Indications et modes ventilatoires pour le Syndrome Obésité Hypoventilation

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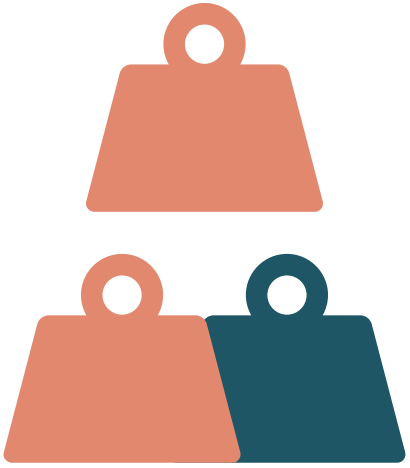
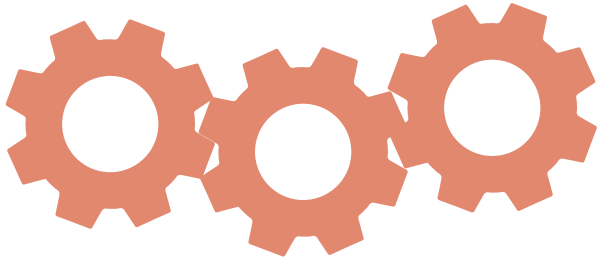


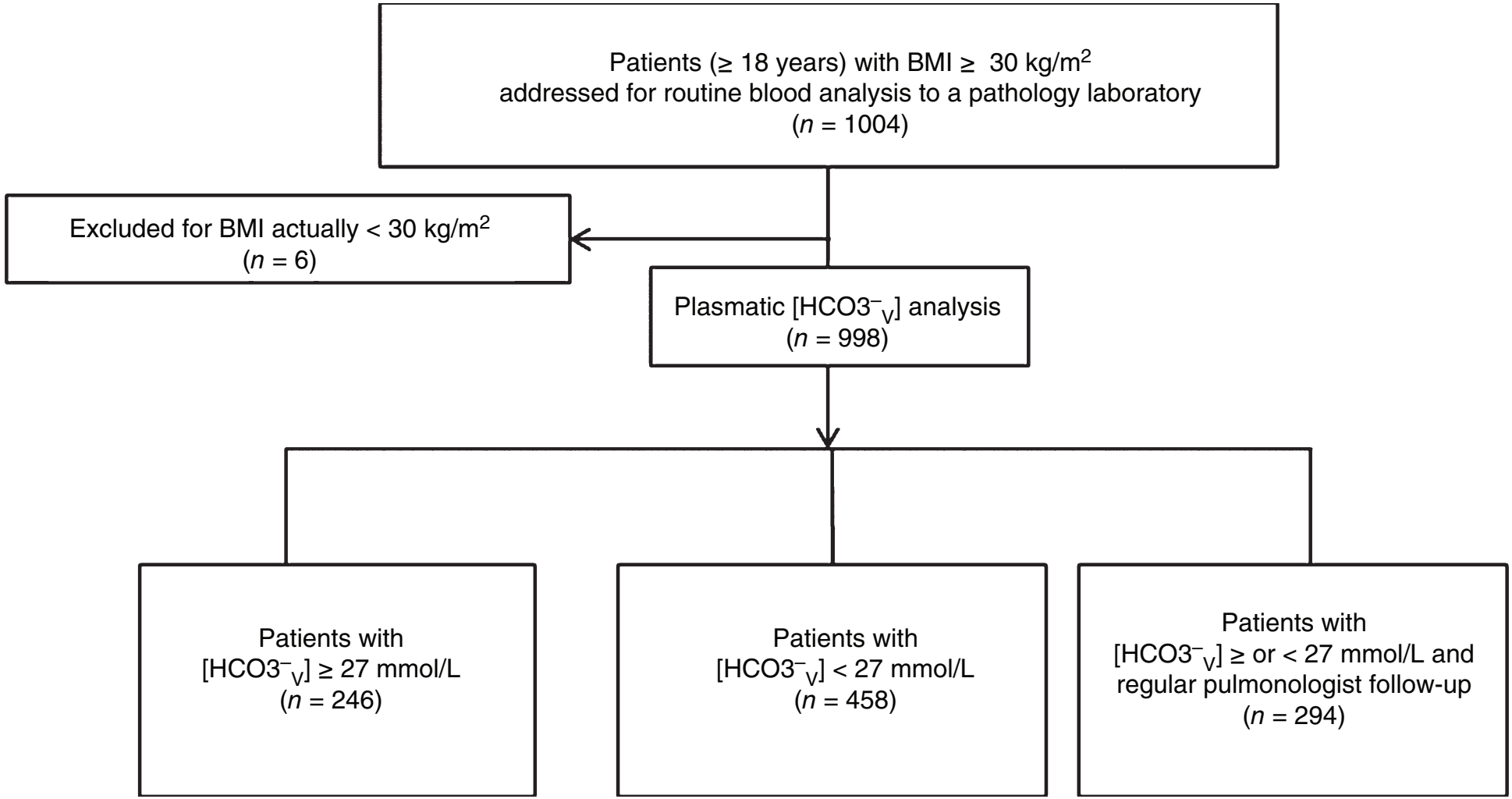


Obésité

Hypercapnie diurne

Sans autre cause

En population générale?



Borel, Respirology 2017

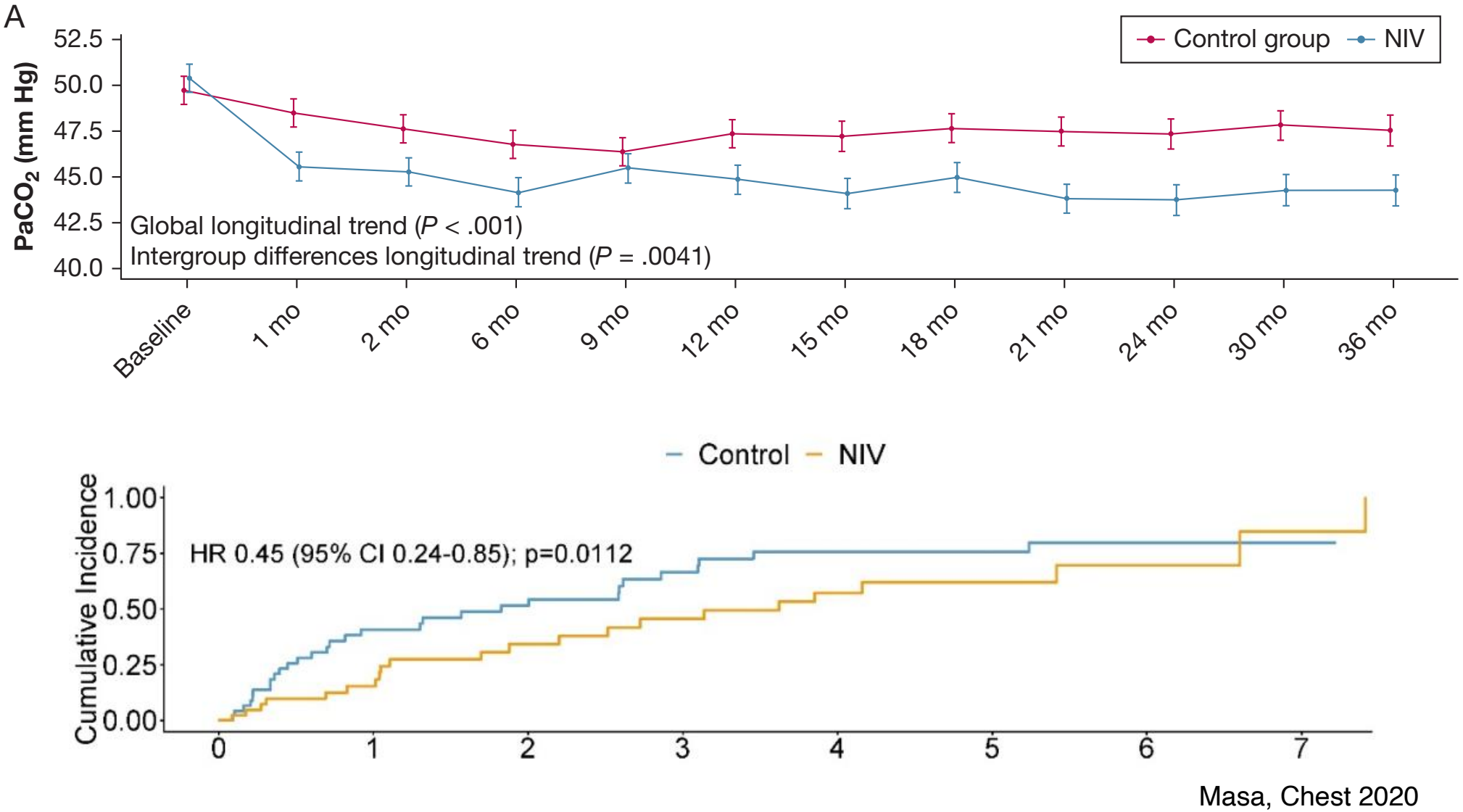
Peut on évaluer un SOH sans examen du sommeil?

Syndrome obésité hypoventilation isolé

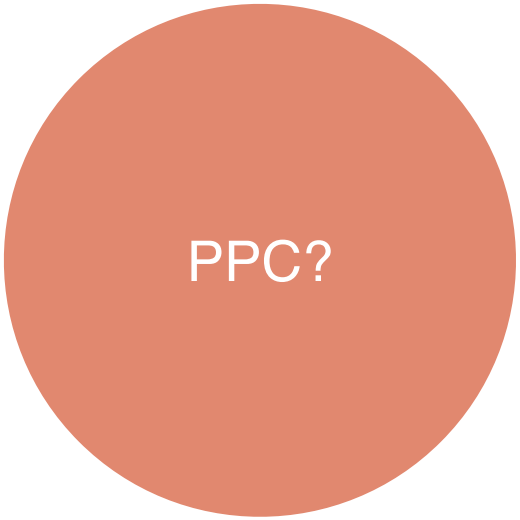
	Baseline, mean (SD)/median (IQR)		Intra-group differences, mean (95% CI)		p Value of inter-group differences§	
	NIV	**Control**	**NIV**	**Control**	**Unadjusted**	**Adjusted**
$PaCO_2$, mm Hg	*49 (4.0)*	*49 (3.5)*	**−6 (−7.7 to −4.2)‡**	**−2.8 (−4.3 to −1.3)‡**	0.006	0.019
Serum bicarbonate, mmol/L	*30 (4.1)*	*29 (3.8)*	**−3.4 (−4.5 to −2.3)‡**	**−1 (−1.7 to −0.2)***	0.000	0.004
pH	7.400 (0.040)	7.400 (0.030)	0.005 (−0.005 to 0.157)	0.031 (−0.008 to 0.147)	NS	–
PaO_2, mm Hg	64 (10)	67 (10)	**4.6 (0.5 to 8.8)***	1.4 (−2.6 to 5.5)	NS	–
FEV_1, %	72 (16)	80 (20)	1.8 (−2.7 to 6.4)	1.9 (−1.2 to 5.1)	NS	–
FVC, %	75 (21)	82 (20)	4.7 (−4.2 to 14)	2.9 (−0.5 to 6.3)	NS	–
6-MWD, m	309 (105)	349 (105)	29 (−16 to 74)	−7.2 (−25 to 11)	NS	–
Systolic BP, mm Hg	136 (18)	136 (15)	−4.2 (−11 to 2.5)	−4.3 (−10 to 1.7)	NS	–
Diastolic BP, mm Hg	*80 (16)*	*80 (18)*	0.5 (−5.3 to 6.2)	−1.2 (−5.4 to 2.9)	NS	–

Masa, Thorax 2016

Syndrome obésité hypoventilation isolé



Masa, Chest 2020


PPC?


