Sevrage respiratoire

Mars 2026

DU Kiné

Pr Hadrien Rozé

Réanimation Polyvalente,

Centre Hospitalier Côte Basque

Université de Bordeaux

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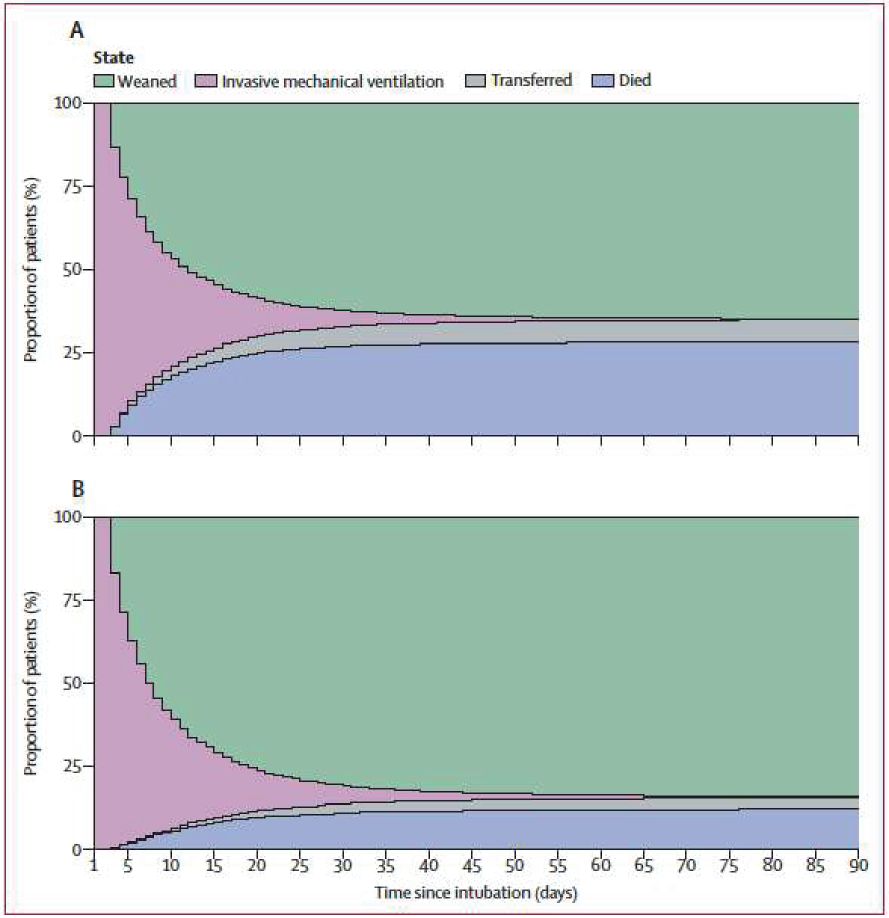
LES GRANDS PRINCIPES DU SEVRAGE

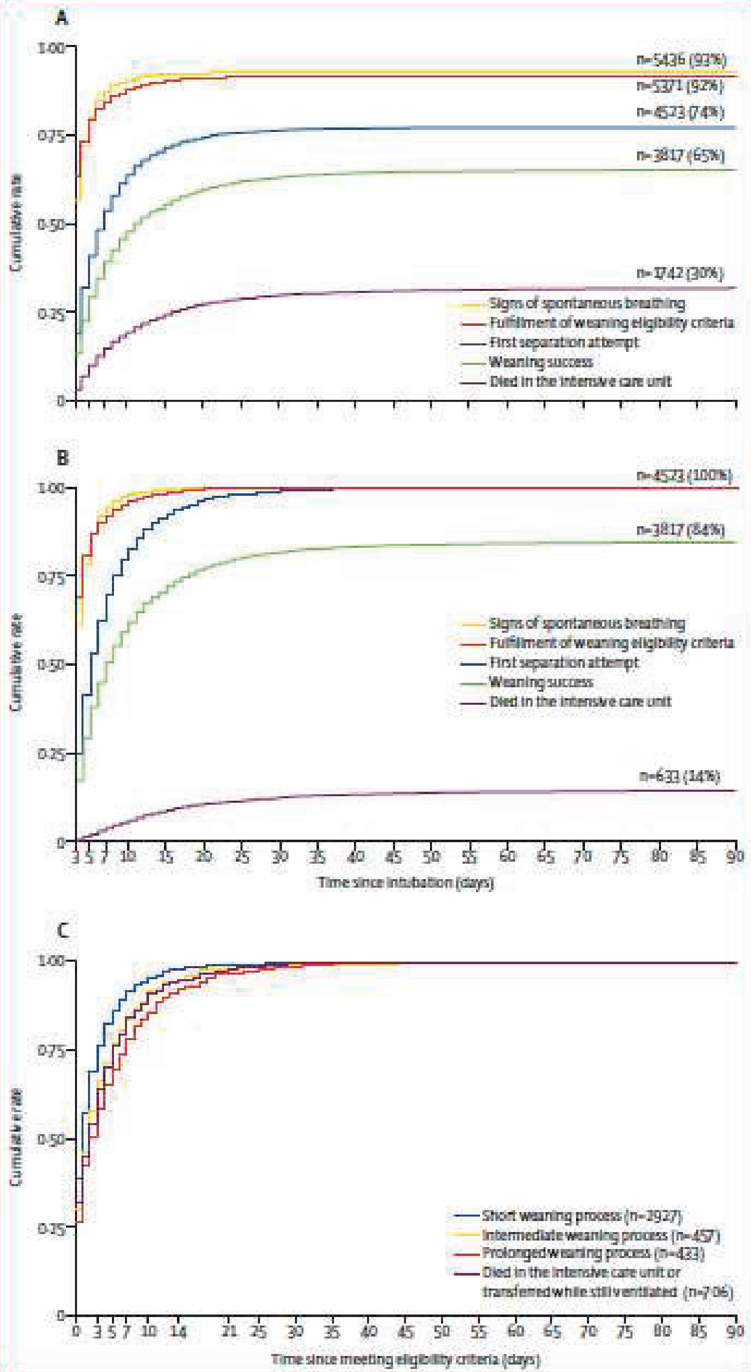
- Simple à Difficile
- Sédation
- Fonction Cardiaque
- Force musculaire

Weaning from mechanical ventilation in intensive care units across 50 countries (WEAN SAFE): a multicentre, prospective, observational cohort study

Tài Pham, Leo Heunks, Giacomo Bellani, Fabiana Madotto, Irene Aragao, Gaëtan Beduneau, Ewan C Goligher, Giacomo Grasselli, Jon Henrik Laake, Jordi Mancebo, Oscar Peñuelas, Lise Piquilloud, Antonio Pesenti, Hannah Wunsch, Frank van Haren, Laurent Brochard, John G Laffey*, for the WEAN SAFE Investigators†*



Lancet Respir Med 2023; 11: 465–76



A
Cumulative rate
1·00
0·75
0·50
0·25
0
n=5436 (93%)
n=5371 (92%)
n=4573 (74%)
n=3817 (65%)
n=1742 (30%)
Signs of spontaneous breathing
Fulfillment of weaning eligibility criteria
First separation attempt
Weaning success
Died in the intensive care unit
B
Cumulative rate
1·00
0·75
0·50
0·25
0
n=4573 (100%)
n=3817 (84%)
n=633 (14%)
Signs of spontaneous breathing
Fulfillment of weaning eligibility criteria
First separation attempt
Weaning success
Died in the intensive care unit
3 5 7 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Time since intubation (days)
C
Cumulative rate
1·00
0·75
0·50
0·25
0
Short weaning process (n=2927)
Intermediate weaning process (n=457)
Prolonged weaning process (n=433)
Died in the intensive care unit or transferred while still ventilated (n=706)
0 3 5 7 10 14 21 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Time since meeting eligibility criteria (days)

Sevrage 3 situations

1) **Sevrage simple** (premier essai)
65%
2) **Sevrage prolongé** (plus d'un essai)
25%
3) **Sevrage (très) difficile**
10%

Sevrage 3 situations

	Funk	Penuelas	Sellares	Tonnelier
Simple	59 %	55 %	44 %	30 %
Prolongé	26 %	39 %	37 %	40 %
Difficile	14 %	6 %	18 %	30 %

Etude WIND G.Beduneau

Mécanismes du Sevrage non difficile

- Sevrage possible d'emblée:
  - ✷ screening quotidien
- Sevrage possible mais non identifié
  - ✷ Sur assistance
  - ✷ Trop de sédation
  - ✷ Pas de screening

Mécanismes du Sevrage difficile

- Pathologie pulmonaire/cardiaque sous jacente sévère
- Surcharge volémique
- Faiblesse musculaire respiratoire
- Métabolique/Nutrition/Anémie

Eur Respir J 2007; 29: 1033–1056
DOI: 10.1183/09031936.00010206

TASK FORCE

Weaning from mechanical ventilation

J-M. Boles[*], J. Bion[#], A. Connors[¶], M. Herridge[+], B. Marsh[§], C. Melot[ƒ], R. Pearl[**], H. Silverman[##], M. Stanchina[¶¶], A. Vieillard-Baron[++], T. Welte[§§]

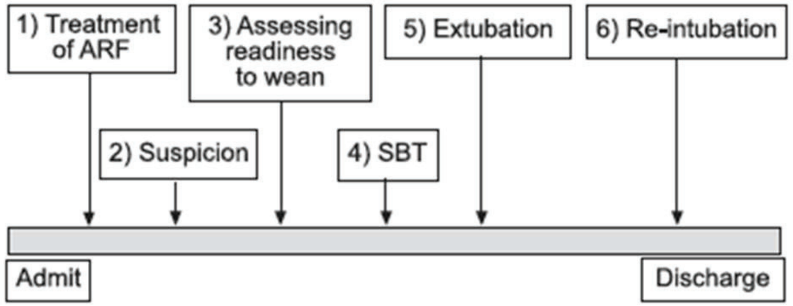


TABLE 3 Classification of patients according to the weaning process

Group/category	Definition
Simple weaning	Patients who proceed from initiation of weaning to successful extubation on the first attempt without difficulty
Difficult weaning	Patients who fail initial weaning and require up to three SBT or as long as 7 days from the first SBT to achieve successful weaning
Prolonged weaning	Patients who fail at least three weaning attempts or require >7 days of weaning after the first SBT

SBT: spontaneous breathing trial.

WEAN SAFE and the definition of the first separation attempt

Authors' reply

We welcome the opportunity to respond to the points raised by Carles Subira Cuyas and Rafael Fernández Fernández and thank them for their interest in our study.[1]

The first point raised is that WEAN SAFE weaning criteria (which included fractional oxygen in inspired air [FiO2] <50% and a positive end-expiratory pressure [PEEP] <10) were uncommon or arbitrary. These criteria were actually adapted from the criteria of Boles and colleagues[2] and informed by protocols uploaded by WEAN SAFE investigators, who reported criteria for FiO_2 from 30% to 50% and for a PEEP of <5 cm H_2O to 10 cm H_2O. We disagree with the suggestion that this constitutes high PEEP and high FiO_2. Furthermore, it is worth noting that in WEAN SAFE the first day the patients meet our general weaning eligibility criteria they also start spontaneous breathing.

The second point made is that clinical criteria (cough, secretions, etc) were omitted and an adequate level of consciousness was considered a criterion for extubation but not for weaning. We suggest that an adequate level of consciousness is necessary for safe extubation but is not a requirement to perform a spontaneous breathing trial. Furthermore, removing patients' level of consciousness from the weaning criteria allowed us to question the role of this modifiable factor in delays in the weaning process, leading to important new insights in this regard.

It is important to clearly distinguish the weaning process from that of extubation. If weaning and extubation are conflated, it could seriously delay the weaning process. This risk is underlined by the authors' statement that a patient who is not ready for extubation should not have a separation attempt. We believe this assertion is highly debatable. Since the main reason for not being extubatable is excessive sedation, if the two questions (separation and extubation) are not considered individually, patients might be kept sedated for extended periods with no separation attempt performed. There would be a price to pay from delayed weaning, leading to prolonged ventilation and further muscle weakness and risk of sequelae.

Knowing that a patient can be separated from the ventilator should be dissociated from criteria for extubation and should be an incentive to also facilitate the reduction of sedation to facilitate successful extubation. We think this approach should enable progress in expediting the weaning process and in enhancing weaning success.

