control				IPPB				T-PEP				Difference between the two methods and control group (covariance analysis)	
	Before treatment		At the last treatment		Before treatment		At the last treatment		Before treatment		At the last treatment		IPPB	T-PEP
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*P*-value	*P*-value
Age	70	6			70	9			73	6				
FVC%	63	11	57	14	58	11	67	12	63	11	70	12	<.001	<.001
FEV1%	30	7	28	8	37	9	44	11	31	11	38	11	<.01	<.05
FEV1/FVC	37	5	37	5	48	10	51	12	38	6	43	12	ns	ns
TLC%	130	23	139	20	128	31	117	28	154	31	127	19	<.05	<.001
RV%	208	68	212	62	203	34	171	33	287	75	217	46	ns	<.01
DLCO%	49	18	46	16	54	11	55	12	54	22	56	21	ns	ns
MIP, kPa	5	1	4	1	4	2	5	2	3	2	4	2	<.01	ns
MEP, kPa	5	1	5	1	5	2	6	2	4	2	6	4	ns	<0.05
PaO_2, mmHg	64	8	63	8	66	11	68	6	72	8	74	7	ns	ns
$PaCO_2$, mmHg	46	9	46	9	48	6	48	6	45	10	43	9	ns	ns
pH	7	0	7	0	7	0	7	0	7	0	7	0	ns	ns
MRC	3	1	4	1	4	0	3	1	4	0	4	1	<.001	<.05
CAT	27	6	27	6	26	7	18	7	27	6	20	7	<.001	<.05
BCSS	5	2	5	2	6	2	3	1	6	2	4	2	ns	ns
Red cells	4 507 250	281 847	3 938 250	1 420 499	4 644 875	525 462	4 444 625	301 775	4 485 000	365 865	4 548 000	397 043	ns	ns
White cells	8714	1616	8795	1764	8081	1100	8571	689	8670	1254	8344	1461	ns	ns
Lymphocytes	2959	546	2969	634	1849	340	1918	248	2691	925	2435	831	ns	ns
C-r prot	0	0	0	0	0	0	0	0	1	0	0	0	ns	ns
γ-Globul	12	1	13	1	13	2	12	2	12	1	12	1	ns	ns

Nicolini; Arch Bronconeumol. 2014

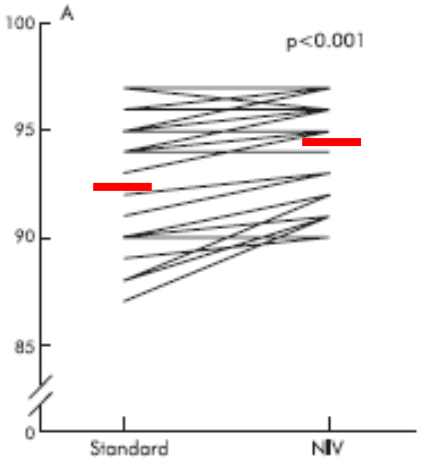
BPCO et désencombrement instrumental

	IPPB				T-PEP				Difference between IPPB and T-PEP (covariance analysis)
	Before treatment		At the last treatment		Before treatment		At the last treatment		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*P*-value
Age	70	9			73	6			
FVC%	58	11	67	12	63	11	70	12	ns
FEV1%	37	9	44	11	31	11	38	11	ns
FEV1/FVC	48	10	51	12	38	6	43	12	ns
TLC%	128	31	117	28	154	31	127	19	ns
RV%	203	34	171	33	287	75	217	46	ns
DLCO%	54	11	55	12	54	22	56	21	ns
MIP, kPa	4	2	5	2	3	2	4	2	ns
MEP, kPa	5	2	6	2	4	2	6	4	ns
PaO_2, mmHg	66	11	68	6	72	8	74	7	ns
$PaCO_2$, mmHg	48	6	48	6	45	10	43	9	ns
pH	7	0	7	0	7	0	7	0	ns
MRC	4	0	3	1	4	0	4	1	<.05
CAT	26	7	18	7	27	6	20	7	<.01
BCSS	6	2	3	1	6	2	4	2	ns
Red cells	4 644 875	525 462	4 444 625	301 775	4 485 000	365 865	4 548 000	397 043	ns
White cells	8081	1100	8571	689	8670	1254	8344	1461	ns
Lymphocytes	1849	340	1918	248	2691	925	2435	831	ns
C-r prot	0	0	0	0	1	0	0	0	ns
γ-Globul	13	2	12	2	12	1	12	1	ns

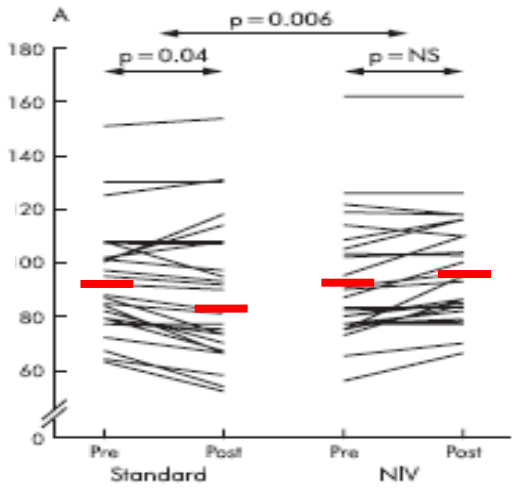
Nicolini; Arch Bronconeumol. 2014

Mucoviscidose et VNI

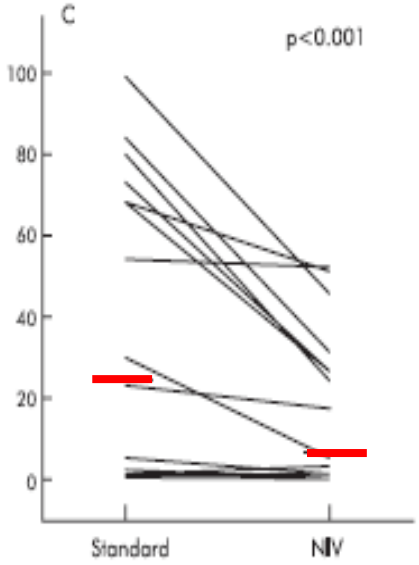
Saturation moyenne



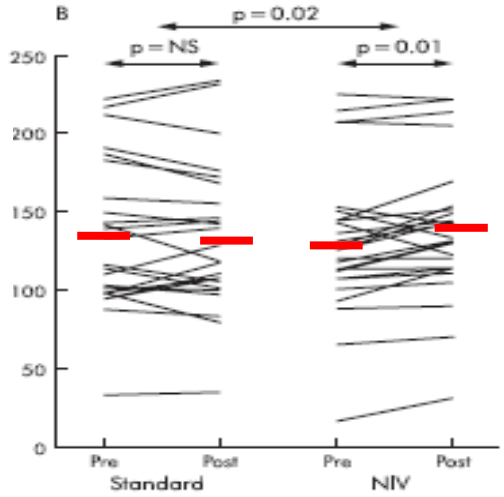
PImax (cmH_2O)