VNI?

Monsieur S en 2007

IMC 39kg/m²

DNID
Dyslipidémie

HTA

Unité de soins intensifs

Dyspnée
OMI
Crépitants

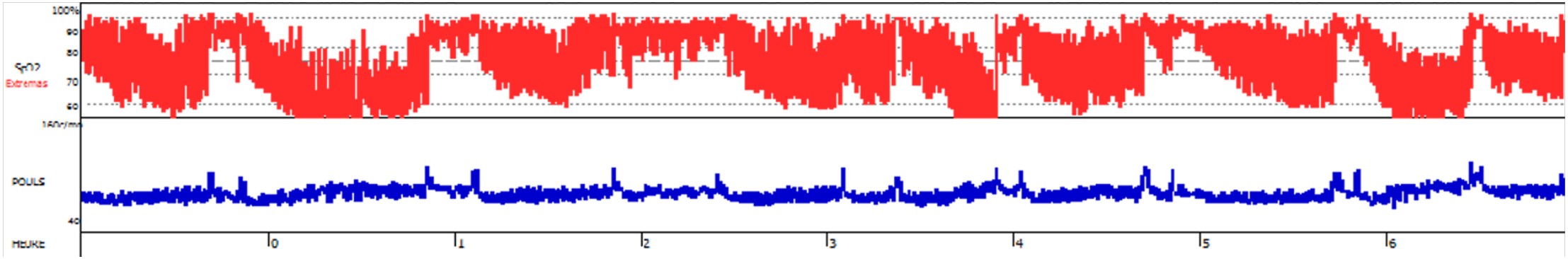
Ronflements
SDE
Céphalées matinales

Condition	pH	PaCO2 (kPa)	PaO2 (kPa)	Bicarbonates
VS AA	7,39	7,3 (55mmHg)	5,8 (43,5mmHg)	32

Polygraphie

Assistance respiratoire

Résultats de la polygraphie



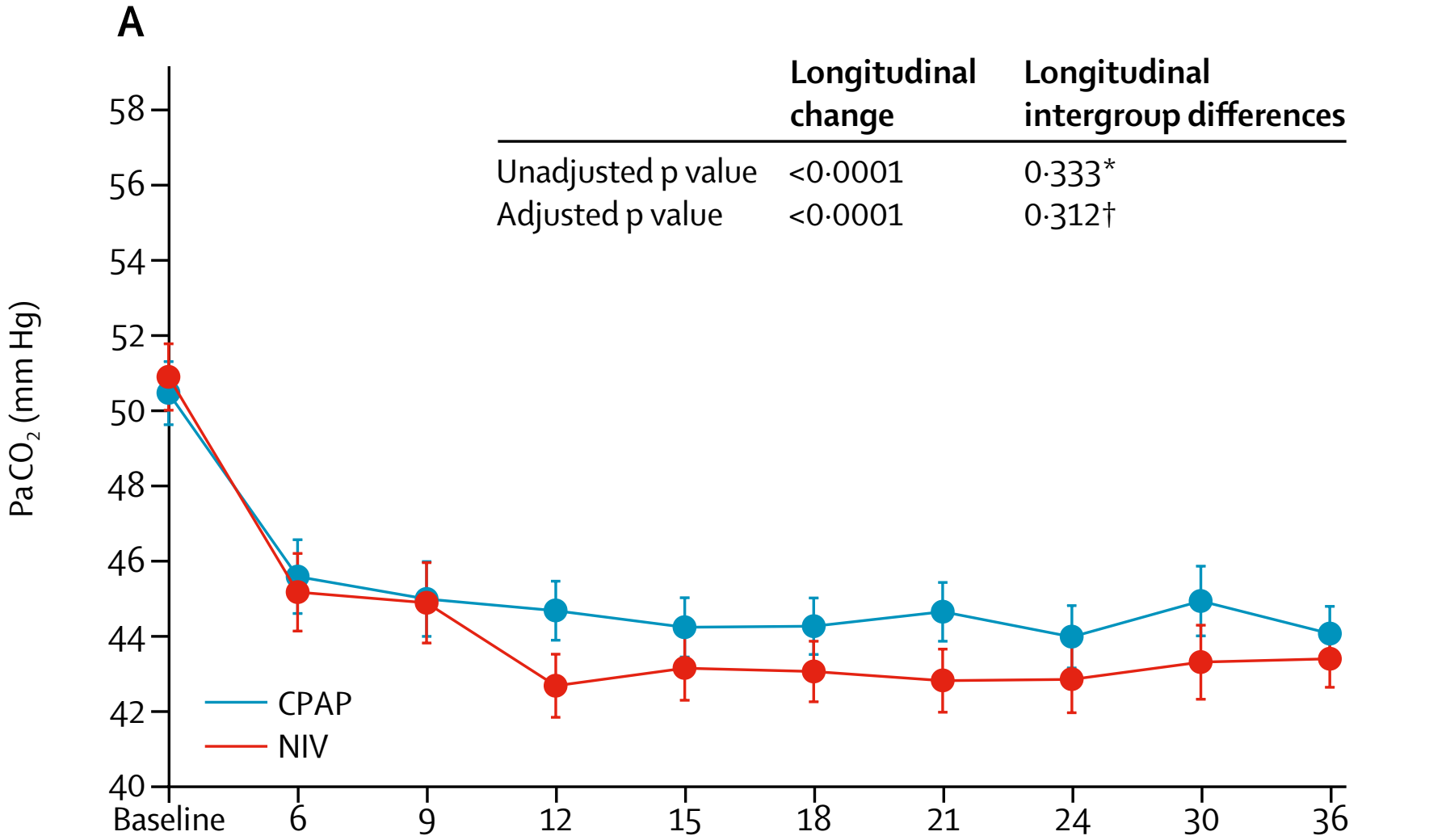
IAH 68/H

60% du temps
<90%

Vous êtes le médecin de garde, que faites-vous?

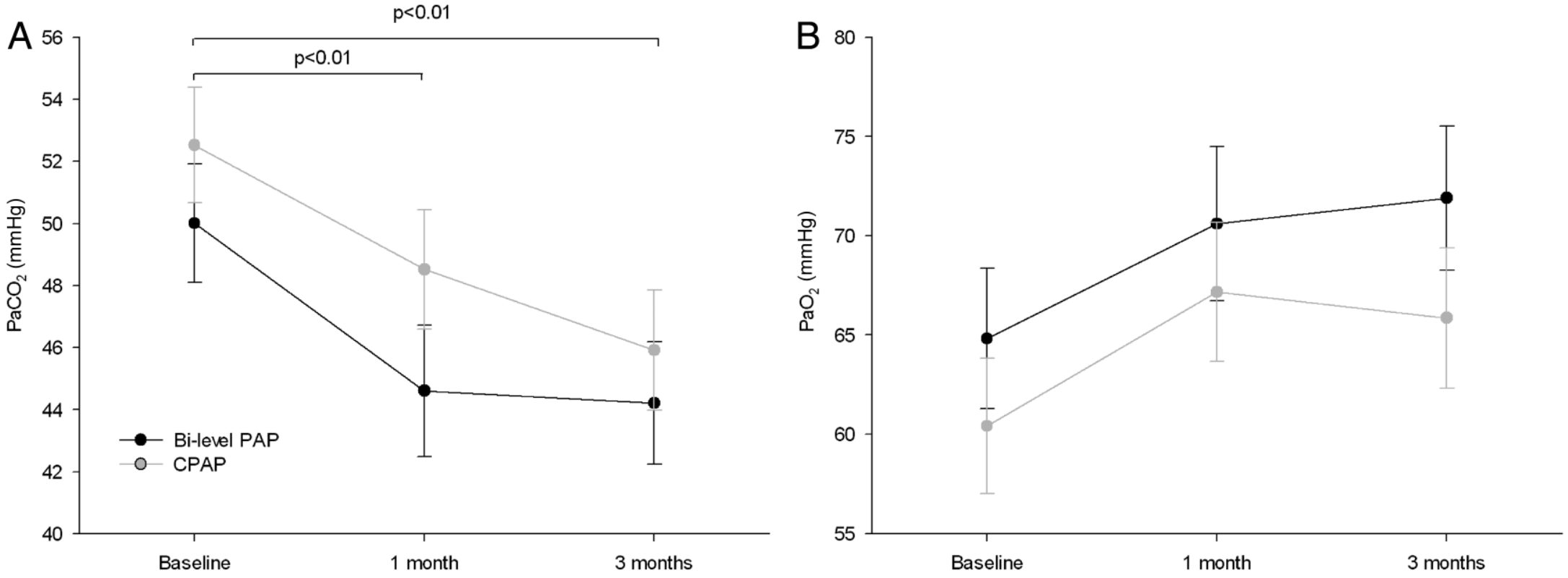
PPC?

VNI?

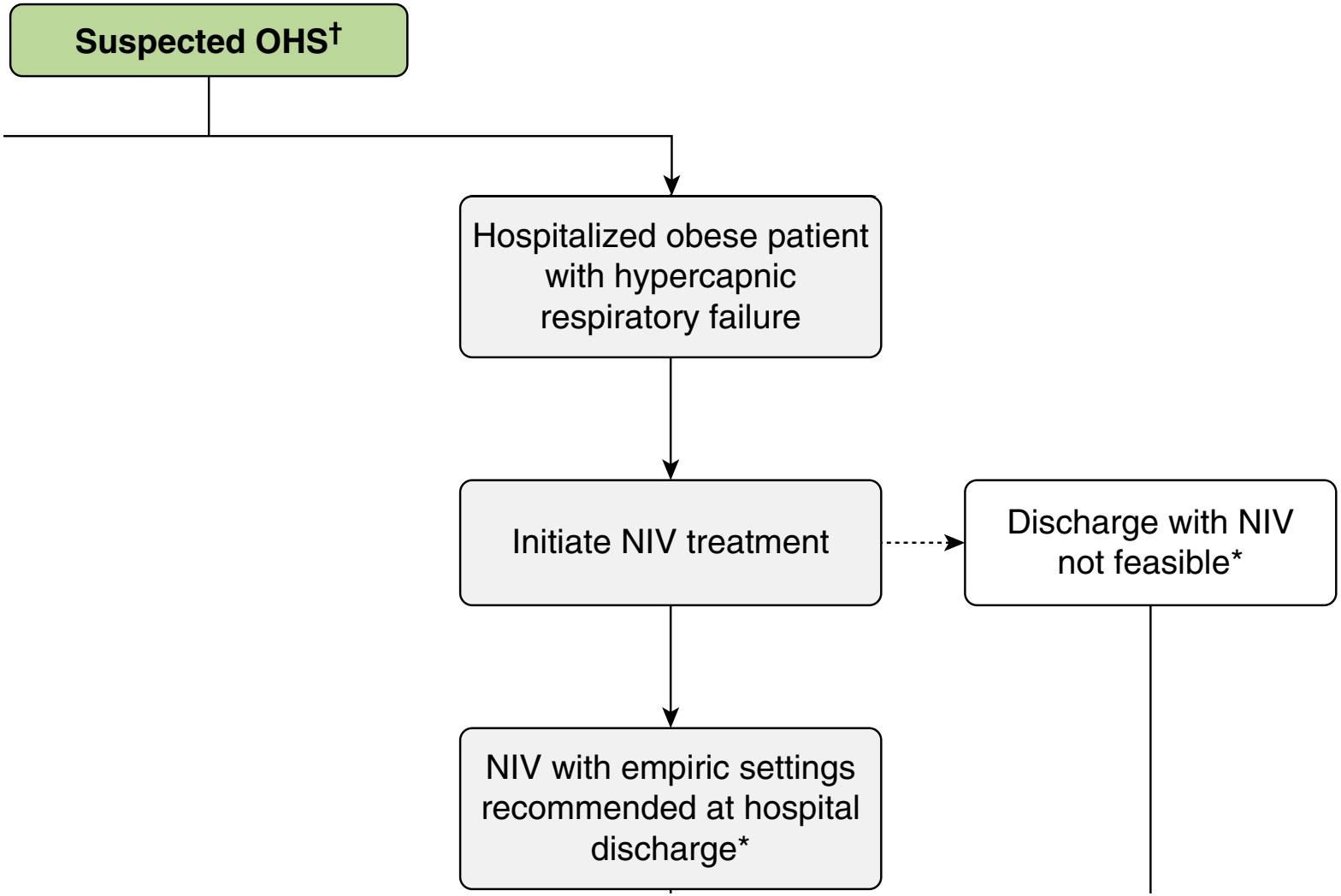


Masa, Lancet 2019

SOH apnéique en post-aigu



Howard M E, Thorax 2017



Mokhlesi B, AJRCCM 2019

- Compte-tenu :
  - De l'hypercapnie
  - De la décompensation cardiaque
  - De l'hématose diurne et nocturne
- Mise en place d'une VNI + OLD :
  - IPAP 18cmH_2O EPAP 7cmH_2O FR 14/min + 3L d'O2