TP reports no competing interests. GB reports a grant from Drager to his institution; consulting fees from Flowmeter; payments or honoraria from Drager and Getinge; and stock options in Dico technologies. LH reports funding from the European Respiratory Society to his institution to support the study; grants from Liberate Medical and InflaRx to his institution; honoraria from Getinge and American Thoracic Society; and reimbursement from European Respiratory Society. LB reports grants from Medtronic, Drager, and Stimit to his institution; honoraria and equipment received from Fisher Paykel. JL reports funding from the European Society of Intensive Care Medicine to support the study; and consulting from Baxter Healthcare and Cellenkos

*Tài Pham, Leo Heunks, Giacomo Bellani, Laurent Brochard, *John Laffey, on behalf of the WEAN SAFE Investigators*
john.laffey@universityofgalway.ie

Service de Médecine Intensive-Réanimation, AP-HP, Hôpital de Bicêtre, DMU CORREVE, FHU SEPSIS, Groupe de recherche CARMAS, Hôpitaux Universitaires Paris-Saclay, Le Kremlin-Bicêtre, France (TP); Université Paris-Saclay, UVSQ, Université Paris-Sud, INSERM U1018, Equipe d'Epidémiologie Respiratoire Intégrative, CESP, Villejuif, France (TP); Department of Intensive Care Medicine, Erasmus University Medical Centre, Rotterdam, Netherlands (LH); School of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy (GB); Department of Emergency and Intensive Care, University Hospital San Gerardo, Monza, Italy (GB); Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Canada (LB); Keenan Research Centre for Biomedical Science, Li Ka Shing Knowledge Institute, St Michael's Hospital, Unity Health Toronto, Canada (LB); Anaesthesia and Intensive Care Medicine, Galway University Hospitals, Galway, Ireland (JL); School of Medicine, Regenerative Medicine Institute (REMEDI) at CÚRAM Centre for Research in Medical Devices, University of Galway, Galway H91 TK33, Ireland (JL)

1 Pham T, Heunks L, Bellani G, et al. Weaning from mechanical ventilation in intensive care units across 50 countries (WEAN SAFE): a multicentre, prospective, observational cohort study. *Lancet Respir Med* 2023 published online Jan 21. https://doi.org/10.1016/S2213-2600(22)00449-0.
2 Boles JM, Bion J, Connors A, et al. Weaning from mechanical ventilation. *Eur Respir J* 2007; 29: 1033-56.

Published Online
March 16, 2023
https://doi.org/10.1016/S2213-2600(23)00089-9

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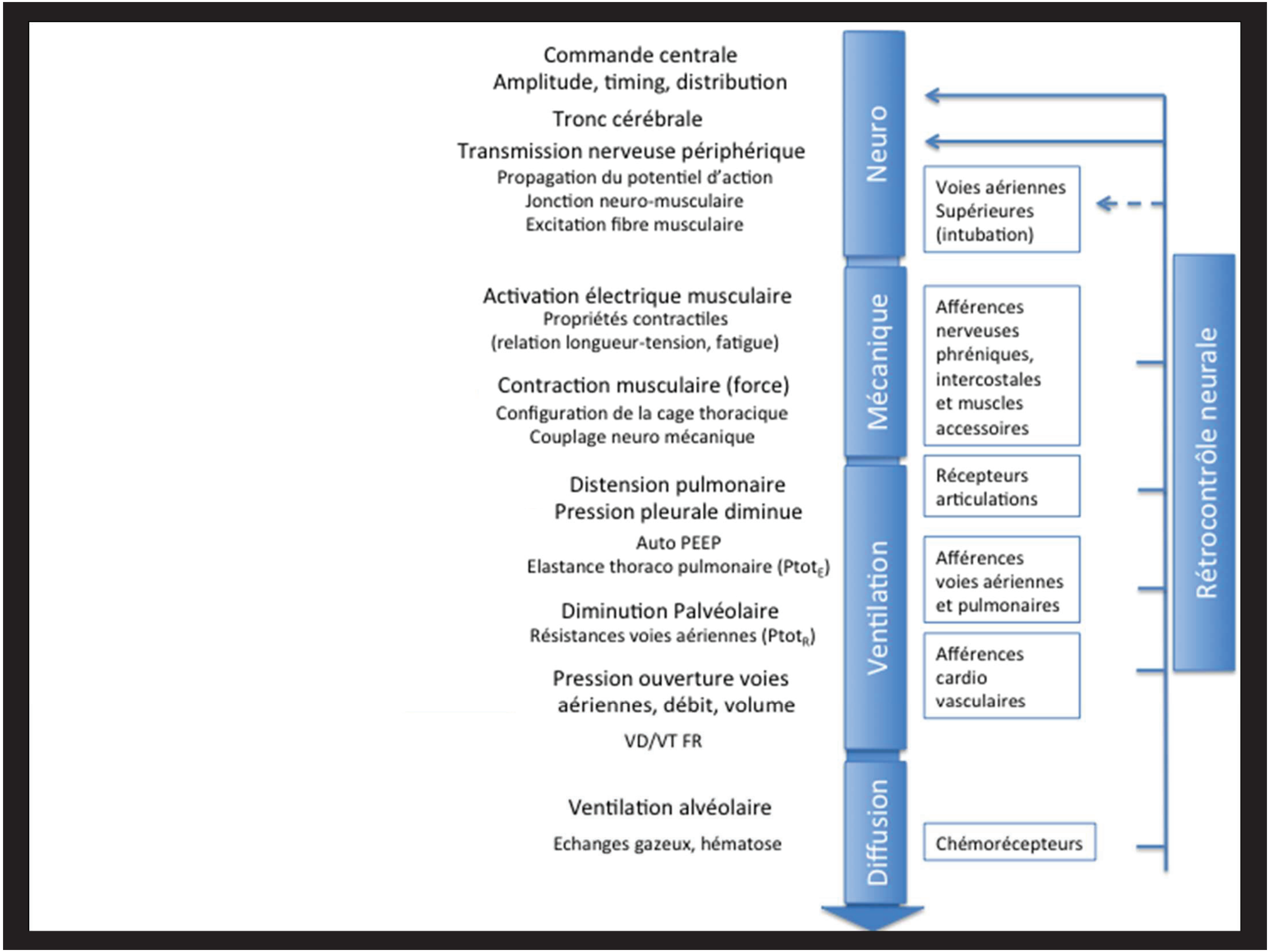
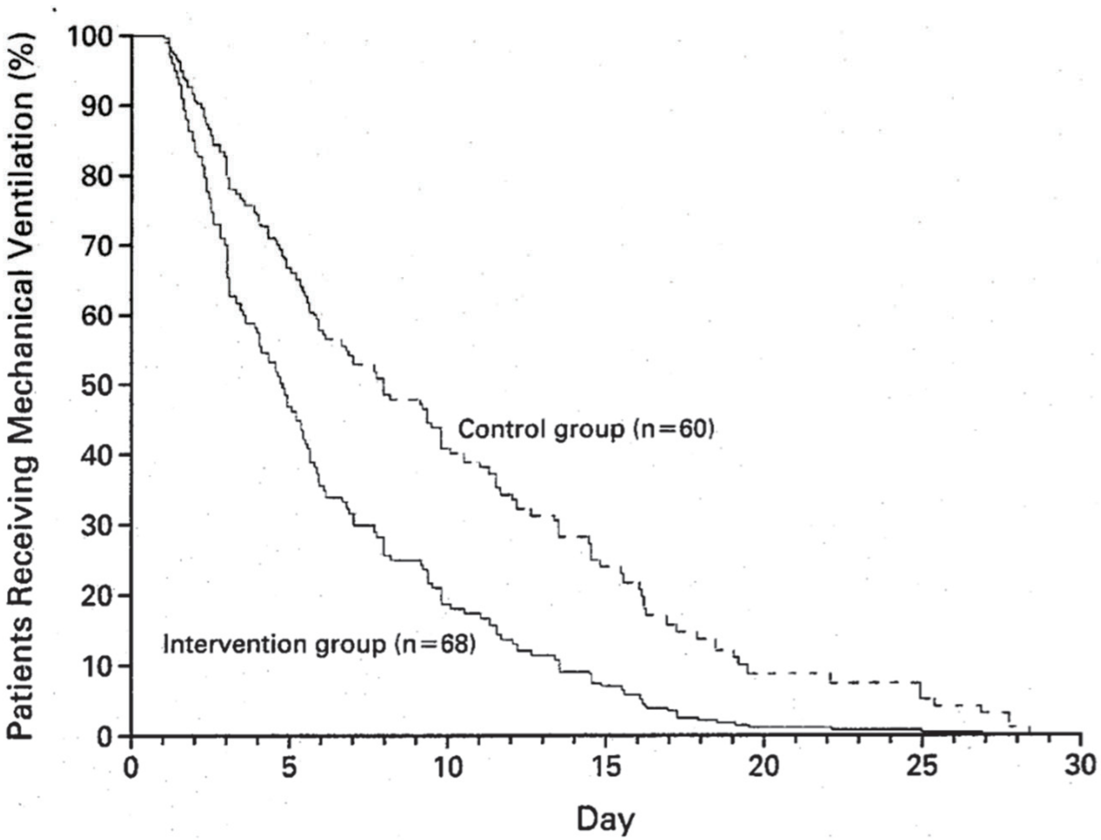
Sevrage du ventilateur

Sevrage de la sonde

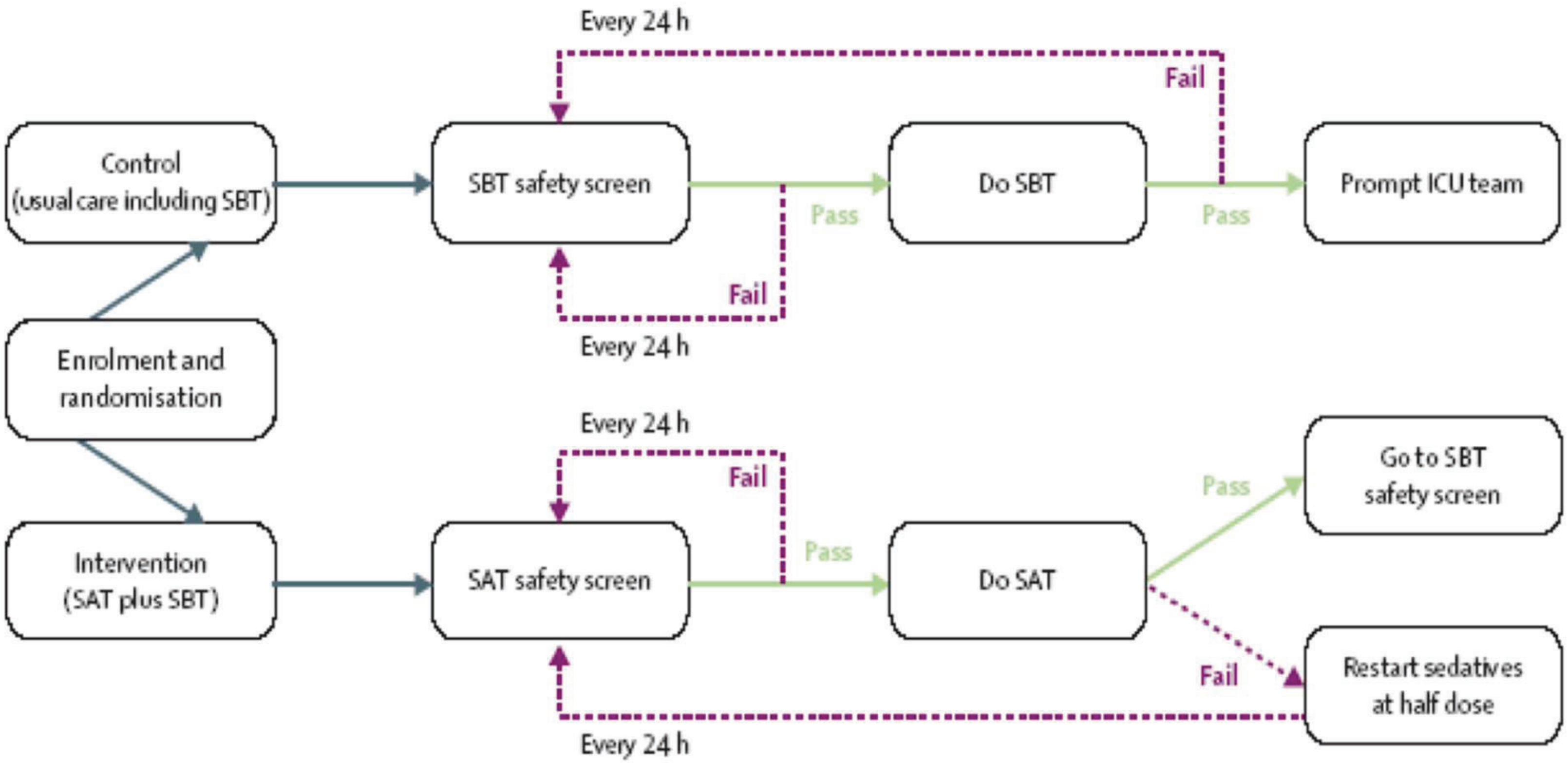

Commande centrale
Amplitude, timing, distribution
Tronc cérébrale
Transmission nerveuse périphérique
Propagation du potentiel d'action
Jonction neuro-musculaire
Excitation fibre musculaire
Activation électrique musculaire
Propriétés contractiles
(relation longueur-tension, fatigue)
Contraction musculaire (force)
Configuration de la cage thoracique
Couplage neuro mécanique
Distension pulmonaire
Pression pleurale diminue
Auto PEEP
Elastance thoraco pulmonaire ($Ptot_E$)
Diminution Palvéolaire
Résistances voies aériennes ($Ptot_R$)
Pression ouverture voies
aériennes, débit, volume
VD/VT FR
Ventilation alvéolaire
Echanges gazeux, hématose
Neuro
Mécanique
Ventilation
Diffusion
Voies aériennes
Supérieures
(intubation)
Afférences
nerveuses
phréniques,
intercostales
et muscles
accessoires
Récepteurs
articulations
Afférences
voies aériennes
et pulmonaires
Afférences
cardio
vasculaires
Chémorécepteurs
Rétrocontrôle neurale

