GROUPE HOSPITALIER DU HAVRE

Groupe de Travail de Kinésithérapie

Mise en place d'une ventilation non invasive à domicile

Cas cliniques

Borel JC
Medrinal C

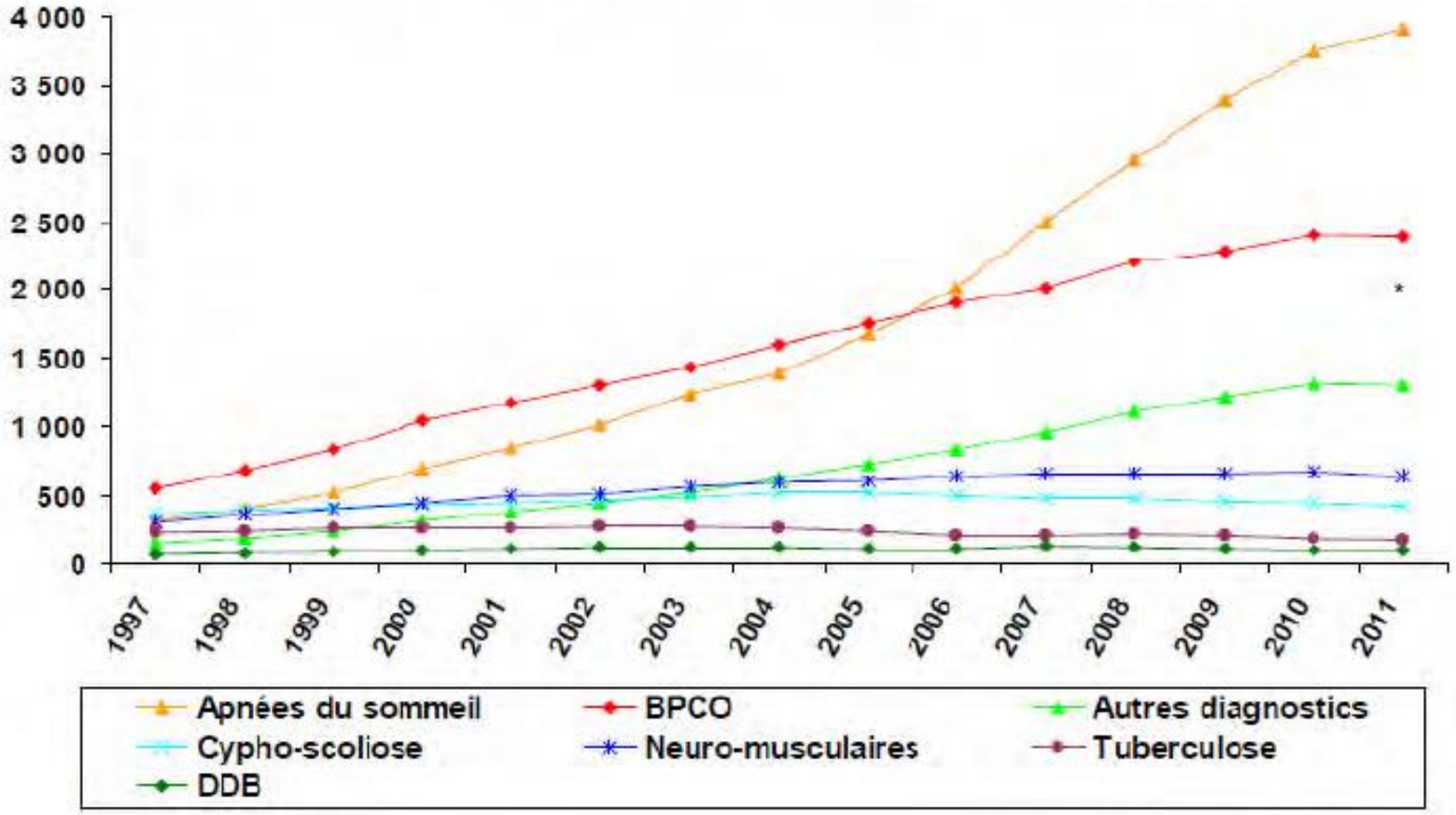
CPLF 2015, Lille

- Aucun conflit d’intérêt

Introduction

- Toute les structures de soins peut en théorie être sollicitée pour la mise en place d'une Ventilation non invasive.
- La tendance actuelle à l'augmentation du nombre de prescriptions conduit vers l'installation au domicile des patients.
- Augmentation de 12% par an du nombre de patients traités par VNI.

Ventilation par masque ± oxygène : évolution des étiologies au 31 décembre



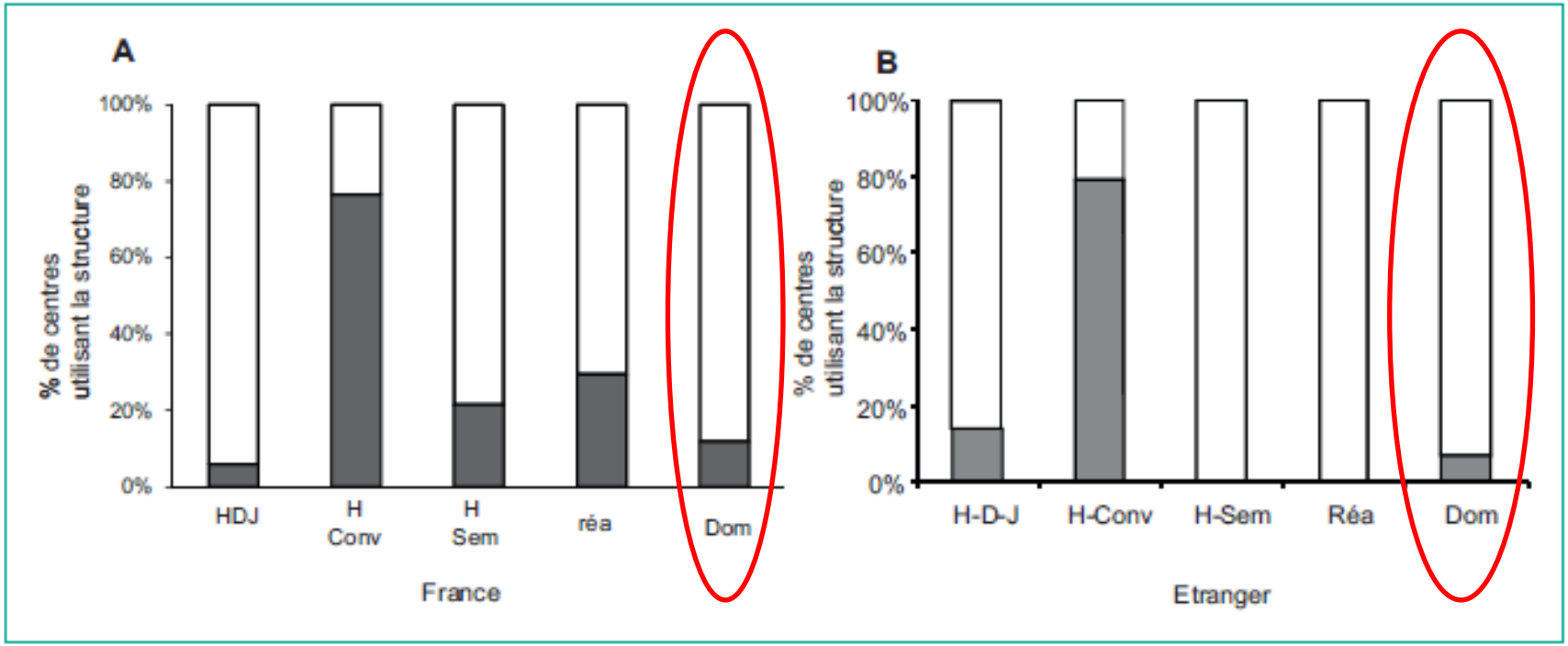
FÉDÉRATION ANTADIR

Où installer une VNI?

Hôpital

binet du
umologue

Groupe CasaVNI



CasaVNI, Rev Mal Respir, 2010

Respiratory Medicine (2007) 101, 1177–1182

ELSEVIER

respiratoryMEDICINE

Non-invasive home mechanical ventilation: Effectiveness and efficiency of an outpatient initiation protocol compared with the standard in-hospital model

Manel Luján, Amalia Moreno, Carmen Veigas, Concepción Montón, Xavier Pomares, Christian Domingo*

Servei de Pneumologia, Corporació Parc Taulí, Parc Taulí s/n, 08208 Sabadell, Institut Universitari Parc Taulí, Departament de Medicina, Universitat Autònoma de Barcelona (Bellaterra), Spain

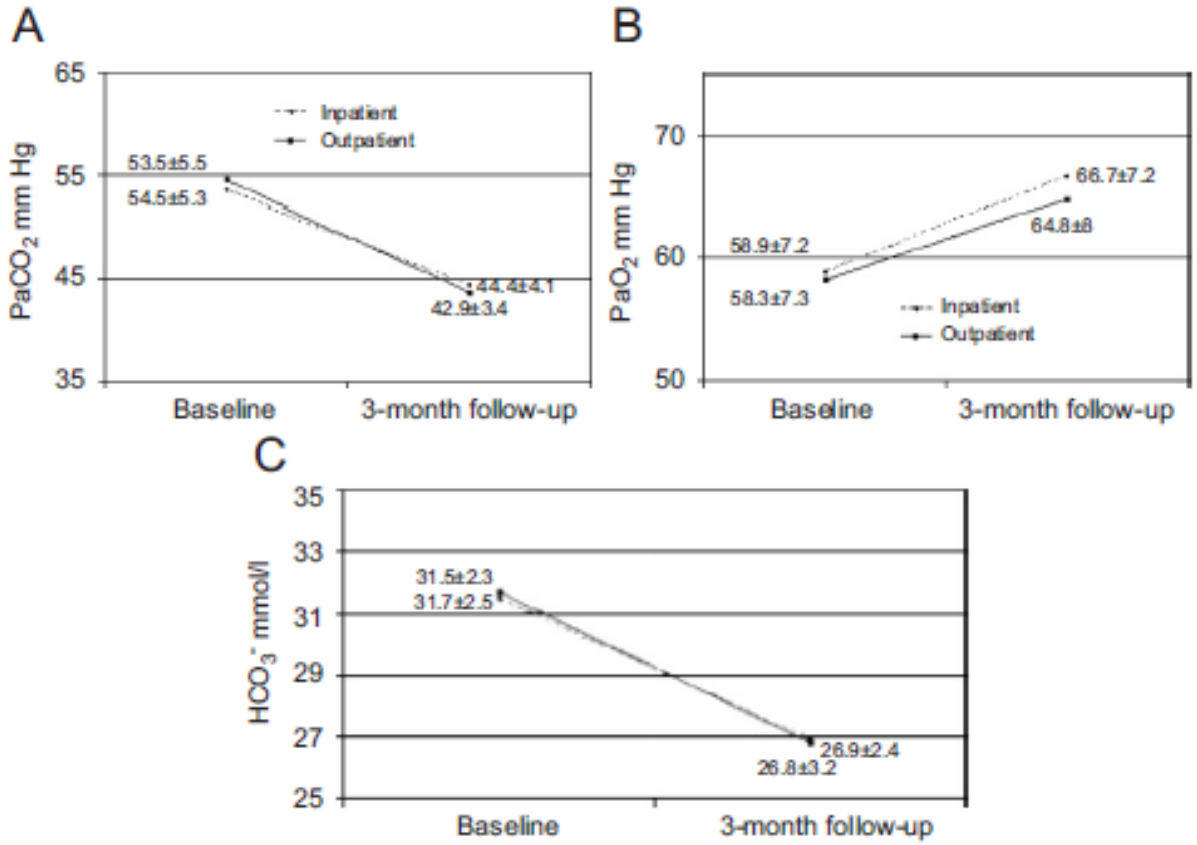


Figure 2 (A) $PaCO_2$ values at baseline and after three months' follow-up. (B) PaO_2 values at baseline and after three months' follow-up. (C) Plasma bicarbonate values at baseline and after three months' follow-up. The comparison reveals significant differences at the end of the follow-up period in both groups, though no differences were associated with the choice of protocol.

Lujàn, Respir Med, 2007

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/rmed

Initiation of home mechanical ventilation at home: A randomised controlled trial of efficacy, feasibility and costs

A. Hazenberg [a,b,*], H.A.M. Kerstjens [a,b], S.C.L. Prins [c], K.M. Vermeulen [d], P.J. Wijkstra [a,b]

Table 2 Changes in daytime arterial blood gasses and lung function pre home mechanical ventilation to 6 months after the start.

	Home group ($n = 30$)			Hospital group ($n = 31$)		Between groups	
	Baseline	Follow-up	*P*-Value[a]	Baseline	Follow-up	*P*-Value[a]	*P*-value[b]
Ph	7.40 ± 0.3	7.40 ± 0.3	0.261	7.40 ± 0.3	7.40 ± 0.3	0.913	0.423
$PaCO_2$ (kPa)	6.6 ± 0.9	5.7 ± 0.8	0.000	6.6 ± 1.1	5.9 ± 0.8	0.000	0.631
PaO_2 (kPa)	10.0 ± 1.7	11.3 ± 2.2	0.002	9.5 ± 1.3	10.3 ± 1.7	0.015	0.579
SaO_2 %	95 ± 2.9	96 ± 1.9	0.020	94 ± 2.7	95 ± 3.6	0.348	0.598
HCO_3 (mmol/l)	30.2 ± 3.8	26.6 ± 3.1	0.000	30.4 ± 3.8	26.9 ± 2.5	0.000	0.996
aBE	4.9 ± 2.6	2.6 ± 1.7	0.000	4.8 ± 2.8	2.2 ± 1.8	0.000	0.283
FVC (% pred)	51.6 ± 22.8	53.4 ± 21.8	0.528	52.4 ± 18.5	49.8 ± 19.0	0.301	0.428

Data are presented as *n* or mean ± SD.
kPa: kilopascal. Ph: acidity level. $PaCO_2$: partial pressure of arterial carbon dioxide. PaO_2: partial pressure of arterial oxygen. SaO_2: arterial oxygen saturation. HCO_3: bicarbonate. VC: vital capacity. Follow-up: six months after the initiation of home mechanical ventilation.
Bold: $p < 0.05$ significant change.
[a] *P*-value refers to paired *t* test analysis form starting ventilatory support to six months follow-up within each group.
[b] *P*-value for difference in change Δ from baseline between groups.

Hazenberg, Respir Med, 2014

HAUTE AUTORITÉ DE SANTÉ

RÉVISION DE CATÉGORIES HOMOGÈNES DE DISPOSITIFS MÉDICAUX

Ventilation mécanique à domicile

Dispositifs médicaux et prestations associées pour traitement de l'insuffisance respiratoire

Date de validation par la CNEDiMTS : 20 novembre 2012

HAUTE AUTORITÉ DE SANTÉ

Les caractéristiques des trois niveaux de prestations sont décrites ci-après.

	Prestation de niveau 1	**Prestation de niveau 2**	**Prestation de niveau 3**
Typologie de patients	Hypercapnie diurne ou nocturne corrigée par une ventilation nocturne exclusive	Persistance d'une hypercapnie diurne malgré une ventilation nocturne bien conduite	Dépendance du patient au ventilateur > 16 h/j
Durée de ventilation prescrite	Au cours du sommeil	Au cours du sommeil et ≥ 1 h dans la journée	> 16 h/j
Autonomie respiratoire estimée	16 h/j	8 à 16 h/j	< 8 h/j
Type de ventilateur	Ventilateur sans batterie interne	Ventilateur avec batterie interne non support de vie	Ventilateur support de vie
2ème ventilateur	Non	Non	Oui, avec circuit en place
Mise à disposition des interfaces	3/an	6/an	8/an
Circuit de secours	Non obligatoire	Obligatoire	Obligatoire

HAUTE AUTORITÉ DE SANTÉ

- la mise en place d'une ventilation à domicile ne doit concerner que des patients adultes, non trachéotomisés ;
- le patient doit être en état clinique « stable » et éligible à la prestation de ventilation mécanique de niveau 1 exclusivement ;

- le rôle des différents intervenants (notamment prestataire) doit être défini et en conformité avec le champ de compétences de chacun. Conformément aux compétences décrites dans le Code de la santé publique, le groupe de travail considère que la présence d'un médecin ou d'un kinésithérapeute est indispensable lors de la mise sous ventilation du patient à domicile ;

- les outils de surveillance à mémoire doivent pouvoir être mis à disposition à domicile (relevé des données du ventilateur, mesure de SpO_2 et de $PtcCO_2$, etc.) et les résultats transmis si besoin à un médecin capable d'adapter la prescription en conséquence ;

Installation de VNI

- De quel matériel ai-je besoin?

1-Ventilateurs

Mode?
Aide inspiratoire?
Pression expiratoire Positive?
Fréquence de sécurité?

2-Circuits

Valve ou Fuites?

3- Interfaces

Narinaire, Nasal, Naso-buccal, Facial, Casque?

Quels patients?

S

O

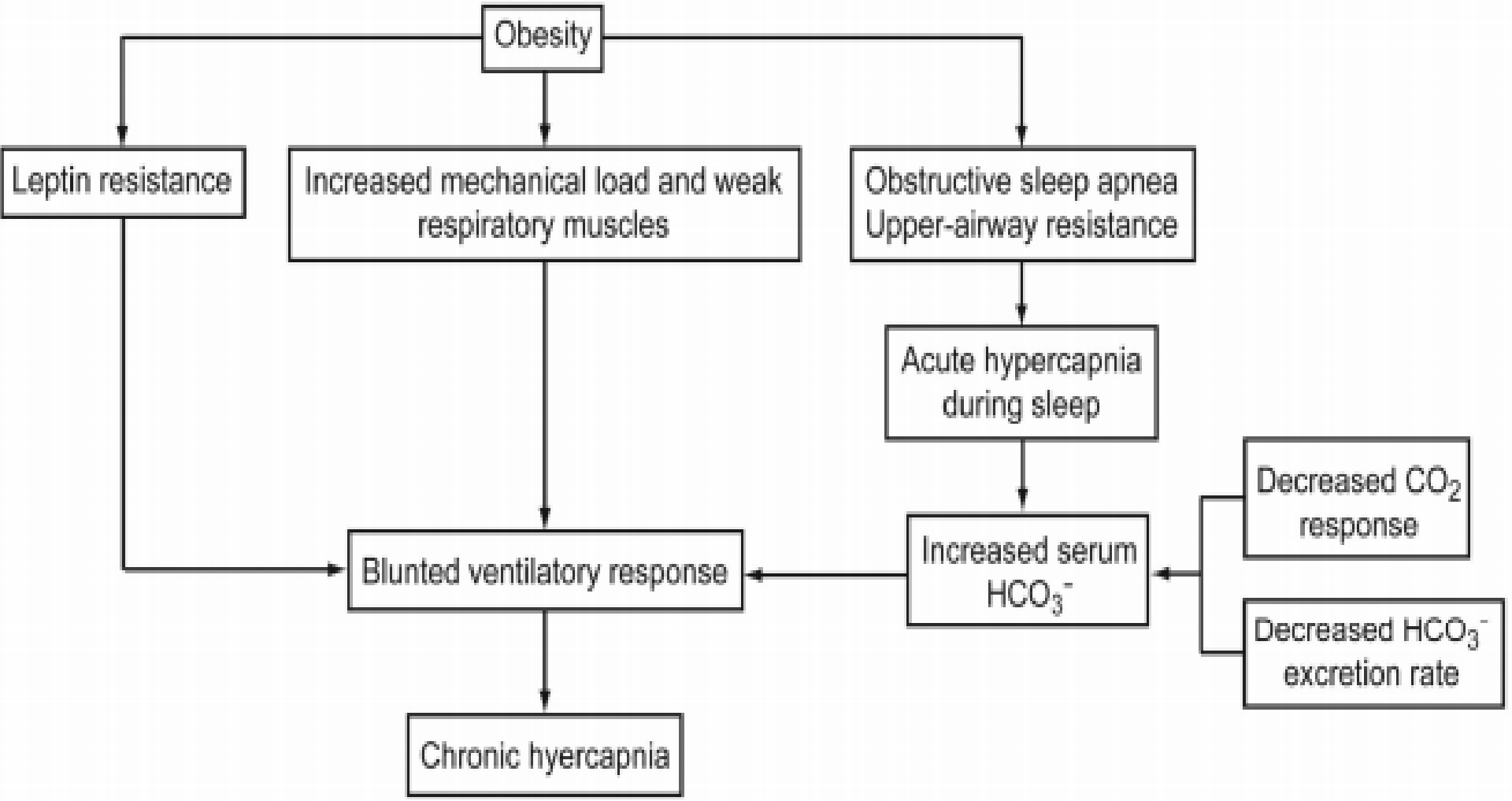
H

Maladie neuromusculaires et thoraco-restrictives

BPCO

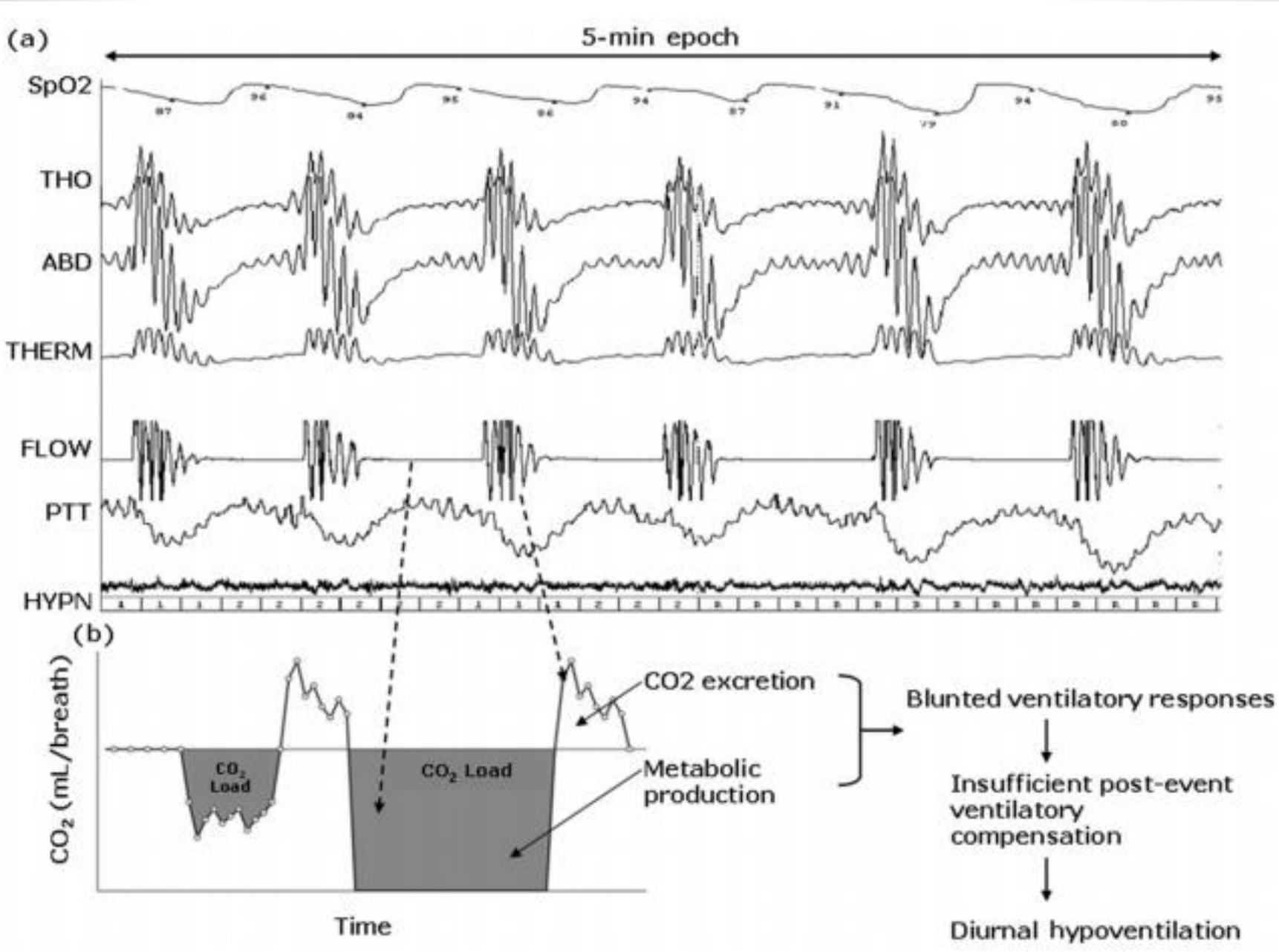
SOH

- Auchincloss 1955: Clinical and physiological aspects of a case of obesity, polycythemia and alveolar hypoventilation.
- « Obesity Hypoventilation Syndrome » formulé en 1974 par Rochester et Enson.
- BMI≥30Kg/m².
- Hypoventilation diurne (PaCO2>45mmHg).
- Seulement 10% n'ont pas de SAOS.
- Entre 11 000 et 22 000 nouveaux cas par an.



g. 8. Mechanisms by which obesity can lead to chronic daytime hypercapnia.