Monsieur S évolue favorablement

Date	Condition	pH	PaCO2 (kPa)	PaO2 (kPa)	Bicarbonates (mmol/l)
11/2008	VS AA	7,42	6,4 (48)	7,6	31,1
11/2008	VNI 3L	7,44	6,1 (46)	13,8	31,2
06/2009	VS AA	7,39	5,7 (43)	9,18	25,4
06/2009	VNI 2L	7,39	5,6 (42)	13,8	25,0

Faites vous un relai VNI par PPC?

Monsieur S en 2016

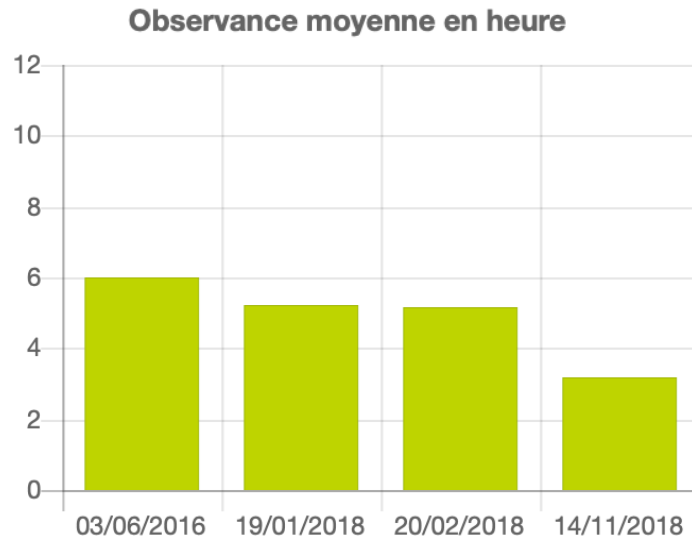
- Toujours pas d'exacerbation, toujours normocapnique
  - Toujours avec une Smartair
  - Poids + 9kg comparativement à 2009
- Hospitalisation pour ré-évaluation
  - IAH 38/h en VS AA
  - Temps passé saturation < 90%: 37%

Condition	pH	PaCO2 (kPa)	PaO2 (kPa)	Bicarbonates (mmol/l)
VS AA réveil	7,43	5,95 (44,6)	9,16 (68,7)	29,5

Faites vous un relai VNI par PPC?

Relai APAP
8-16cmH20

Une
hospitalisation
« Moins bien »

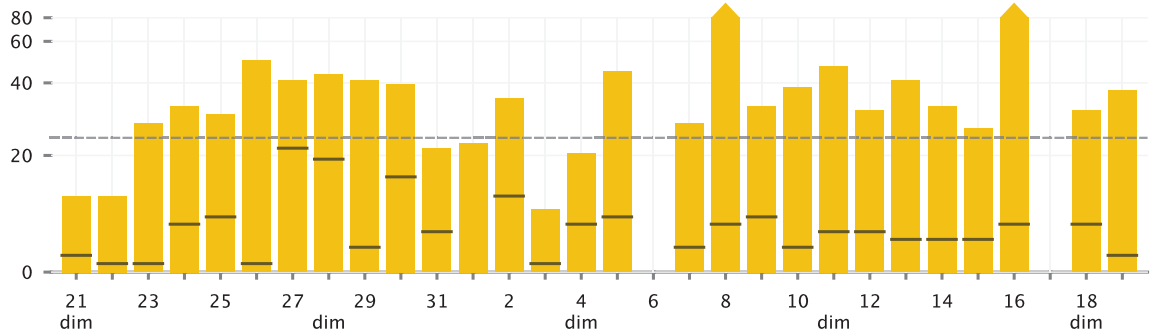


Analyse données machine

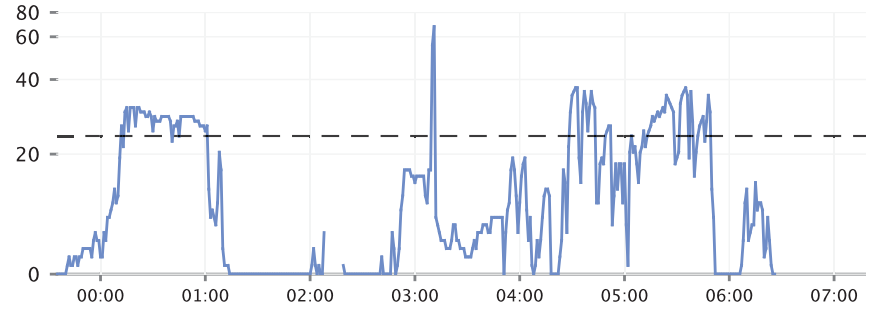
Gaz du sang

Données machine et gaz du sang

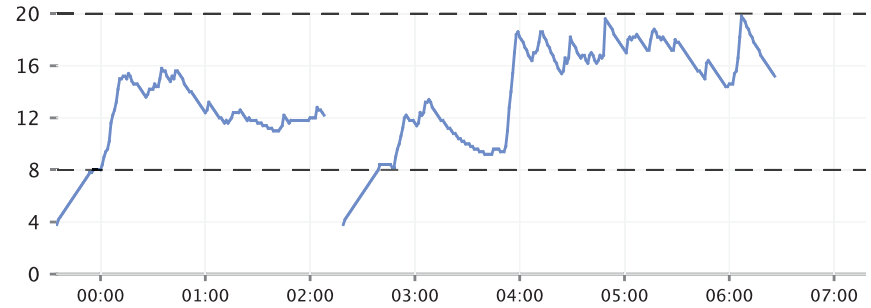
Fuite (l/min, 95e centile)



Fuite (l/min)



Pression (cmH2O)



Condition	pH	PaCO2 (kPa)	PaO2 (kPa)	Bicarbonates
VS AA diurne	7,38	6,1 (45,8)	8,9	26,6

Reprise VNI

Adaptation PPC / interface

Adaptation de la PPC et de l'interface

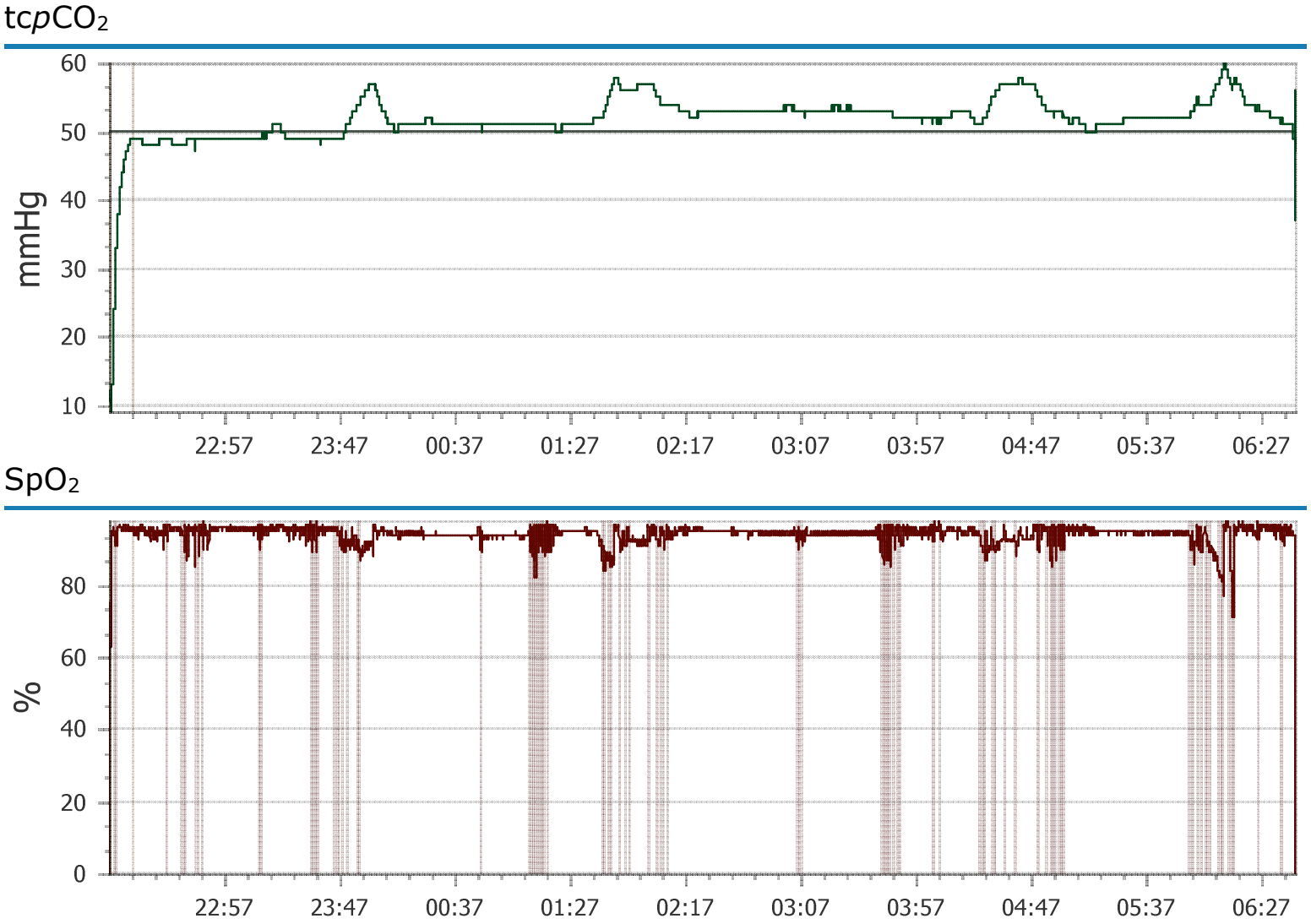
Fuites 0L/min

IAH résiduel 3/H

PEP 95:
11cmH20

Condition	pH	PaCO2 (kPa)	PaO2 (kPa)	Bicarbonates (mmol/l)
Diurne VS AA	7,43	5,8 (43,5)	11,2 (83)	27,6
PPC AA réveil	7,36	7,1 (53,3)	9 (67,5)	29,9