% de temps < 90%

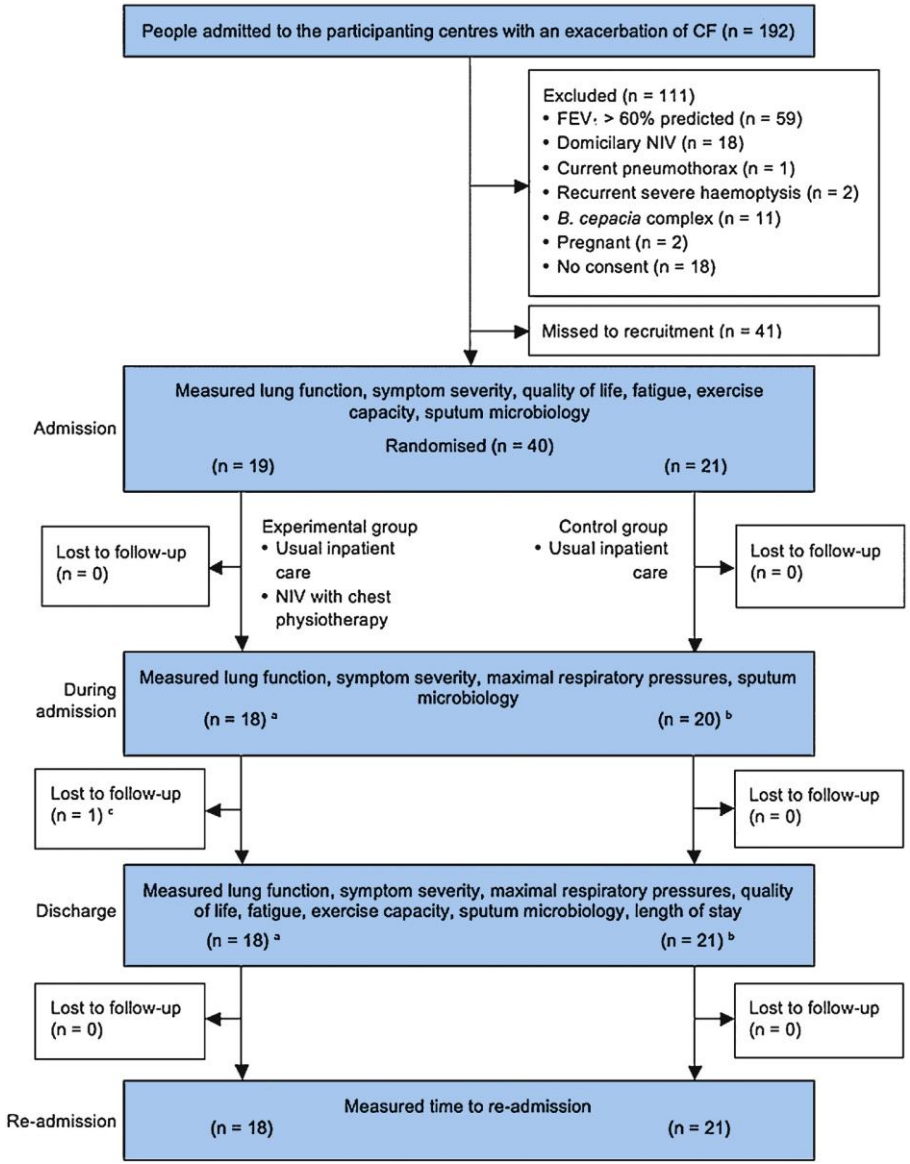


PEmax (cmH_2O)