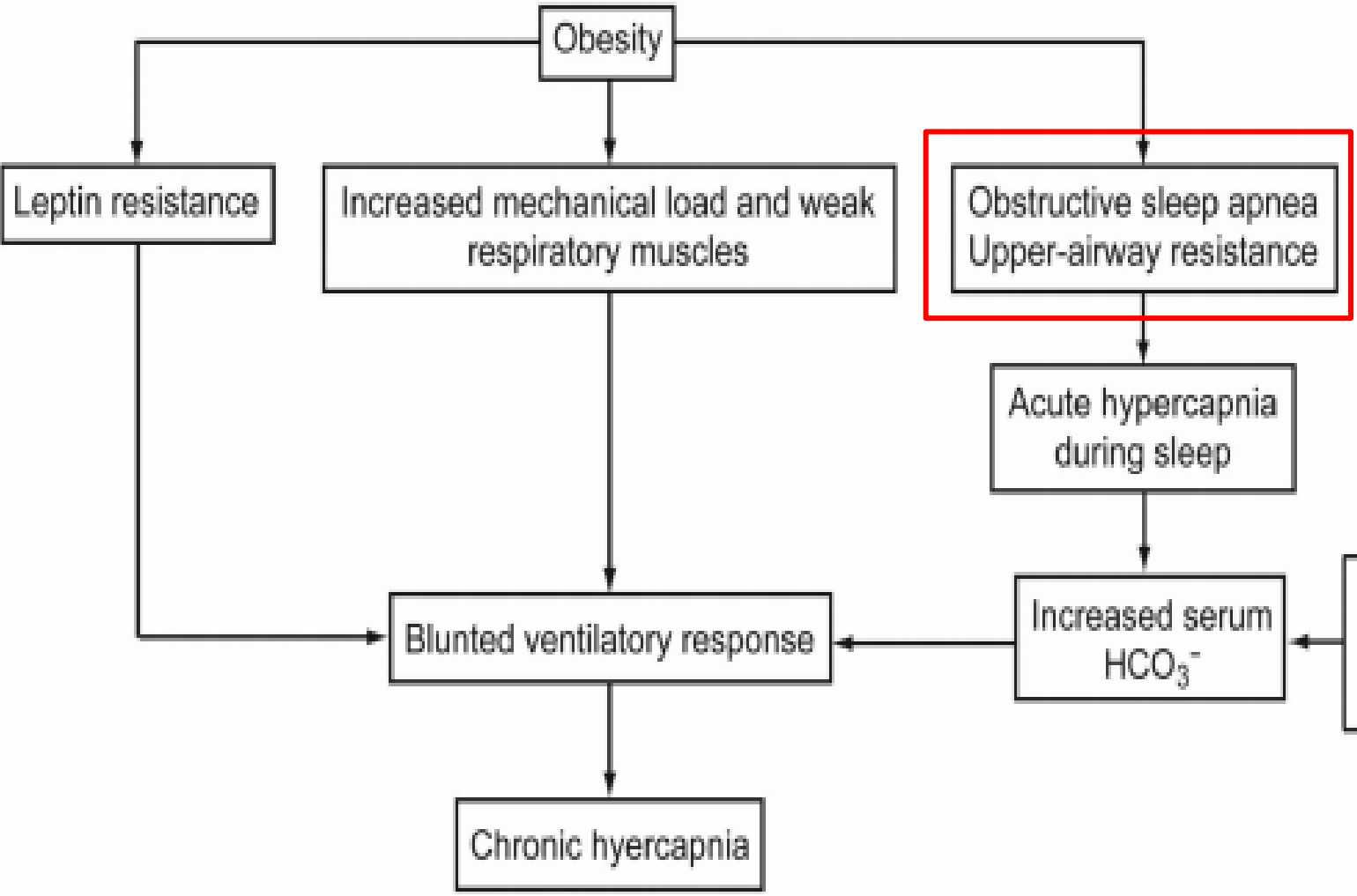
Mokhlesi, Respir Care, 2010



Borel, Respirology, 2012

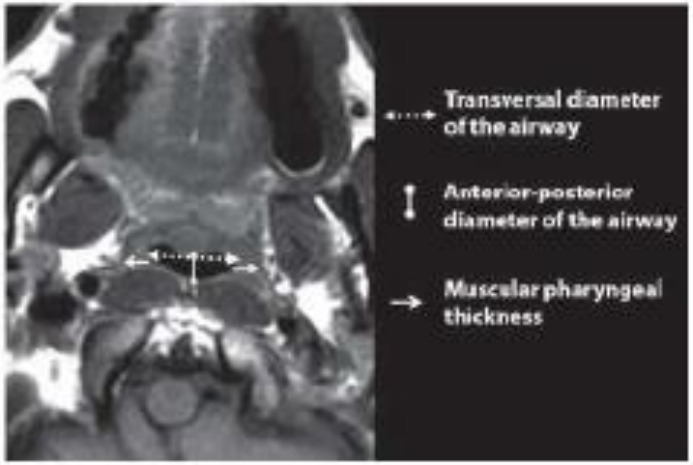
Obesity Hypoventilation Syndrome: A State-of-the-Art Review

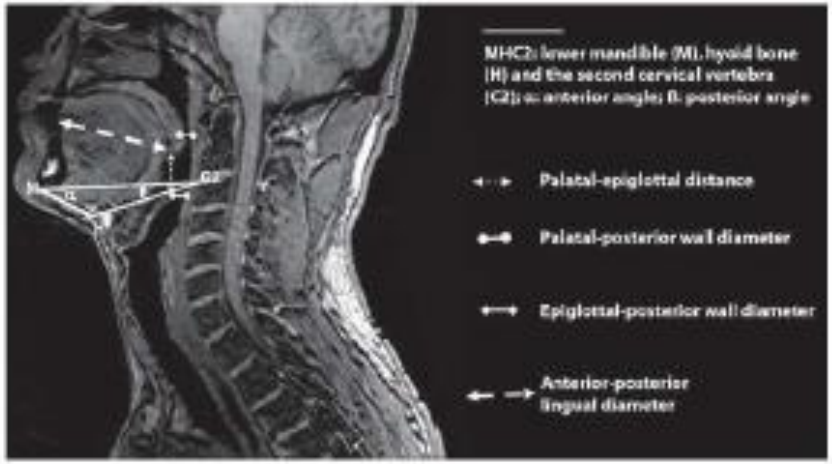
90% SAOS

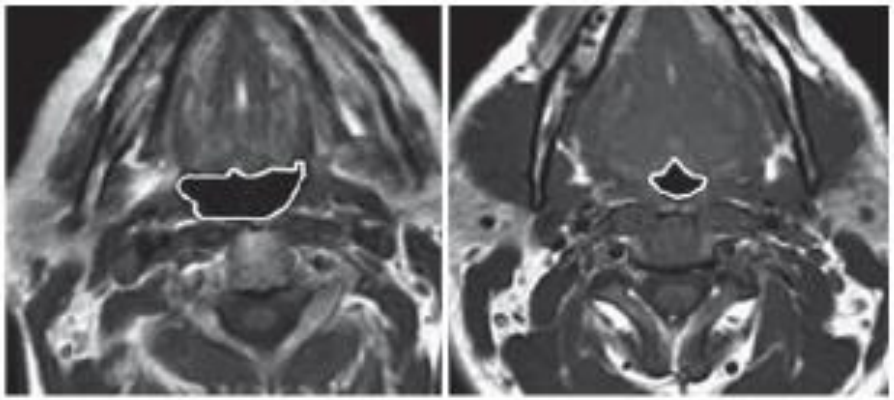


g. 8. Mechanisms by which obesity can lead to chronic daytime hypercapnia.

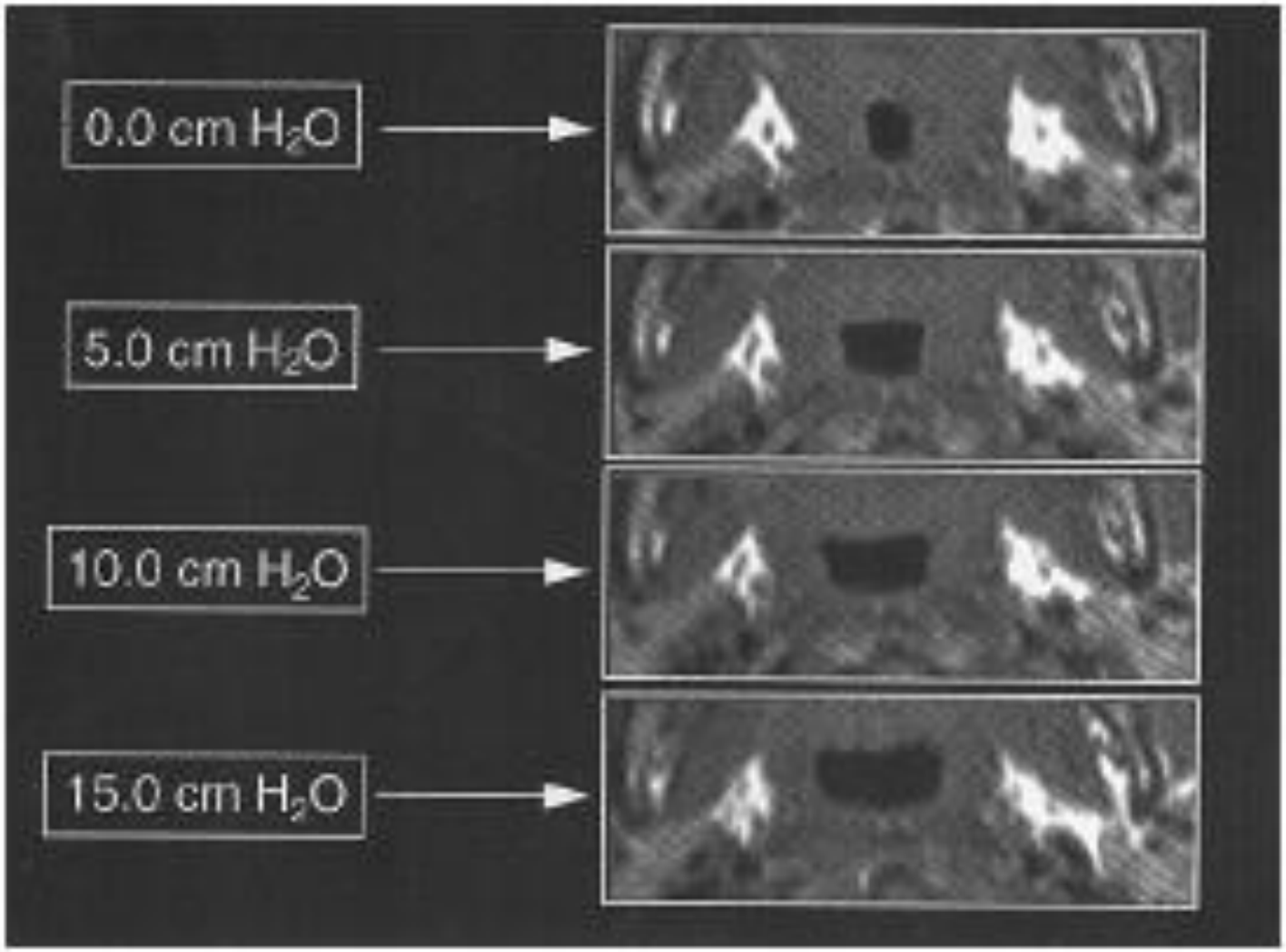
Mokhlesi, Respir Care, 2010


Transversal diameter of the airway
Anterior-posterior diameter of the airway
Muscular pharyngeal thickness


MHC2: lower mandible (M), hyoid bone (H) and the second cervical vertebra (C2); α: anterior angle; ß: posterior angle
Palatal-epiglottal distance
Palatal-posterior wall diameter
Epiglottal-posterior wall diameter
Anterior-posterior lingual diameter



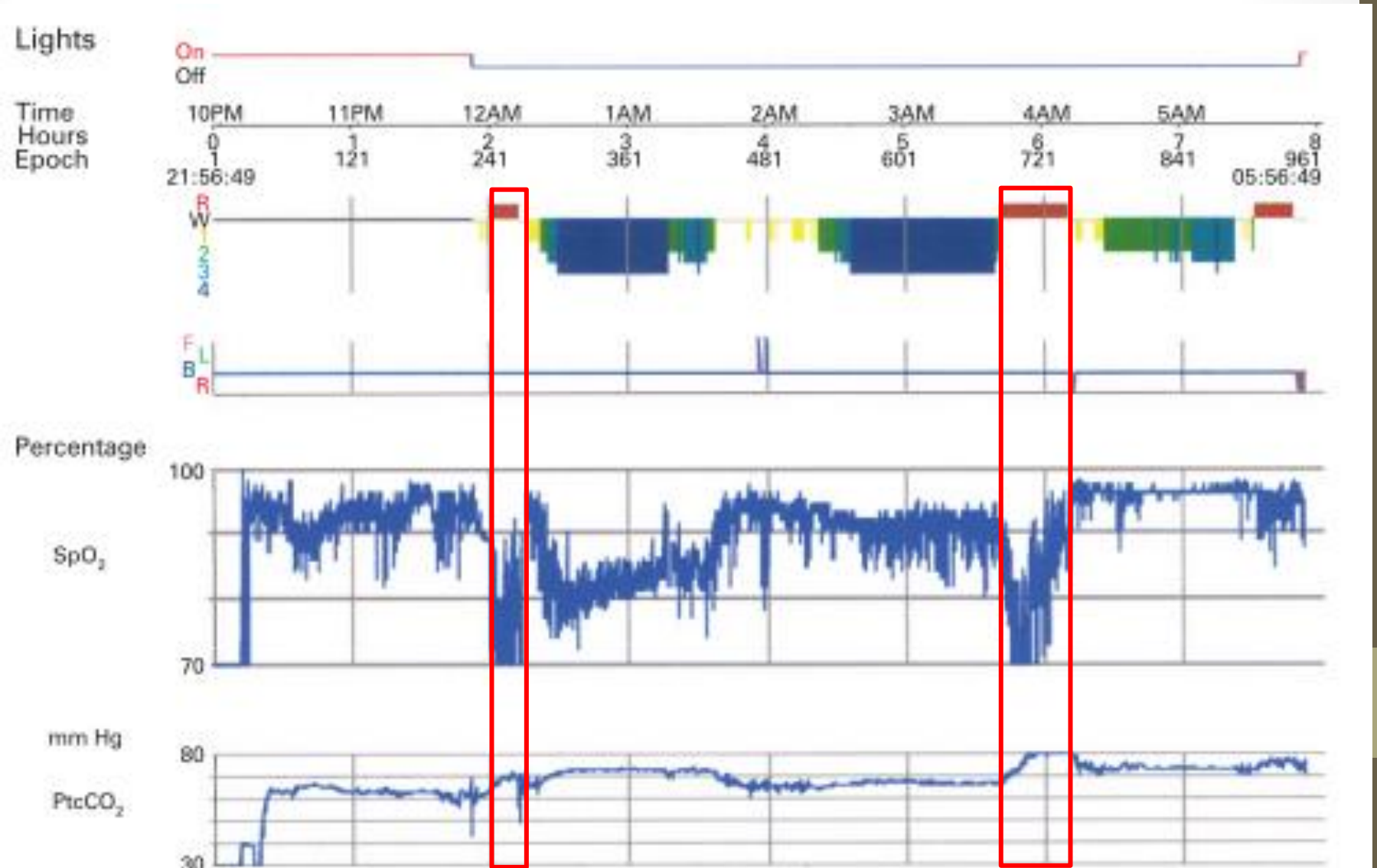
Effet de la Pression expiratoire Positive

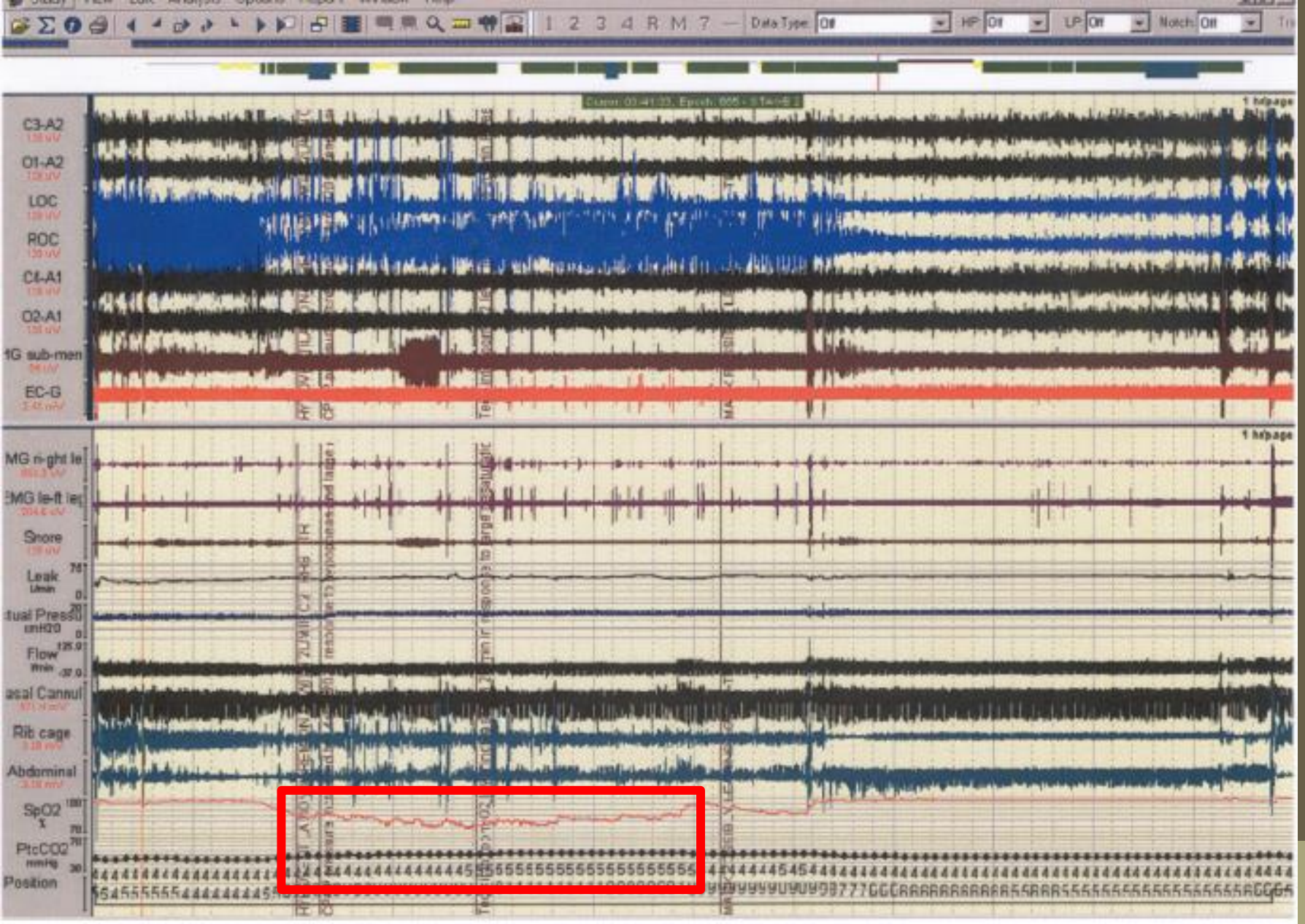


Cas clinique

Crummy, Thorax, 2008

- Homme de 22ans, 228 Kg, 158 cm, $PaCO_2$ diurne: 67mmHg





Mauvais contrôle de l'hypoventilation (hypoxie+hypercapnie) par CPAP seule pendant la phase REM