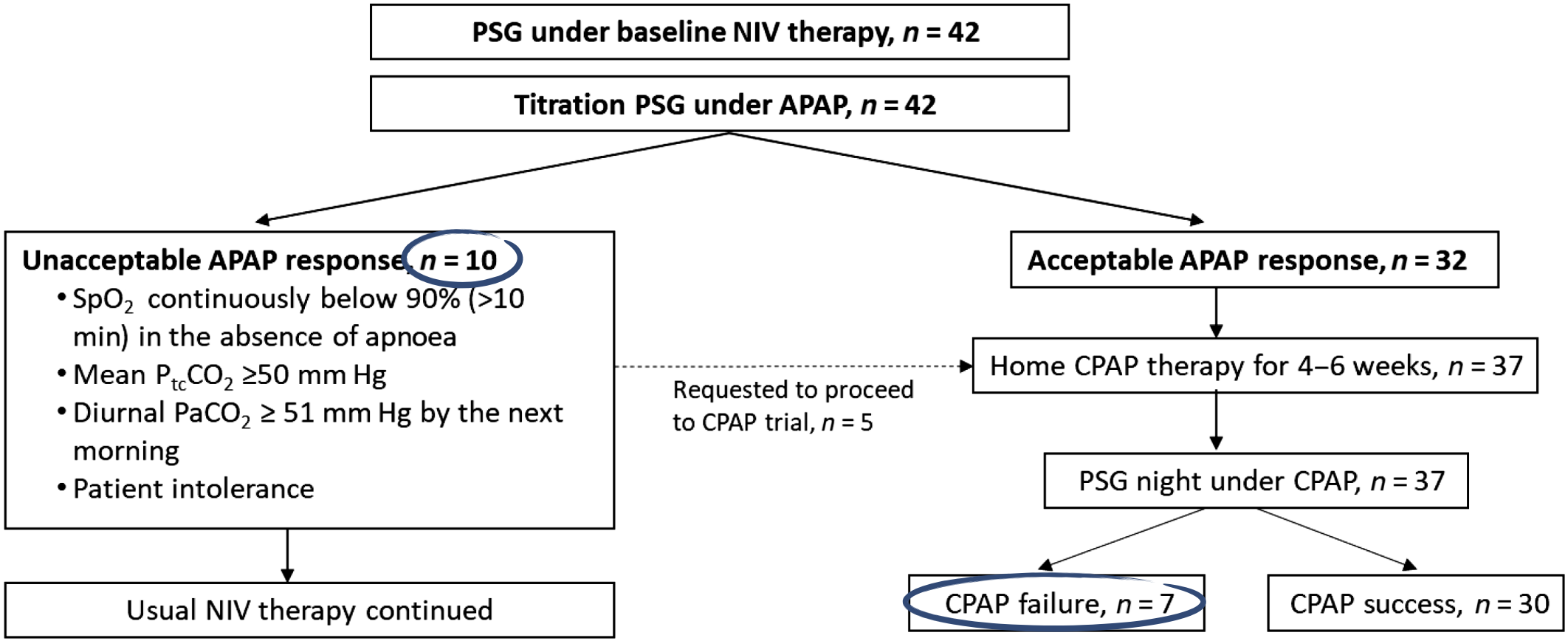
Capnographie sous PPC



Reprise VNI

Maintien de la PPC

Condition	pH	PaCO2 (kPa)	PaO2 (kPa)	Bicarbonates (mmol/l)
Diurne VS AA	7,49	6,3 (47,3)	9,6 (72)	29,1
VNI AA	7,47	5,3 (39,8)	10,1 (75,8)	29,1



Arellano Maric, M. P. Respirology 2019

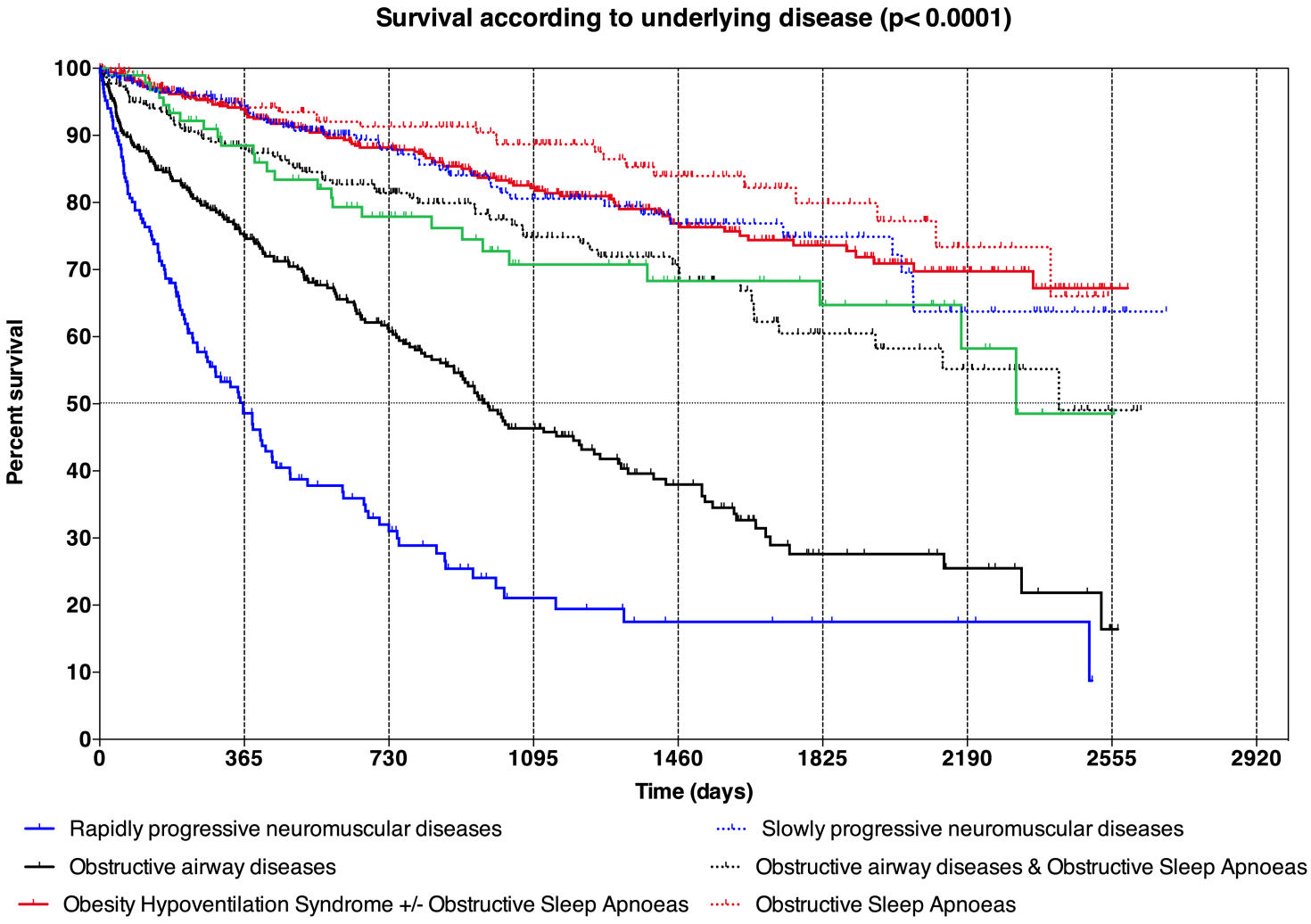
Adherence to CPAP and BPAP therapy was significantly different at 6-week follow-up (2.5 (1.6–6.7) on CPAP vs 7.0 (4.0–8.5) h/night on BPAP (P = 0.028)). 75.7% of patients achieved an adequate nightly adherence (adherence>4 h/night) using BPAP compared to 42.9% of patients using CPAP therapy (P = 0.045). Both therapies improved subjective sleepiness measures. The baseline ESS (16.0 (8.0–19.0) points) dropped significantly more with BPAP usage than with CPAP (ESS on CPAP 10.0 (6.0–17.0) vs ESS on BPAP 4.0 (1.0–7.0) points; P = 0.039). On BPAP, patients required a lower EPAP compared to the previously used CPAP levels (10 (8–12) cm H_2O vs 16.8 (15.7–19.2) cm H_2O; P = 0.001) to maintain sufficient control of OSA.