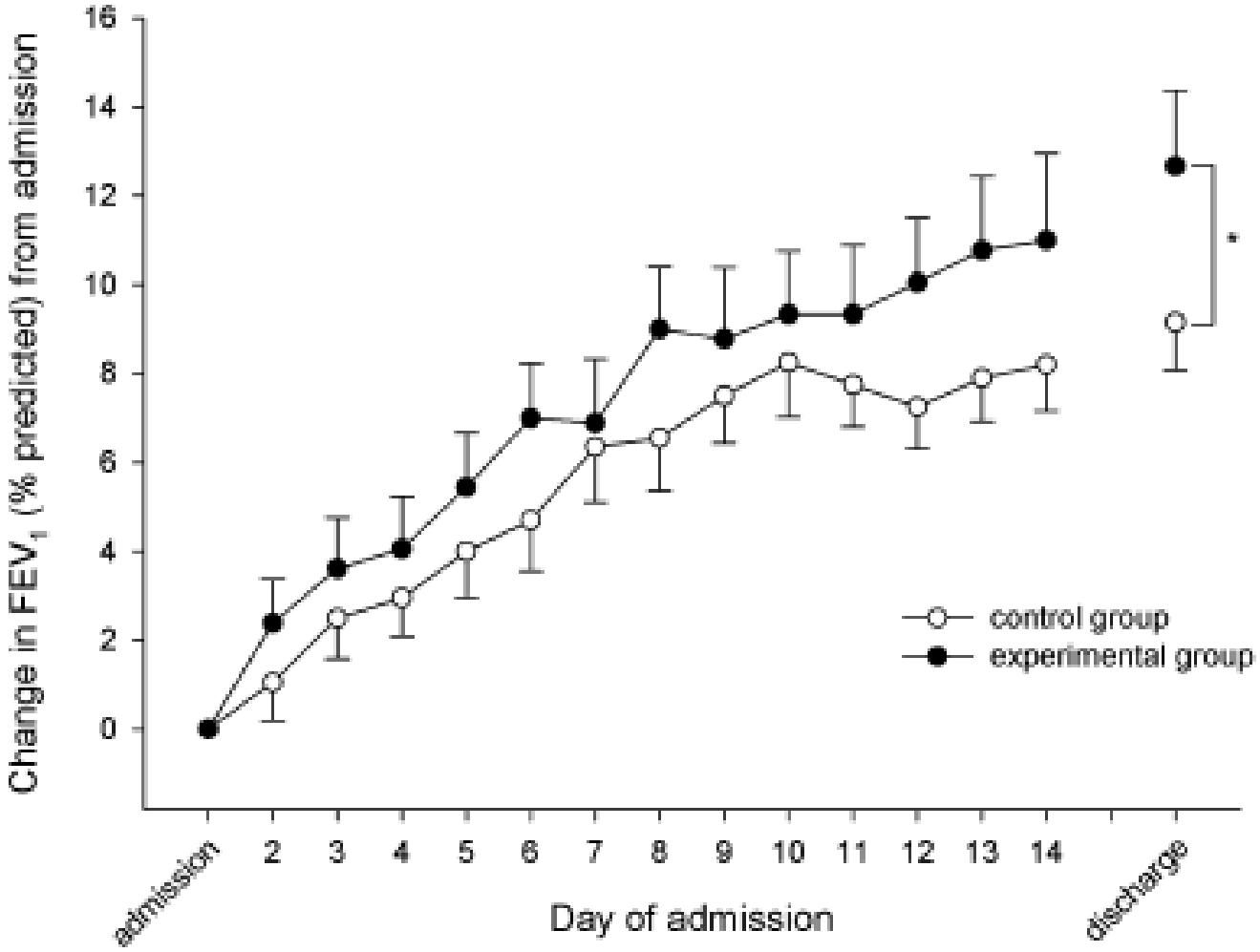
Holland; Thorax 2003

Désencombrement + VNI lors d'une exacerbation chez patient CF



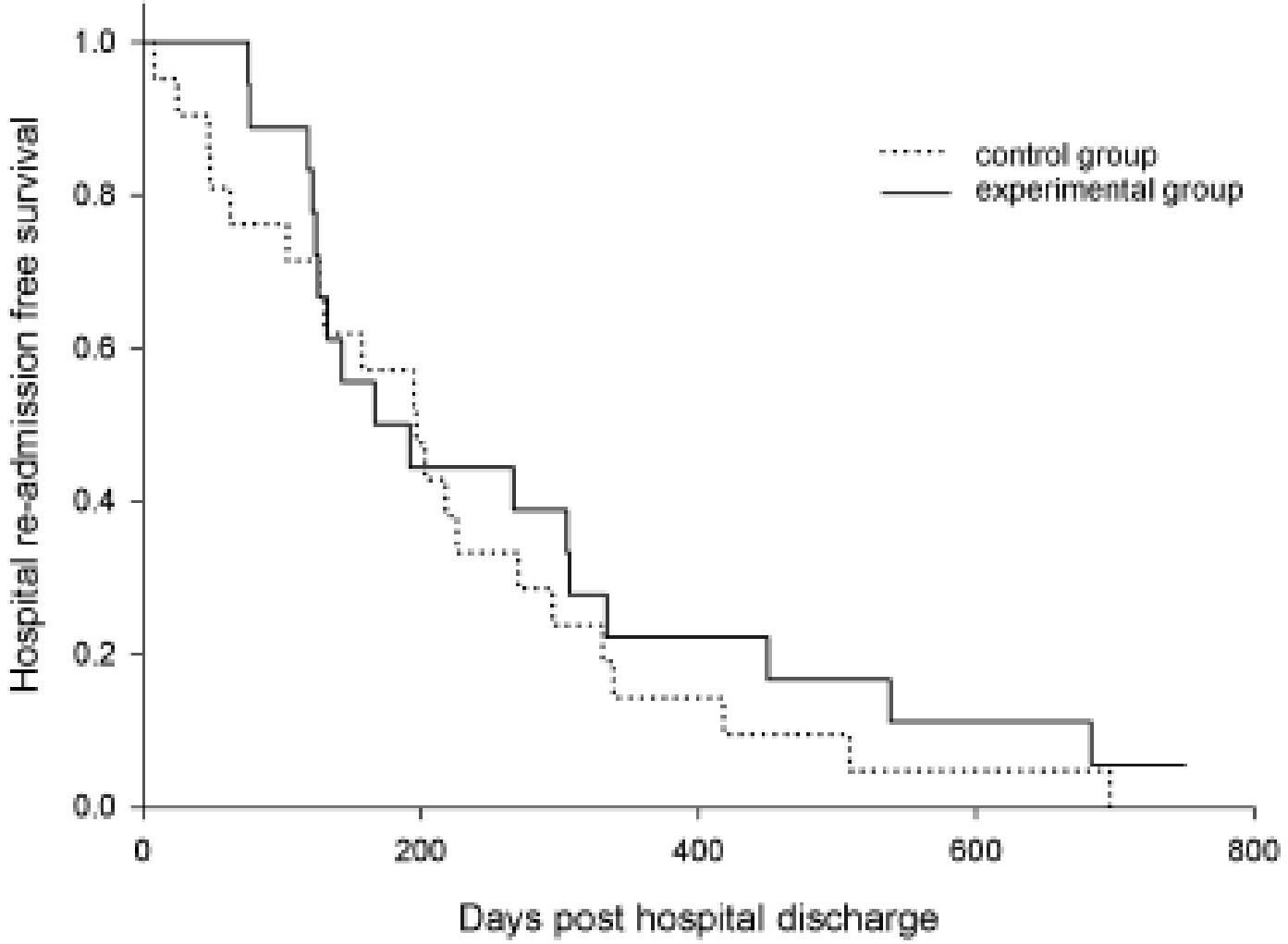
Dwyer: J of Physiotherapy 2015

Désencombrement + VNI lors d'une exacerbation chez patient CF



Dwyer: J of Physiotherapy 2015

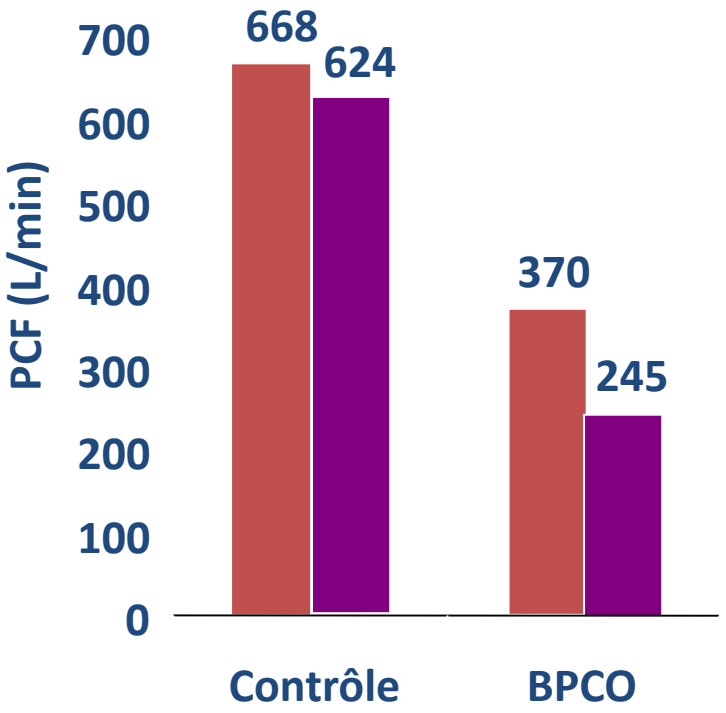
Désencombrement + VNI lors d'une exacerbation chez patient CF



Dwyer: J of Physiotherapy 2015

Toux assistée chez le sujet sain *vs* BPCO

- 8 BPCO vs 9 contrôles sains
- Mesure du PCF durant la
  - toux spontanée
  - toux assistée par Cough-Assist