Protocole de sedation

Kress, JP. et al. N Engl J Med 2000; 342:1471-1477



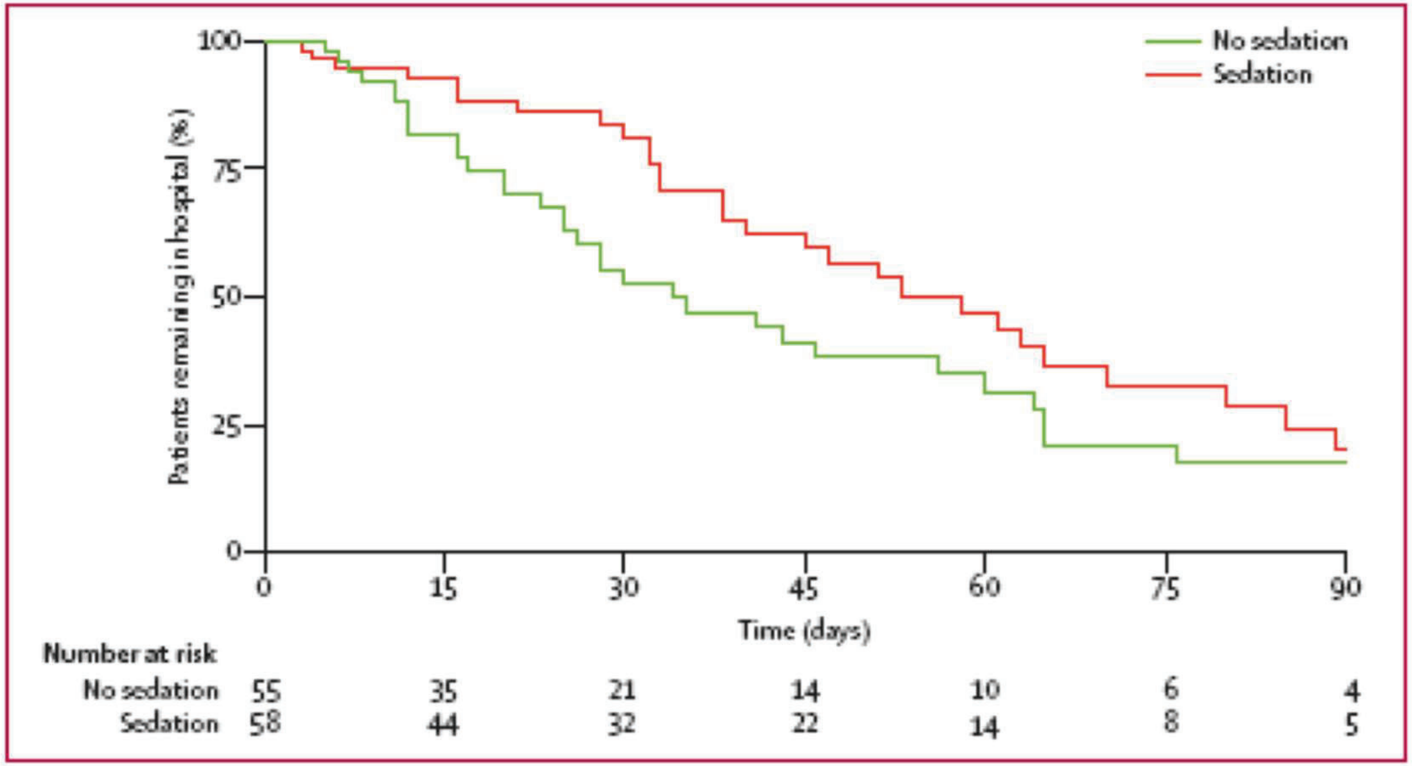
Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): a randomised controlled trial



Lancet 2008; 371: 126–34

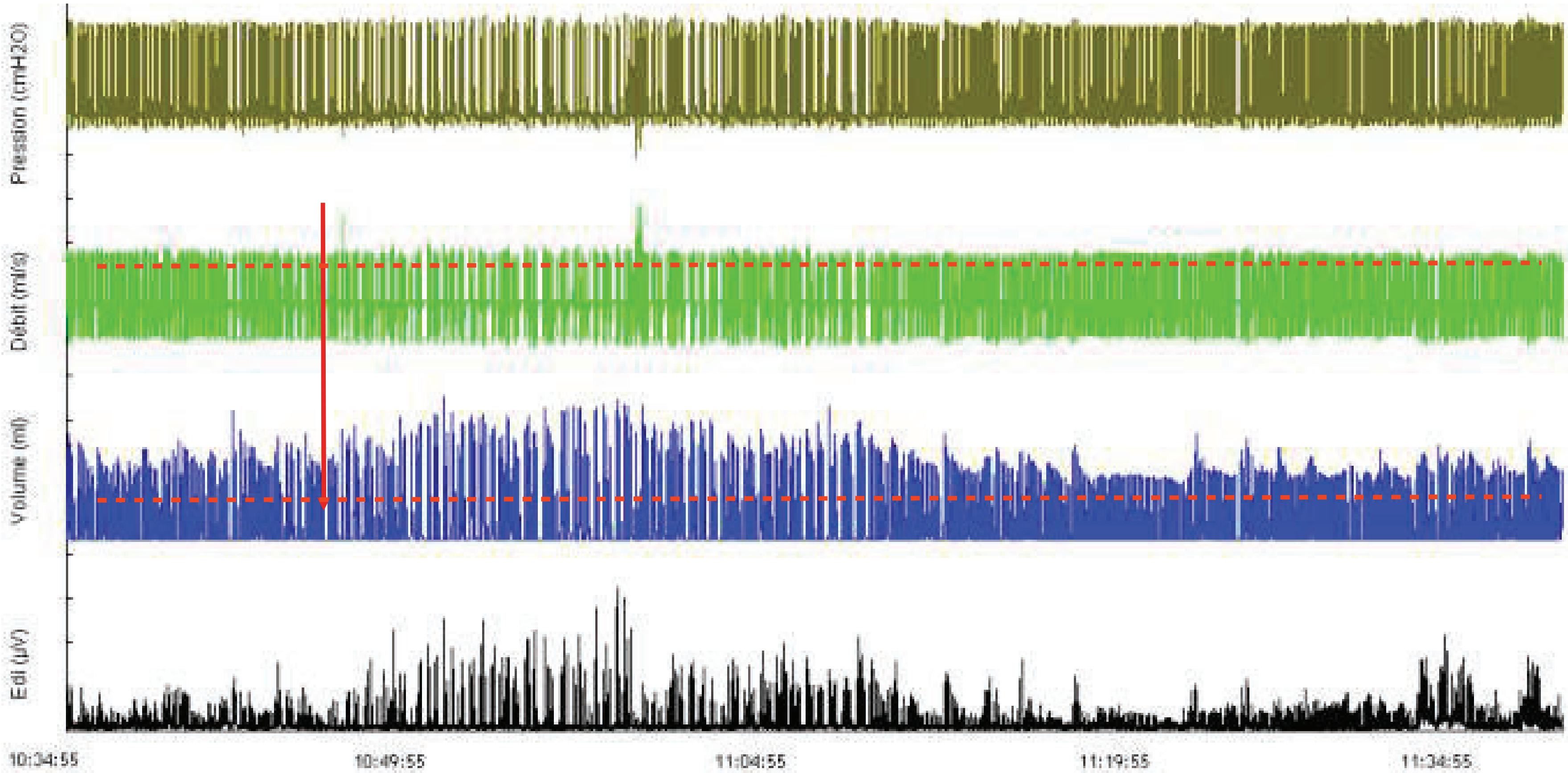
A protocol of no sedation for critically ill patients receiving mechanical ventilation: a randomised trial

Thomas Strøm, Torben Martinussen, Palle Toft



Lancet 2010

Test à l'anexate démontre l'inhibition de la sedation



Teboul *et al. Critical Care* 2010, 14:211
http://ccforum.com/14/2/211

CRITICAL CARE

REVIEW

Weaning failure of cardiac origin: recent advances

Jean-Louis Teboul*, Xavier Monnet, and Christian Richard

Intensive Care Med (2005) 31:1605–1607
DOI 10.1007/s00134-005-2698-x

EDITORIAL

Christian Richard
Jean Louis Teboul

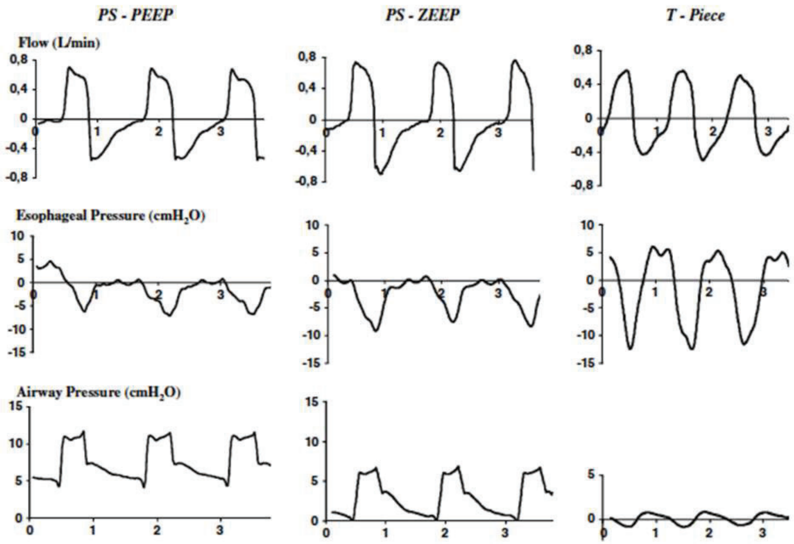
Weaning failure from cardiovascular origin