Ishak. Respirology 2019

Ok PPC

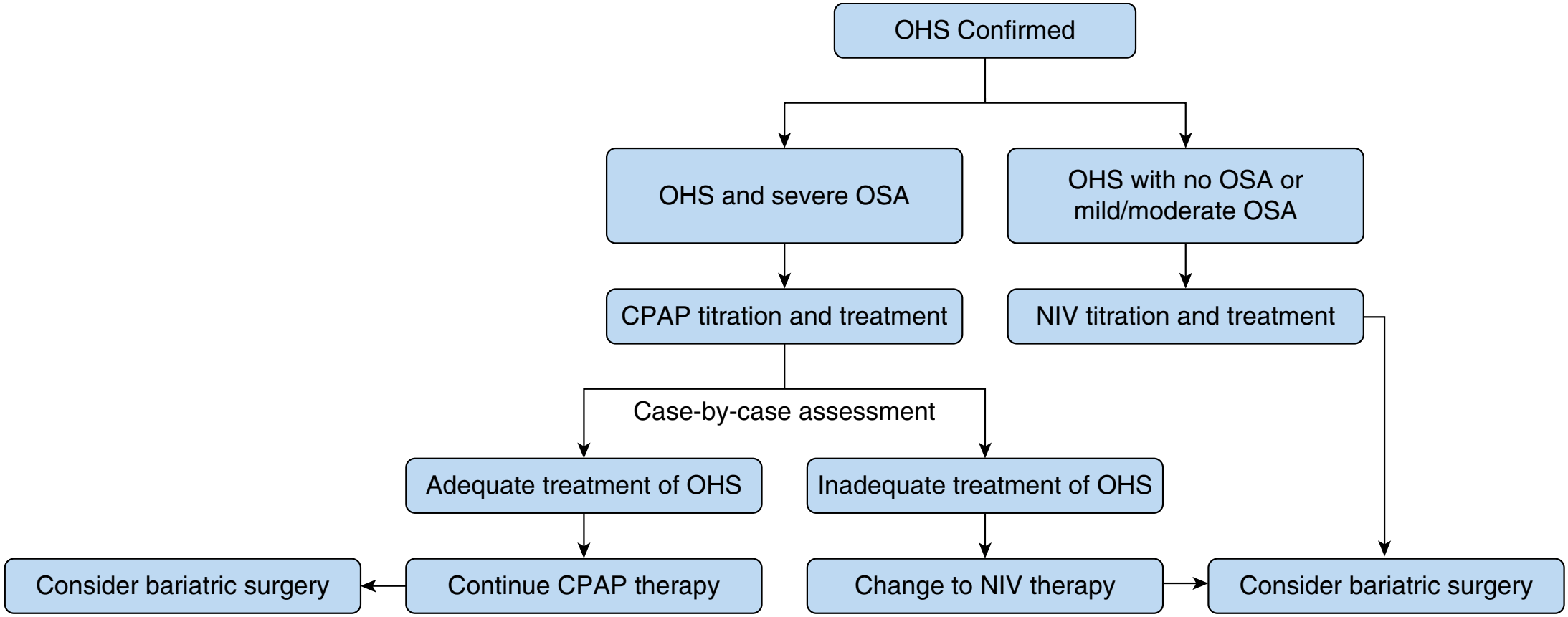
Mais surveillance de l'hypoventilation

Sauf si post-aigu

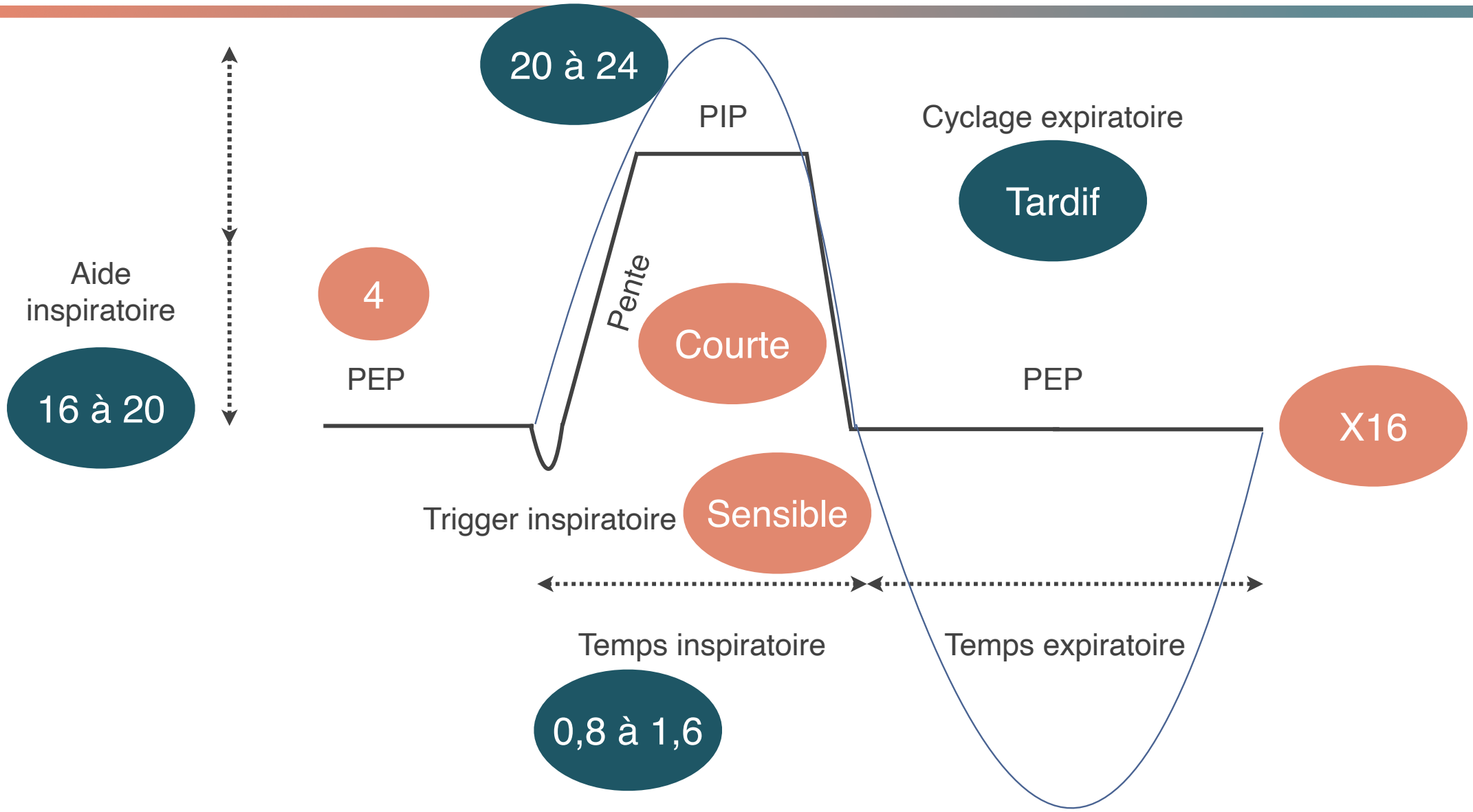


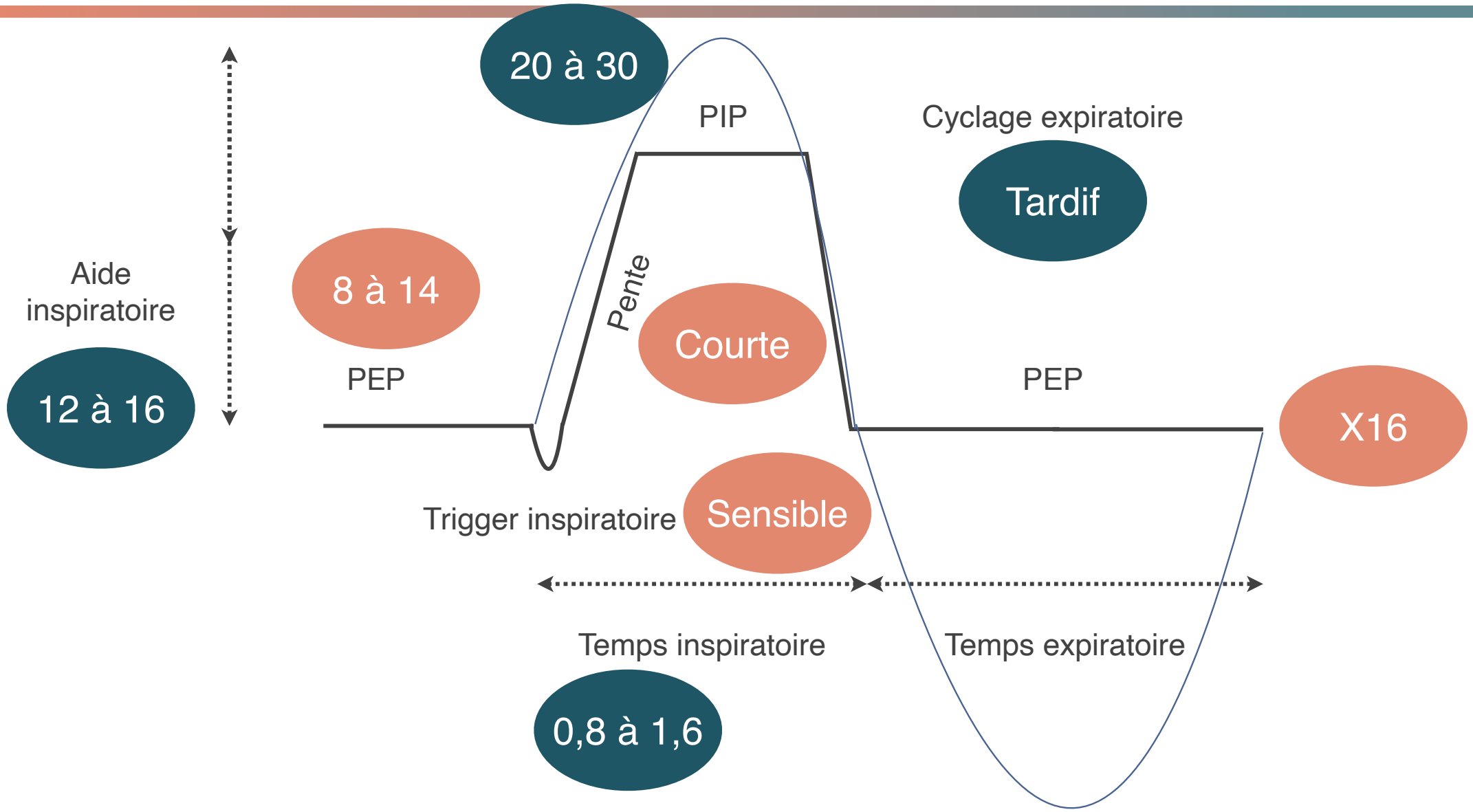
Patout M. Thorax 2020

Recommandations américaines

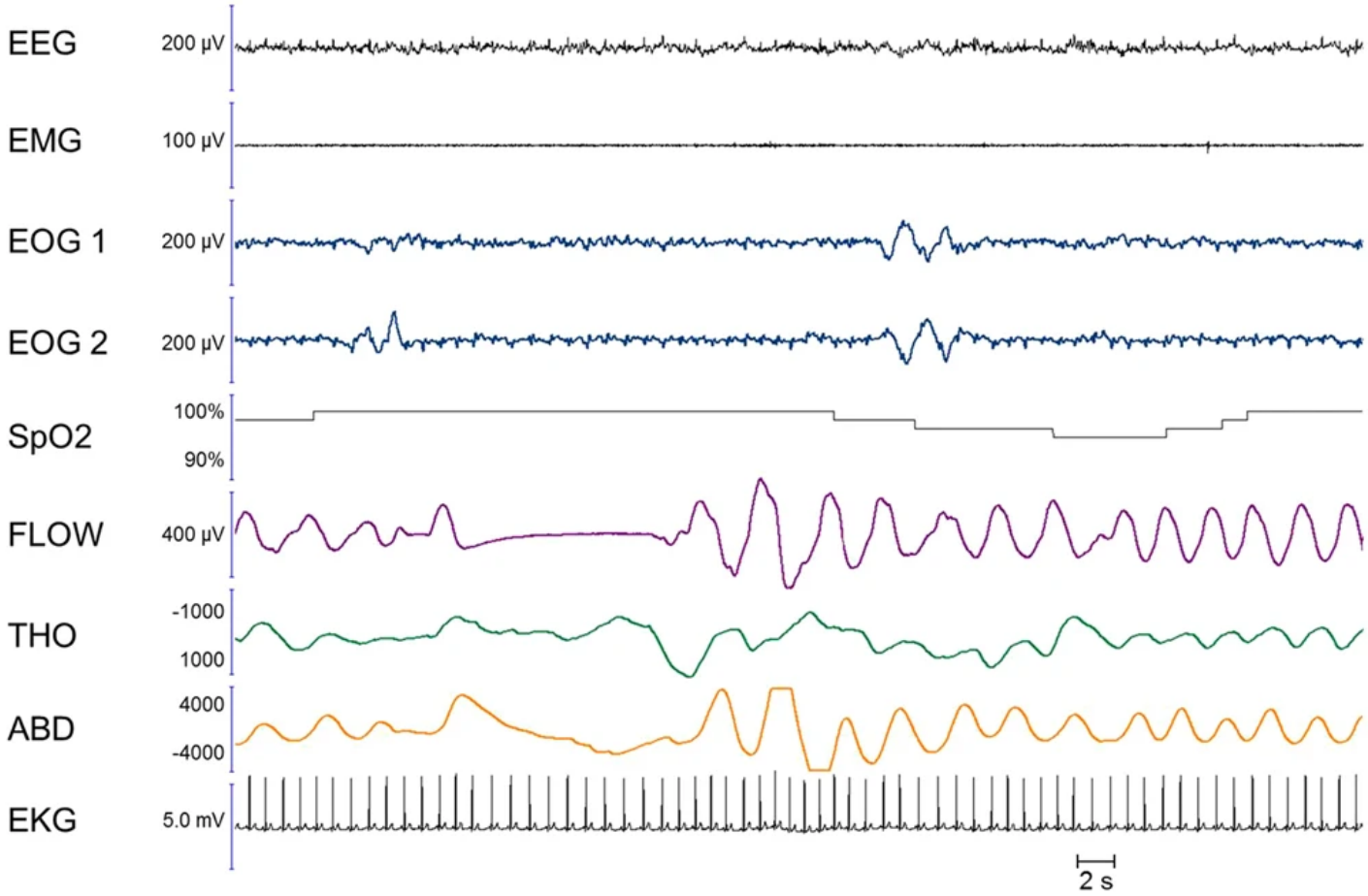


Mokhlesi B, AJRCCM 2019


20 à 24
PIP
Cyclage expiratoire
Tardif
Aide
inspiratoire
16 à 20
4
Pente
Courte
PEP
PEP
X16
Trigger inspiratoire
Sensible
Temps inspiratoire
Temps expiratoire
0,8 à 1,6