Crummy, Thorax, 2008

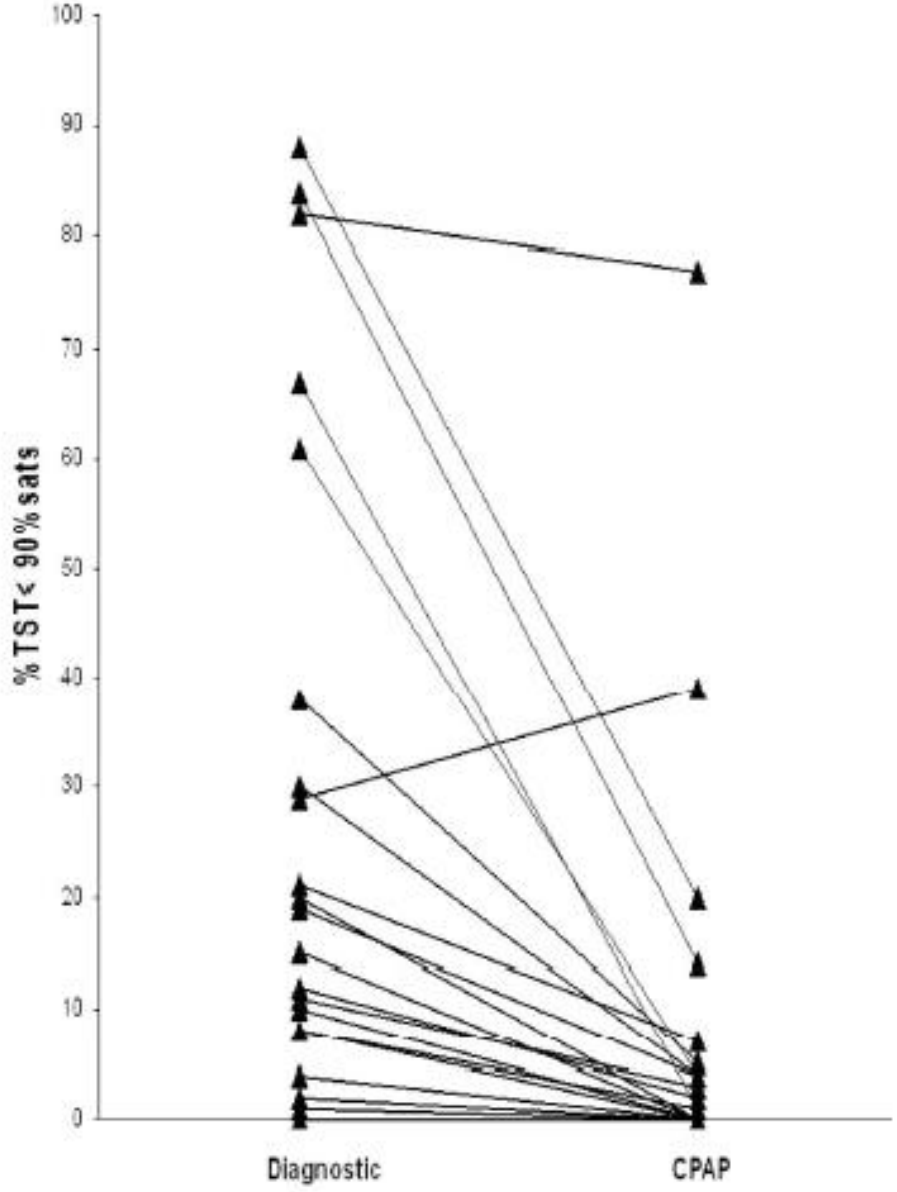
Le patient présente une hypoventilation réfractaire sous CPAP malgré une correction du SAOS. Quels paramètres pourraient améliorer son oxygénation?

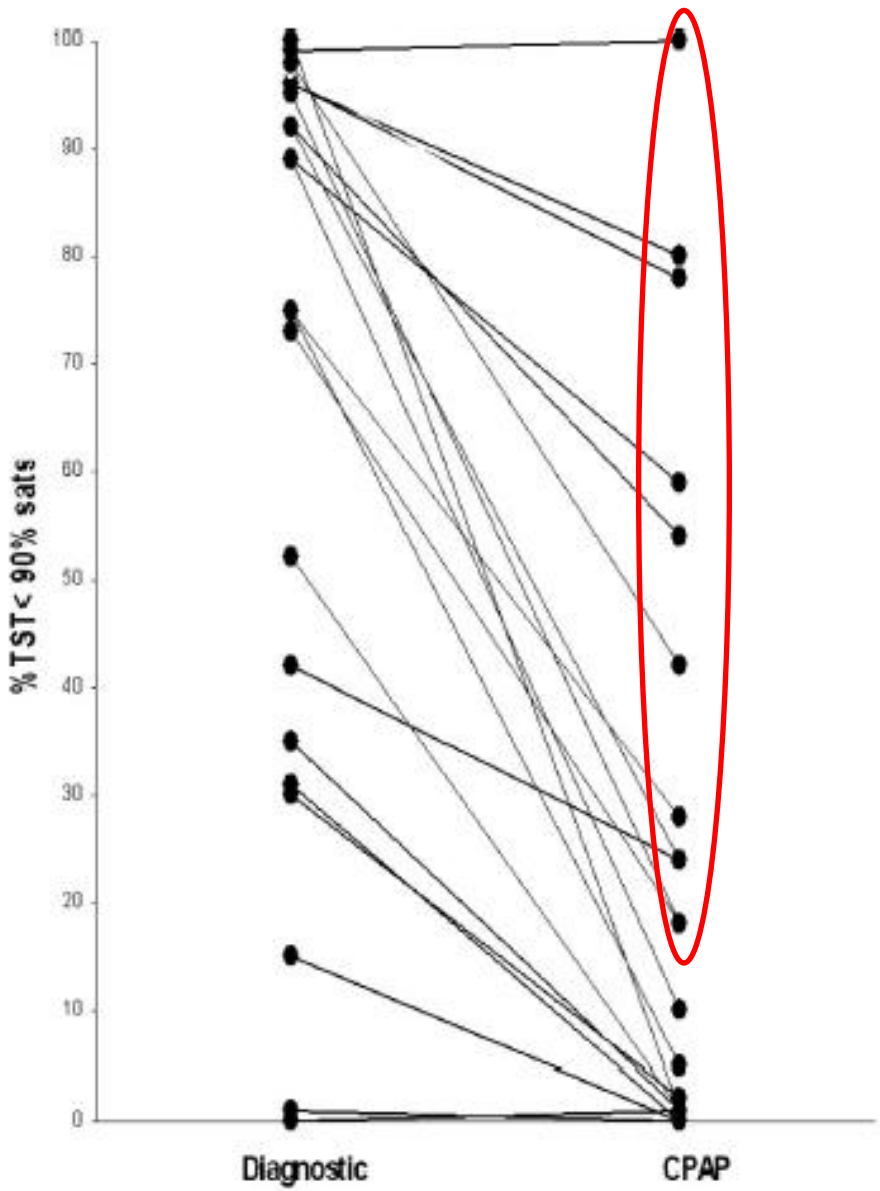
A: Une augmentation de la Pep

B: Passer à un mode à deux niveaux de pression

C: Augmenter l'oxygène

D: La réponse D





Banerjee, Chest, 2007

Table 4—*Comparison of OHS Subjects Who Spend > 20% of TST With Spo_2 < 90% (n = 10) With Those Who Spend ≤ 20% of TST With Spo_2 < 90% (n = 13) During CPAP***

Parameters	>20% of TST With Spo_2 < 90%	≤ 20% of TST With Spo_2 < 90%	p Value
BMI	61.6 (1.7)	56.5 (1.2)	0.02
Percentage of TST with Spo_2 < 90%	87 (5)	46 (10)	0.004
Pao_2, mm Hg	59.4 (2.1)	62.3 (1.5)	NS
$Paco_2$, mm Hg	55.5 (3.0)	53.3 (1.4)	NS
FEV_1, L	2.07 (0.23)	2.17 (0.23)	NS
FVC, L	2.55 (0.32)	2.79 (0.30)	NS
Percentage of REM (CPAP)	26.6 (5.0)	22.1 (2.3)	NS
REM AHI, /h	15.3 (2.9)	5.3 (0.8)	0.009
Total AHI, /h	25.1 (12.5)	9.8 (5.0)	NS
Percentage of TST with Spo_2 < 90% (CPAP)	56.5 (8.4)	4.4 (1.8)	0.0001

*Data were normally distributed and presented as mean (SE). See Table 1 for expansion of abbreviation.

Banerjee, Chest, 2007

CHEST

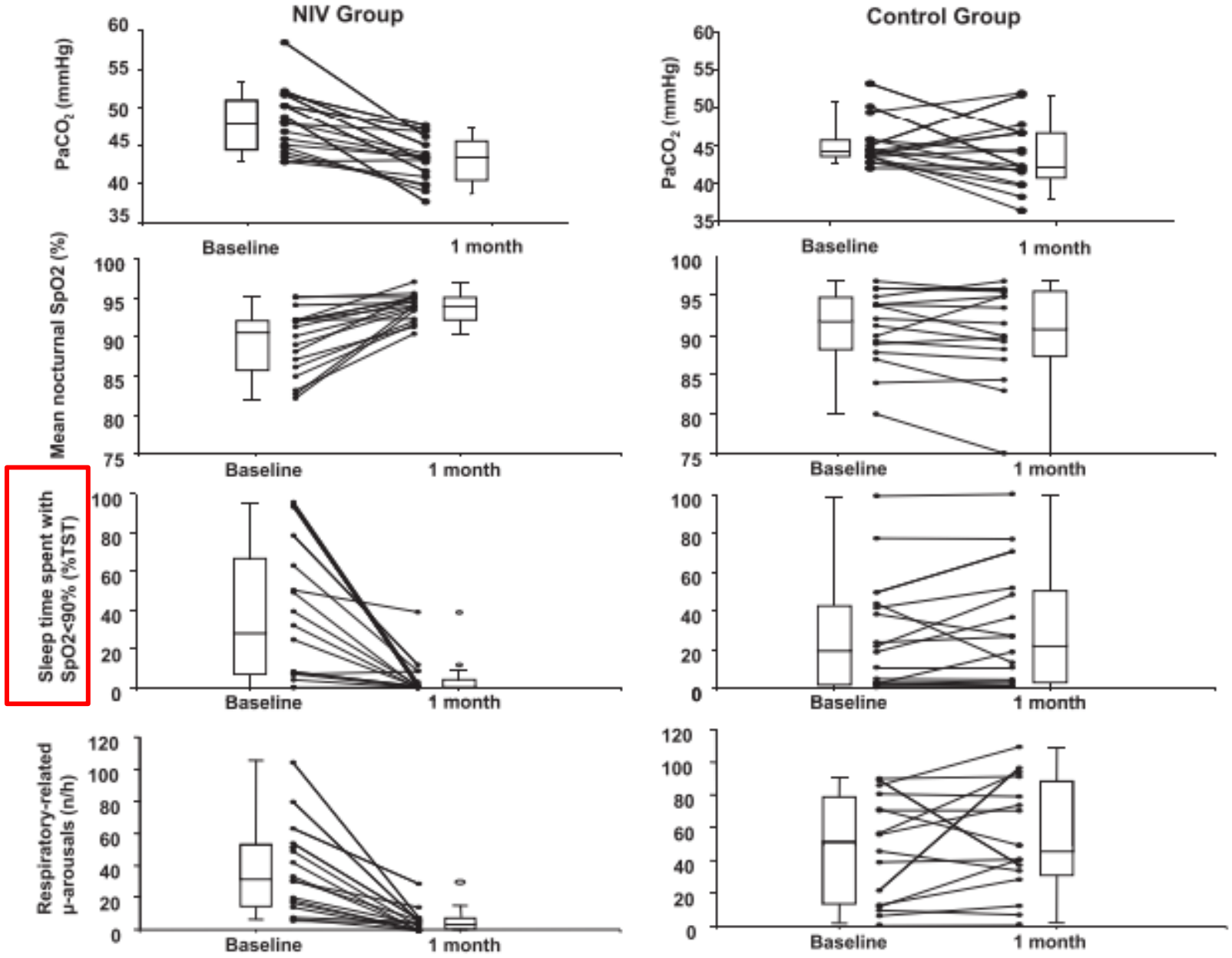
Original Research

SLEEP DISORDERS

Noninvasive Ventilation in Mild Obesity Hypoventilation Syndrome

A Randomized Controlled Trial

Jean-Christian Borel, PhD; Renaud Tamisier, MD, PhD; Jesus Gonzalez-Bermejo, MD, PhD; Jean-Philippe Baguet, MD, PhD; Denis Monneret, PharmD; Nathalie Arnol, MSc; Pascale Roux-Lombard, MD; Bernard Wuyam, MD, PhD; Patrick Levy, MD, PhD; and Jean-Louis Pépin, MD, PhD



Borel, Chest, 2012

Quels réglages en plus de la Pep pour une ventilation à deux niveaux de pression?

A: Favoriser une Ai élevée

B: Un mode à volume cible

C: Une aide inspiratoire et une fréquence de sécurité

D: La réponse D

Berger[13] 2001 Retrospective Case Series Level IV	group 2: 12 patients BPAP Rx IPAP 18 cm H_2O range (12 to 25) cm H_2O EPAP 8 range (3 to 14)
Budweiser[18] 2007 Survival of OHS on NPPV Case Series	BPAP ST IPAP 22.5 ± 3.6 mbar EPAP 5.8 ± 3.1 mbar backup rate 19.2/min
De Lucas-Ramos[19] 2004 Case Series Level IV	end IPAP = 19 ± 2 EPAP of 5 cm H_2O
Piper[22] 2007 RCT Level I CPAP vs BPAP	CPAP mean pressure was 14 cm H_2O BPAP S mode mean IPAP = 16 cm H_2O EPAP = 10 cm H_2O
Redolfi[20] 2006 Leptin in OHS prospective case controlled Level IV	BPAP Synchrony device mean pressures IPAP = 12 EPAP = 4
Guo[21] 2007 Level IV	BPAP ST mode used mean IPAP = 18.5 ± 4.6 mean EPAP = 6.2 ± 1.4 mean backup rate = 13.7 ± 2.2 bpm

Berry, J Clin Sleep Med, 2010

NIV Settings and Compliance to NIV

Mean inspiratory and expiratory therapeutic pressures were 18 ± 3 cm H_2O and 11 ± 2 cm H_2O, respectively (mean pressure support, 8 ± 2 cm H_2O); mean back-up rate breathing frequency was set at 13 ± 2 cycles/min. None of the patients received additional oxygen therapy. At 1 month, the mean use of nocturnal NIV was 5.6 ± 2.2 h/night. Four of the 18 patients in the NIV group used the device < 4 h per night.

Borel, Chest, 2012

Table 1—*Characteristics of Patients Included and Usual Ventilator Settings*

Characteristic	Mean	SD	% Predicted	SD
Age, y	55.7	9.2	…	…
BMI, kg/m^2	48.5	5.1	…	…
TLC, L	5.0	1.5	82	18
FVC, L	3.2	1.1	86	22
FEV_1, L	2.6	0.8	87	23
FEV_1/FVC	0.82	0.05	100	1
Arterial blood gases				
pH	7.44	0.03	…	…
$PaCO_2$, mm Hg	41.3	5.6	…	…
PaO_2, mm Hg	72.7	10.9	…	…
HCO_3^-, mmol/L	28.1	2.6	…	…
Baseline ventilator settings				
Duration of NPPV, mo	42.7	46.8	…	…
Compliance, h/min	7:16	1:44	…	…
BURR,[a] cycles/min	14	1.5	…	…
IPAP, cm H_2O	20.5	3.7	…	…
EPAP, cm H_2O	9.2	1.8	…	…
Rise time, ms	155	65	…	…
T_{Imin}, s	0.7	0.06	…	…
T_{Imax}, s	1.3	0.1	…	…

Contal, Chest, 2013

Et la fréquence respiratoire?

CHEST

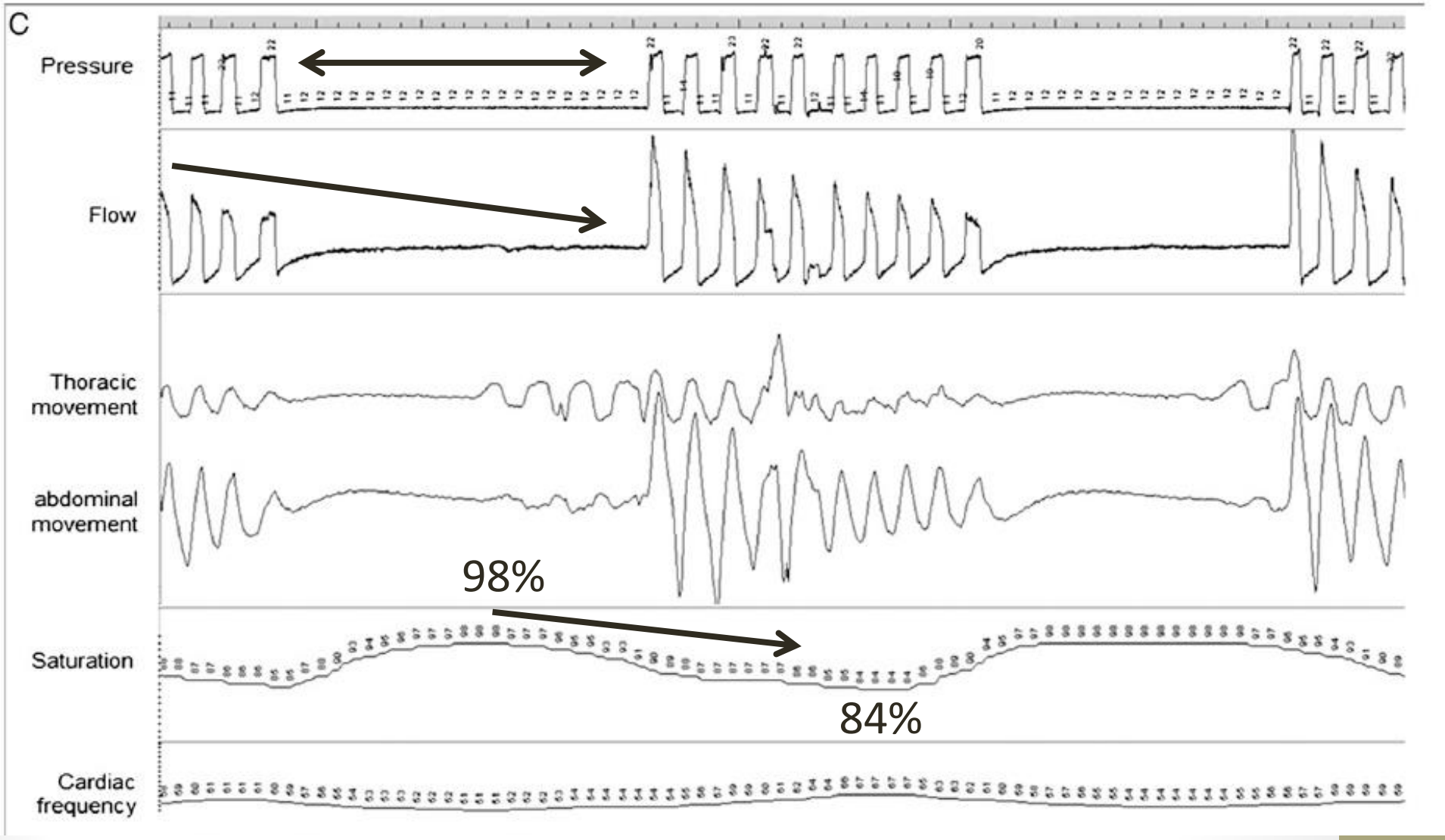
Original Research

SLEEP DISORDERS

Impact of Different Backup Respiratory Rates on the Efficacy of Noninvasive Positive Pressure Ventilation in Obesity Hypoventilation Syndrome

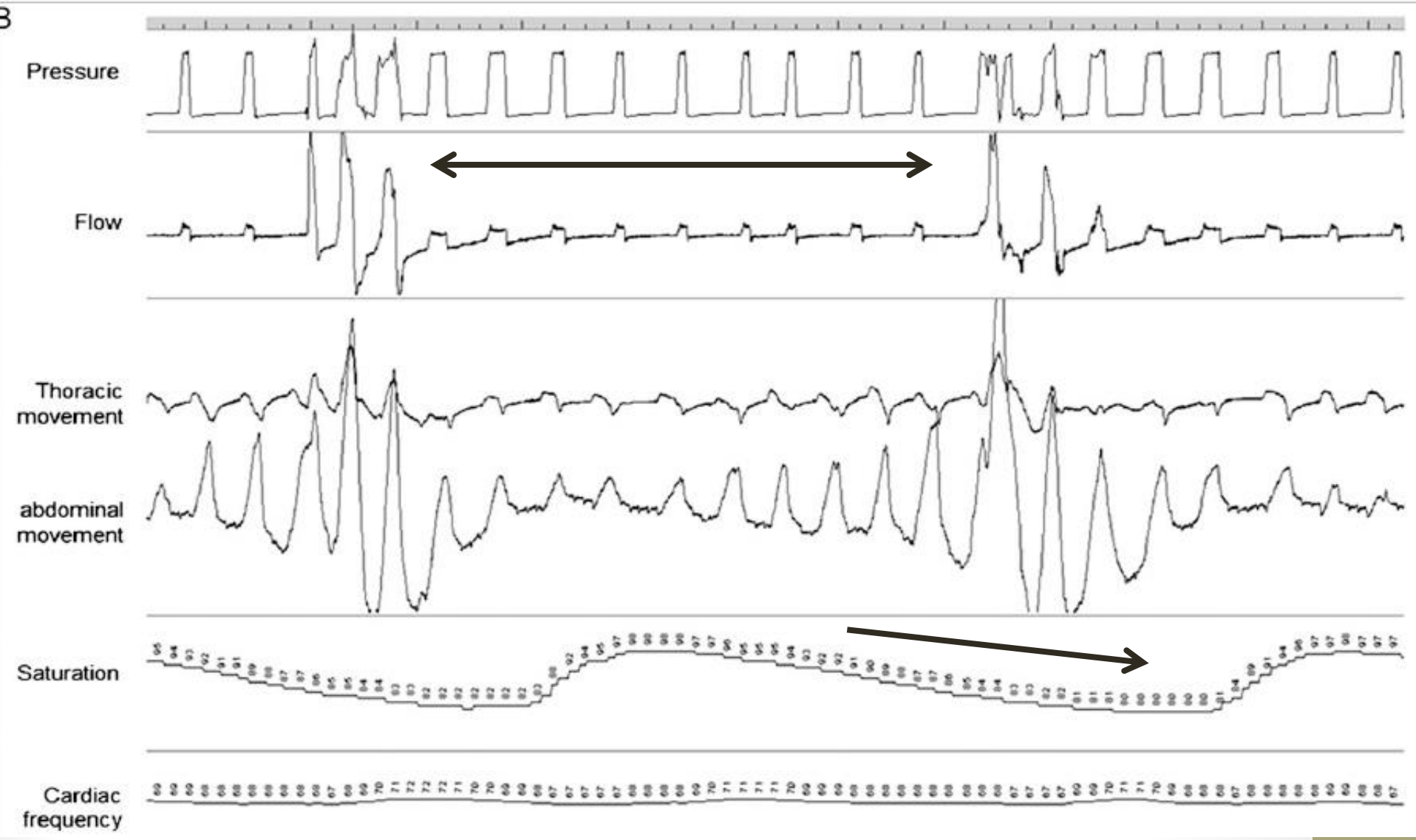
A Randomized Trial

Olivier Contal, PhD, PT; Dan Adler, MD; Jean-Christian Borel, PhD; Fabrice Espa, RPSGT; Stephen Perrig, MD; Daniel Rodenstein, MD; Jean-Louis Pépin, MD; and Jean-Paul Janssens, MD