Intensive Care Med
DOI 10.1007/s00134-010-1870-0

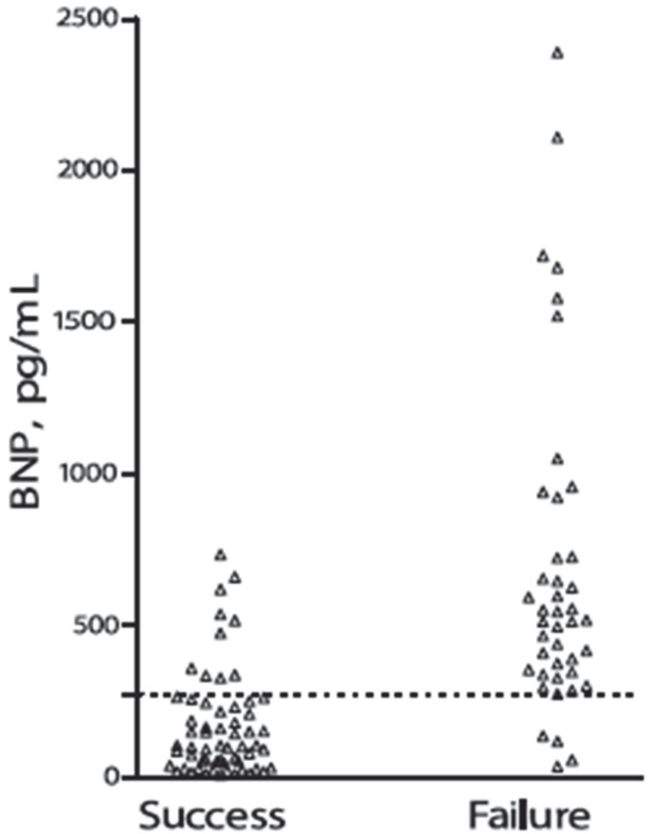
ORIGINAL

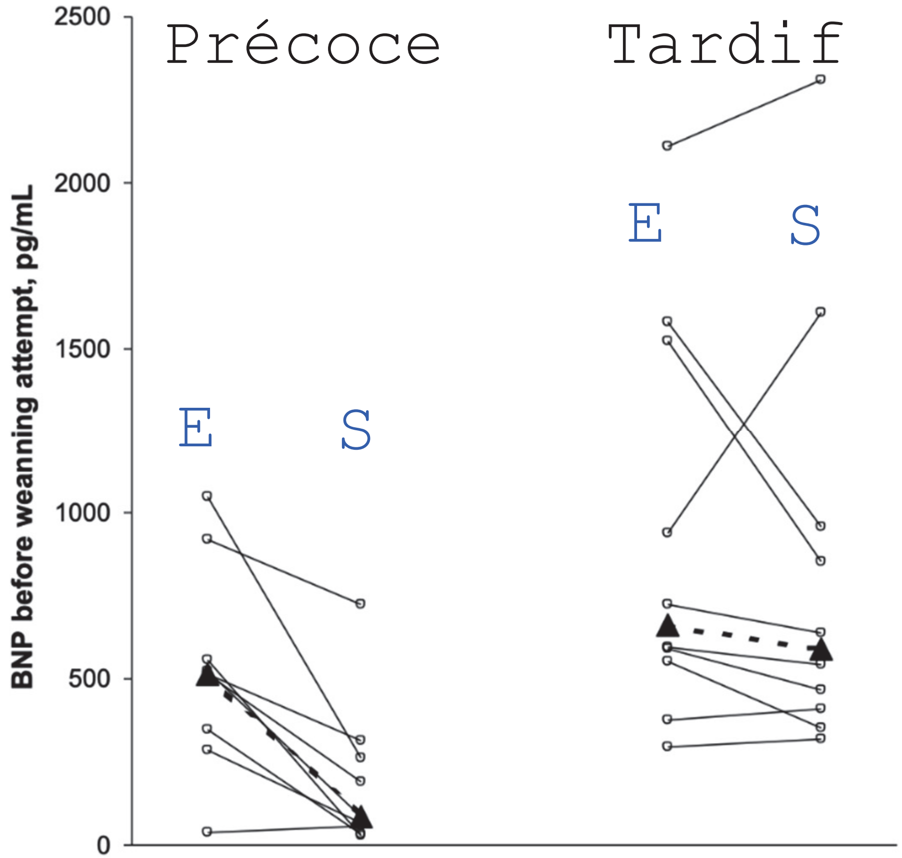
Belén Cabello
Arnaud W. Thille
Ferran Roche-Campo
Laurent Brochard
Francisco J. Gómez
Jordi Mancebo

Physiological comparison of three spontaneous breathing trials in difficult-to-wean patients



Fonction cardiaque





Succès vs échec

Mekontso-Dessap ICM 2006

Balance hydrique

Intensive Care Med (2005) 31:1643–1647
DOI 10.1007/s00134-005-2801-3

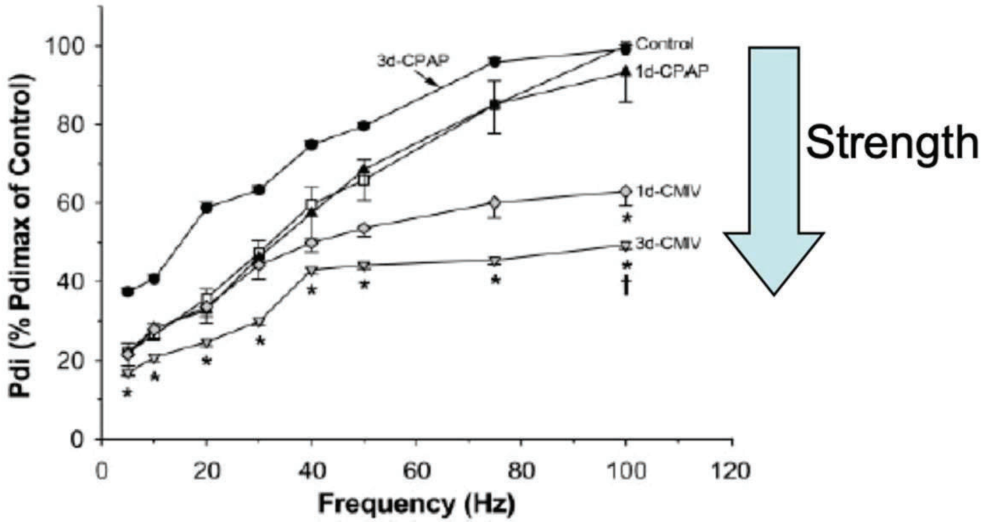
ORIGINAL

Anupama Upadya
Lisa Tilluckdharry
Visvanathan Muralidharan
Yaw Amoateng-Adjepong
Constantine A. Manthous

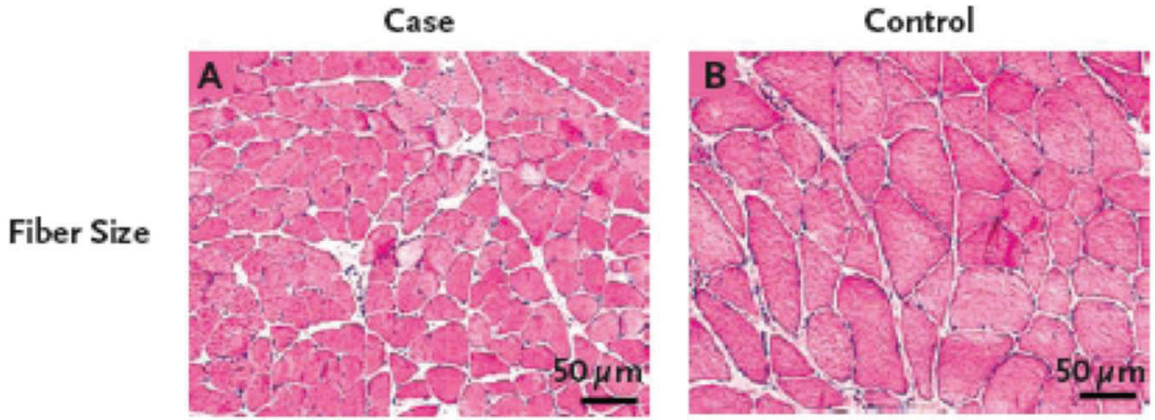
Fluid balance and weaning outcomes

	Weaning success (*n*=39)	Weaning failure (*n*=48)	All patients (*n*=87)	*p*
Duration of ventilation (days)	2 (1 to 8)	3 (1 to 14)	3 (1 to 14)	0.03
APACHE II (day of BT)	17 (3 to 30)	15 (3 to 25)	16 (3 to 30)	0.2
Fluid balance 24 h (ml)	−625 (−4,380 to +3,274)	+242 (−3,923 to +4,272)	−91 (−4,380 to +4,272)	0.01
Cumulative fluid balance (ml)	−633 (−8,232 to +9,534)	+920 (−1,1760 +2,0483)	−65 (−1,1760 to +2,0483)	0.06
Diuretics on day of trial	62%	51%	56%	0.2
Prealbumin (mg/dl)	14 (2 to 35)	12 (2 to 30)	13 (2 to 35)	0.8
f/V_t (breaths min^{-1} l^{-1})	50 (13 to 260)	80 (17 to 300)	67 (13 to 300)	0.005
PaO_2/FIO_2	240 (88 to 477)	244 (100 to 503)	240 (88 to 503)	0.9
Compliance (ml/cmH_2O)	44 (22 to 76)	39 (13 to 80)	43 (13 to 80)	0.2
Left ventricular dysfunction (%)	69	68	69	0.6

Faiblesse musculaire: Dysfonction diaphragmatique



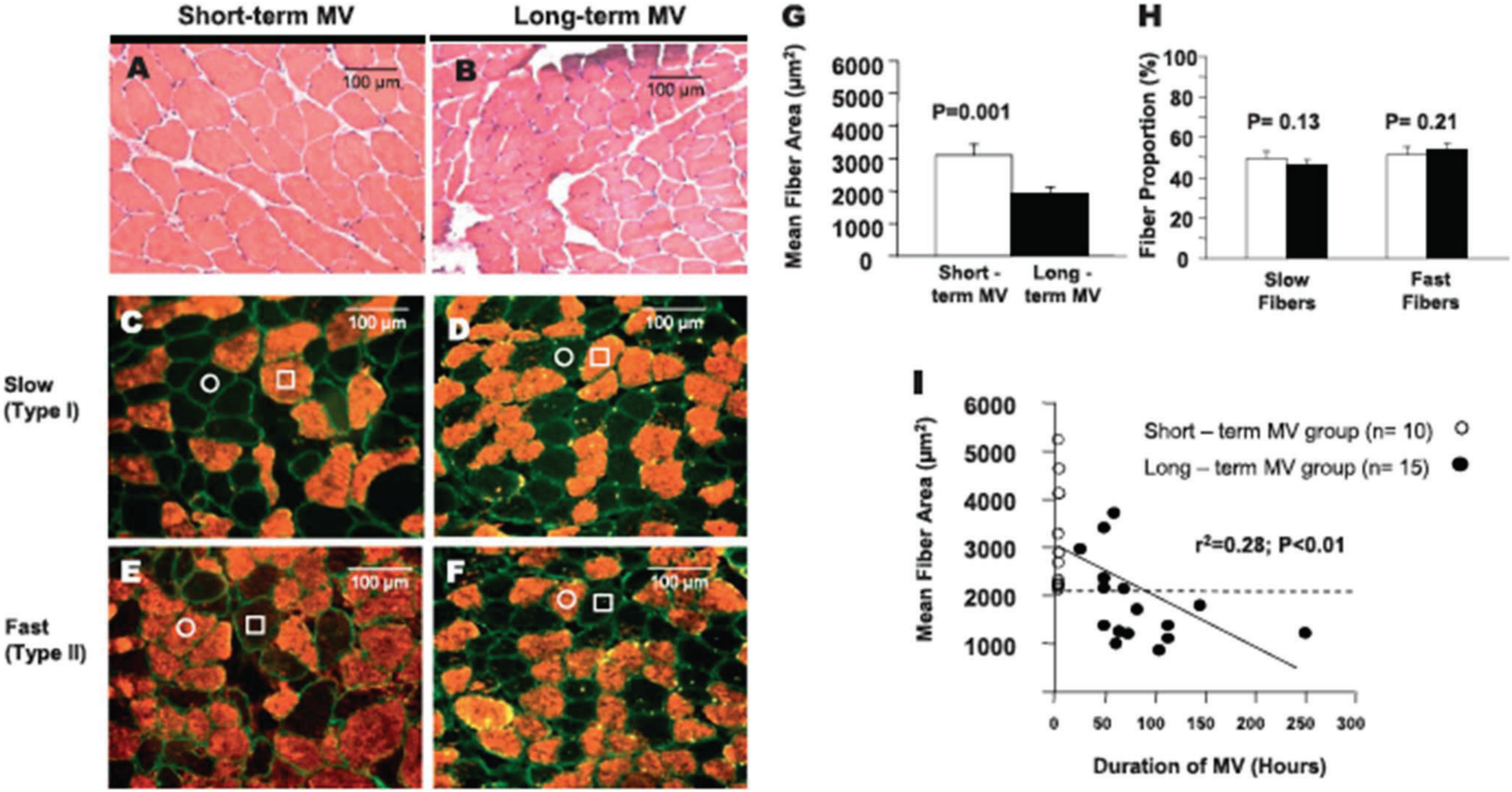
J Appl Physiol 92: 2585–2595, 2002.



N Engl J Med 2008;358:1327-35.