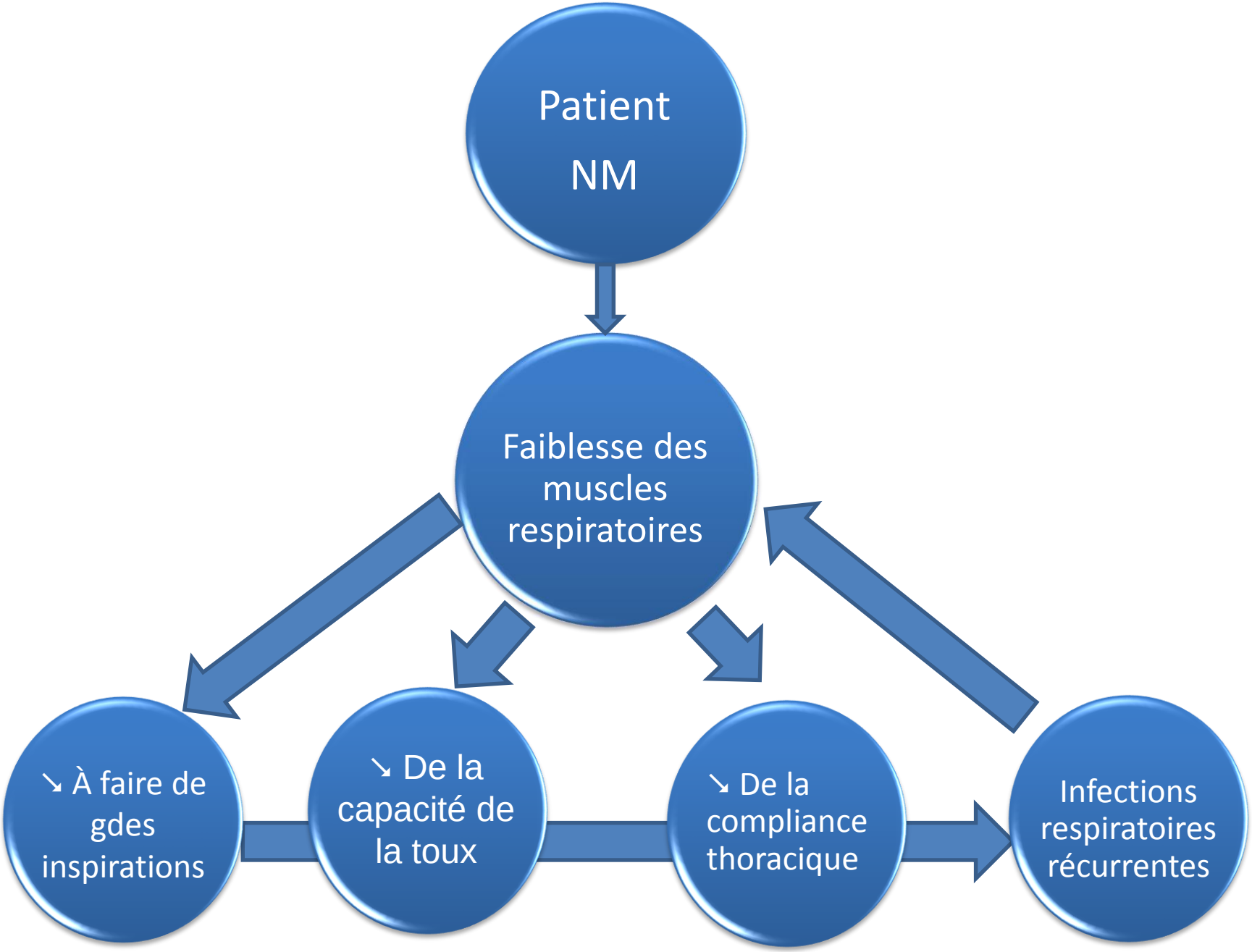


Sivasothy et al. 2001, Thorax

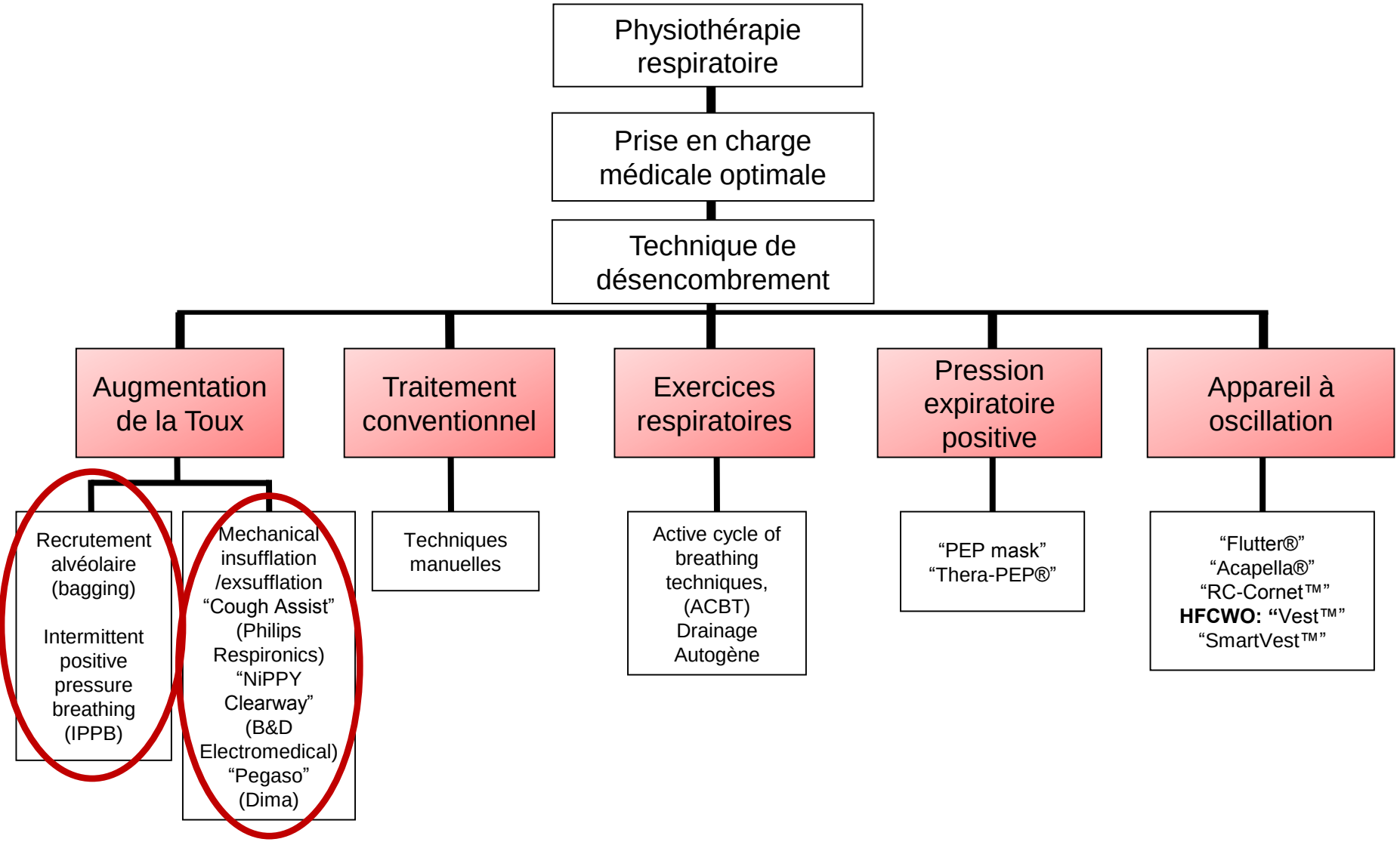
- <u>Conclusion</u>:

  Meilleur PCF sans Cough- Assist ($p<0.05$)

Patients restrictifs


Patient
NM
Faiblesse des muscles respiratoires
↘ À faire de gdes inspirations
↘ De la capacité de la toux
↘ De la compliance thoracique
Infections respiratoires récurrentes