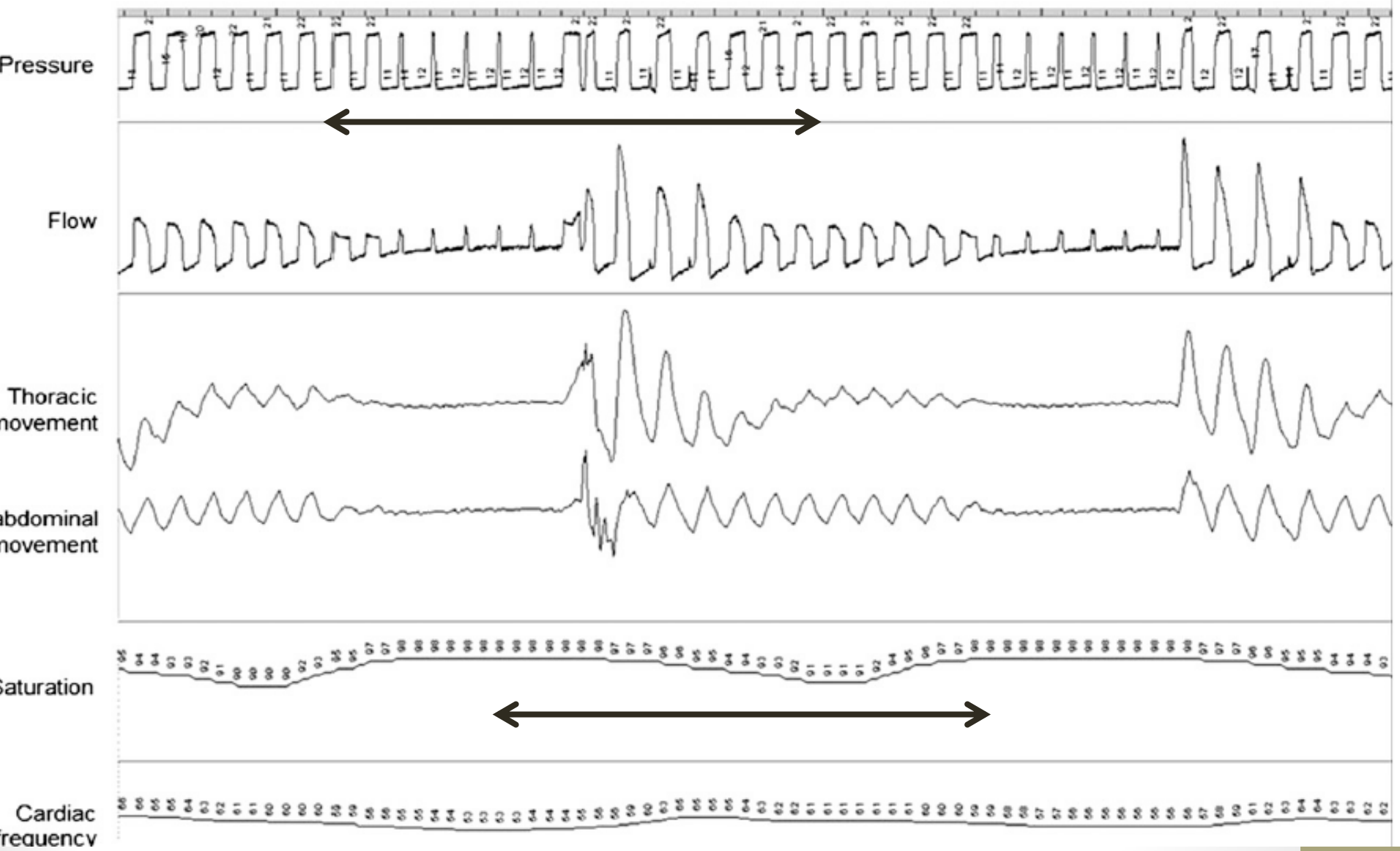
Fréquence de sécurité = 0

Contal, Chest, 2013



Fréquence de sécurité = 11

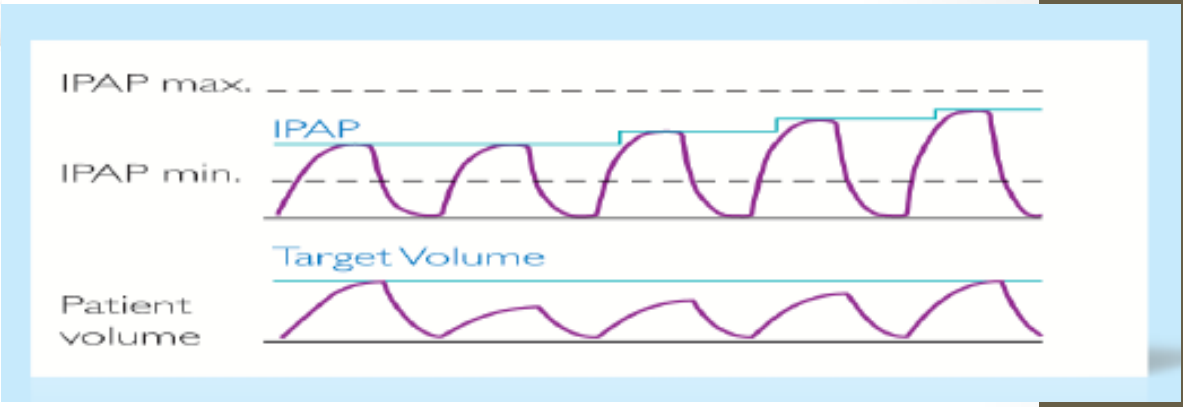
Contal, Chest, 2013



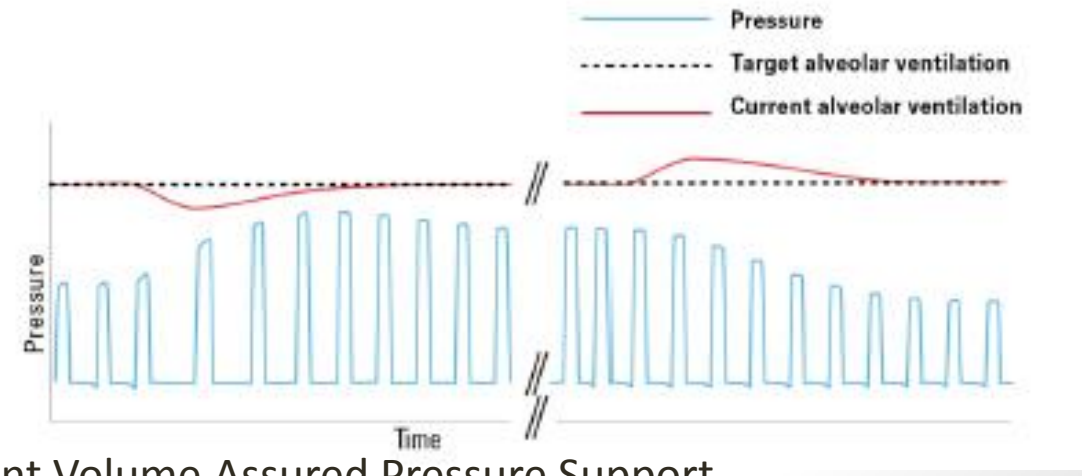
Fréquence de sécurité = 21

Contal, Chest, 2013

Mode à volume cibles

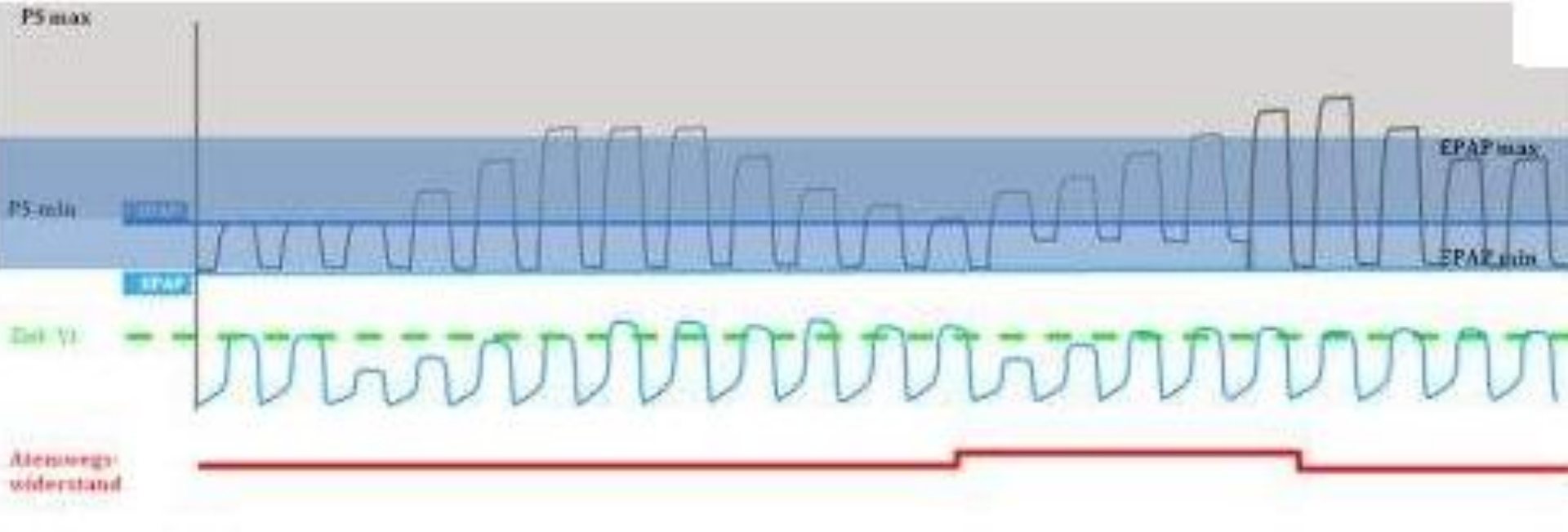


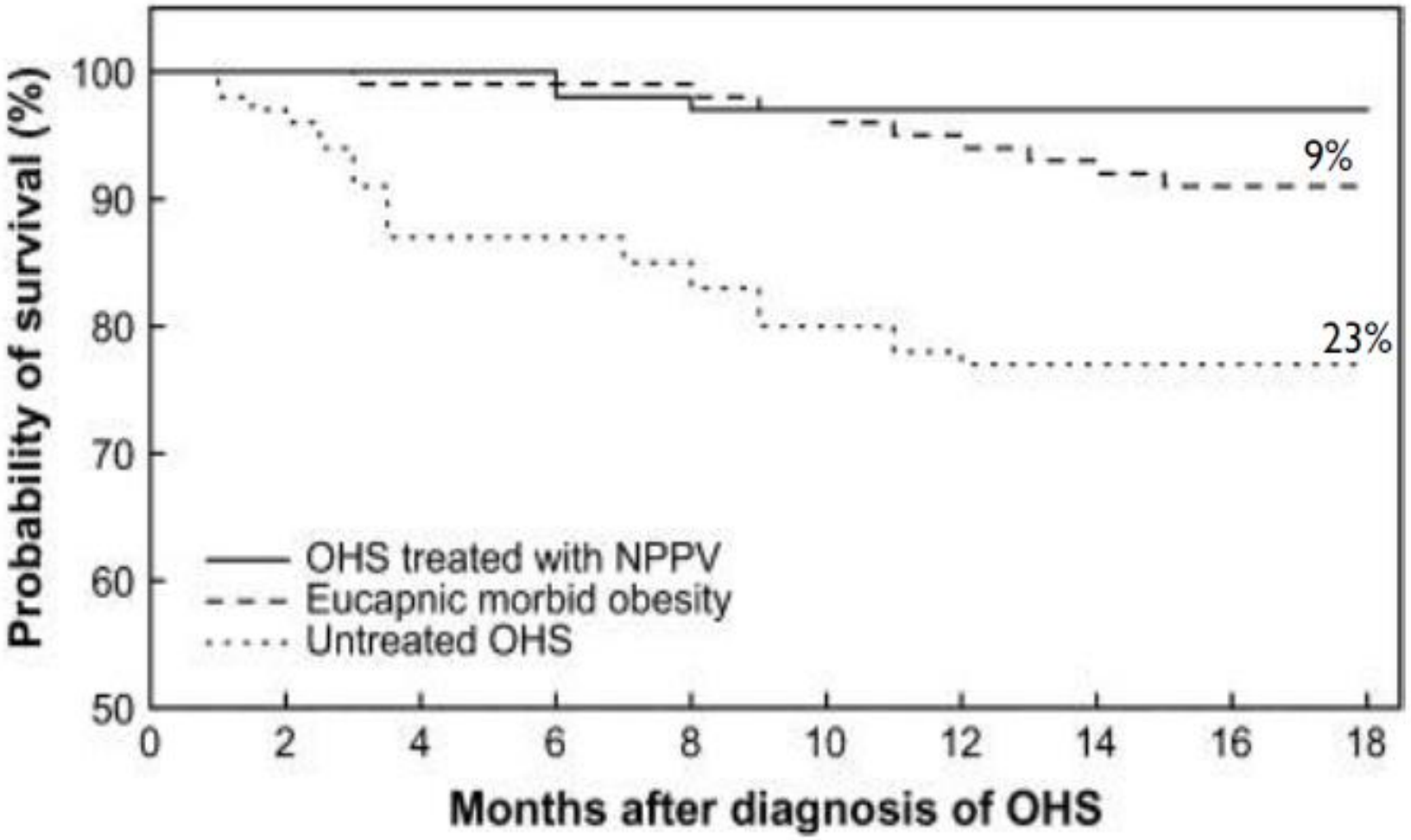
Average Volume Assured Pressure Support Ventilation



Intelligent Volume Assured Pressure Support

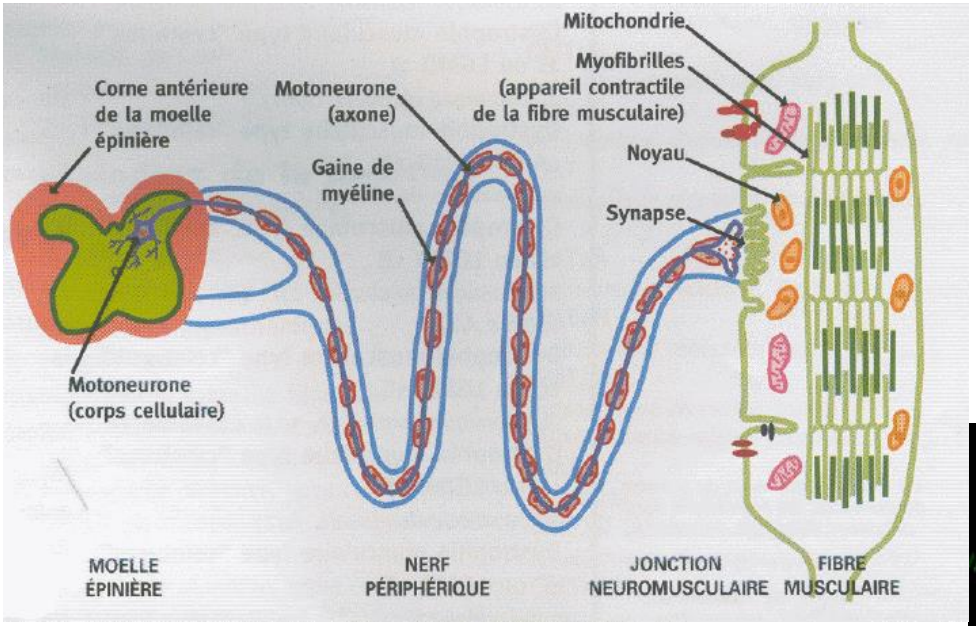
Mode AVAPS-AE?