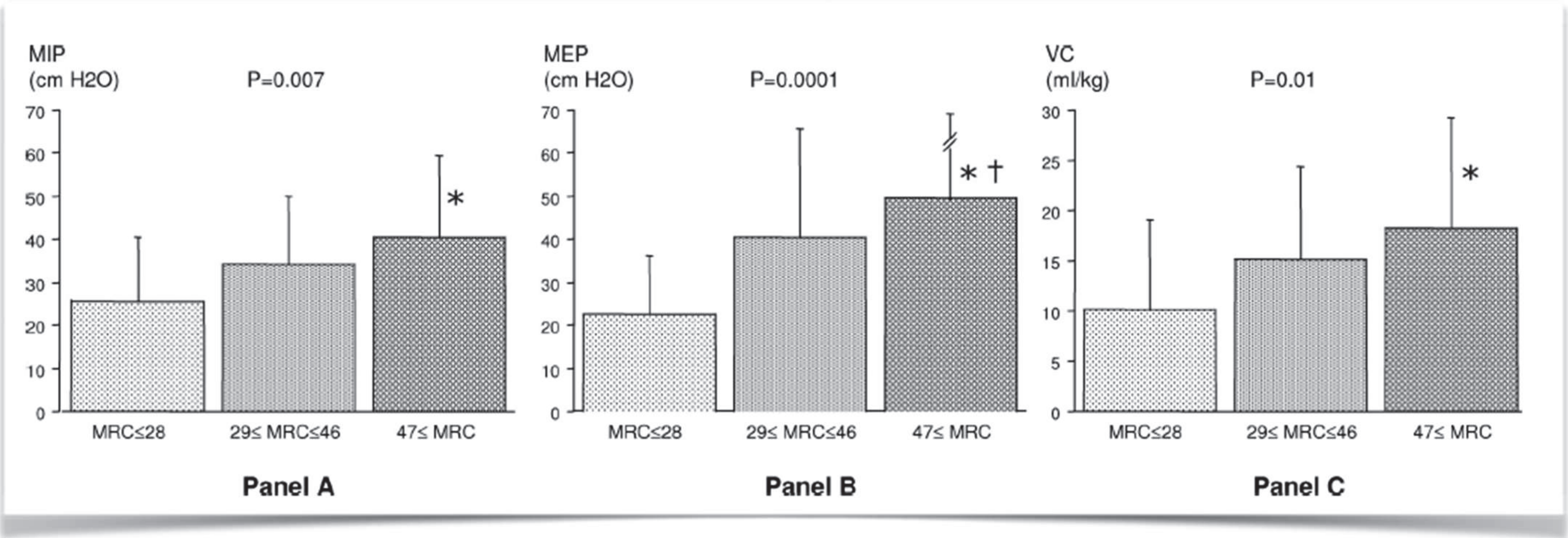
Rapidly Progressive Diaphragmatic Weakness and Injury during Mechanical Ventilation in Humans

Samir Jaber[1,2,6], Basil J. Petrof[3], Boris Jung[1,2], Gérald Chanques[1,2], Jean-Philippe Berthet[4], Christophe Rabuel[5], Hassan Bouyabrine[6], Patricia Courouble[1,2], Christelle Koechlin-Ramonatxo[7], Mustapha Sebbane[1,2], Thomas Similowski[8], Valérie Scheuermann[9], Alexandre Mebazaa[5], Xavier Capdevila[1,2], Dominique Mornet[2], Jacques Mercier[2,10], Alain Lacampagne[9], Alexandre Philips[2], and Stefan Matecki[2,10]



Respiratory weakness is associated with limb weakness and delayed weaning in critical illness*

Bernard De Jonghe, MD; Sylvie Bastuji-Garin, MD, PhD; Marie-Christine Durand, MD;
Isabelle Malissin, MD; Pablo Rodrigues, MD; Charles Cerf, MD; Hervé Outin, MD; Tarek Sharshar, MD, PhD;
for Groupe de Réflexion et d'Etude des Neuromyopathies En Réanimation



Crit Care Med 2007; 35:2007–2015

Table 6. Analysis of risk factors for low maximal inspiratory pressure (MIP) or maximal expiratory pressure (MEP)

Univariate Analysis	MIP or MEP ≤30 cm H_2O (n = 53)	MIP and MEP >30 cm H_2O (n = 26)	*p* Value
At ICU admission			
Age in years, median (IQR)	67 (53–78)	70 (54–76)	.9
Female sex, n (%)	22 (41.5)	7 (26.9)	.3
Admission SAPS II, median (IQR)	46 (36–58)	44 (38–50)	.4
COPD, n (%)	20 (37.7)	13 (50)	.3
Before awakening			
Days of MV, median (IQR)	10 (8–14)	10 (8–13)	.9
Days with ≥2 failed organs, median (IQR)	6 (4–10)	5 (0–9)	.2
Use of corticosteroids, n (%)	33 (62.3)	16 (61.5)	.9
Use of neuromuscular blockers, n (%)[a]	13 (24.5)	11 (42.3)	.1
Average daily morning BGL (mmol/L), median (IQR)	8.1 (7.0–9.3)	7.5 (6.8–8.6)	.1
Septic shock, n (%)	31 (58.5)	8 (30.8)	.02

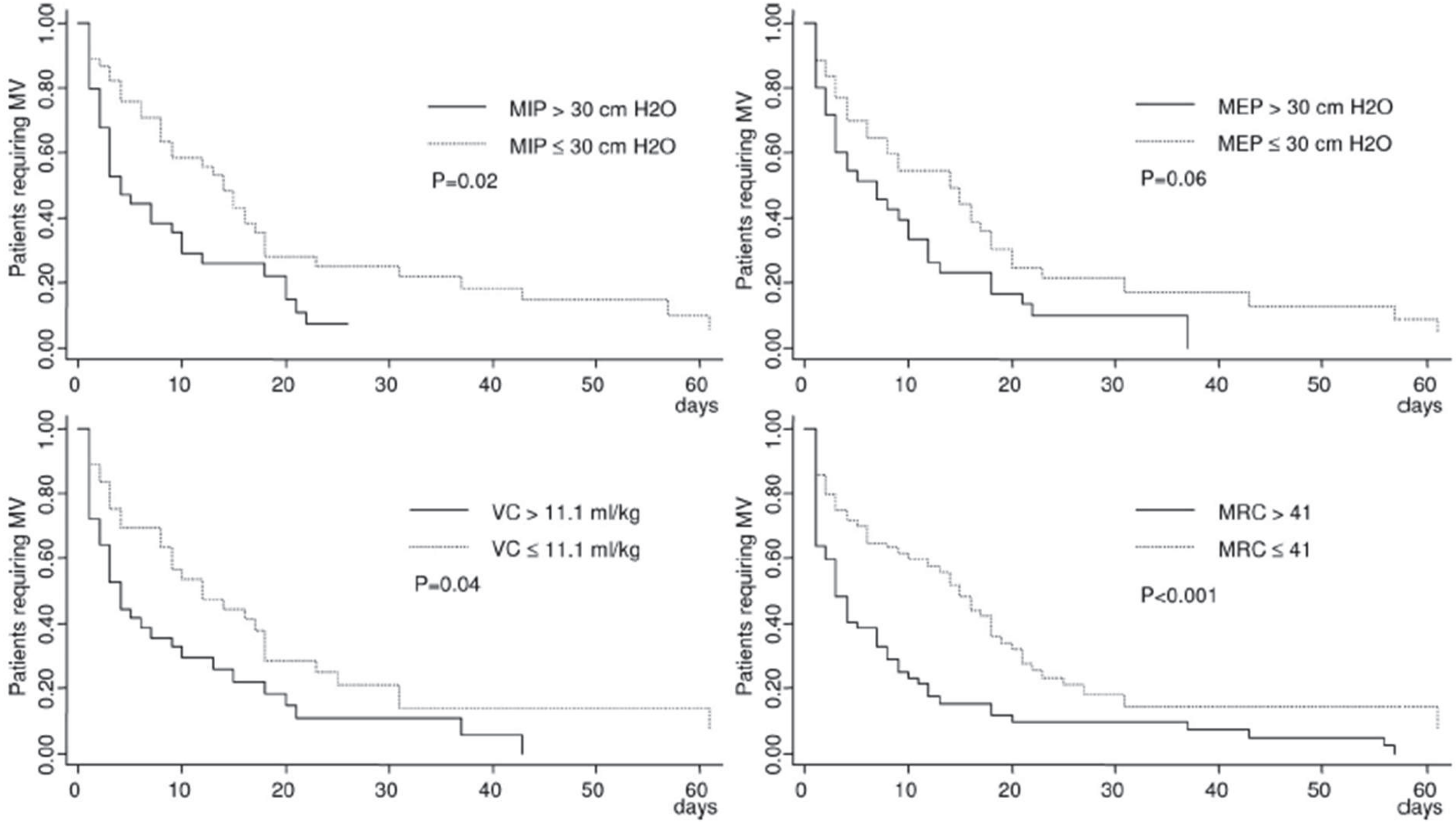
Multivariate Logistic Regression Analysis of Low MIP or MEP ≤30 cm H_2O	OR	95% CI	*p* Value
Septic shock	3.17	1.17–8.58	.02

Crit Care Med 2007; 35:2007–2015

Table 5. Independent determinants of the risk of successful extubation delayed for ≥7 days after awakening

Model with MIP				Model with MEP				Model with VC				Model with MRC			
	OR	95% CI	*p* Value		OR	95% CI	*p* Value		OR	95% CI	*p* Value		OR	95% CI	*p* Value
MIP ≤30 cm H_2O	8.02	2.12–30.36	.002	MEP ≤30 cm H_2O	4.15	1.16–14.82	.03	VC ≤11.1 mL/kg	2.75	0.82–9.18	.1	MRC ≤41	3.03	1.23–7.43	.02
COPD	4.43	1.20–16.41	.03	COPD	4.56	1.24–16.75	.02	COPD	4.43	1.3–14.79	.02	COPD	2.74	1.10–6.85	.03
Cardiac insufficiency	4.96	1.25–19.71	.02	Cardiac insufficiency	3.79	1.07–13.39	.04	Cardiac insufficiency	3.24	0.92–11.38	.07	Cardiac insufficiency	2.14	0.82–5.61	.1

Crit Care Med 2007; 35:2007–2015



Crit Care Med 2007; 35:2007–2015

Poddighe et al. Critical Care (2024) 28:70
https://doi.org/10.1186/s13054-024-04823-4

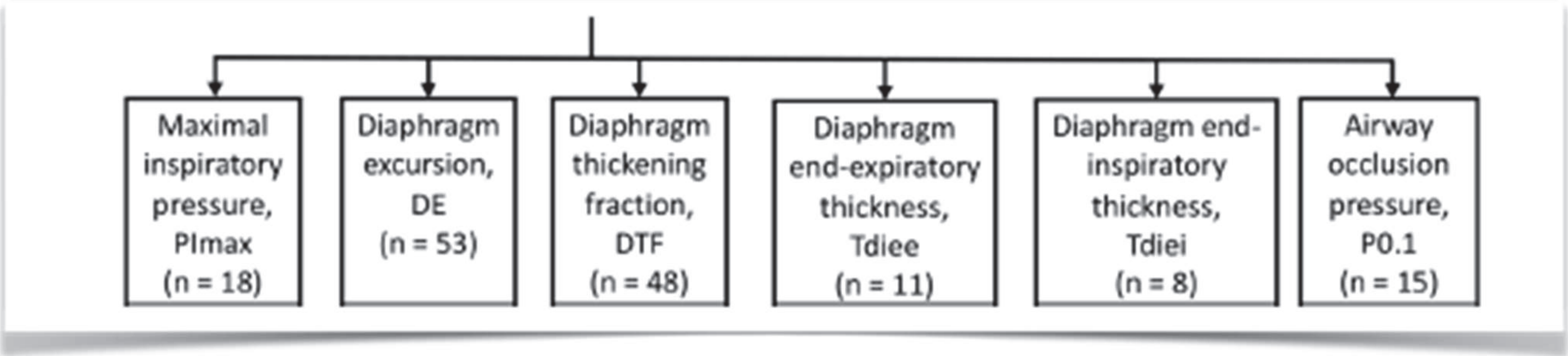
Critical Care

RESEARCH

Open Access

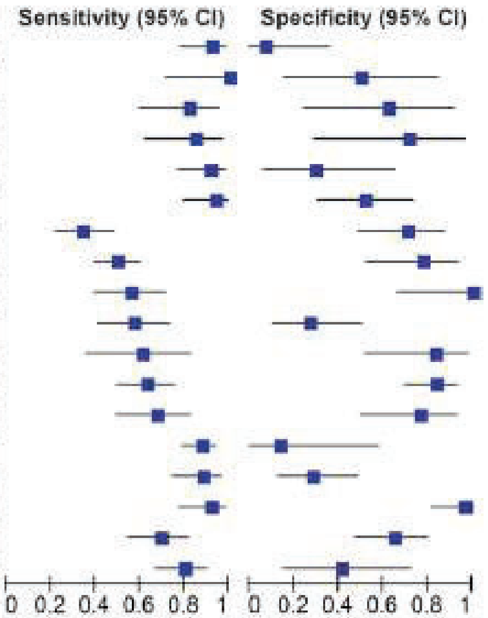
Accuracy of respiratory muscle assessments to predict weaning outcomes: a systematic review and comparative meta-analysis

Diego Poddighe[1,2†], Marine Van Hollebeke[1,2†], Yasir Qaiser Choudhary[1], Débora Ribeiro Campos[3], Michele R. Schaeffer[1], Jan Y. Verbakel[4,5], Greet Hermans[2,6], Rik Gosselink[1,2,7] and Daniel Langer[1,2*]