Méthodes de désencombrement



Débit de pointe à la toux

- Débit de toux normal entre 360 et 840 l/min

Leiner et al, 1963 Am Rev Respir Dis

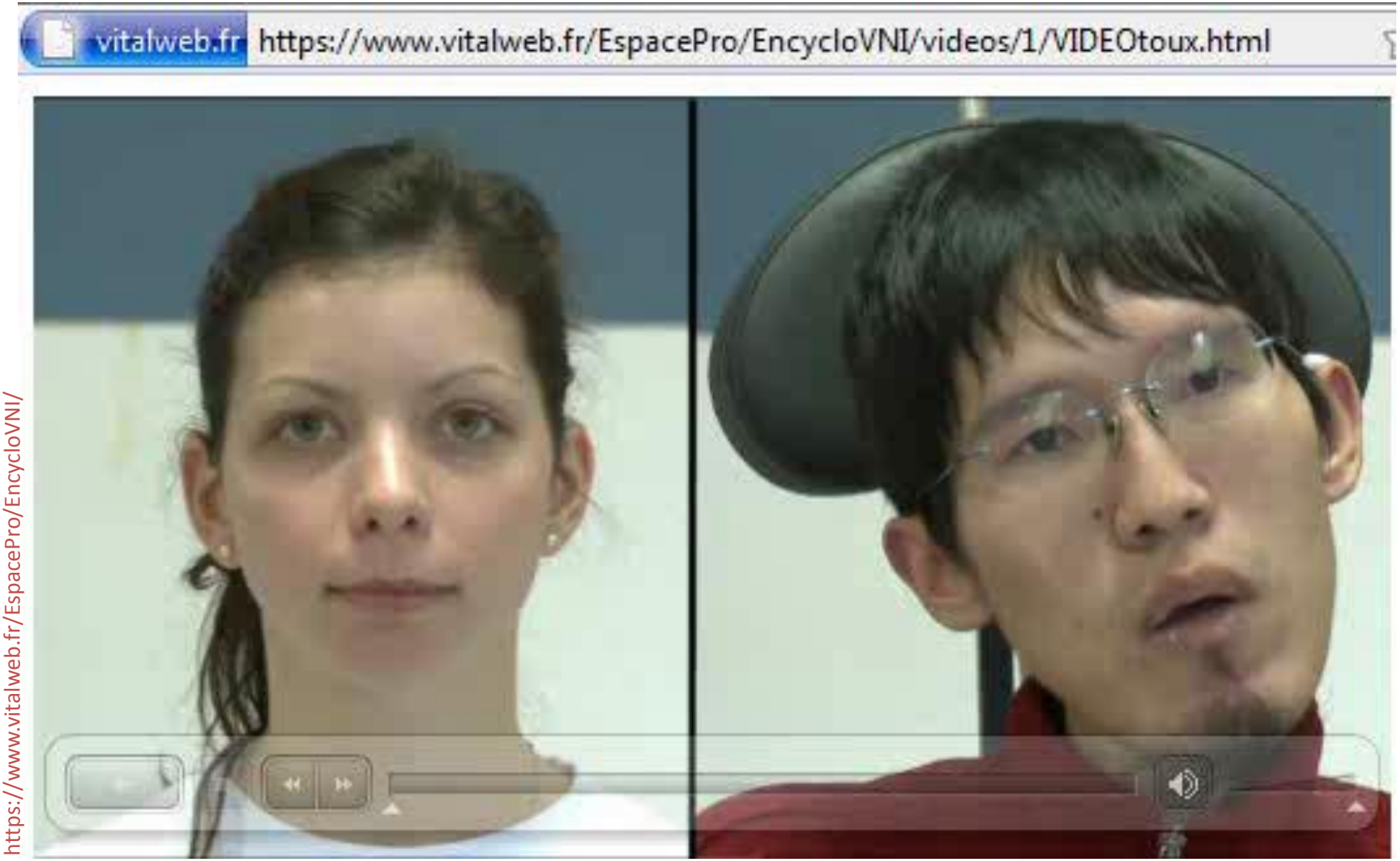
- Patient à risque si débit de toux < 160 l/min

Bach et al., 1997, Chest

- Patient SLA avec atteinte bulbaire < 250 l/min

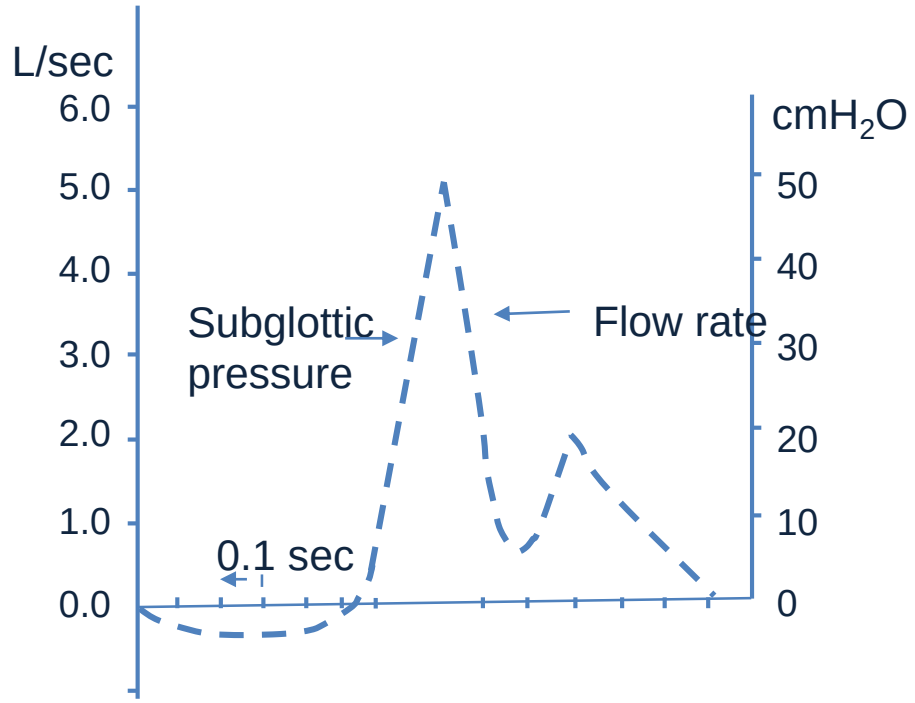
Sancho et al. 2007 AJRRCM

La toux



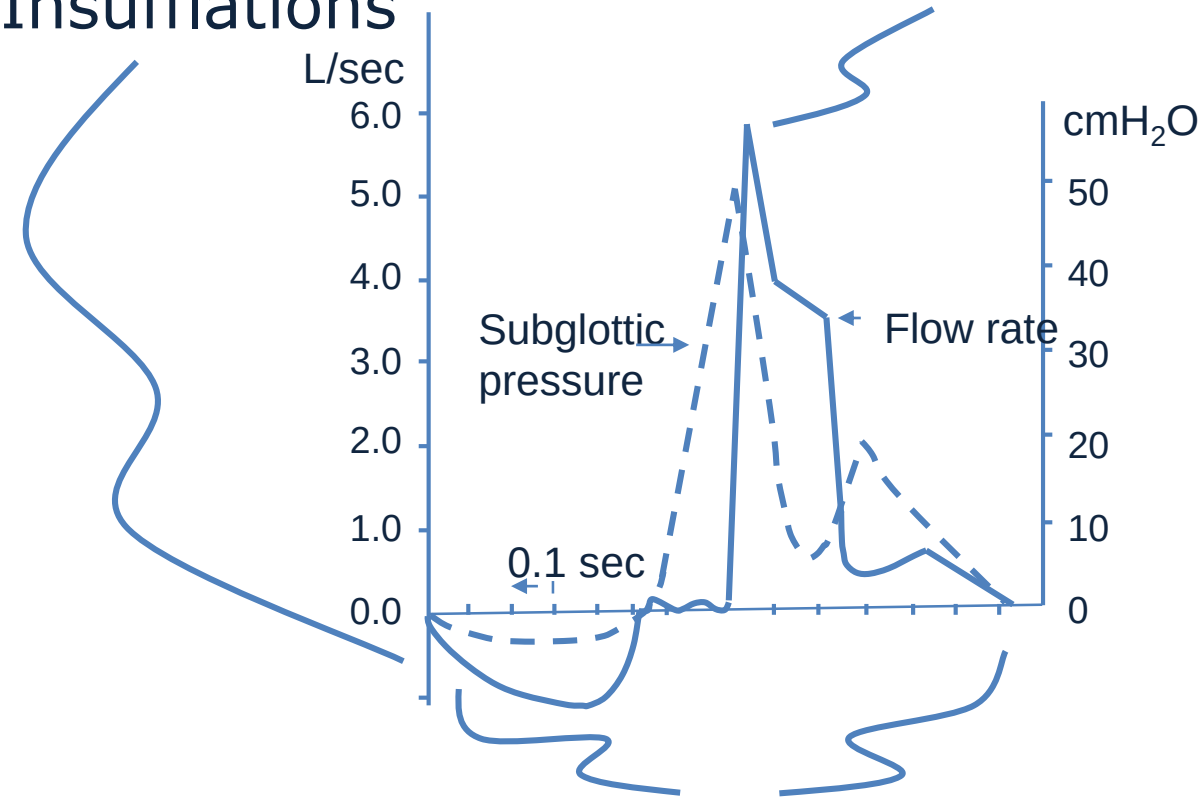
https://www.vitalweb.fr/EspacePro/EncycloVNI/