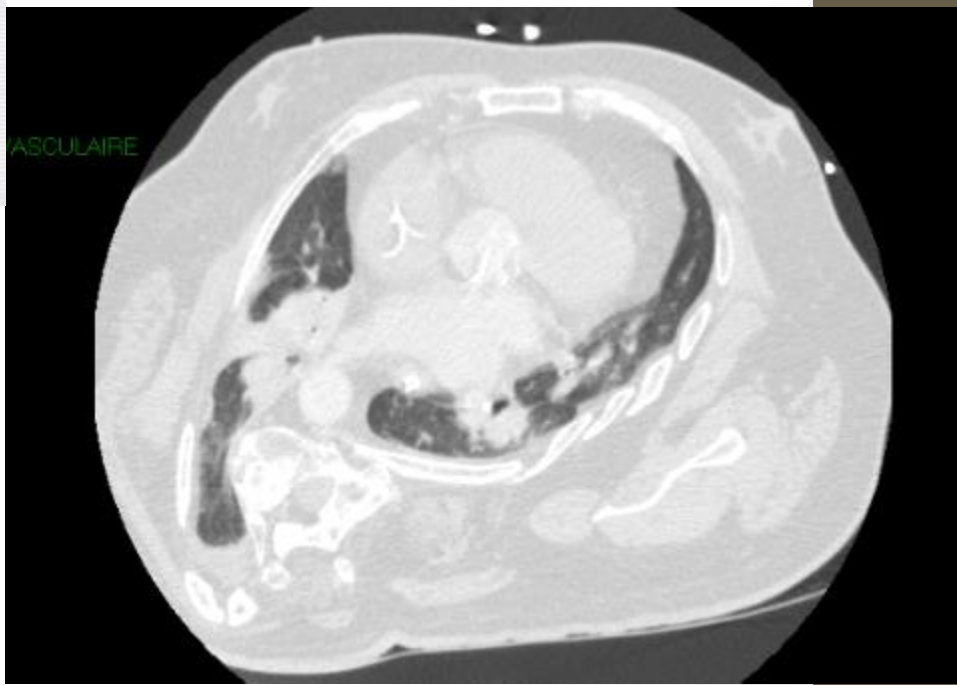


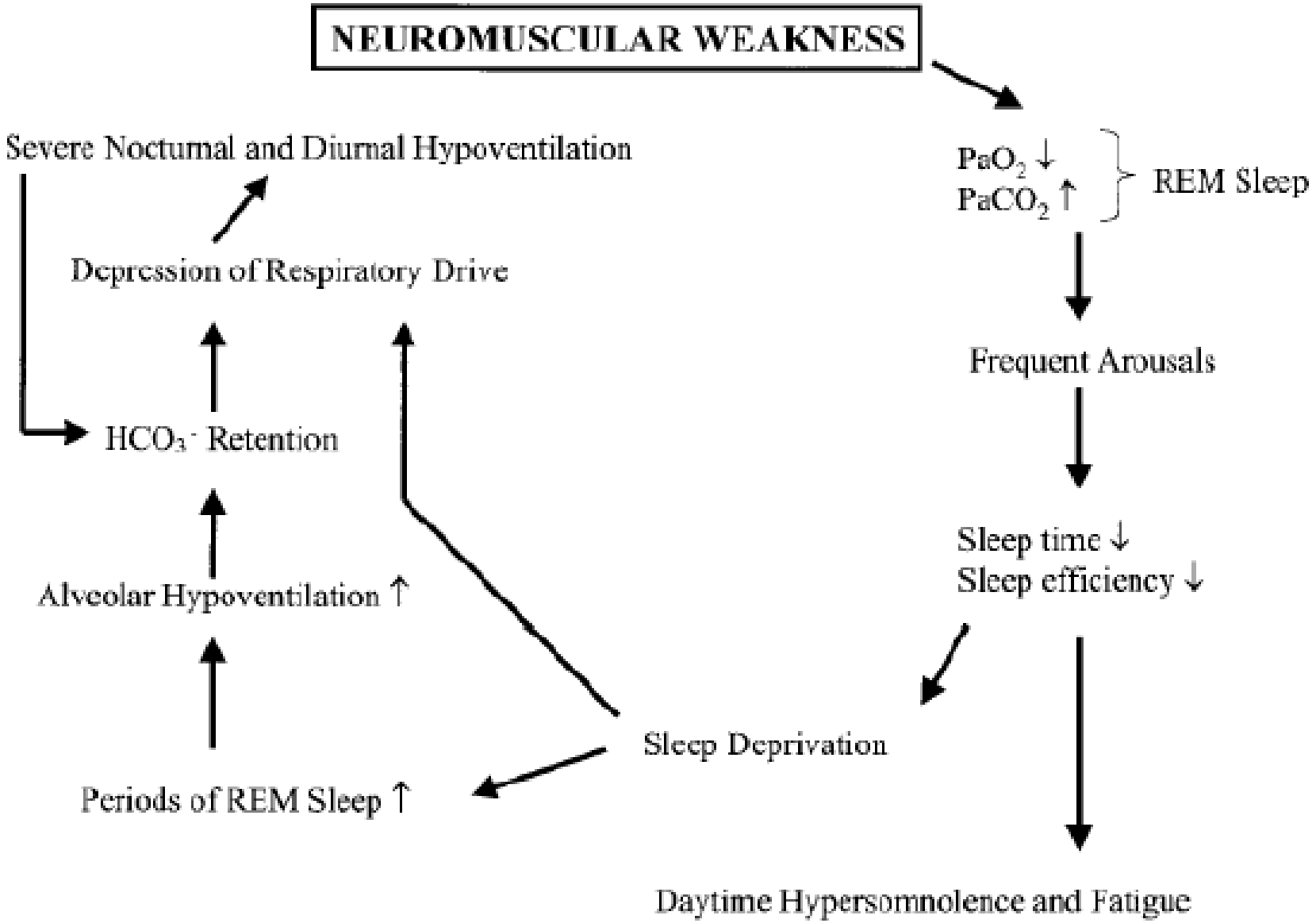


Nowbar 2004, Budweiser 2007

Maladie Neuromusculaire et thoraco-restrictive







Perrin, Muscle Nerve, 2004

RLD

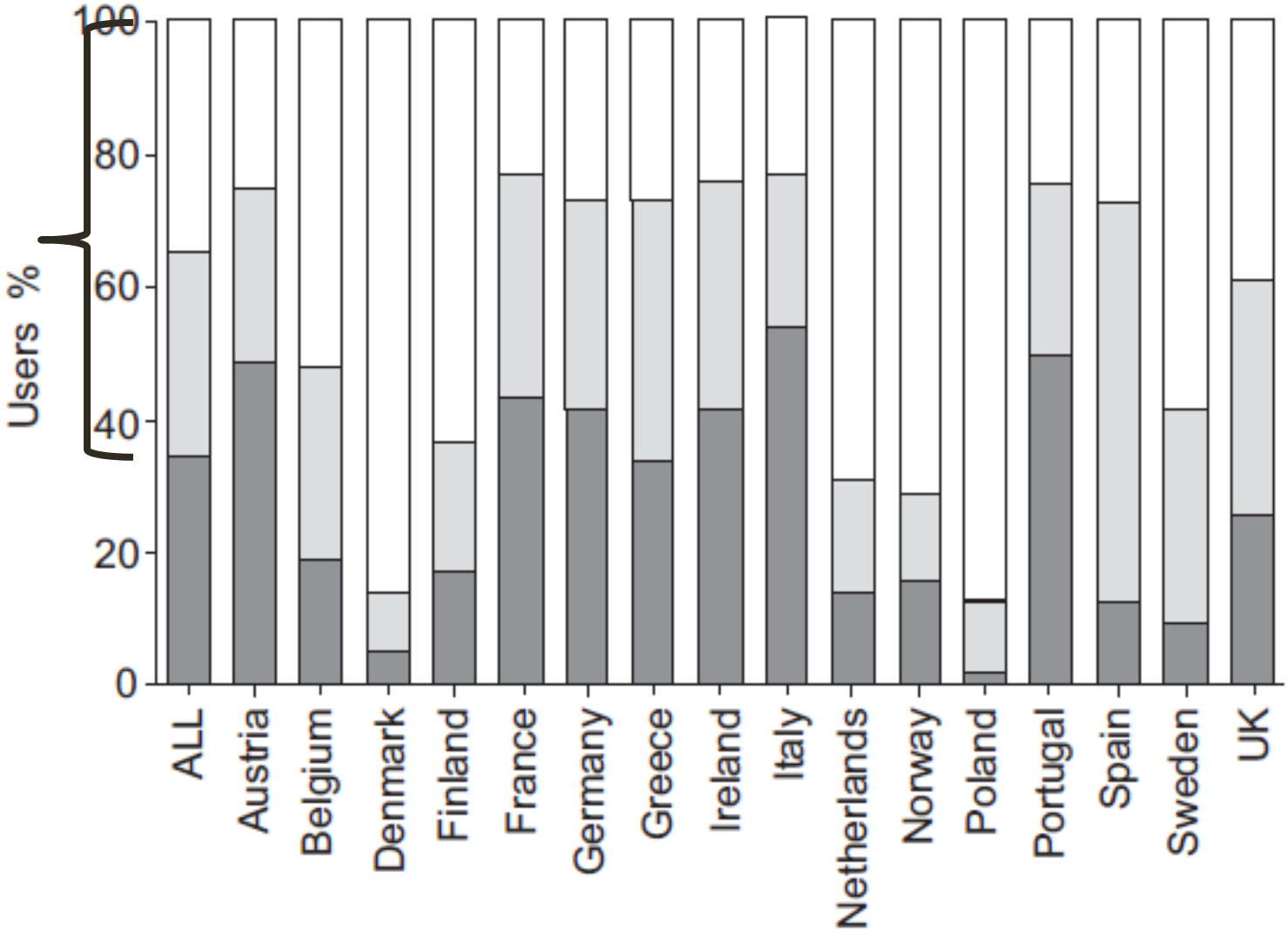


FIGURE 4. Percentage of users in each disease category by country (see *Methods* section for an explanation of disease categories). ■: lung/airways; ■: thoracic cage; □: neuromuscular.

Lloyd-Owen, Eur Respir J, 2005

Quels sont les effets de la VNI dans les pathologies Neuromusculaires et thoraco-restrictives?

A: Améliore l'espérance de vie

B: Détériore la qualité du sommeil

C: Améliore la capacité vitale et la force des muscles respiratoires

D: La réponse D

Kyphoscoliosis

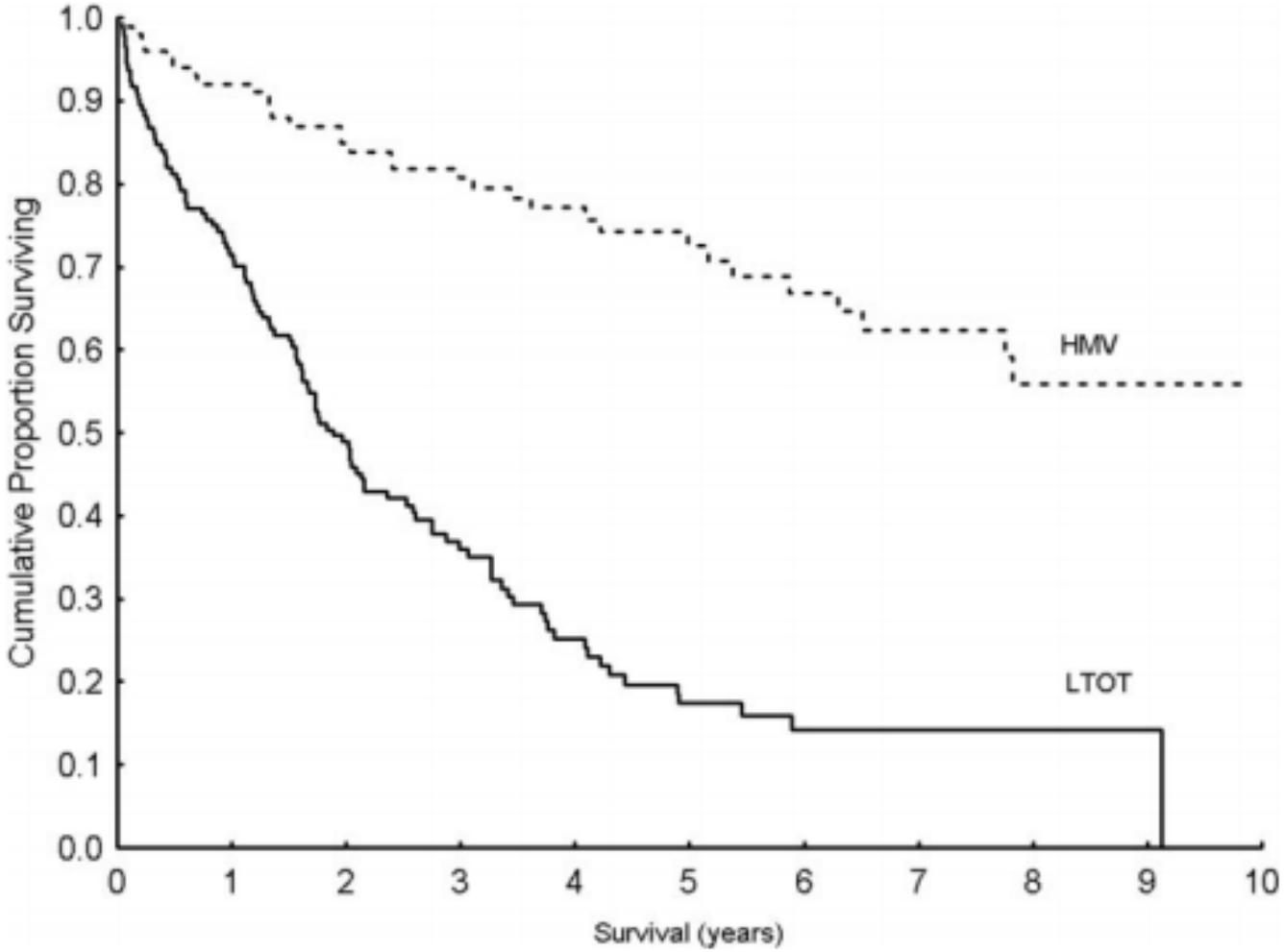


FIGURE 2. Cumulative proportion of surviving patients receiving HMV or LTOT alone.

Gustafson, Chest, 2006

Et les autres pathologies?

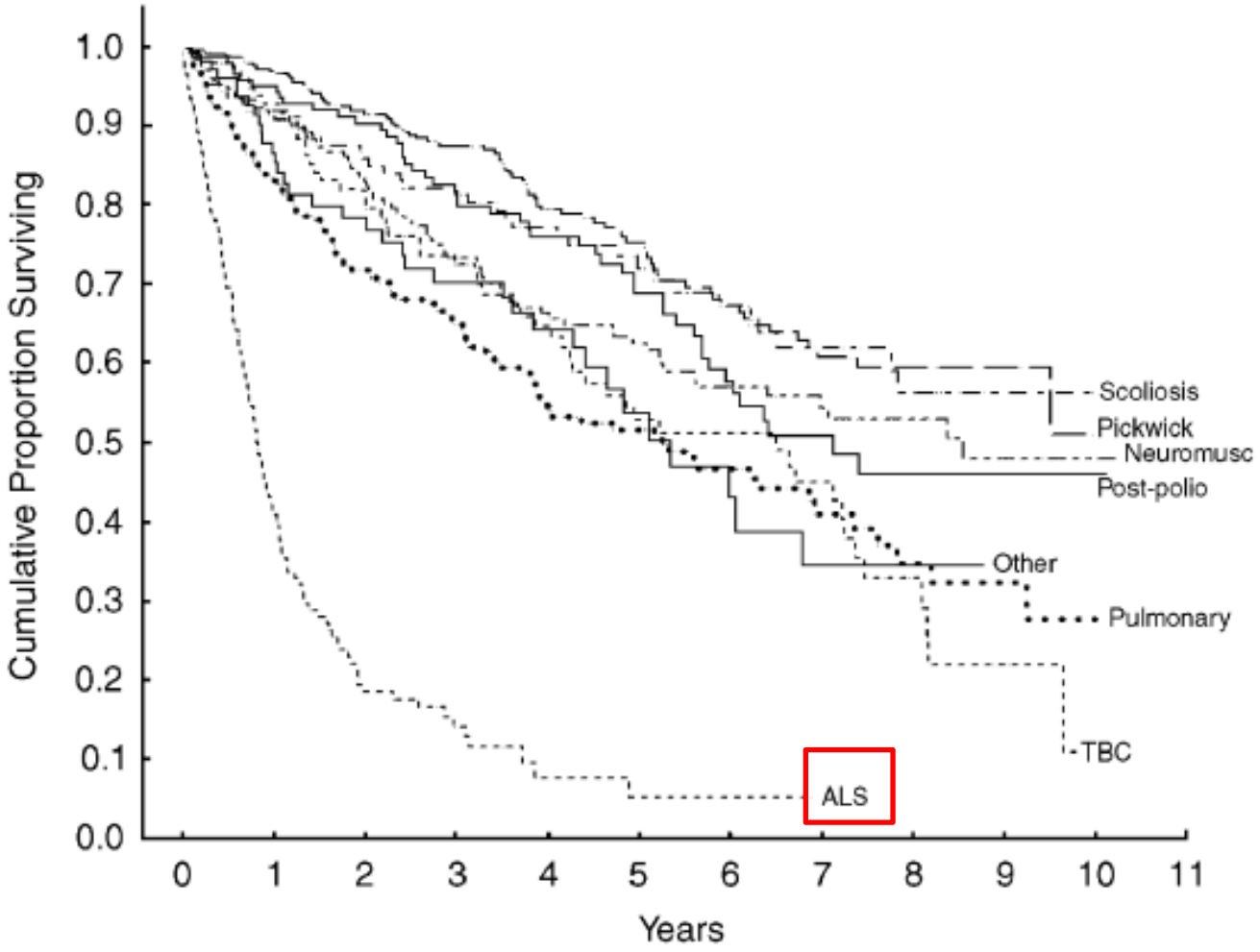
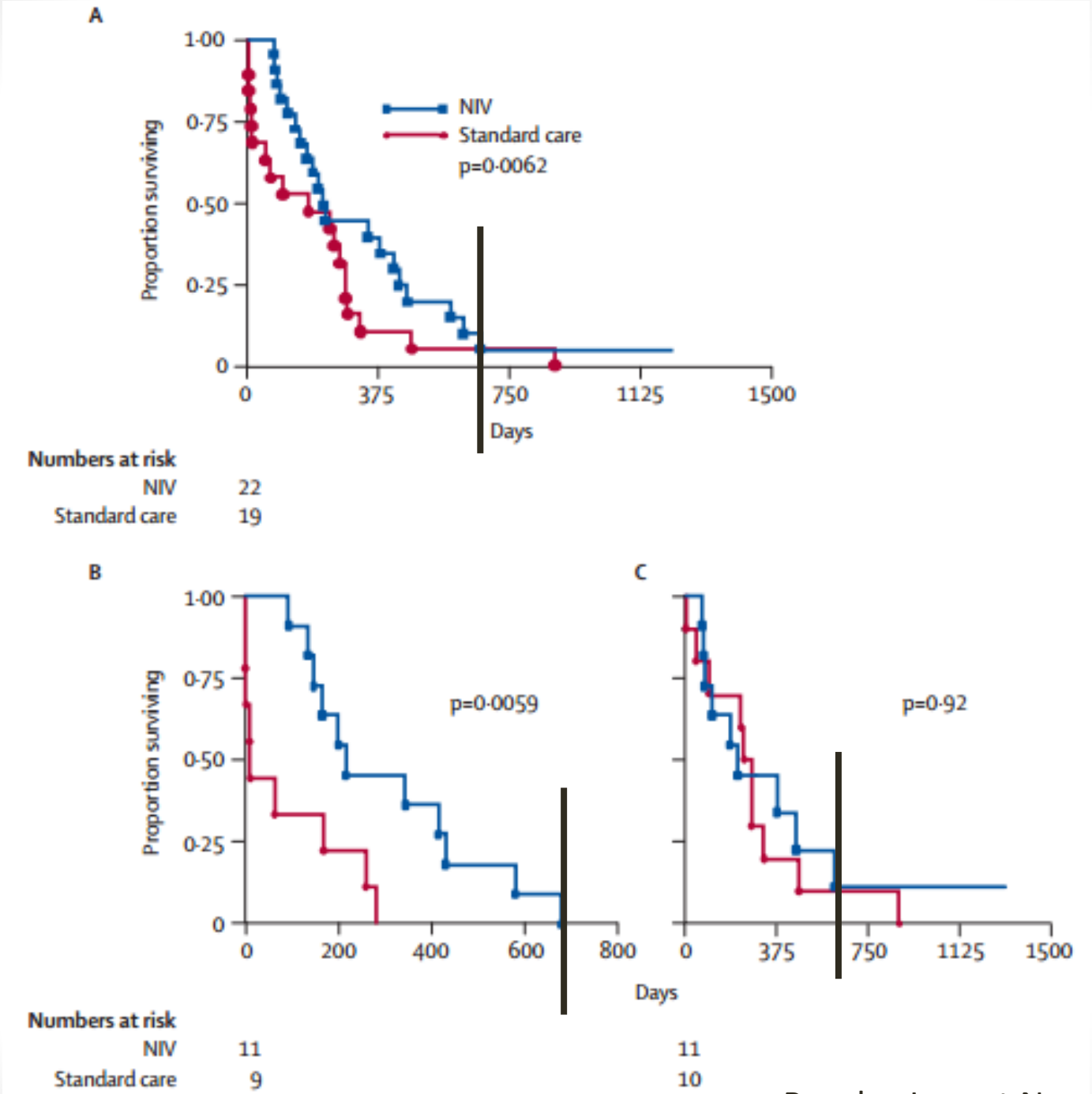


Figure 1 Probability to survive in 1526 adult patients after starting HMV.

Laub, Respiratory Medicine, 2007



Bourke, Lancet Neurology, 2006

Qualité du sommeil?

Contents lists available at ScienceDirect

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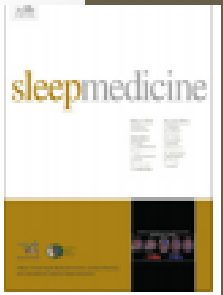
journal homepage: www.elsevier.com/locate/sleep



Original Article

Sleep in ventilatory failure in restrictive thoracic disorders. Effects of treatment with non invasive ventilation

Olivier Contal [a], Jean-Paul Janssens [a], Myriam Dury [b], Pierre Delguste [b], Geneviève Aubert [b], Daniel Rodenstein [b,*]

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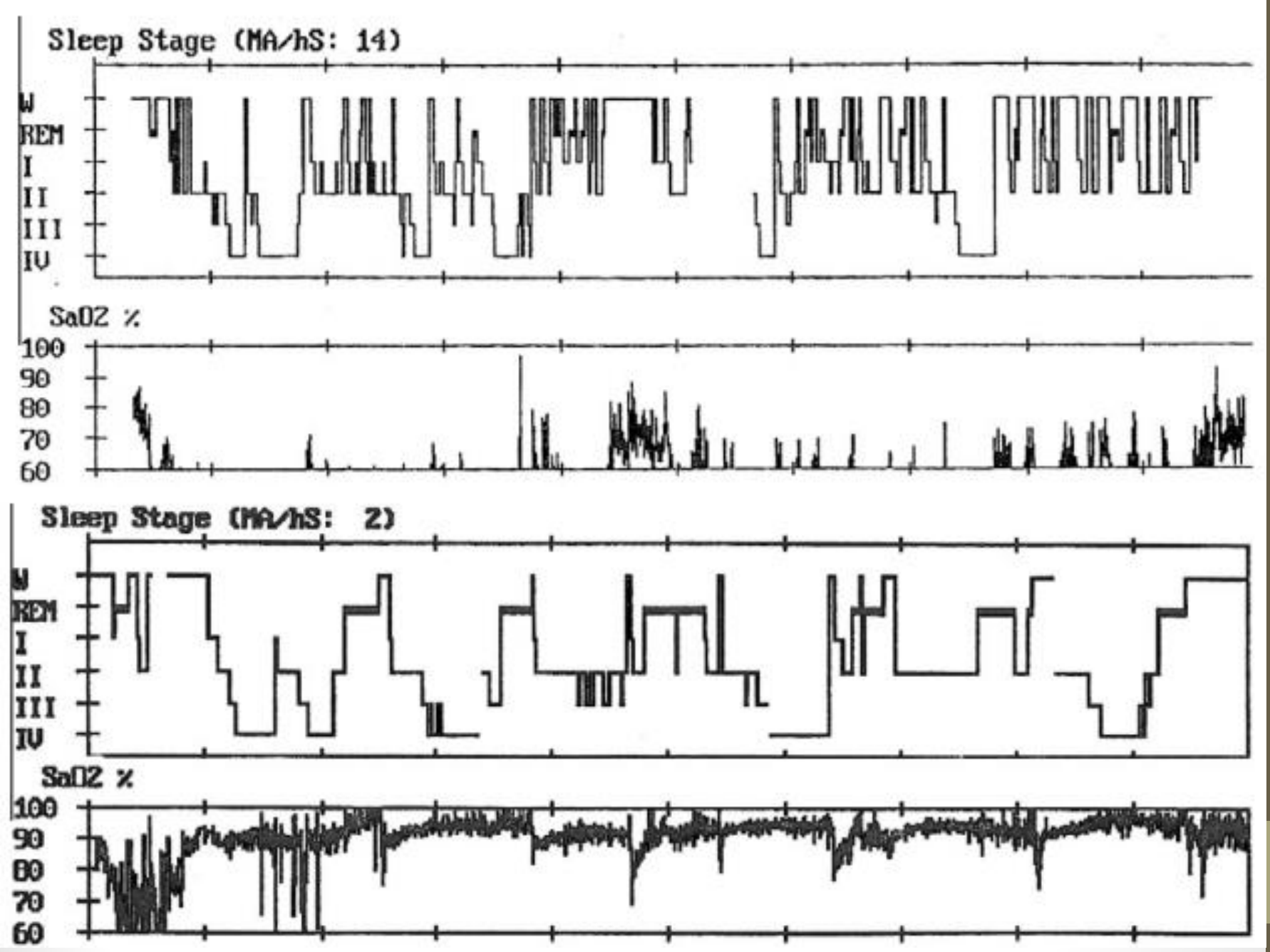
[b] *Service de pneumologie et Centre de médecine du sommeil, Cliniques Universitaires Saint Luc, Université Catholique de Louvain, 1200 Brussels, Belgium*

Table 4
Results of initial PSG and PSG under NIV.

	N	Mean before NIV	Mean with NIV	Difference between before and after NIV	95% CI	*p* value
Total sleep time (min)*	54	360	361	1	−31 ; 32	0.98
Sleep efficiency (%)	55	64	71	7	2 ; 12	0.004
Sleep latency (min)	55	43	28	−15	−30; 1	0.07
REM (% of TST)	60	12	18	6	2 ; 9	0.002
Sleep stage 1 (% of TST)	60	26	14	−12	−18 ; −5	0.001
Sleep stage 2 (% of TST)	60	40	41	1	−5 ; 7	0.83
SWS (% of TST)	55	22	30	8	−0.02; 15	0.051
Movement arousal index	57	25	14	−11	−18 ; −4	0.003
Mean SpO_2 %	59	85	93	8	4 ; 10	<0.001
Lowest SpO_2 %	56	63	77	14	10 ; 18	<0.001
Oxygen desaturation index	43	37	13	−24	−33 ; −15	<0.001

TST: total sleep time* (6 split-night studies were excluded for this parameter); REM: rapid-eye movement; SWS, slow wave sleep; SpO_2: oxyhemoglobin saturation; 95% CI: 95% confidence interval.