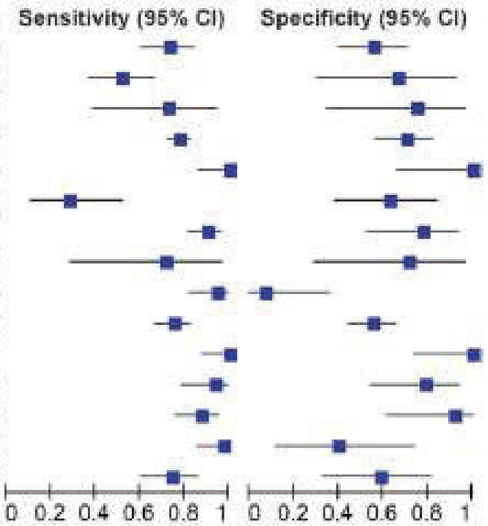
Maximal inspiratory pressure

Study	TP	FP	FN	TN	n	> cmH₂O Threshold	Condition	Risk of bias	Sensitivity (95% CI)	Specificity (95% CI)
Conti 2004	34	12	3	1	50	16.0	SBT	Low	0.92 [0.78, 0.98]	0.08 [0.00, 0.36]
Bruton 2002	11	4	0	4	19	17.5	NR	High	1.00 [0.72, 1.00]	0.50 [0.16, 0.84]
Saeed 2016	18	3	4	5	30	20.0	SBT	High	0.82 [0.60, 0.95]	0.63 [0.24, 0.91]
Flevari 2016	17	2	3	5	27	20.0	SBT	Low	0.85 [0.62, 0.97]	0.71 [0.29, 0.96]
Sassoon 1993	32	7	3	3	45	20.0	NR	Low	0.91 [0.77, 0.98]	0.30 [0.07, 0.65]
Jiang 2004	30	11	2	12	55	20.0	MV	High	0.94 [0.79, 0.99]	0.52 [0.31, 0.73]
De Jonghe 2007	19	7	36	17	79	30.0	MV	High	0.35 [0.22, 0.49]	0.71 [0.49, 0.87]
Medrinal 2016	53	4	53	14	124	30.0	MV	Low	0.50 [0.40, 0.60]	0.78 [0.52, 0.94]
Shamil 2022	23	0	18	9	50	30.0	SBT	High	0.56 [0.40, 0.72]	1.00 [0.66, 1.00]
Tenza-Lozano 2018	23	16	17	6	62	30.0	NR	Low	0.57 [0.41, 0.73]	0.27 [0.11, 0.50]
Carrie 2017	11	2	7	10	30	30.0	NR	Low	0.61 [0.36, 0.83]	0.83 [0.52, 0.98]
de Souza 2012	38	7	22	36	103	30.0	MV	Low	0.63 [0.50, 0.75]	0.84 [0.69, 0.93]
Spadaro 2016	23	4	11	13	51	30.0	SBT	High	0.68 [0.49, 0.83]	0.76 [0.50, 0.93]
O'Keefe 2001	77	6	11	1	95	30.0	MV	High	0.88 [0.79, 0.94]	0.14 [0.00, 0.58]
Vieira 2022	37	20	5	8	70	30.0	SBT	High	0.88 [0.74, 0.96]	0.29 [0.13, 0.49]
Zaytoun 2021	33	1	3	27	64	30.0	NR	High	0.92 [0.78, 0.98]	0.96 [0.82, 1.00]
Lim 2015	34	13	15	24	86	33.0	MV	High	0.69 [0.55, 0.82]	0.65 [0.47, 0.80]
Capdevila 1995	44	7	11	5	67	50.0	SBT	High	0.80 [0.67, 0.90]	0.42 [0.15, 0.72]



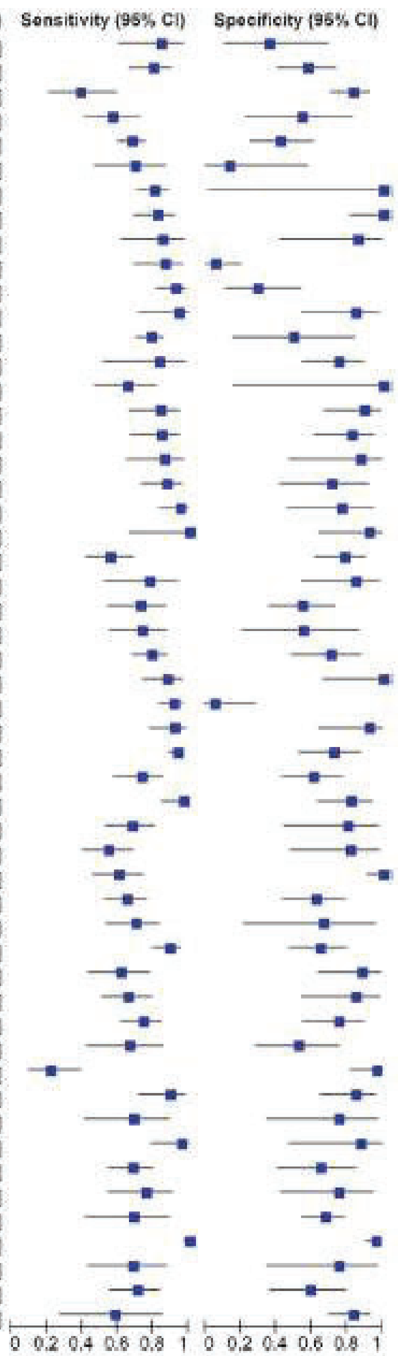
Airway occlusion pressure

Study	TP	FP	FN	TN	n	< cmH₂O Threshold	Condition	Risk of bias	Sensitivity (95% CI)	Specificity (95% CI)
de Souza 2012	44	19	16	24	103	2.3	MV	Low	0.73 [0.60, 0.84]	0.56 [0.40, 0.71]
Fernandez 2004	25	3	23	6	57	2.8	SBT	Low	0.52 [0.37, 0.67]	0.67 [0.30, 0.93]
Hurtado 2001	8	2	3	6	19	3.0	MV	Low	0.73 [0.39, 0.94]	0.75 [0.35, 0.97]
Azeredo 2017	215	16	62	38	331	3.1	MV	Low	0.78 [0.72, 0.82]	0.70 [0.56, 0.82]
Okamoto 1990	24	0	0	9	33	3.5	SBT	Low	1.00 [0.86, 1.00]	1.00 [0.66, 1.00]
Thabet 2020	6	7	15	12	40	3.6	SBT	Low	0.29 [0.11, 0.52]	0.63 [0.38, 0.84]
Liu 2010	66	4	7	14	91	3.7	SBT	Low	0.90 [0.81, 0.96]	0.78 [0.52, 0.94]
Montgomery 1987	5	2	2	5	14	3.8	SBT	High	0.71 [0.29, 0.96]	0.71 [0.29, 0.96]
Conti 2004	35	12	2	1	50	4.0	SBT	High	0.95 [0.82, 0.99]	0.08 [0.00, 0.36]
Vallverdu 1998	94	41	31	51	217	4.5	MV	Low	0.75 [0.67, 0.82]	0.55 [0.45, 0.66]
Rivera 1997	28	0	0	12	40	4.5	SBT	Low	1.00 [0.88, 1.00]	1.00 [0.74, 1.00]
Kaur 2022	29	4	2	15	50	4.7	SBT	High	0.94 [0.79, 0.99]	0.79 [0.54, 0.94]
Capdevila 1995	48	1	7	11	67	5.0	SBT	High	0.87 [0.76, 0.95]	0.92 [0.62, 1.00]
Sassoon 1993	34	6	1	4	45	5.5	NR	Low	0.97 [0.85, 1.00]	0.40 [0.12, 0.74]
Chittock 2000	38	7	13	10	68	7.5	SBT	Low	0.75 [0.60, 0.86]	0.59 [0.33, 0.82]



Diaphragm excursion

Study	TP	FP	FN	TN	n	> mm Threshold	Condition	Risk of bias	Sensitivity (95% CI)	Specificity (95% CI)
Elgazzar 2019	16	7	3	4	30	9.1	SBT	Low	0.84 [0.60, 0.97]	0.36 [0.11, 0.69]
Huang 2023	40	16	10	22	88	9.95	MV	High	0.80 [0.66, 0.90]	0.58 [0.41, 0.74]
Kim 2011	11	9	17	45	82	10.0	SBT	Low	0.39 [0.22, 0.59]	0.83 [0.71, 0.92]
Haji 2018	24	5	18	6	53	10.0	SBT	High	0.57 [0.41, 0.72]	0.55 [0.23, 0.83]
Vivier 2019	106	19	50	14	189	10.0	SBT	High	0.68 [0.60, 0.75]	0.42 [0.25, 0.61]
Baess 2016	16	6	7	1	30	10.0	SBT	Low	0.70 [0.47, 0.87]	0.14 [0.00, 0.58]
Varon-Vega 2021	67	0	16	1	84	10.0	SBT	Low	0.81 [0.71, 0.89]	1.00 [0.03, 1.00]
Osman 2017	42	0	9	18	69	10.0	SBT	Low	0.82 [0.69, 0.92]	1.00 [0.81, 1.00]
Flevari 2016	17	1	3	6	27	10.0	SBT	Low	0.85 [0.62, 0.97]	0.86 [0.42, 1.00]
Spadaro 2021	26	30	4	2	62	10.0	MV	Low	0.87 [0.69, 0.96]	0.06 [0.01, 0.21]
Palkar 2018	49	14	4	6	73	10.0	SBT	Low	0.92 [0.82, 0.98]	0.30 [0.12, 0.54]
Eltrabili 2019	16	2	1	11	30	10.0	SBT	Low	0.94 [0.71, 1.00]	0.85 [0.55, 0.98]
Eksombatchai 2023	96	4	26	4	130	10.5	NR	High	0.79 [0.70, 0.86]	0.50 [0.16, 0.84]
Huang 2017	10	7	2	21	40	10.7	SBT	Low	0.83 [0.52, 0.98]	0.75 [0.55, 0.89]
Mariani 2016	21	0	11	2	34	11.0	SBT	Low	0.66 [0.47, 0.81]	1.00 [0.16, 1.00]
Kaur 2022	26	2	5	17	50	11.0	SBT	High	0.84 [0.66, 0.95]	0.89 [0.67, 0.99]
Jiang 2004	27	4	5	19	55	11.0	SBT	High	0.84 [0.67, 0.95]	0.83 [0.61, 0.95]
Saeed 2016	19	1	3	7	30	11.0	SBT	High	0.86 [0.65, 0.97]	0.88 [0.47, 1.00]
Farghaly 2017	35	4	5	10	54	11.0	SBT	High	0.88 [0.73, 0.96]	0.71 [0.42, 0.92]
Banerjee 2018	38	3	2	10	53	11.0	SBT	Low	0.95 [0.83, 0.99]	0.77 [0.46, 0.95]
Helmy 2021	9	1	0	12	22	[illegible]	[illegible]	[illegible]	[illegible]0.66, 1.00]	0.92 [0.64, 1.00]
Xu 2022	33	8	26	29	96	[illegible]	[illegible]	[illegible]	[illegible].42, 0.69]	0.78 [0.62, 0.90]
Alam 2022	14	2	4	11	31	[illegible]	[illegible]	[illegible]	[illegible].52, 0.94]	0.85 [0.55, 0.98]
Samanta 2017	24	14	9	17	64	[illegible]	[illegible]	[illegible]	[illegible]0.54, 0.87]	0.55 [0.36, 0.73]
Hiroli 2023	25	4	9	5	43	12.0	SBT	High	0.74 [0.56, 0.87]	0.56 [0.21, 0.86]
Hayat 2017	60	7	16	17	100	12.0	SBT	High	0.79 [0.68, 0.87]	0.71 [0.49, 0.87]
Shamil 2022	36	0	5	9	53	12.0	SBT	High	0.88 [0.74, 0.96]	1.00 [0.66, 1.00]
Fossat 2022	76	16	7	1	100	12.0	SBT	High	0.92 [0.83, 0.97]	0.06 [0.00, 0.29]
Abbas 2018	34	1	3	12	50	12.0	SBT	Low	0.92 [0.78, 0.98]	0.92 [0.64, 1.00]
Saravan 2022	160	8	11	21	200	12.1	SBT	High	0.94 [0.89, 0.97]	0.72 [0.53, 0.87]
Vieira 2022	33	14	12	22	81	12.5	SBT	High	0.73 [0.58, 0.85]	0.61 [0.43, 0.77]
Elshazly 2020	33	5	1	23	62	12.5	SBT	Low	0.97 [0.85, 1.00]	0.82 [0.63, 0.94]
Luo 2017	34	2	16	8	60	12.6	SBT	High	0.68 [0.53, 0.80]	0.80 [0.44, 0.97]
Theerawit 2018	28	2	23	9	62	12.8	SBT	Low	0.55 [0.40, 0.69]	0.82 [0.48, 0.98]
Mawla 2022	31	0	20	39	90	13.0	SBT	Low	0.61 [0.46, 0.74]	1.00 [0.91, 1.00]
Li 2021	45	12	24	20	101	13.0	SBT	Low	0.65 [0.53, 0.76]	0.63 [0.44, 0.79]
Gok 2021	28	2	12	4	46	13.1	SBT	High	0.70 [0.53, 0.83]	0.67 [0.22, 0.96]
Song 2022	65	13	8	24	110	13.5	SBT	High	0.89 [0.80, 0.95]	0.65 [0.47, 0.80]
Spadaro 2016	21	2	13	15	51	14.0	SBT	High	0.62 [0.44, 0.78]	0.88 [0.64, 0.99]
Yoo 2018	31	2	16	11	60	14.0	SBT	High	0.66 [0.51, 0.79]	0.85 [0.55, 0.98]
Khan 2018	46	7	16	21	90	14.0	SBT	High	0.74 [0.62, 0.84]	0.75 [0.55, 0.89]
Thabet 2020	14	9	7	10	40	14.1	SBT	Low	0.67 [0.43, 0.85]	0.53 [0.29, 0.76]
Zaytoun 2021	8	1	28	27	64	15.0	SBT	High	0.22 [0.10, 0.39]	0.96 [0.82, 1.00]
Ali 2017	25	4	3	22	54	15.0	MV	High	0.89 [0.72, 0.98]	0.85 [0.65, 0.96]
Al Tayar 2022	11	2	5	6	24	16.0	SBT	High	0.69 [0.41, 0.89]	0.75 [0.35, 0.97]
Saeed 2019	23	1	1	7	32	16.0	MV	Low	0.96 [0.79, 1.00]	0.88 [0.47, 1.00]
Mohamed 2021	41	7	19	13	80	17.0	SBT	High	0.68 [0.55, 0.80]	0.65 [0.41, 0.85]
Zhang 2020	19	3	6	9	37	17.2	SBT	High	0.76 [0.55, 0.91]	0.75 [0.43, 0.95]
Amara 2022	11	21	5	44	81	17.9	NR	Low	0.69 [0.41, 0.89]	0.68 [0.55, 0.79]
Abdelhafeez 2019	117	5	0	118	240	18.4	SBT	High	1.00 [0.97, 1.00]	0.96 [0.91, 0.99]
Er 2021	13	2	6	6	27	22.1	SBT	High	0.68 [0.43, 0.87]	0.75 [0.35, 0.97]
Carrie 2017	32	9	13	13	67	27.0	SBT	Low	0.71 [0.56, 0.84]	0.59 [0.36, 0.79]
Saad 2022	7	8	5	40	60	61.0	SBT	Low	0.58 [0.28, 0.85]	0.83 [0.70, 0.93]