Augmentation de la toux

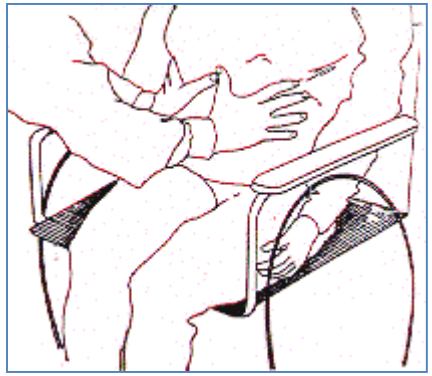


Augmentation de la toux

Breath Stacking, IPPB
Manuel / Mechanical
Insufflations

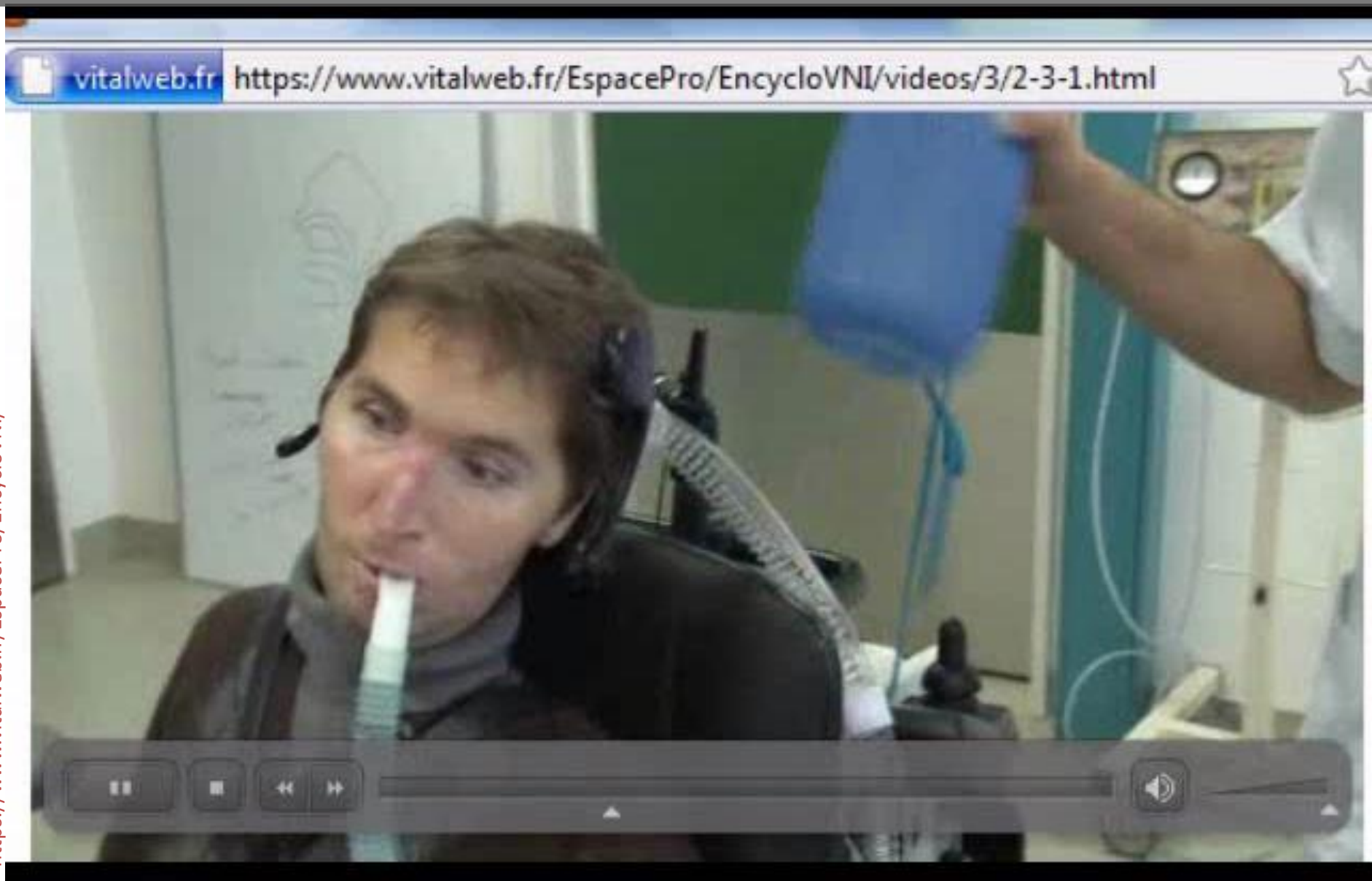


Assistance à la toux manuelle



Mechanical Insufflation / Exsufflation

Bagging



https://www.vitalweb.fr/EspacePro/EncycloVNI/

Ventilateur VS bagging

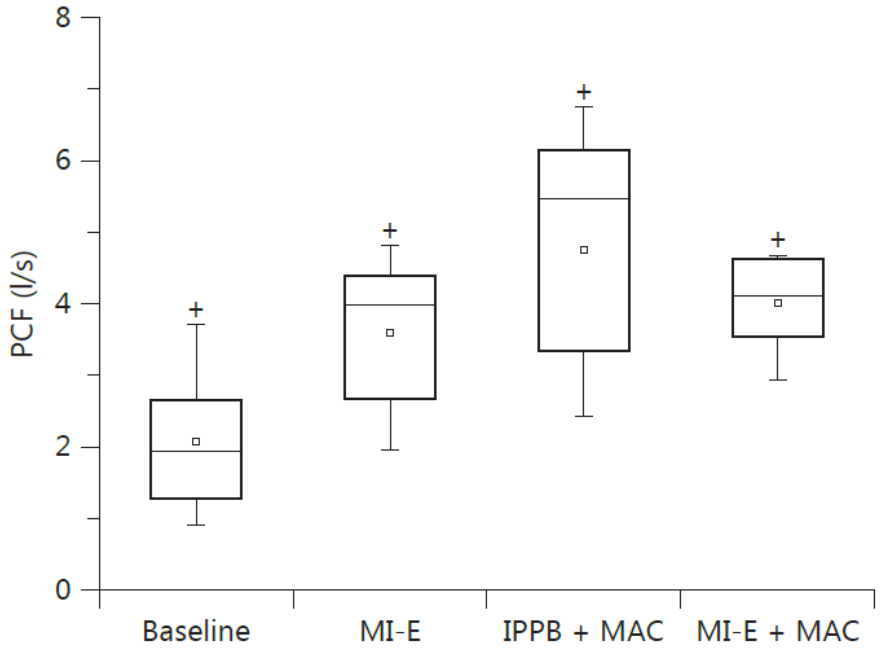
	Ventilator (n = 27)	Resuscitator Bag (n = 25)	P
Age, y	25.3 ± 5.1	24.7 ± 5.7	.60
BMI, kg/m^2	17 ± 6.5	17.1 ± 6.6	.96
FVC, mL	809 ± 555	807 ± 495	.99
FVC, % predicted	17 ± 10	16 ± 8	.95
P_{Emax}, cm H_2O	18.3 ± 10.9	17.7 ± 7.5	.82
CPF, L/min	132 ± 55	125 ± 52	.68
CPF_{MAC}, L/min	210 ± 55	205 ± 52	.74
NIV tidal volume, mL	716 ± 88	724 ± 92	.75
MIPPV use, n	19	16	NA
Vent-free time, h	7.2 ± 6.3	7 ± 5.5	.90