Contal, Sleep Medicine, 2011



Contal, Sleep Medicine, 2011

Outcome: 7 Forced vital capacity: long-term

Study or subgroup	Ventilation N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pinto 1995	3	1787 (301)	6	1412 (514)		20.7 %	375.00 [-159.01, 909.01]
Raphaël 1994	10	1198 (251)	9	1096 (343)		79.3 %	102.00 [-170.80, 374.80]
Total (95% CI)	**13**		**15**			**100.0 %**	**158.50 [-84.43, 401.43]**

Heterogeneity: Chi² = 0.80, df = 1 (P = 0.37); I² =0.0%

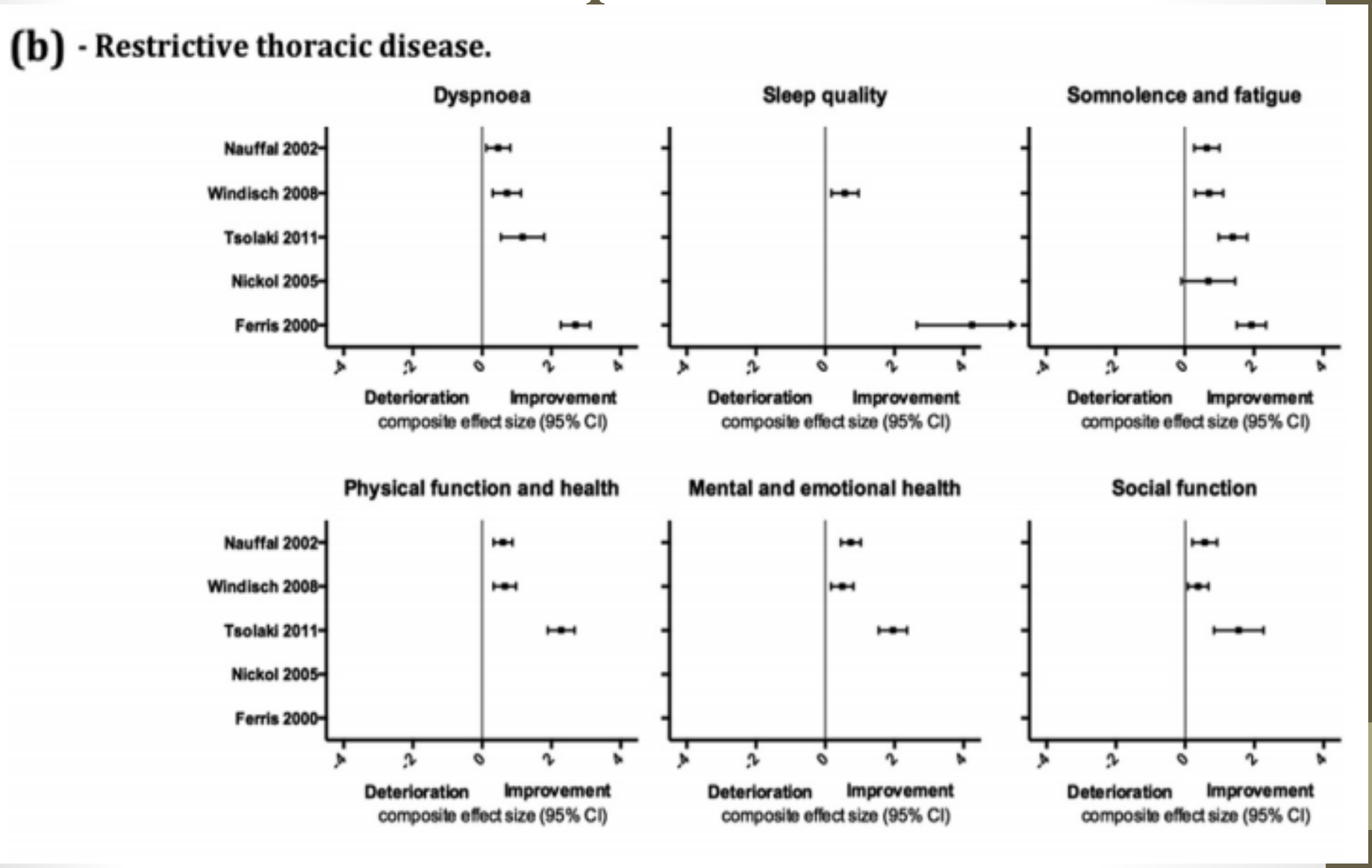
Test for overall effect: Z = 1.28 (P = 0.20)

Test for subgroup differences: Not applicable

Study or subgroup	Ventilation N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Mean improvement in maximal inspiratory pressure							
Ward 2005	1	0 (0)	1	0 (0)			Not estimable
Subtotal (95% CI)	**1**		**1**				**Not estimable**
Heterogeneity: not applicable							
Test for overall effect: not applicable							
2 Mean improvement in SNIP							
Ward 2005	14	-4.1 (14.1)	12	1.62 (6.1)		100.0 %	-5.72 [-13.87, 2.43]
Subtotal (95% CI)	**14**		**12**			**100.0 %**	**-5.72 [-13.87, 2.43]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.38 (P = 0.17)							
Total (95% CI)	**15**		**13**			**100.0 %**	**-5.72 [-13.87, 2.43]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.38 (P = 0.17)							
Test for subgroup differences: Not applicable							

Annane, Cochrane, 2014

Autres paramètres?

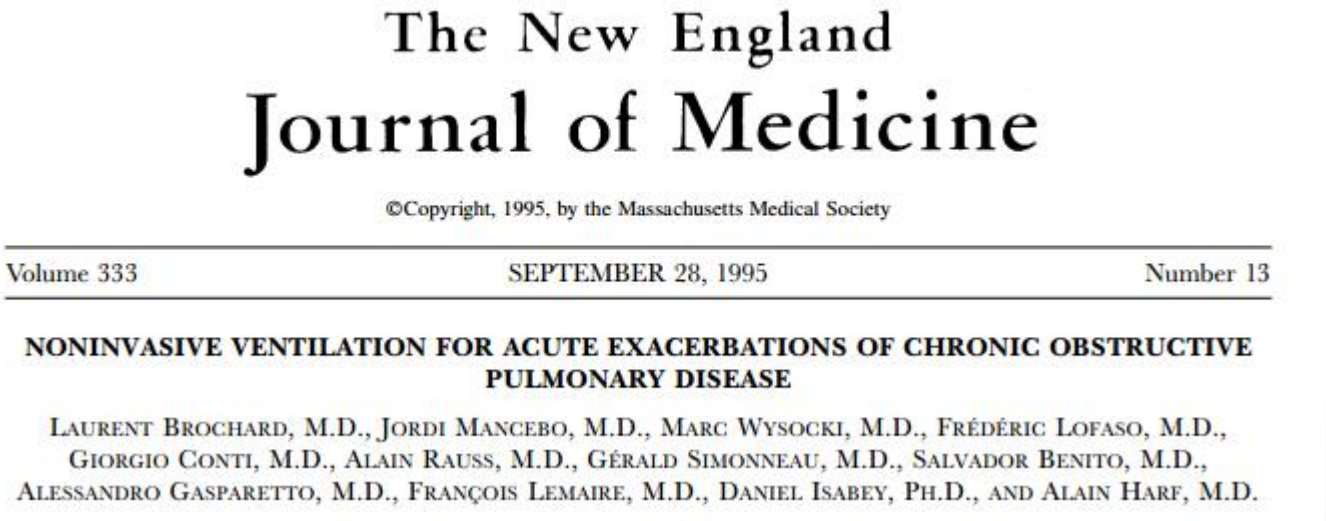


Hannan, Respir Medicine, 2014

BPCO

- Première description de l'intérêt de la VNI dans la décompensation du BPCO en 1995.

- Aujourd'hui, la VNI est acceptée à l'unanimité dans la décompensation respiratoire hypercapnique.



The New England
Journal of Medicine

Volume 333 SEPTEMBER 28, 1995 Number 13

NONINVASIVE VENTILATION FOR ACUTE EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

LAURENT BROCHARD, M.D., JORDI MANCEBO, M.D., MARC WYSOCKI, M.D., FRÉDÉRIC LOFASO, M.D., GIORGIO CONTI, M.D., ALAIN RAUSS, M.D., GÉRALD SIMONNEAU, M.D., SALVADOR BENITO, M.D., ALESSANDRO GASPARETTO, M.D., FRANÇOIS LEMAIRE, M.D., DANIEL ISABEY, PH.D., AND ALAIN HARF, M.D.

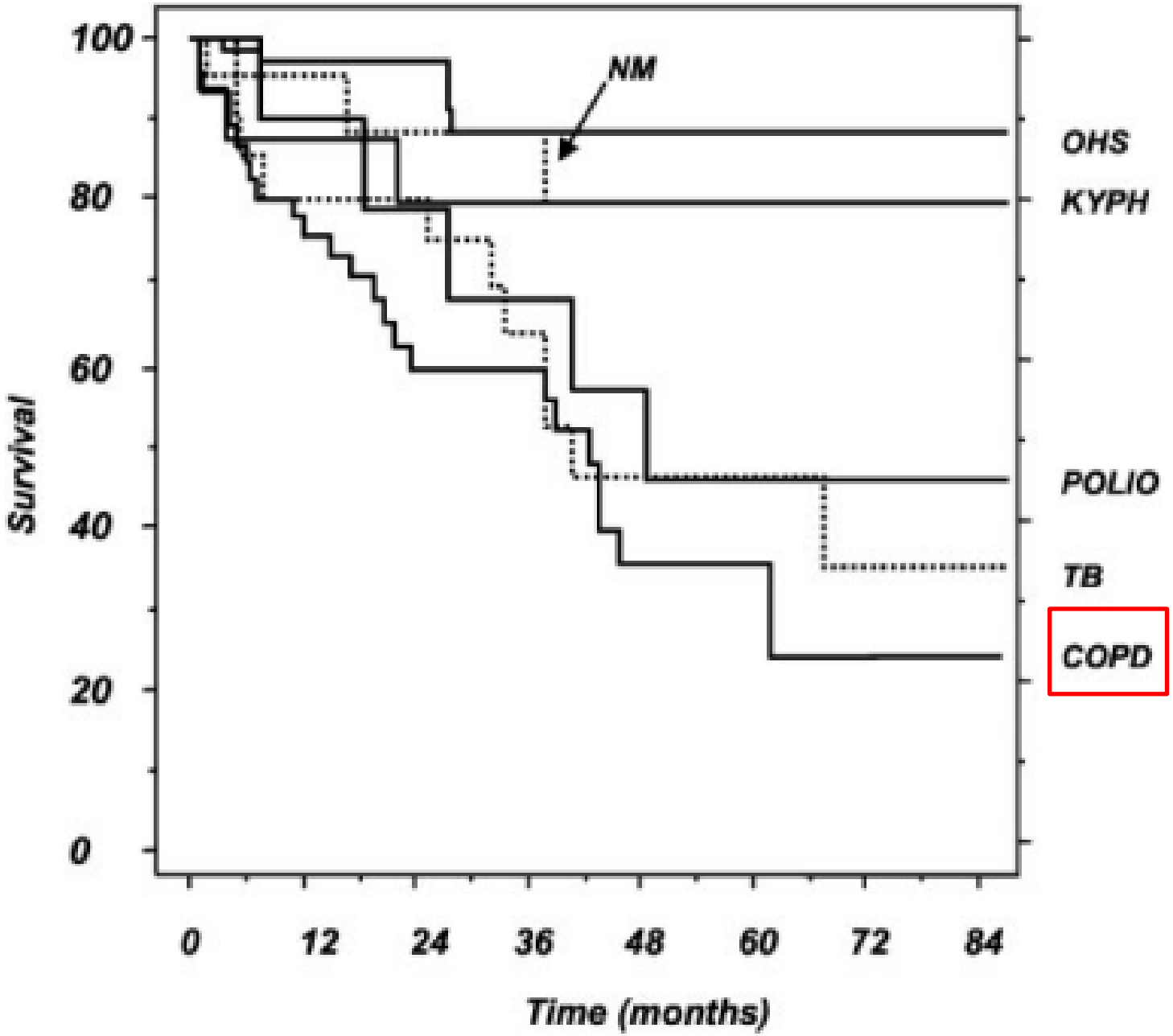
Quels sont les effets de la VNI au long court chez les BPCO?

A: Diminue la mortalité

B: Diminution de la $PaCO_2$

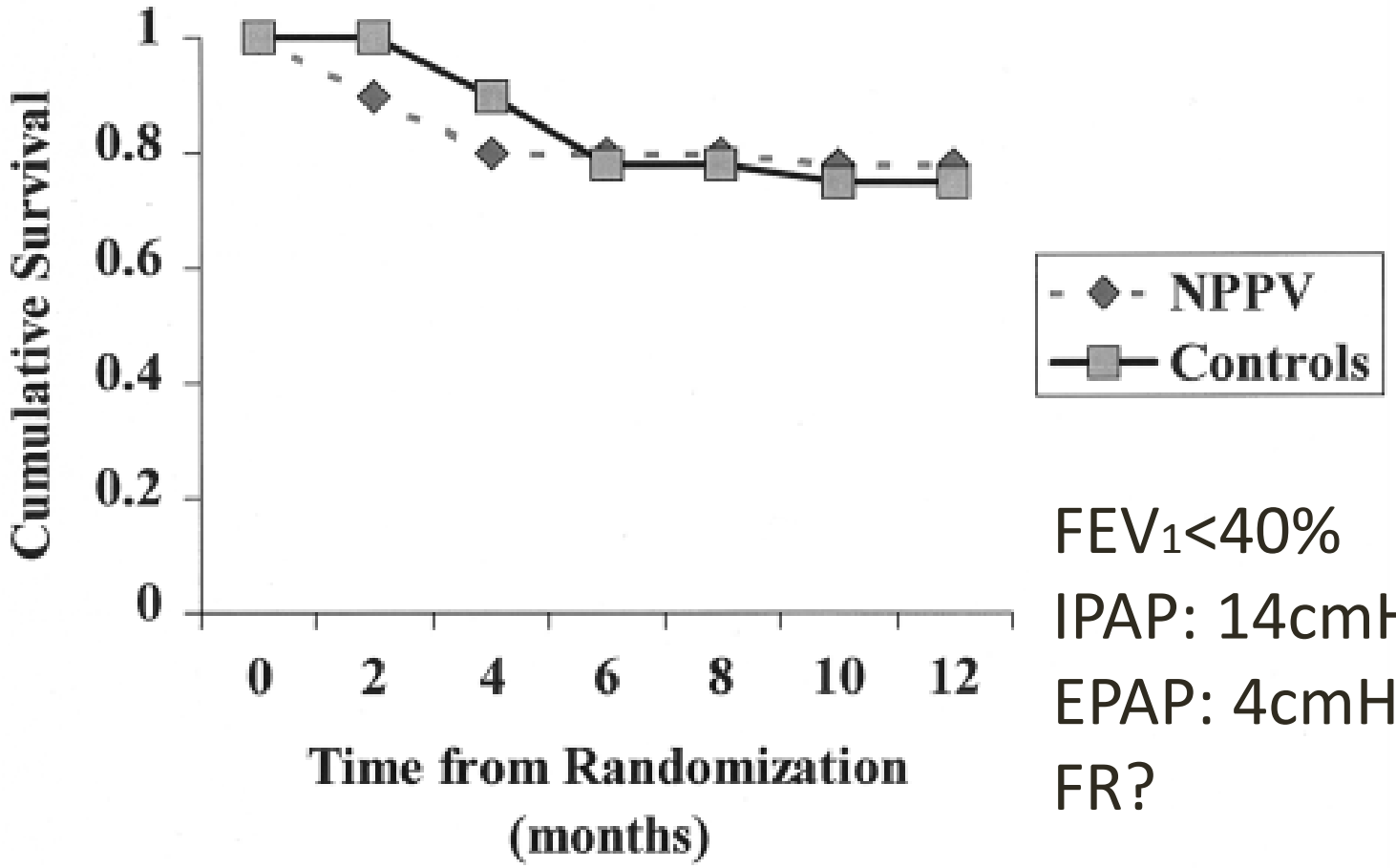
C: Améliore la qualité de vie

D: La réponse D



Janssens, Chest, 2003

VNI Vs O2?



FEV$_1$<40%

IPAP: 14cmH2O

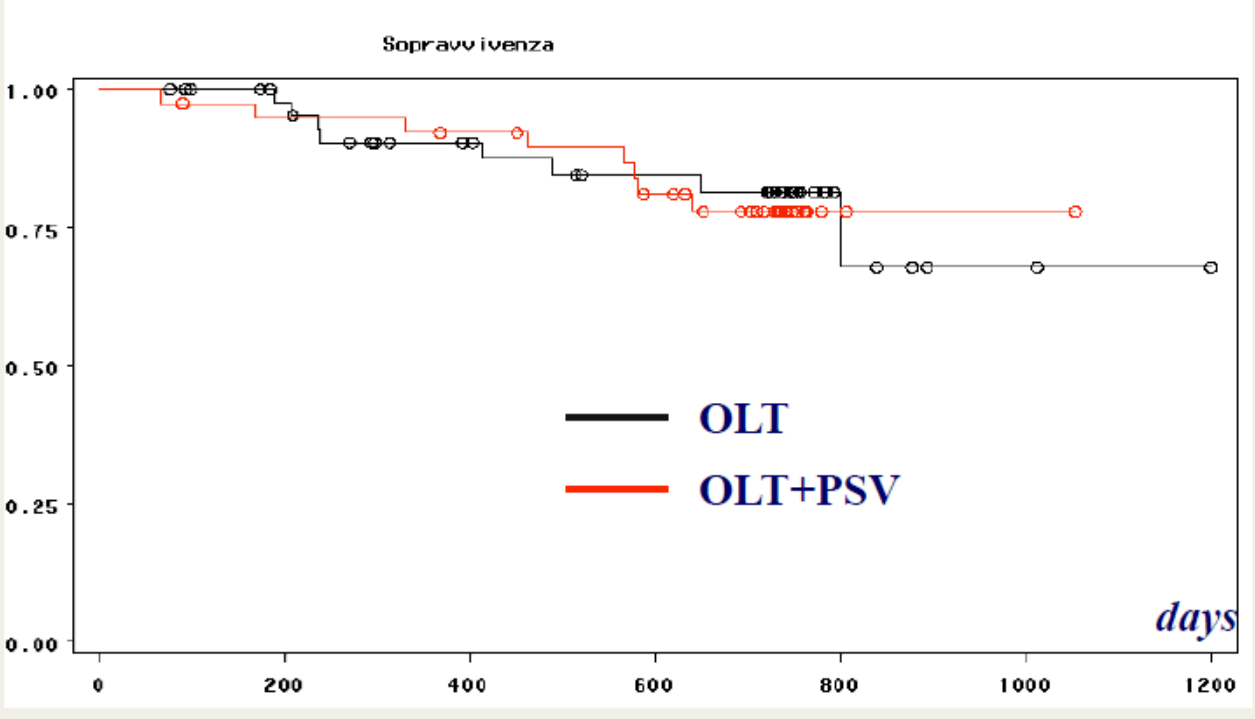
EPAP: 4cmH2O

FR?

FIGURE 2. One-year survival was similar in patients with severe COPD after oxygen treatment alone and oxygen plus NPPV.

Casanova, Chest, 2000

Mortality rate was similar in the two groups (18 and 17% in NPPV and LTOT, respectively). Deaths were due to acute respiratory failure (three and five patients in LTOT and NPPV groups, respectively), cardiac failure (one patient in both LTOT and NPPV groups) and other acute diseases (four and two patients in LTOT and NPPV, respectively).



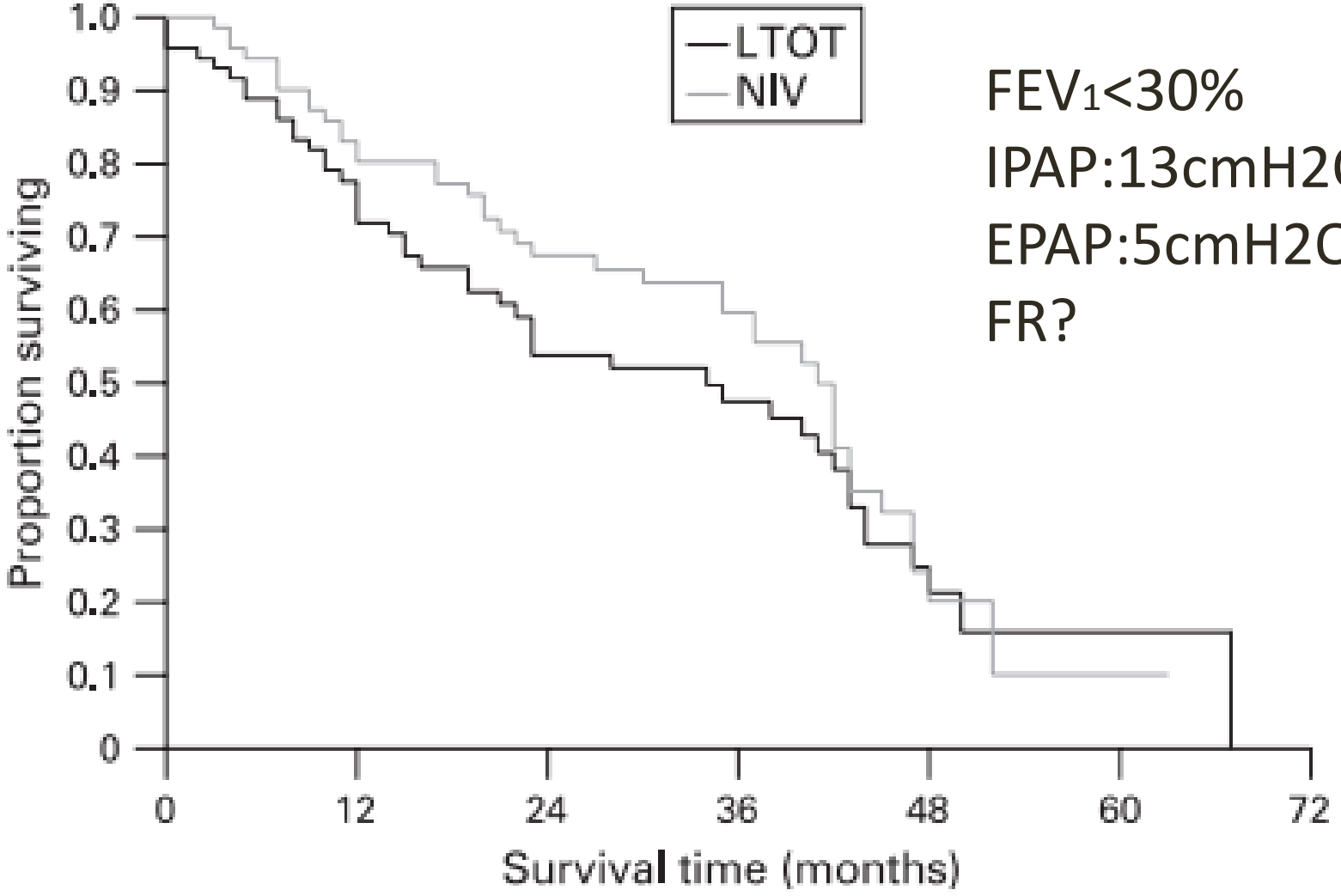
FEV_1<30%

IPAP: 14cmH2O

EPAP: 2cmH2O

FR?