DTF n°1

Faiblesse musculaire

Review

J Appl Physiol 107: 962–970, 2009.
First published April 30, 2009; doi:10.1152/japplphysiol.00165.2009.

HIGHLIGHTED TOPIC | *The Respiratory Muscles in Chronic Obstructive Pulmonary Disease*

Role of the respiratory muscles in acute respiratory failure of COPD: lessons from weaning failure

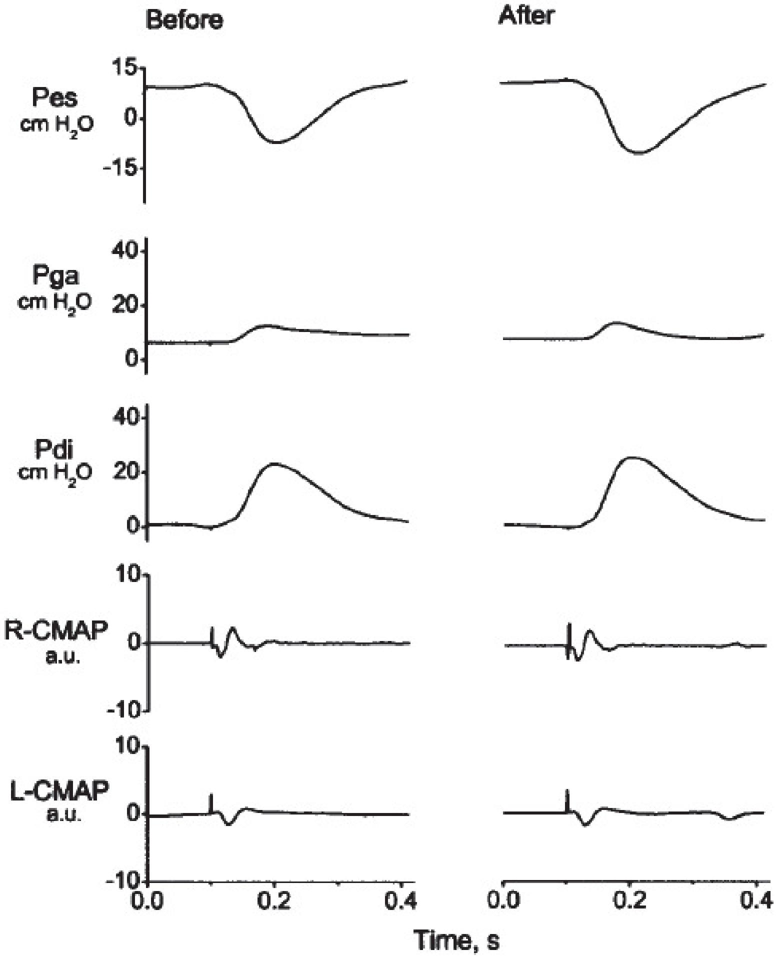
Martin J. Tobin,[1] Franco Laghi,[1] and Laurent Brochard[2]

Is Weaning Failure Caused by Low-Frequency Fatigue of the Diaphragm?

Voir de la fatigue ?

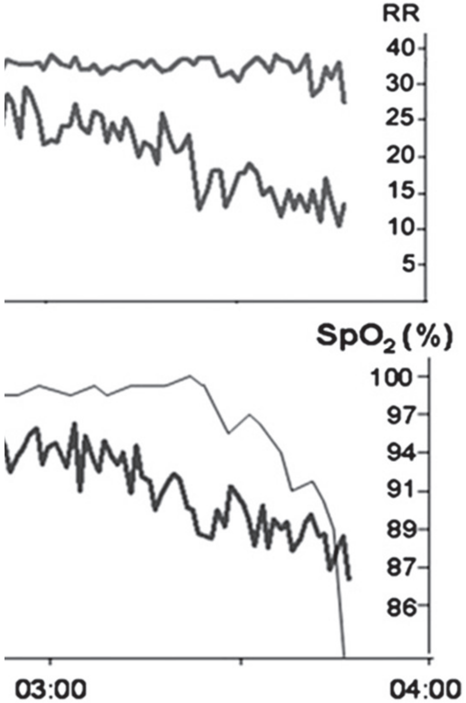
Franco Laghi, Steven E. Cattapan, Amal Jubran, Sairam Parthasarathy, Paul Warshawsky, Yoon-Sub A. Choi, and Martin J. Tobin

Am J Respir Crit Care Med Vol 167. pp 120–127, 2003



ıgm Fatigue under
Assist

hard M.D., , Alain Mercat M.D., , and

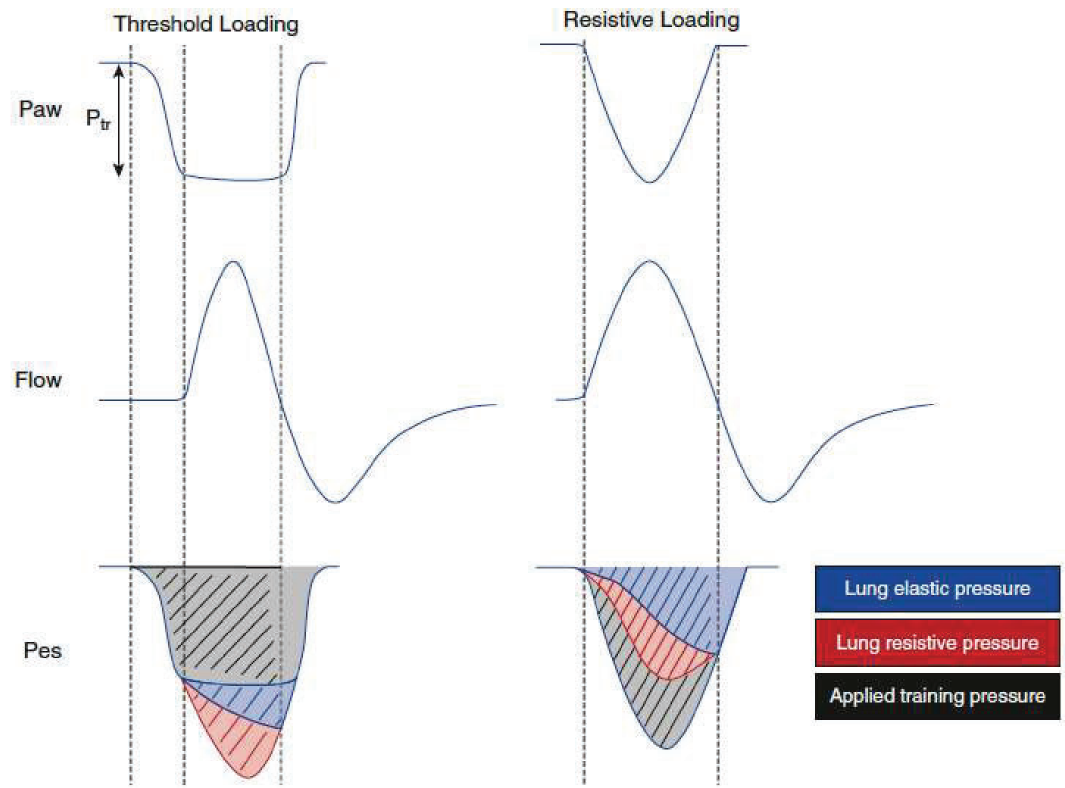


ORIGINAL RESEARCH

Inspiratory Muscle Rehabilitation in Critically Ill Adults

A Systematic Review and Meta-Analysis

Stefannie Vorona[1], Umberto Sabatini[1], Sulaiman Al-Maqbali[1], Michele Bertoni[1], Martin Dres[2,3], Bernie Bissett[4,5], Frank Van Haren[5,6,7], A. Daniel Martin[8], Cristian Urrea[1], Debbie Brace[1], Matteo Parotto[9,10,11], Margaret S. Herridge[1,9,12], Neill K. J. Adhikari[9,13,14], Eddy Fan[1,9,12,15], Luana T. Melo[16], W. Darlene Reid[9,16], Laurent J. Brochard[2,9,12], Niall D. Ferguson[1,9,12,14,15], and Ewan C. Goligher[1,9,15]