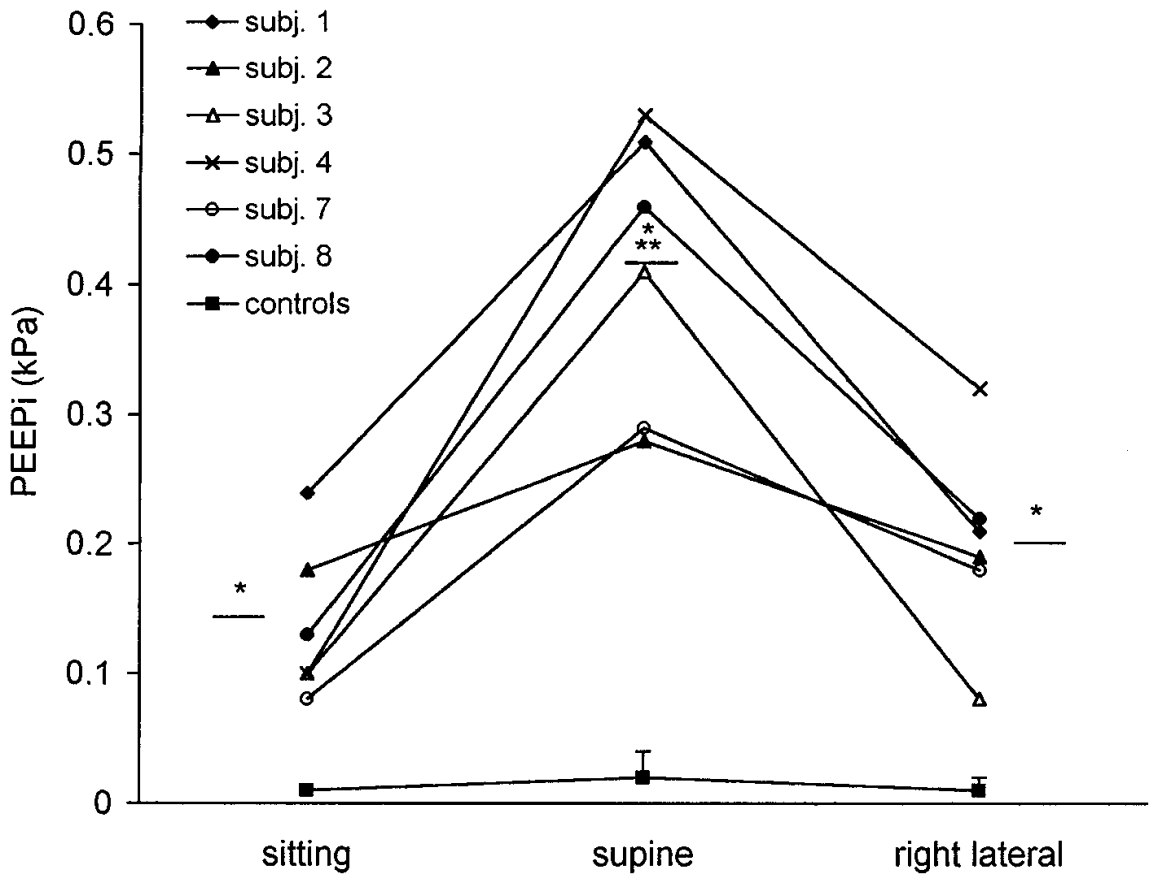

20 à 30
PIP
Cyclage expiratoire
Tardif
Aide
inspiratoire
12 à 16
8 à 14
Pente
Courte
PEP
PEP
X16
Trigger inspiratoire
Sensible
Temps inspiratoire
Temps expiratoire
0,8 à 1,6

On ne respire pas de la même manière au cours du sommeil



Oudiette D. Scientific reports 2018

La compliance change selon les positions



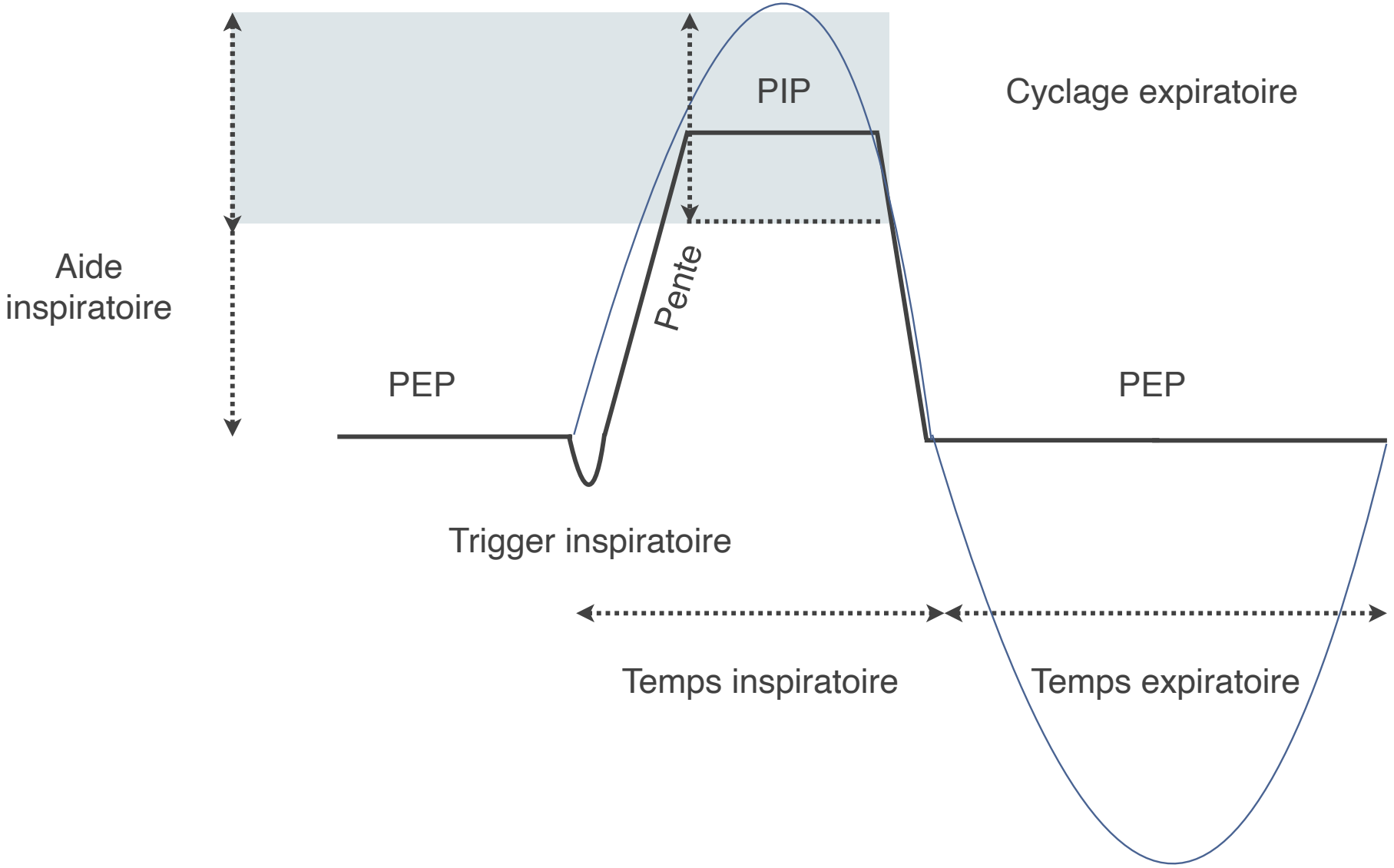
Pankow W. J. App Physiology 1998

Mode hybrides avec volume cible

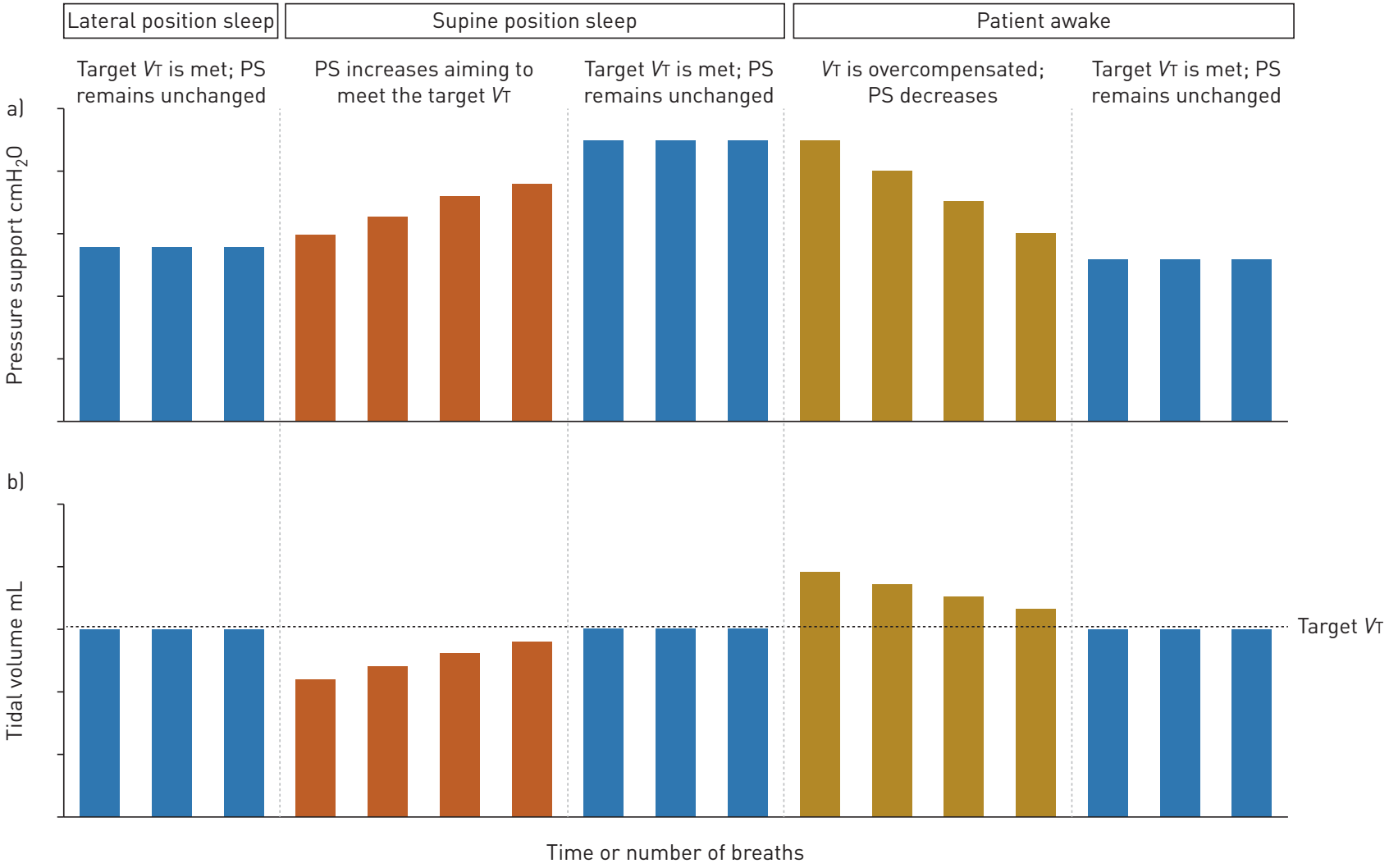
Barométrique

Avec bornes de pression inspiratoire

Définition d'un Vt cible


PIP
Cyclage expiratoire
Aide
inspiratoire
Pente
PEP
PEP
Trigger inspiratoire
Temps inspiratoire
Temps expiratoire