Clini, Eur Respir J, 2002



FEV_1<30%

IPAP:13cmH2O

EPAP:5cmH2O

FR?

Mc Evoy, Thorax, 2009

Nocturnal non-invasive nasal ventilation in stable hypercapnic COPD: a randomised controlled trial

Pas de diminution de la PaCO2!

Table 3 Follow-up $Paco_2$ and $FEV_{1.0}$ results

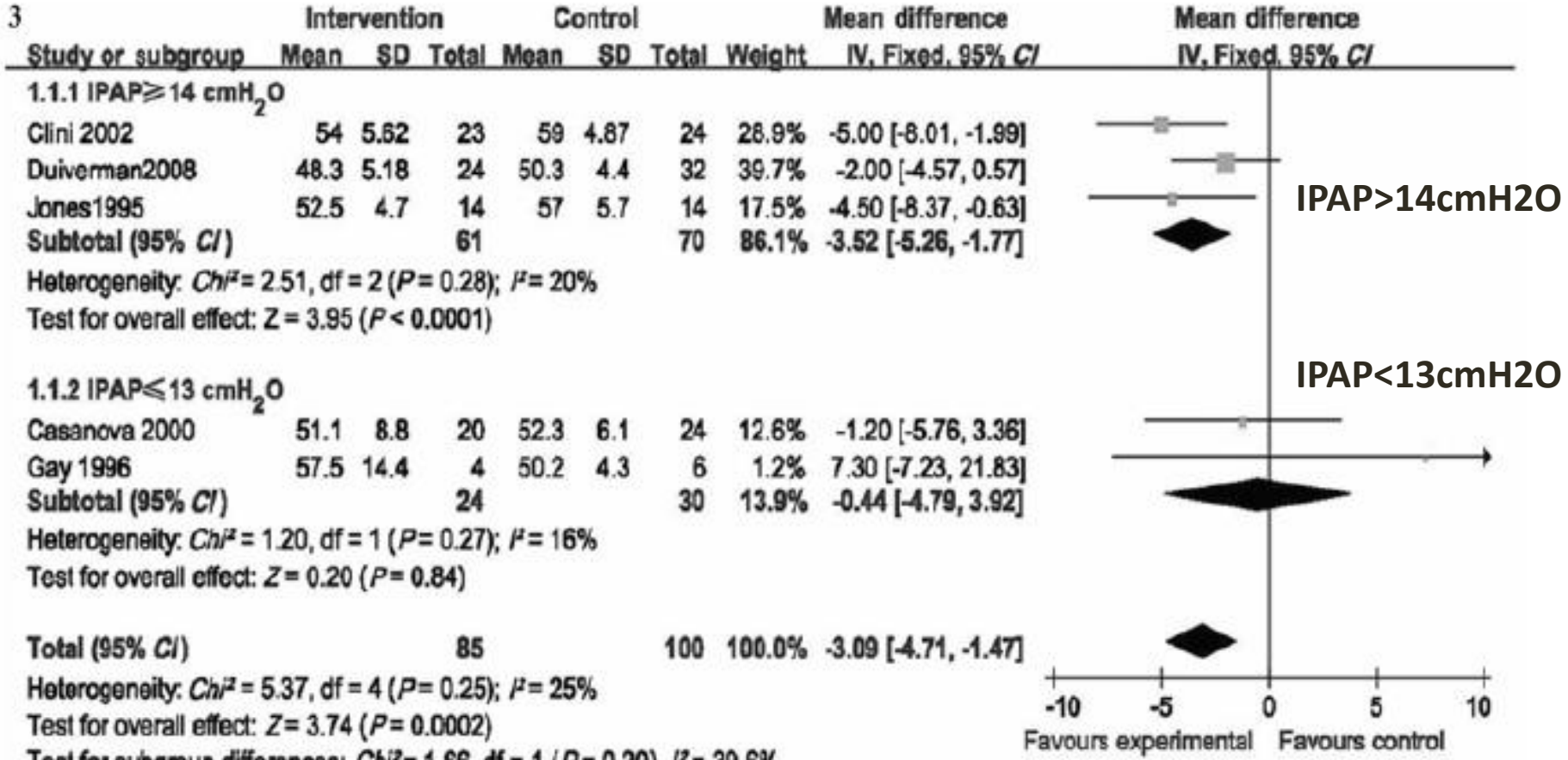
		Baseline	6 months	12 months
$Paco_2$ (mm Hg)	LTOT	54.2 (52.0 to 56.4)	55.1 (52.1 to 58.1)	52.2 (49.5 to 54.9)
		n = 45	n = 43	n = 29
	NIV+LTOT	54.1 (51.7 to 56.5)	52.9 (50.5 to 55.3)	53.2 (50.6 to 55.8)
		n = 54	n = 44	n = 43
$FEV_{1.0}$ (% pred)	LTOT	23.9 (21.9 to 25.9)	23.4 (21.4 to 25.4)	26.3 (24.1 to 28.5)
		n = 51	n = 47	n = 38
	NIV+LTOT	25.3 (22.3 to 28.3)	24.9 (21.7 to 28.1)	24.1 (21.1 to 27.1)
		n = 58	n = 56	n = 47

Diminution de la qualité de vie!

patients treated with NIV had poorer general and mental health and reported less vigour and more confusion and bewilderment.

Mc Evoy, Thorax, 2009

Quels réglages?



Chen, Chinese Medical Journal, 2011

Quels seraient les réglages à faire pour un patient BPCO?

A: IPAP élevée malgré le risque d'effort inefficace

B: Pep élevée pour l'obstruction expiratoire

C: Pressions élevées malgré le risques de fuites

D: La réponse D

IPAP élevée?

Table I. Ventilator settings for 69 patients receiving pressure-limited NPPV

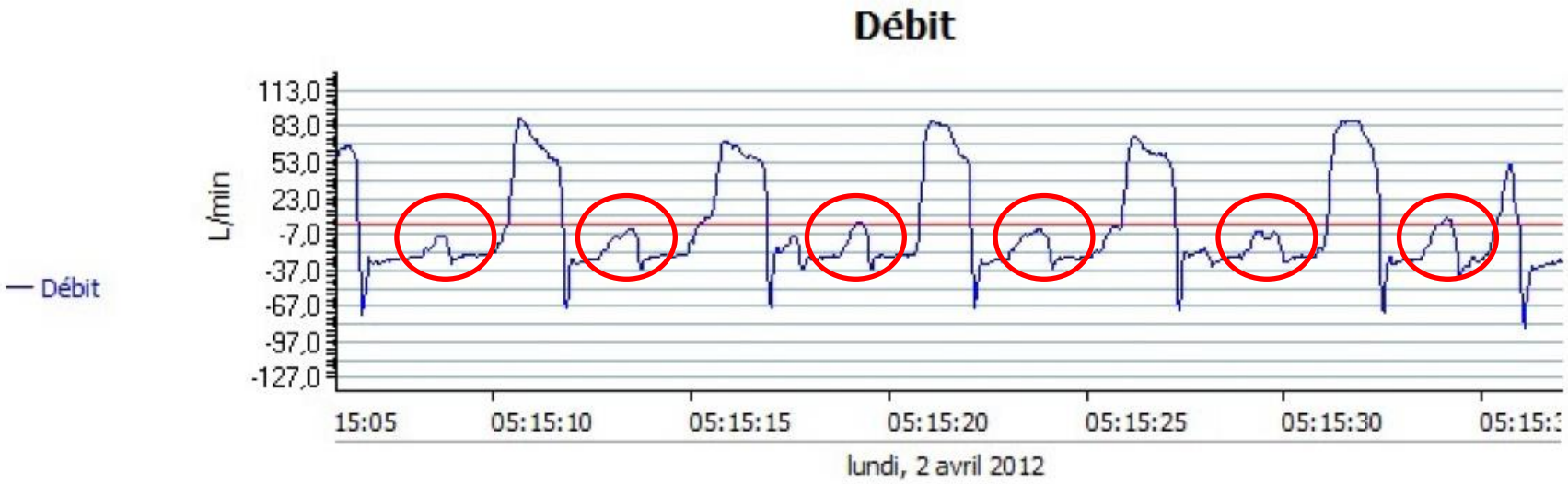
	Mean ± SD	Min	Max
IPAP (cmH_2O)	28.0 ± 5.4	17	42
EPAP (cmH_2O)	4.6 ± 1.3	2	9
b_f (/min)	21.0 ± 2.8	10	26
Supplemental oxygen (l/min)	1.6 ± 1.5	0	6

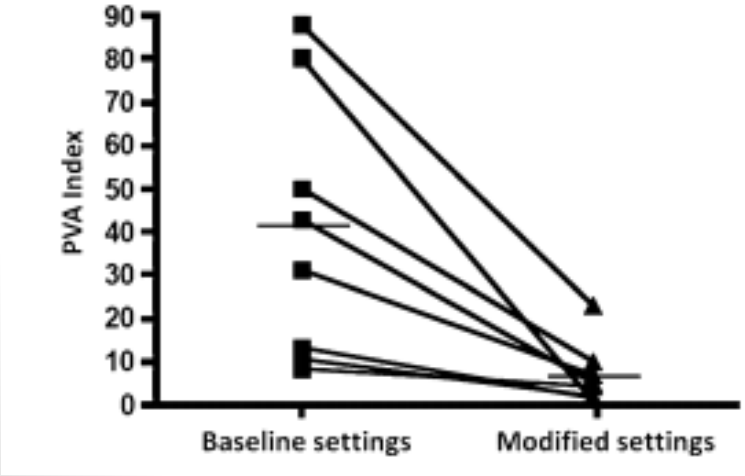
IPAP = inspiratory positive airway pressure, EPAP = expiratory airway pressure, b_f = breathing frequency; SD = standard deviation.

↘de la PaCO2 à 2 mois

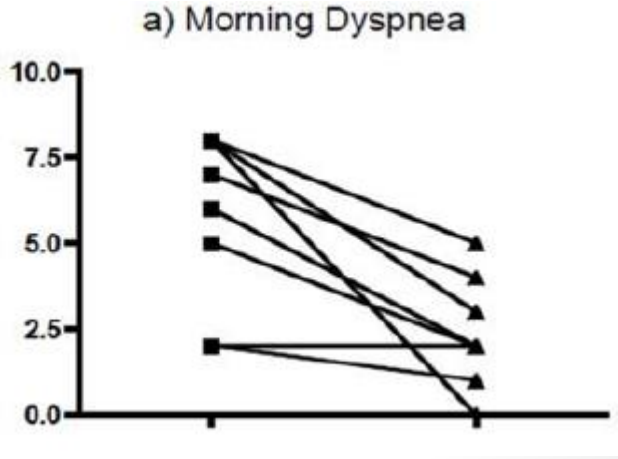
Windisch, Int J Med Sci, 2009

IPAP élevée? Oui mais…





P= 0.006



Adler, Sleep Breath, 2012

High-intensity versus low-intensity non-invasive ventilation in patients with stable hypercapnic COPD: a randomised crossover trial

Michael Dreher,[1] Jan H Storre,[1] Claudia Schmoor,[2] Wolfram Windisch[1]

NPPV

Period	LI-NPPV	HI-NPPV
IPAP (mbar)	14.6±0.8	28.6±1.9
EPAP (mbar)	4.0±0	4.5±0.7
Bf (/min)	8.0±0	17.5±2.1

2 patients ont refusé de passer dans le groupe low-intensity!

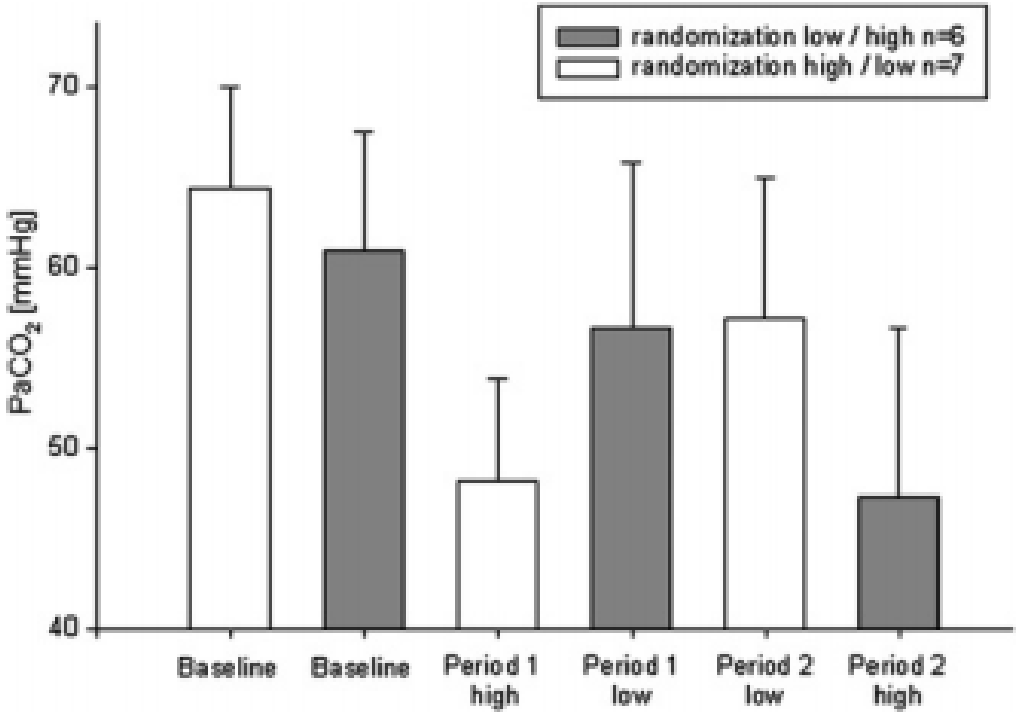
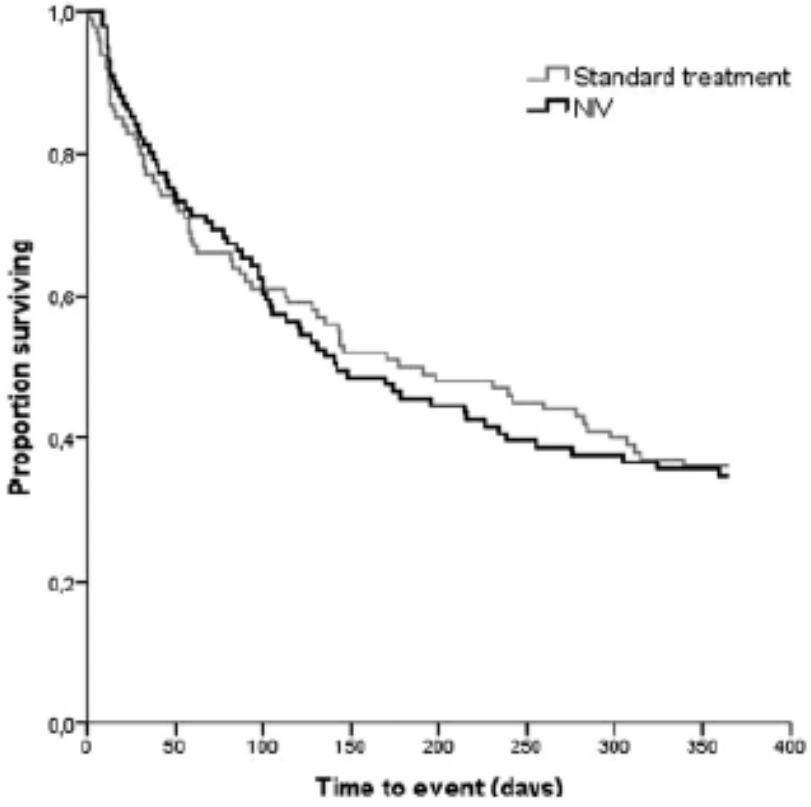


Figure 2 Nocturnal mean±SD arterial carbon dioxide tension ($Paco_2$) at baseline and at follow-up visits.

Nocturnal non-invasive ventilation in COPD patients with prolonged hypercapnia after ventilatory support for acute respiratory failure: a randomised, controlled, parallel-group study

F M Struik,[1,2] R T M Sprooten,[3] H A M Kerstjens,[1,2] G Bladder,[1] M Zijnen,[4] J Asin,[5] N A M Cobben,[3] J M Vonk,[2,6] P J Wijkstra[1,2]



↘ de la PaCO2; p=0,03

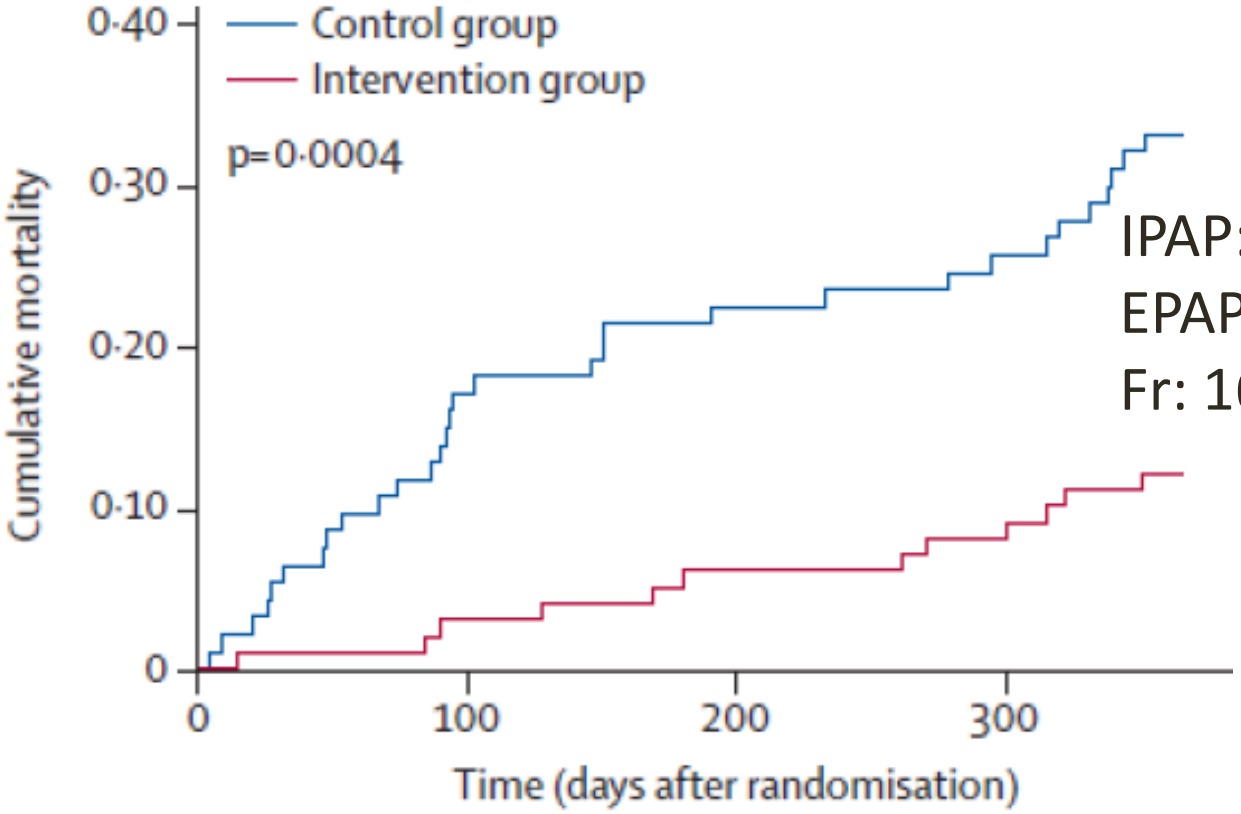
Tendance à
l'amélioration de HRQL;
p=0,054

IPAP: 19,2(3,4)cmH2O
EPAP: 4,8(1)cmH2O
Fr: 15(3)c/min

Struik, Thorax, 2014

Non-invasive positive pressure ventilation for the treatment of severe stable chronic obstructive pulmonary disease: a prospective, multicentre, randomised, controlled clinical trial

Thomas Köhnlein, Wolfram Windisch, Dieter Köhler, Anna Drabik, Jens Geiseler, Sylvia Hartl, Ortrud Karg, Gerhard Laier-Groeneveld, Stefano Nava, Bernd Schönhofer, Bernd Schucher, Karl Wegscheider, Carl P Criée, Tobias Welte



IPAP: 21,6(4,7) cmH2O
EPAP: 4,8(1,6) cmH2O
Fr: 16,1(3,6) c/min

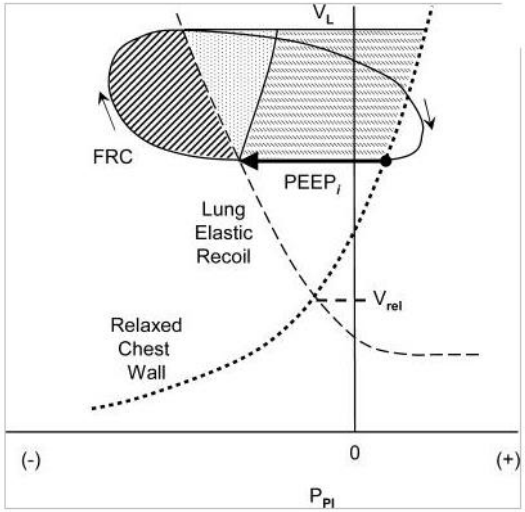
Köhnlein, Respir Lancet, 2014

IPAP élevée? OUI! et l'EPAP…?