	Ventilator	Resuscitator Bag	P
Able to perform air stacking, n (%)	24/27 (89)	22/25 (88)	NA
Insufflations to maximal insufflation capacity, n	2.6 ± 0.6	1.8 ± 0.6	<.001
CPF_{AS}, L/min	199 ± 48	186 ± 50	.33
Maximal insufflation capacity, mL	1,481 ± 477	1,344 ± 520	.33
Expected expired volume, mL	1,770 ± 404	NA	NA
Ventilator leak, mL	289 ± 468	NA	NA
P_{EmaxAS}, cm H_2O	28 ± 10	26 ± 9	.45

Toussaint; Resp Care 2015

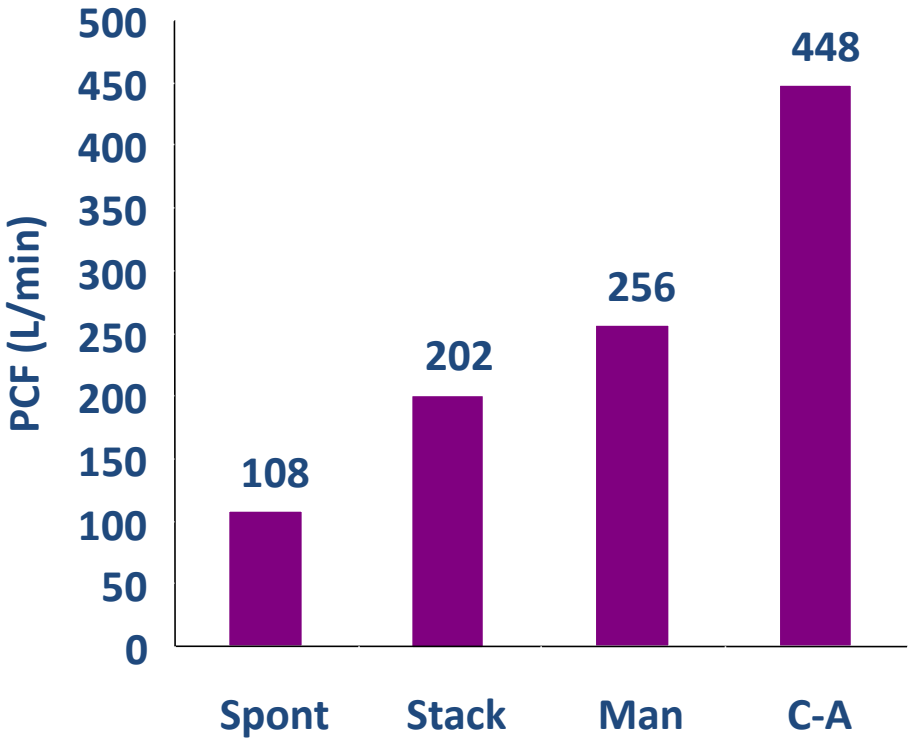
Comparaison des débits à la toux avec différentes techniques de toux assistée