Mode hybrides avec volume cible



Arello-Maric M.P, ERJ, 2017

Mode hybrides avec volume cible

Variables	Baseline	CPAP Therapy	BPV-S/T Therapy	BPV-S/T-AVAPS Therapy
TST, min	307 ± 77	309 ± 98	279 ± 124	270 ± 87
Sleep efficiency, %	76 ± 19	80 ± 10	82 ± 27	78 ± 16
NREM sleep stage, % TST				
1	18 ± 11	8 ± 8	9 ± 11	14 ± 14
2	66 ± 20	57 ± 17	54 ± 13	53 ± 24
3 + 4	10 ± 11	19 ± 11	28 ± 9†	22 ± 14†
REM sleep, % TST	6 ± 6	16 ± 10	10 ± 10	11 ± 14
Arousals, No./h)	53 ± 26	22 ± 21†	25 ± 27†	27 ± 18†
RDI score, events/h	74 ± 25	25 ± 21†	21 ± 15†	31 ± 21†
Apnea index, events/h	21 ± 17	2 ± 3†	0 ± 0†	0 ± 0†
Sao_2, %	88 ± 5	92 ± 2†	92 ± 2†	92 ± 1†
Desaturation index, events/h	78 ± 26	29 ± 18†	27 ± 15†	33 ± 17†
$Ptcco_2$, mm Hg	58 ± 12	56 ± 9	52 ± 4	45 ± 3†
Heart rate, beats/min	69 ± 14	67 ± 13	67 ± 14	65 ± 11
PH	7.39 ± 0.02	7.39 ± 0.03	7.40 ± 0.04	7.42 ± 0.04
$Paco_2$, mm Hg	47.4 ± 2.0	48.0 ± 5.0	45.9 ± 3.7	42.0 ± 5.2†
Pao_2, mm Hg	73.3 ± 6.3	70.0 ± 7.4	76.31 ± 12.4	72.8 ± 9.1
HCO^-_3, mmol/L	28.0 ± 1.0	28.4 ± 1.8	27.8 ± 1.8	26.5 ± 2.0†

*Values are given as the mean ± SD (n = 10). REM = rapid eye movement; TST = total sleep time.
†$p < 0.05$ compared with baseline.

Storre Chest 2006

Mode hybrides avec volume cible

	Without V_T targeting mean ± SD	With V_T targeting mean ± SD	*p* Value
TST (min)	397 ± 79	334 ± 68	0.004
Sleep efficiency (%)	75 ± 10	68 ± 11	0.06
Sleep latency (min)	14 ± 12	21 ± 19	0.1
Stage 1 (% of TST)	22.6 ± 6.4	25.7 ± 8.7	0.07
Stage 2 (% of TST)	55.6 ± 6.9	50.4 ± 6.3	0.007
Slow wave sleep (% of TST)	8.8 ± 5.3	10.6 ± 5.6	0.11
REM sleep (% of TST)	13.8 ± 5.4	13.2 ± 5.8	0.28
Stage changes (*n*)	394 ± 145	326 ± 98	0.019
Wake after sleep onset (% of TST)	25.8 ± 10.6	33.8 ± 12.0	0.017
Awakenings >2 min (*n*)	101 ± 38	97 ± 29	0.31
Awakenings >20 s (*n*)	11 ± 7	16 ± 8	0.05
Micro-arousal index (*n*/h)	32 ± 11	30 ± 12	0.22
Sleep fragmentation index (*n*/h)	75 ± 27	78 ± 30	0.27

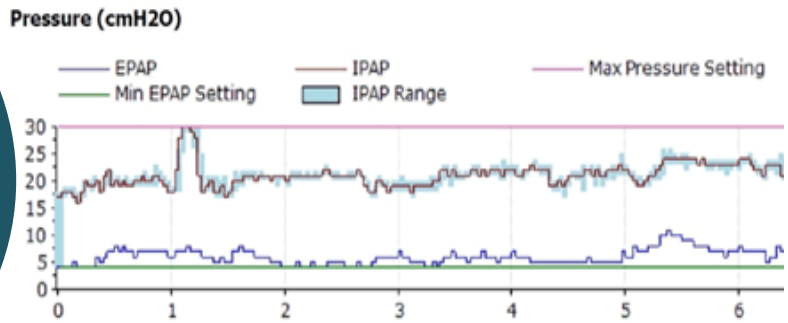
St. Mary's Hospital sleep questionnaire	Without V_T targeting mean ± SD	With V_T targeting mean ± SD	*p* Value*
Depth of sleep (scale range: 1–8)[a]	5.6 ± 1.6	3.3 ± 1.7	0.005
Number of awakenings	3.3 ± 2.0	4.9 ± 2.3	0.01
Duration of sleep (hh:mm)	07:13 ± 02:16	05:33 ± 02:31	0.06
Quality of sleep (scale range: 1–5)[a]	3.8 ± 0.6	2.8 ± 1.2	0.05
Morning sleepiness (scale range: 1–6)[a]	4.0 ± 0.7	3.6 ± 1.0	0.13
Satisfaction with quality of sleep (scale range: 1–5)[a]	3.8 ± 1.1	2.9 ± 1.1	0.08
Early awakening (yes/no)	6/6	6/6	
Difficulty in falling asleep (scale range: 1–4)	1.4 ± 1.0	2.1 ± 1.3	0.04
Time needed to fall asleep (hh:mm)	00:46 ± 01:10	00:54 ± 00:55	0.2
Comfort of ventilation (VAS scales, 0–10)			
Comfort of ventilation[a]	7.5 ± 1.9	6.0 ± 2.5	0.018
Desychronisation perceived by patient[a]	7.5 ± 2.2	6.1 ± 3.1	0.2
Too much air delivered[a]	9.0 ± 1.9	6.0 ± 3.8	0.012
Too little air delivered[a]	7.7 ± 2.9	8.0 ± 2.8	1.00
Morning headache[a]	9.7 ± 0.9	9.7 ± 0.7	1.00
Perception of leaks[a]	7.7 ± 2.4	4.8 ± 3.7	0.016
Noise of ventilator[a]	7.5 ± 2.2	6.5 ± 2.8	0.44
Quality of sleep[a]	6.8 ± 2.6	4.8 ± 2.7	0.02

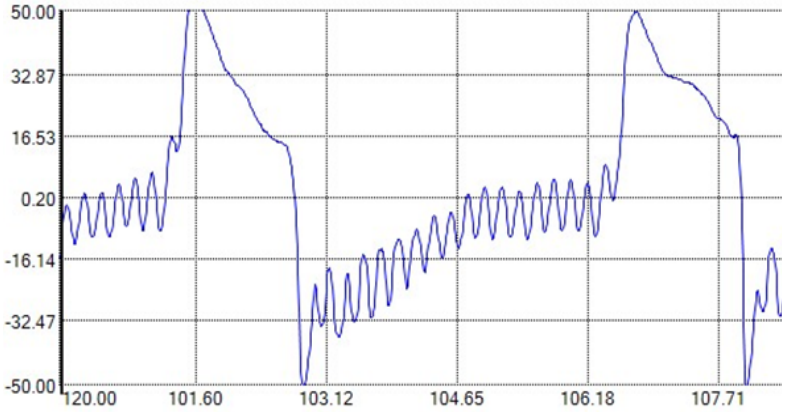
Janssens Respiratory Medicine 2009

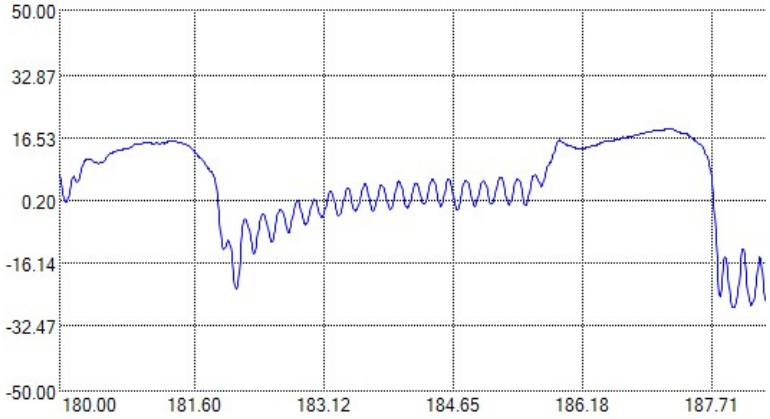
Auteur	Population	Design	Conclusion
Storre 2006	SOH	RCT	Pas de différence
Crisafulli 2009	SOH	Cross-over	Pas de différence*
Janssens 2009	SOH	Cross-over	Baro > Hybride
Murphy 2012	SOH	RCT	Pas de différence
Oscroft 2010	BPCO	Cross-over	Baro > Hybride
Ekkernkamp 2014	BPCO	Cross-over	Pas de différence*
Storre 2014	BPCO	Cross-over	Pas de différence
Oscroft 2014	BPCO	RCT	Pas de différence#

* confort perçu supérieur hybride > barométrique
# titration plus courte hybride > barométrique