Patients	ZEEP	
	RF	INT
ΔP, cmH_2O	8.8 ± 2.3	7.22 ± 2.0
R_{int}, $cmH_2O/L/s$	9.1 ± 2.1	10.9 ± 3.7
E_{st}, cmH_2O/L	22 ± 8	22 ± 6.2
$PEEP_i$,stat, cmH_2O	9.2 ± 2.4	7.1 ± 1.7
$PEEP_i$,dyn, cmH_2O	2.5 ± 0.7	2.4 ± 0.9
$PEEP_i$,dyn/$PEEP_i$,stat	0.27 ± 0.09	0.34 ± 0.07§
ΔEELV (L)	0.45 ± 0.09	0.35 ± 0.10
f_H beats/min	89 ± 25	91 ± 22
MAP, mmHg	80 ± 16	85 ± 17

Antonaglia, Respir Physiol Neurobiol, 2012

Fig. 3.



PEEPi at rest = 4 cmH2O

Loring, J Appl Physiol, 2009

Initier une VNI en résumé

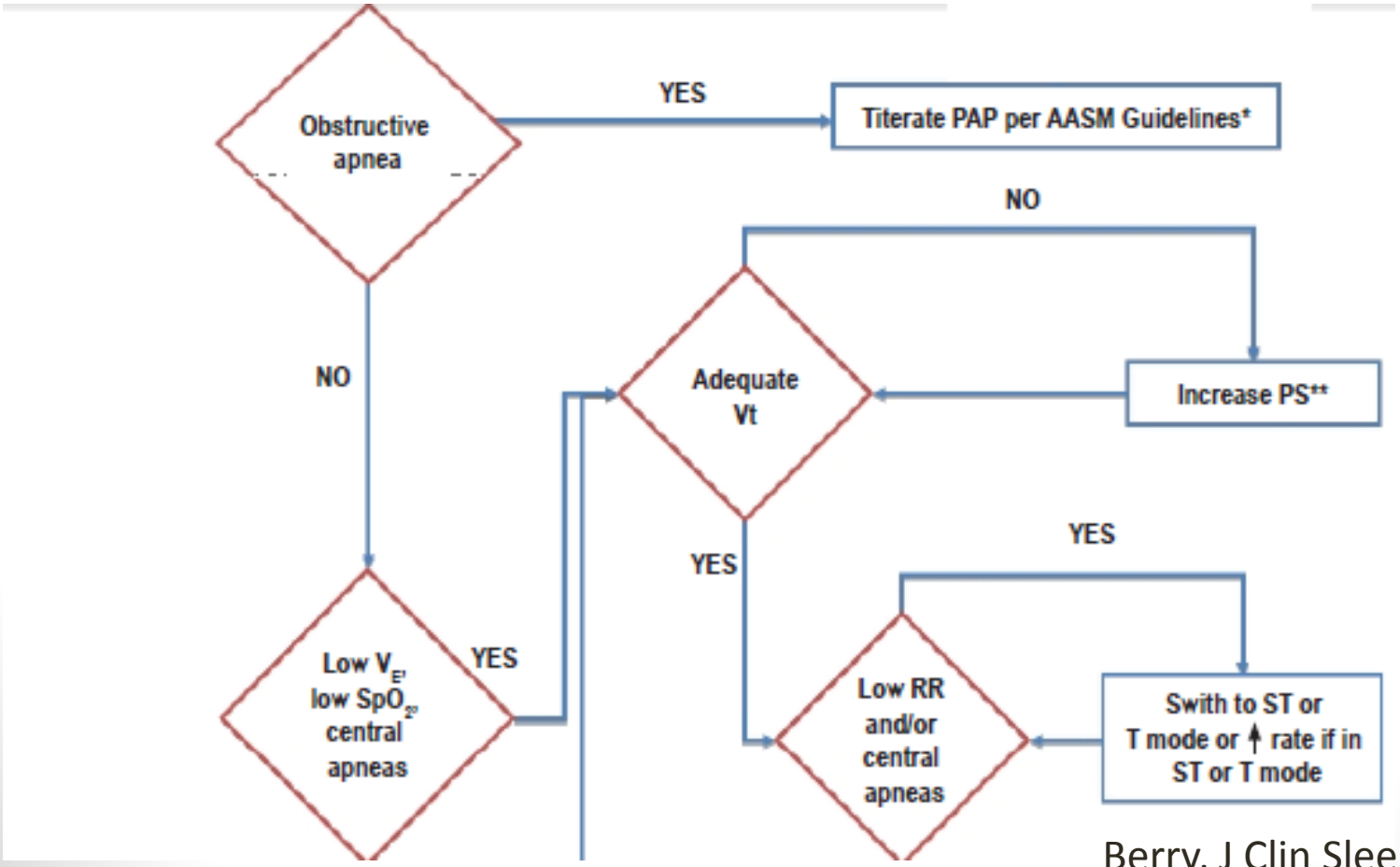
SOH:
IPAP: 15-16 cmH2O
EPAP: 7-8cmH2O

⟷

Réglages minimum:
IPAP:8cmH2O
EPAP:4cmH2O

→

BPCO:
↗IPAP selon la tolérance



Berry, J Clin Sleep Med, 2010

Les interfaces à domicile

OU

?

Le choix des patients?

- **n= 29 états stables naïfs de VNI**
  - 20 OHS, 4 pariéto-restrictifs, 3 neuro-µ, 2 BPCO
- **2 x 2h de VNI diurne (2 j distincts)**
  - MN
  - MNB
- **Mode ST**
- **Prescription: préférence patient**
  - sauf 3 sujets: NB imposé car meilleure correction PCO2)
- **Evaluation à 3 mois**
  - GDS/SpO2/observance

Table 1. Results of the Adaptation Process to Nasal vs Oronasal Mask

	Nasal Mask (n = 29)	Oronasal Mask (n = 29)	P
P_{aCO_2} after NIV (2 h day session), mm Hg	47.3 ± 6.3	50.2 ± 5.1	.87
pH after NIV (2 h day session)	7.40 ± 0.30	7.40 ± 0.28	.81
HCO_3^- after NIV (2 h day session), mmol/L	29.3 ± 3.2	32.2 ± 1.8	.23
T90 after NIV (night session), %	39.4 ± 20.3	36.6 ± 29.5	.67
IPAP, cm H_2O	13.7 ± 2.7	15.4 ± 2.4	.02
EPAP, cm H_2O	6.3 ± 1.1	6.2 ± 1.2	.89
Respiratory rate, breaths/min	15.5 ± 3.1	14.5 ± 2.3	.71
Comfort score, analog scale	6.9 ± 2.3	5.3 ± 2.3	.01

38% préférence MNB
62% préférence MN

Fernandez R, Respir Care 2012

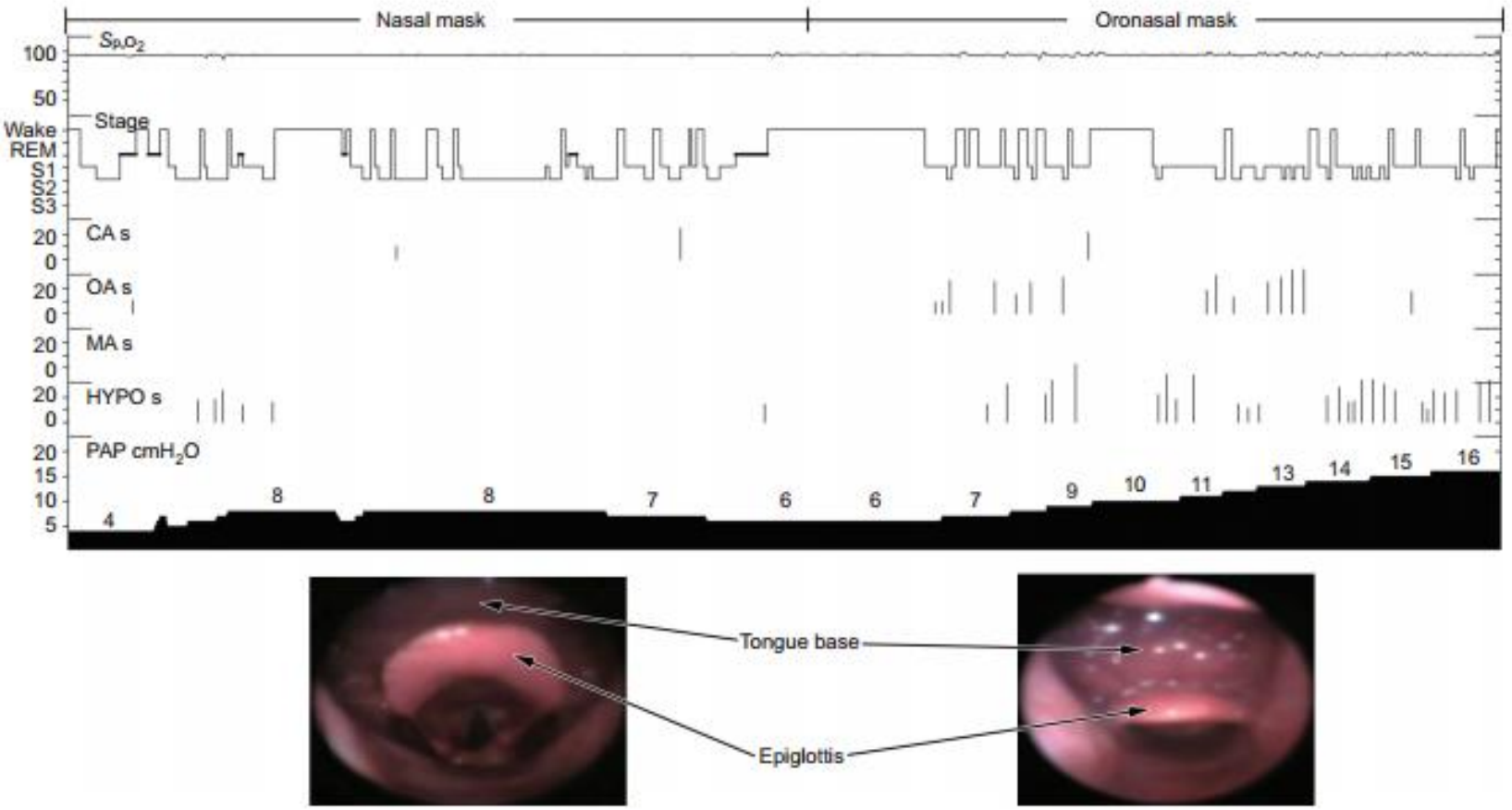


FIGURE 1. Polysomnography summary of a natural sleep continuous positive airway pressure (CPAP) titration study (top) and sleep endoscopy images (bottom) using both nasal and oronasal masks. During the first part of the natural sleep CPAP titration, a nasal CPAP of 7 cmH_2O adequately controlled obstructive events. During the second part, an oronasal mask was used. Observe the persistence of obstructive respiratory events even at pressures up to 16 cmH_2O. The endoscopic image taken with nasal CPAP of 7 cmH_2O shows a wide open oropharynx. In contrast, the image taken with oronasal CPAP of 16 cmH_2O shows the tongue base posteriorly displaced, pushing the epiglottis and significantly narrowing the airway. Sp_2: arterial oxygen saturation measured by pulse oximetry; CA: central apnoea; OA: obstructive apnoea; MA: mixed apnoea; HYPO: hypopnoea; PAP: pulmonary artery pressure; REM: rapid eye movement. Respiratory event time is shown in seconds.

Lorenzi-Filho, Eur Respir J, 2012

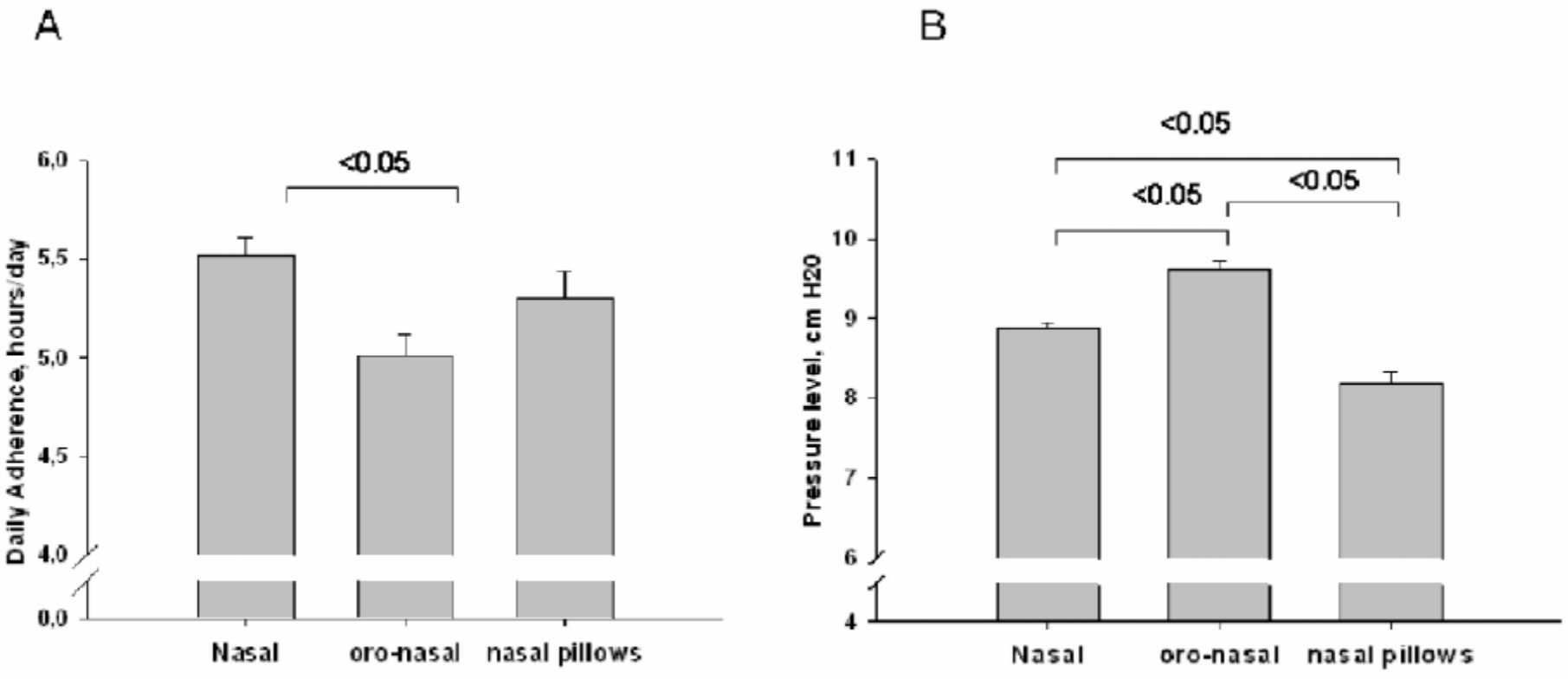


Figure 2. Adherence (a) and positive airway pressure level (b) according to the type of interface.
doi:10.1371/journal.pone.0064382.g002

Borel, Plos One, 2013

Attention si changement nasal pour oronasal!

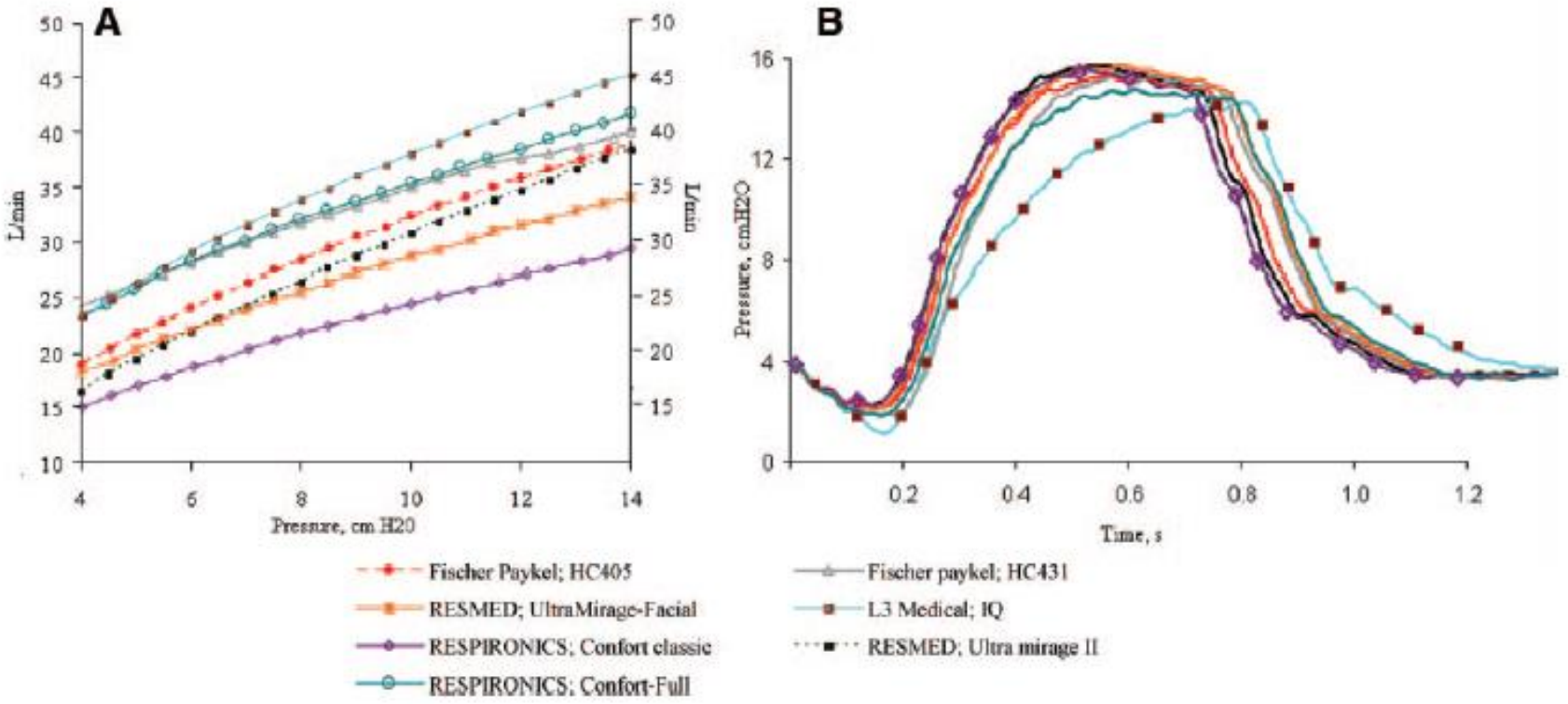
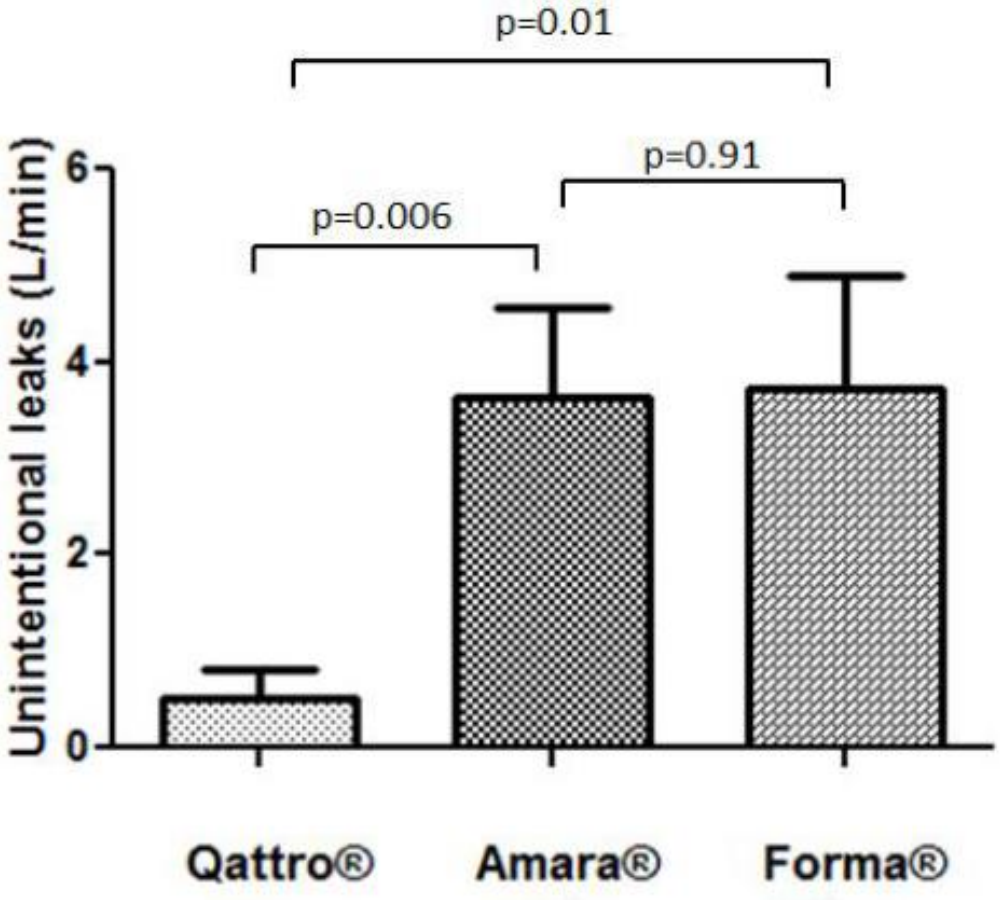


FIGURE 1. *Left, A*: Intentional leaks expressed as function of the pressure in seven different masks. *Right, B*: Pressure-time plot of VPAP III ST with the seven masks for the normal lung condition.

Borel, Chest, 2009

Même pour des masques de dernière génération!



Pas de différence sur la PtCO2 avec une EPAP à 4cmH2O!

Pas de lien entre les fuites non intentionnelles et le confort du masque!

Medrinal, Minerva Anestesiol, 2014

Conclusion

- L'installation de la ventilation non invasive au domicile est l'objectif de demain et le kinésithérapeute sera confronté aux premiers appareillages des patients.
- SOH, Neuro-musculaires, BPCO en état stables sont les principales indications de la VNI à domicile.
- Privilégier une interface nasale pour débuter.
- Les études nous guident sur les réglages optimaux.
- En pratique quotidienne, les réglages sont à adapter selon les patients et leur tolérance.


Merci de votre
attention