- 18 patients restrictifs



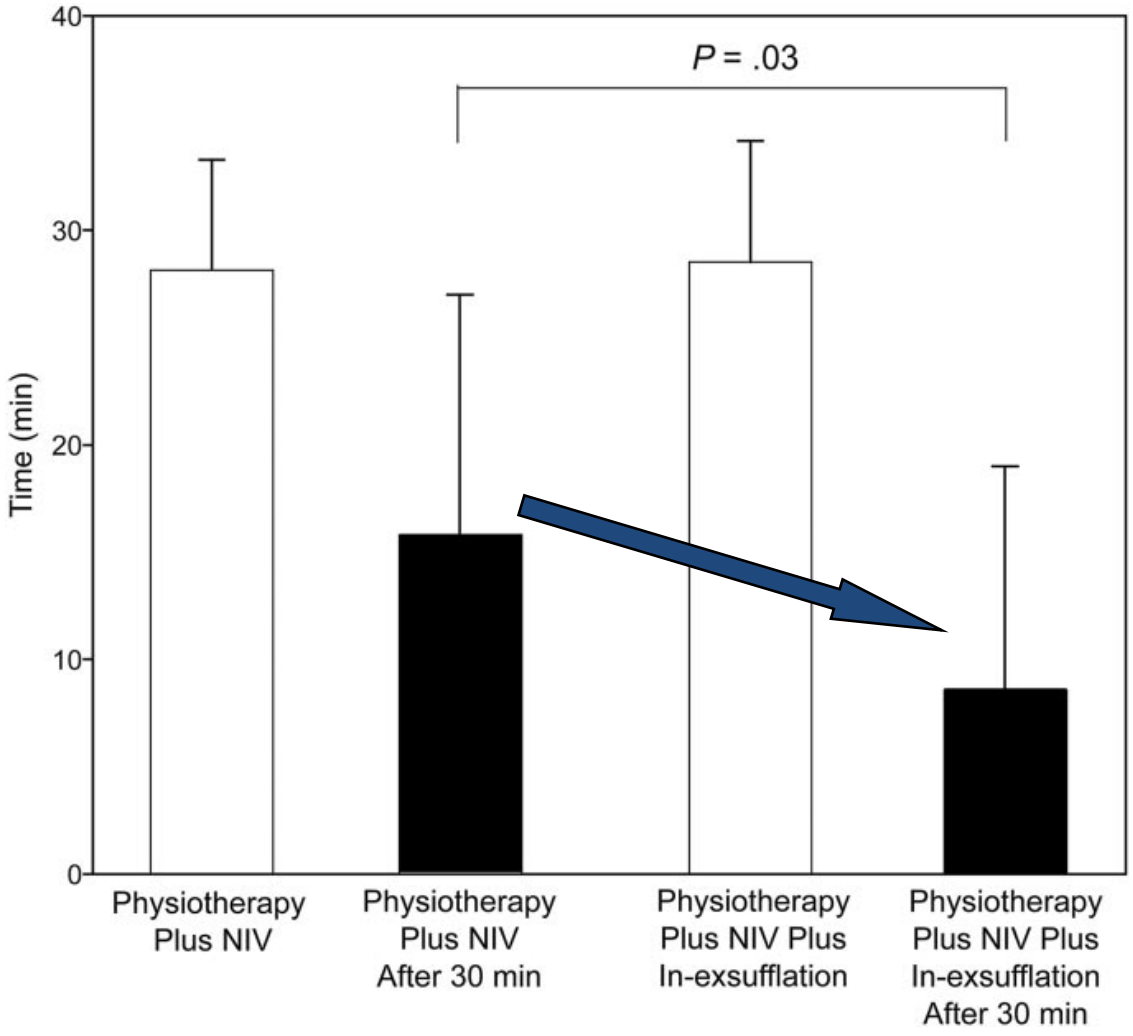
Lacombe; Respiration 2014

- 21 patients restrictifs



Bach; Chest 1993

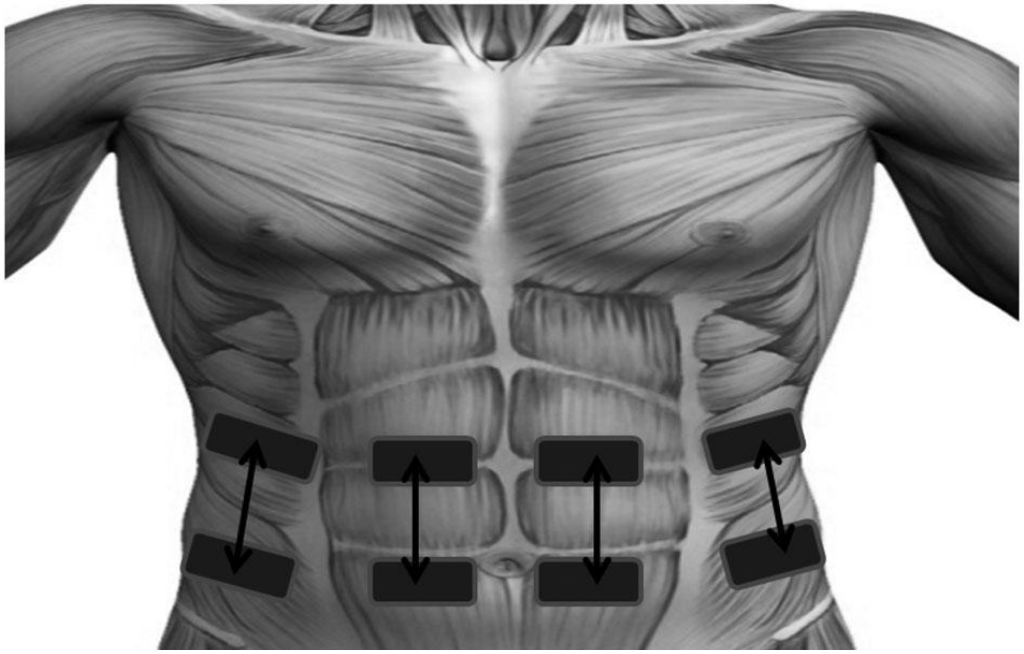
Comparaison des débits à la toux avec différentes techniques de toux assistée



Chatwin, Respir Care 2009

Exemple pratique

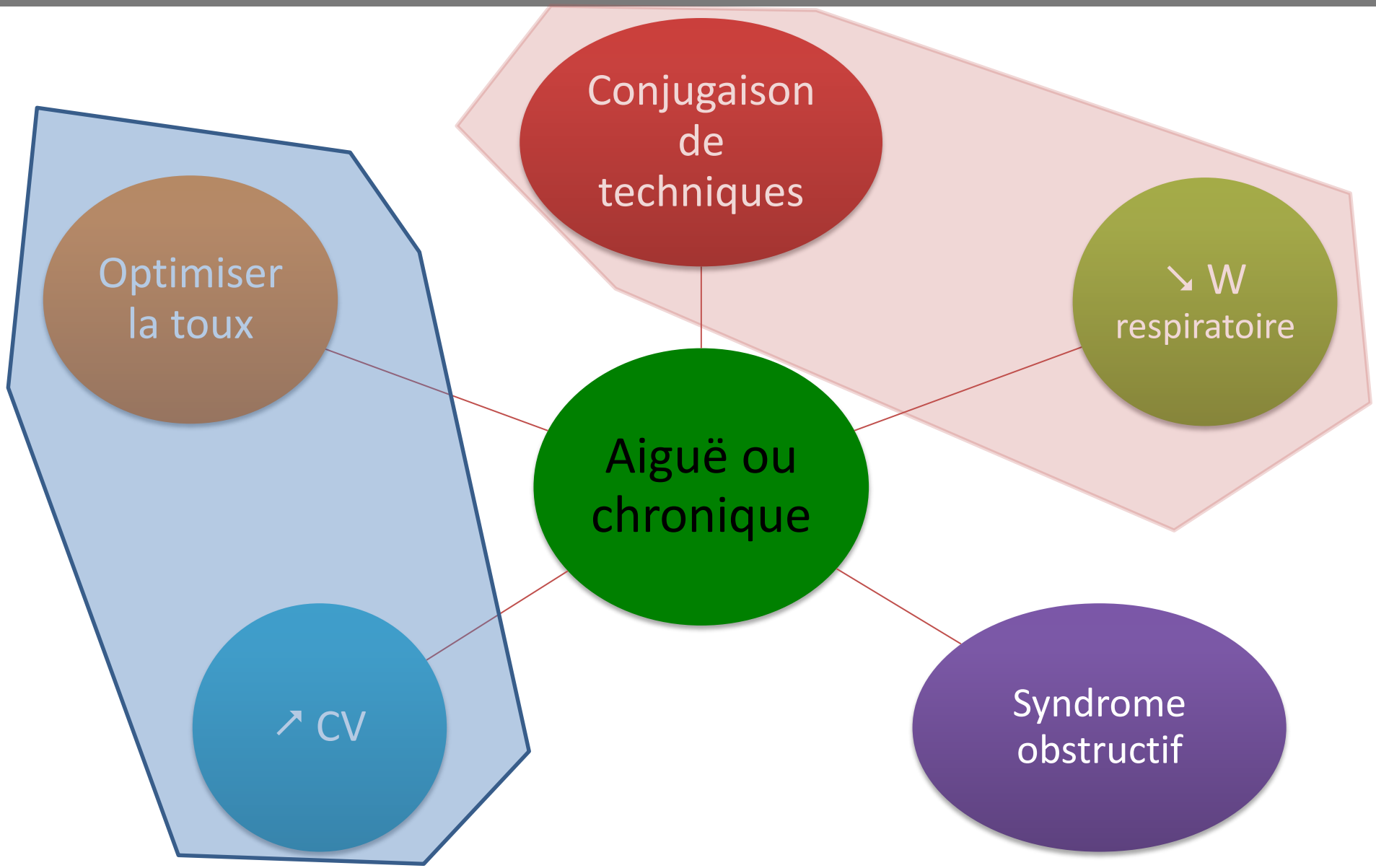
Le Futur?



Assessment Session	FVC (L)		PEF (L/s)	
	Unstimulated	Stimulated	Unstimulated	Stimulated
A0	1.60	1.84	1.97	2.18
A7	1.99	2.28	2.00	2.39

McCaughey; The Journal of Spinal Cord Medicine 2016

Conclusion


Conjugaison de techniques
Optimiser la toux
↘ W respiratoire
Aiguë ou chronique
↗ CV
Syndrome obstructif