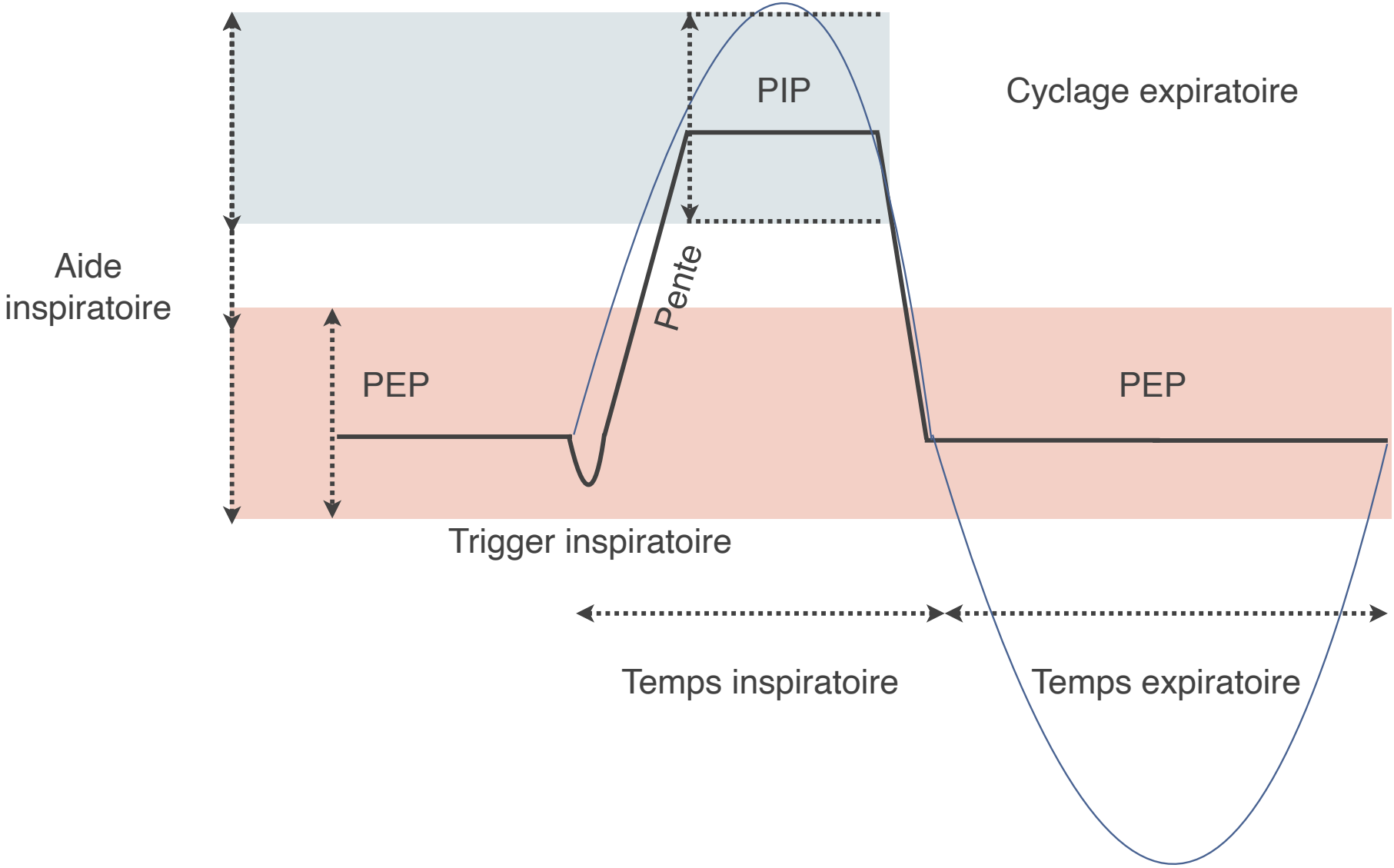
Titration automatique de la PEP







Mode hybrides avec volume cible complexe



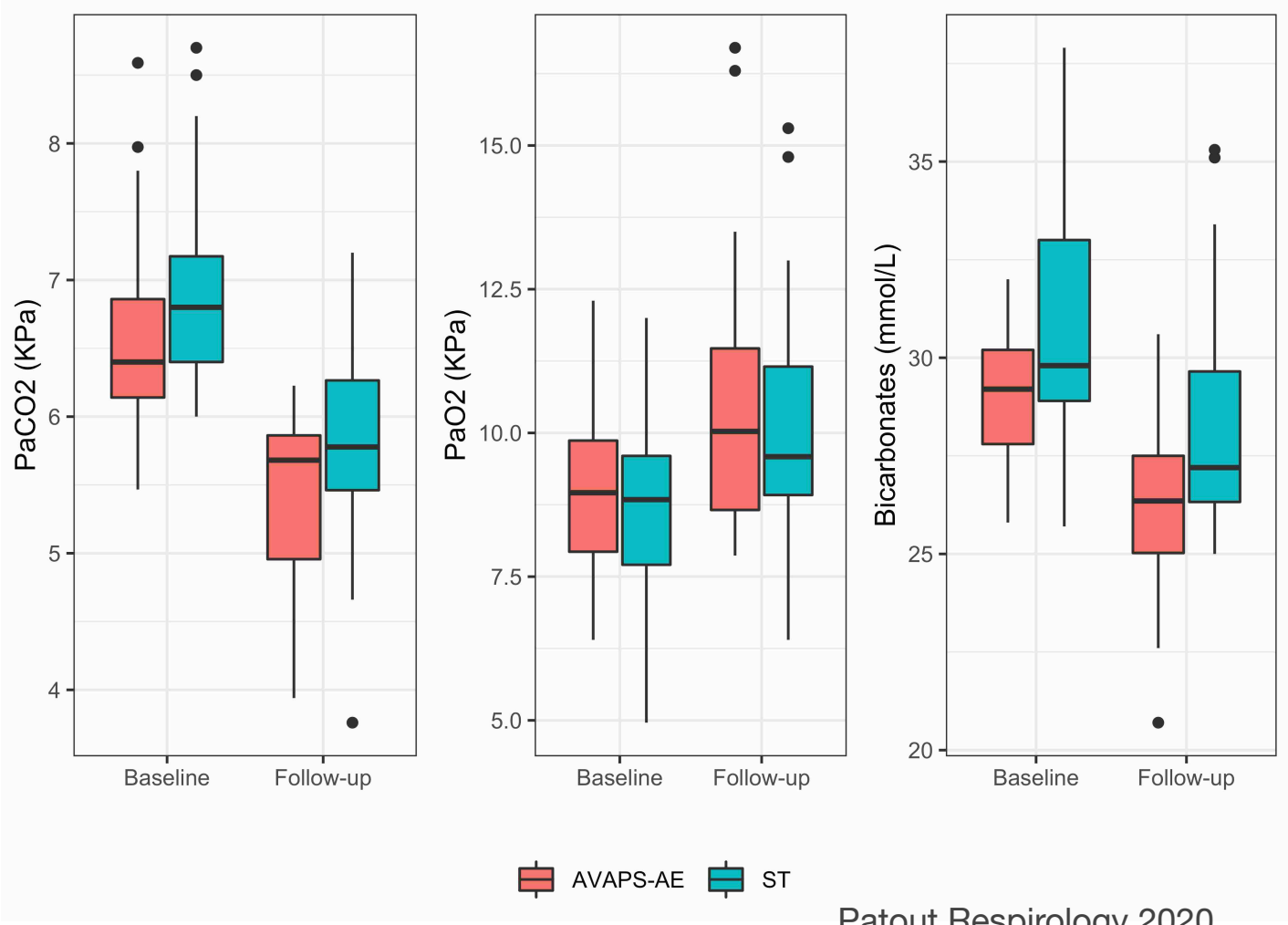
Mode hybrides avec volume cible complexe

Qualité du sommeil

	Mean ± SD (median) Minimum, maximum(*n*)		
	iVAPS AutoEPAP (*n* = 38)	iVAPS manual EPAP (*n* = 38)	*P*-value
Sleep parameters			
TST (min)	303.3 ± 79.58 (315.8) 55.9, 410.5 (38)	308.0 ± 82.37 (328.3) 47.5, 450.5 (38)	0.75
Stage N1 (% of TST)	16.18 ± 11.50 (12.90) 1.9, 54.6 (38)	20.47 ± 14.69 (17.10) 1.4, 73.1 (38)	0.01
Stage N2 (% of TST)	50.03 ± 13.83 (51.35) 11.9, 72.9 (38)	48.52 ± 17.20 (48.65) 6.5, 76.6 (38)	0.55
Stage N3 (% of TST)	17.93 ± 17.98 (11.30) 0.0, 77.3 (38)	17.74 ± 18.36 (14.45) 0.0, 74.8 (38)	0.61
REM sleep (% of TST)	15.58 ± 8.54 (16.05) 0.0, 32.1 (38)	12.76 ± 7.44 (12.80) 0.0, 26.3 (38)	0.04
Arousals (/h)	25.85 ± 17.39 (20.70) 2.9, 87.0 (38)	31.91 ± 20.19 (24.70) 3.6, 87.2 (38)	0.04
Sleep efficiency (%)	73.70 ± 16.41 (73.95) 25.6, 94.1 (38)	73.89 ± 19.05 (76.47) 11.1, 98.1 (38)	0.95

Orr Respirology 2019

Amélioration de l'hypoventilation



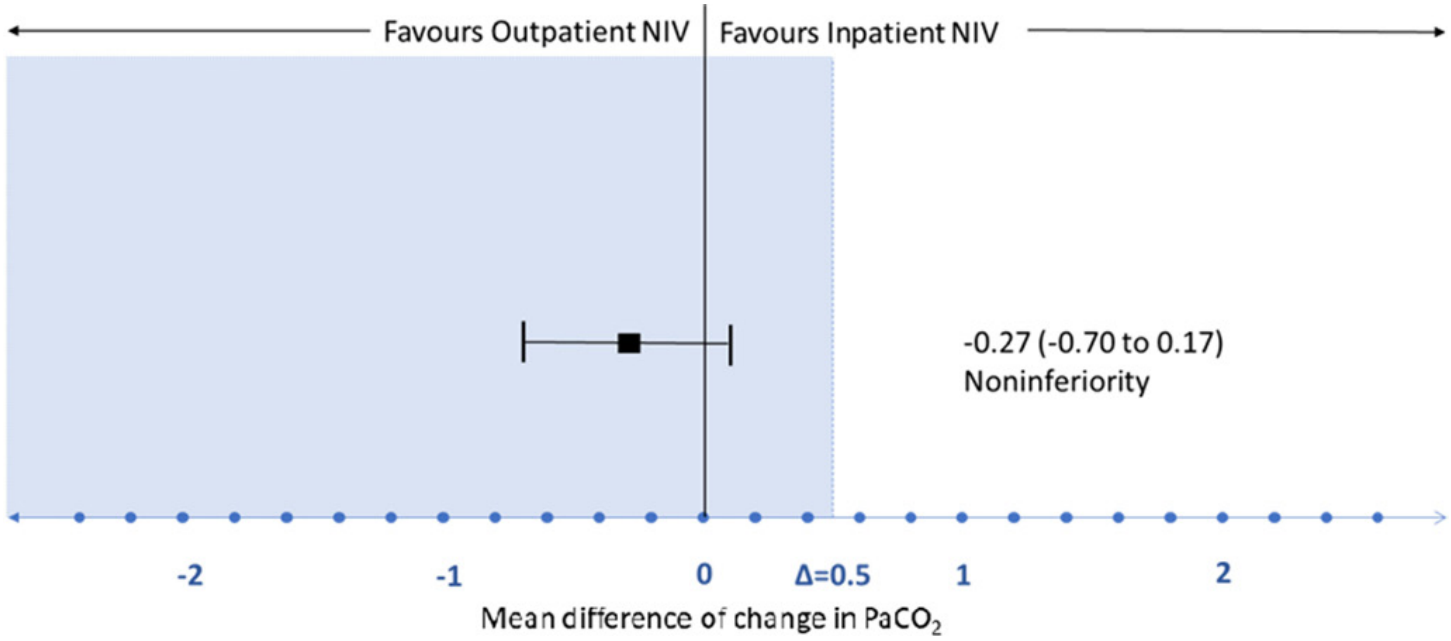
Patout Respirology 2020

Amélioration de l'hypoventilation

Follow-up	ST group (n=26)	AVAPS-AE group (n=30)	P
AHI (/h)	10.5±10.6	12.1±12.9	0.565
3% ODI (/h)	21.9±15.8	22.1±15.2	0.859
TST SaO_2<90% (%)	30.9±31.9	34.4±31.1	0.560
Mean saturation (%)	90.5±2.6	90.6±2.6	0.961
Sleep efficacy (%)	77.1±16.8	81.4±10.1	0.527
REM (%)	16.9±12.1	18.9±10.1	0.388
N1 (%)	19.1±10.6	17.3±14.7	0.217
N2 (%)	45.2±10.9	43.7±9.3	0.589
N3 (%)	20.9±11.8	23.6±11.6	0.384

Patout M, Respirology 2020

Autorise l'ambulatoire



Murphy PB, Thorax 2022

PPC ou VNI

Surtout surveiller

Rôle des modes complexes au long cours?

Merci de votre attention

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