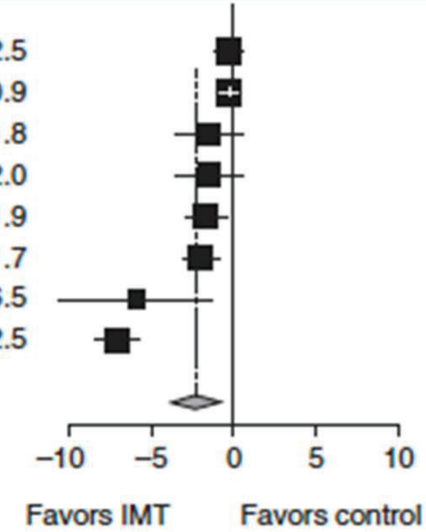


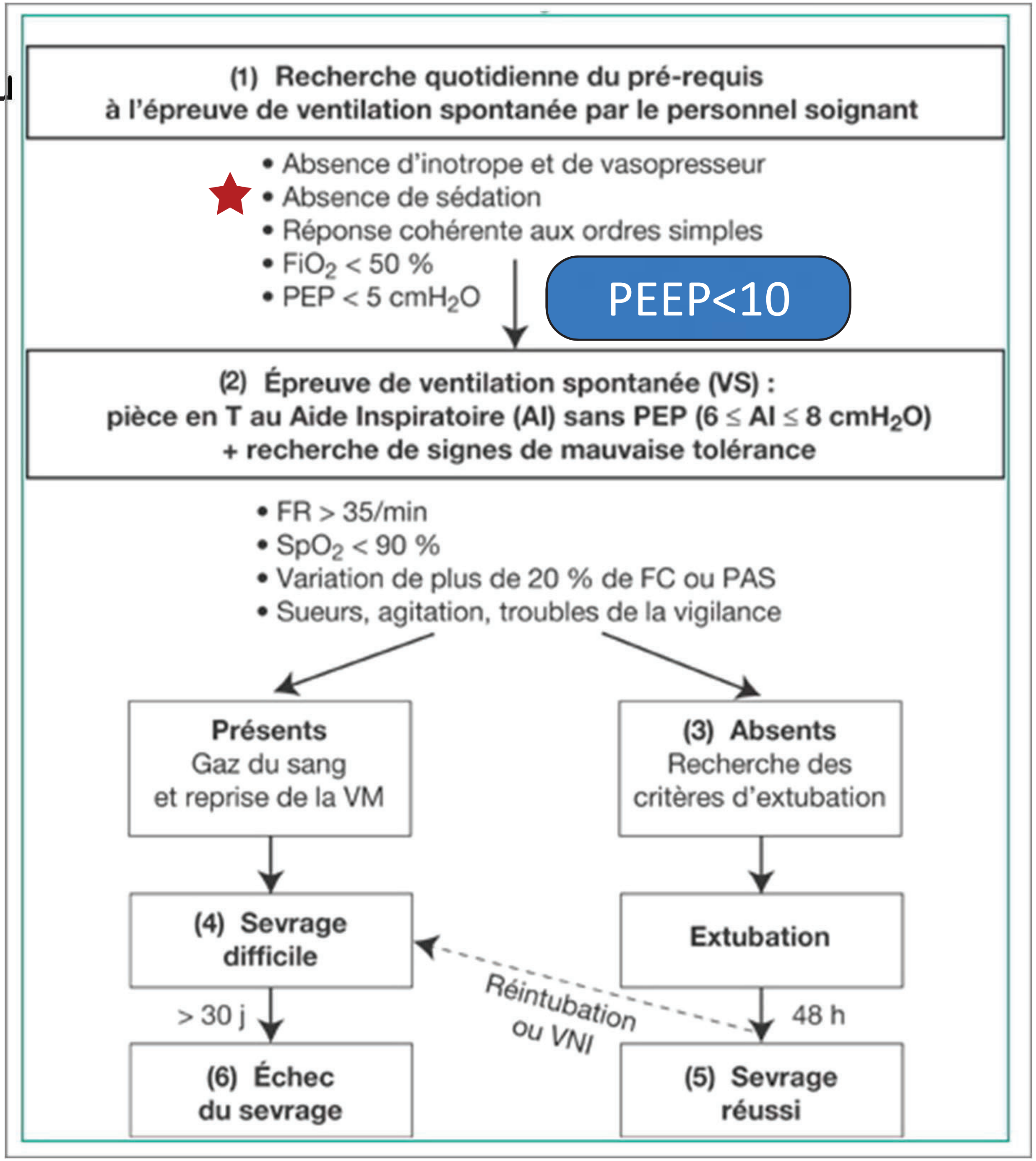
Outcome	Impact Effect (95% CI)	No. of Participants (RCTs)	Quality of the Evidence (GRADE)
Change in maximal inspiratory pressure from baseline after IMT	Mean difference in change 6 (5 to 8) cm H_2O higher in IMT group than in control group Pooled ratio of means for change in MIP relative to baseline MIP, 1.21 (1.16 to 1.26)	647 (15 RCTs)	⊕○○○ Very low*,†,‡
Change in maximal inspiratory pressure from baseline after IMT (sensitivity analysis excluding studies at high risk of bias)	Mean difference 9 (7 to 12) cm H_2O higher in IMT group than in control group	175 (3 RCTs)	⊕⊕⊕⊕ High
Maximal inspiratory pressure after IMT	Mean difference 7 (6 to 8) cm H_2O higher in IMT group than in control group	575 (15 RCTs)	⊕⊕○○ Low*,‡
Change in maximal expiratory pressure from baseline after IMT	Mean difference in change 9 (5 to 14) cm H_2O higher in IMT group than in control group Pooled ratio of means for change in MEP relative to baseline MEP, 1.39 (1.27 to 1.54)	153 (4 RCTs)	⊕⊕⊕○ Moderate*
Change in maximal expiratory pressure from baseline after IMT (sensitivity analysis excluding studies at high risk of bias)	Mean difference in change 9 (5 to 14) cm H_2O higher in IMT group than in control group	106 (2 RCTs)	⊕⊕⊕⊕ High
Duration of ventilation	Pooled duration of ventilation was 4.1 (0.8 to 7.4) d shorter in IMT group than in control group	325 (9 RCTs)	⊕○○○ Very low*,†,‡,§
Duration of ventilation (sensitivity analysis excluding studies at high risk of bias)	Pooled duration of ventilation was 4.6 (−1.0 to 10.1) d shorter in IMT group than in control group	220 (4 RCTs)	⊕⊕○○ Low†,§
Duration of weaning from mechanical ventilation	Pooled duration of weaning from mechanical ventilation was 2.3 (0.7 to 3.9) d shorter in IMT group than in control group	257 (8 RCTs)	⊕○○○ Very low*,†,§
Duration of weaning (sensitivity analysis excluding studies at high risk of bias)	Pooled duration of weaning from mechanical ventilation was 3.2 (0.6 to 5.8) d shorter in IMT group than in control group	209 (5 RCTs)	⊕⊕○○ Low†,§
ICU length of stay	Length of stay in ICU was 3.1 (−1.0 to 7.1) d shorter in IMT group than in control group	28 (2 RCTs)	⊕○○○ Very low*,‡,§
Mortality in ICU	Pooled relative risk of death in ICU was 0.67 (0.20 to 2.20) in IMT group compared with control group	197 (3 RCTs)	⊕⊕○○ Low‡,§

The impact of inspiratory muscle training (IMT) on the duration of weaning from mechanical ventilation

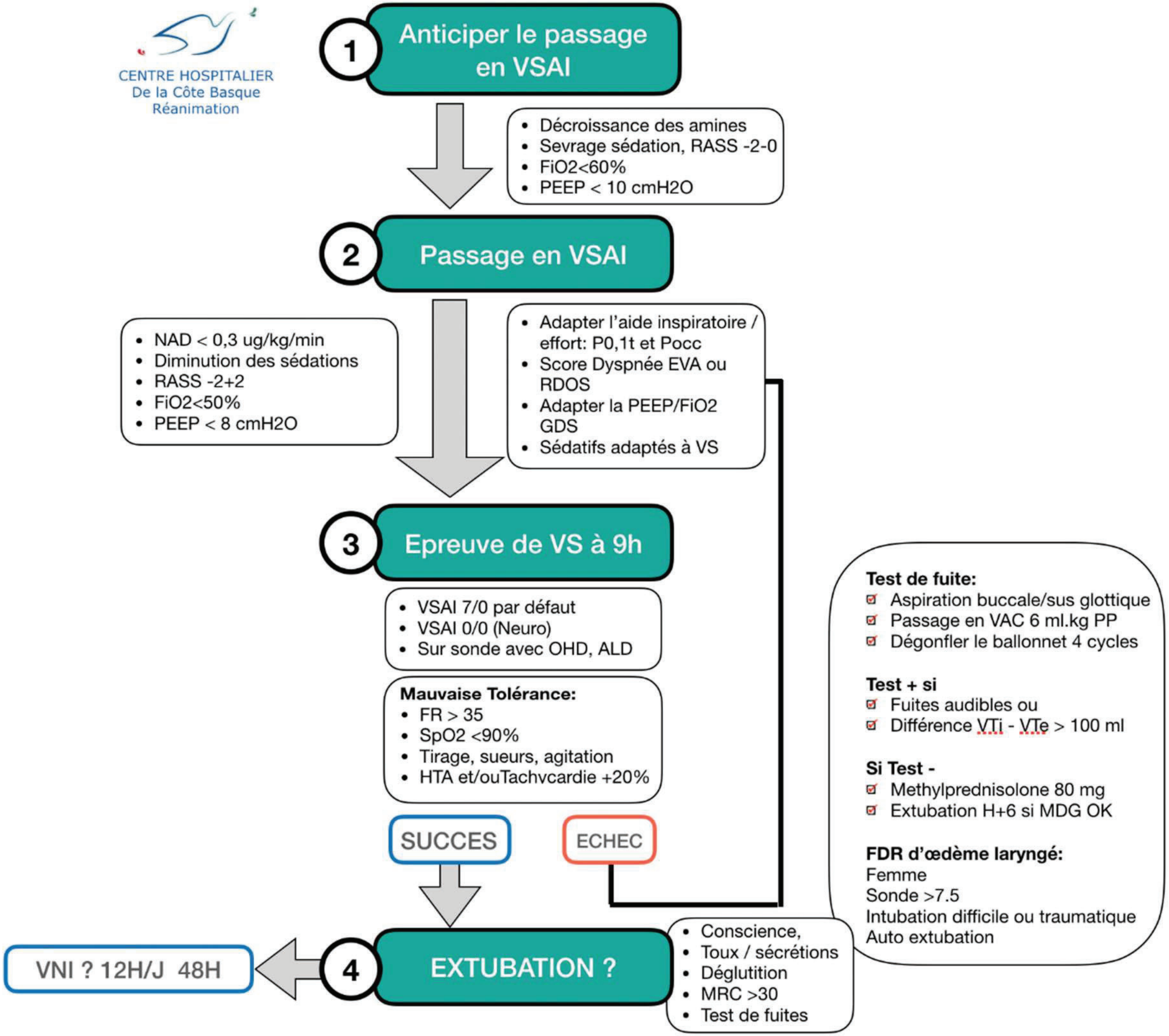
Study	Experimental Total	Experimental Mean	Experimental SD	Control Total	Control Mean	Control SD	MD	95% CI	Weight
Condessa 2013	45	2.2	1.8	47	2.5	2.5	−0.30	[−1.19; 0.59]	14.1%
Caruso 2005	12	1.0	0.5	13	1.3	0.9	−0.30	[−0.87; 0.27]	14.4%
Melo 2017	6	4.9	1.2	4	6.4	1.8	−1.50	[−3.51; 0.51]	12.0%
Shimizu 2014	8	3.4	1.3	5	4.9	2.0	−1.50	[−3.47; 0.47]	12.1%
Cader 2010	14	3.6	1.5	14	5.3	1.9	−1.70	[−2.97; −0.43]	13.5%
Dixit 2014	15	4.3	1.5	15	6.3	1.7	−2.00	[−3.15; −0.85]	13.7%
Tonella 2017	11	3.5	1.6	8	9.4	6.5	−5.90	[−10.50; −1.30]	6.8%
Mohamed 2014	20	3.3	1.6	20	10.4	2.5	−7.10	[−8.40; −5.80]	13.4%
Random effects model	**131**			**126**			**−2.30**	**[−3.94; −0.67]**	**100.0%**

Heterogeneity: $I^2 = 93\%$, $\tau^2 = 4.724$, $p < 0.01$




(1) Recherche quotidienne du pré-requis
à l'épreuve de ventilation spontanée par le personnel soignant
• Absence d'inotrope et de vasopresseur
• Absence de sédation
• Réponse cohérente aux ordres simples
• FiO2 < 50 %
• PEP < 5 cmH2O
PEEP<10
(2) Épreuve de ventilation spontanée (VS) :
pièce en T au Aide Inspiratoire (AI) sans PEP (6 ≤ AI ≤ 8 cmH2O)
+ recherche de signes de mauvaise tolérance
• FR > 35/min
• SpO2 < 90 %
• Variation de plus de 20 % de FC ou PAS
• Sueurs, agitation, troubles de la vigilance
Présents
Gaz du sang
et reprise de la VM
(3) Absents
Recherche des
critères d'extubation
(4) Sevrage
difficile
Extubation
> 30 j
Réintubation
ou VNI
48 h
(6) Échec
du sevrage
(5) Sevrage
réussi

CENTRE HOSPITALIER
De la Côte Basque
Réanimation

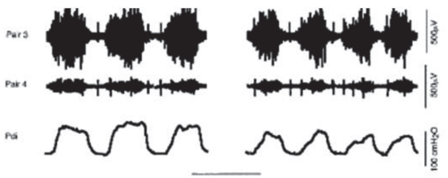


LA VENTILATION ASSISTEE LORS DU SEVRAGE

- Niveau d'aide
- Synchronisation

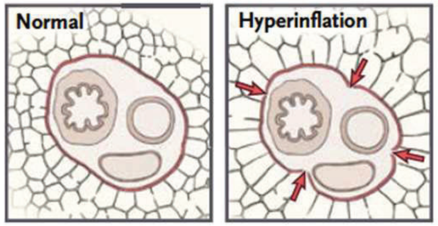
Problématiques du mode lors du sevrage

- Synchroniser le patient au respirateur/limiter les asynchronies
- Adapter l'aide inspiratoire aux besoins du patient
  - VSAI: aide fixe à adapter manuellement
  - Intelligence artificielle en VSAI: Smartcare
  - Neurally Adjusted Ventilatory Assist: NAVA
  - Proportionnal Assist Ventilation: PAV+



JAP 2001;90:1691-1699

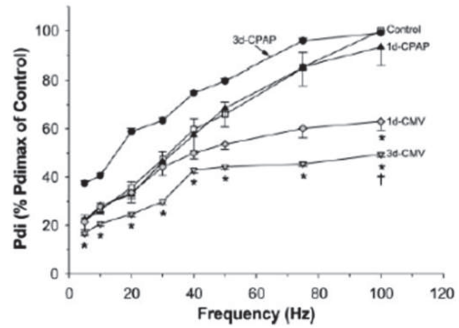
Ventilation à haut volume



Rupture de paroi fuite aérique

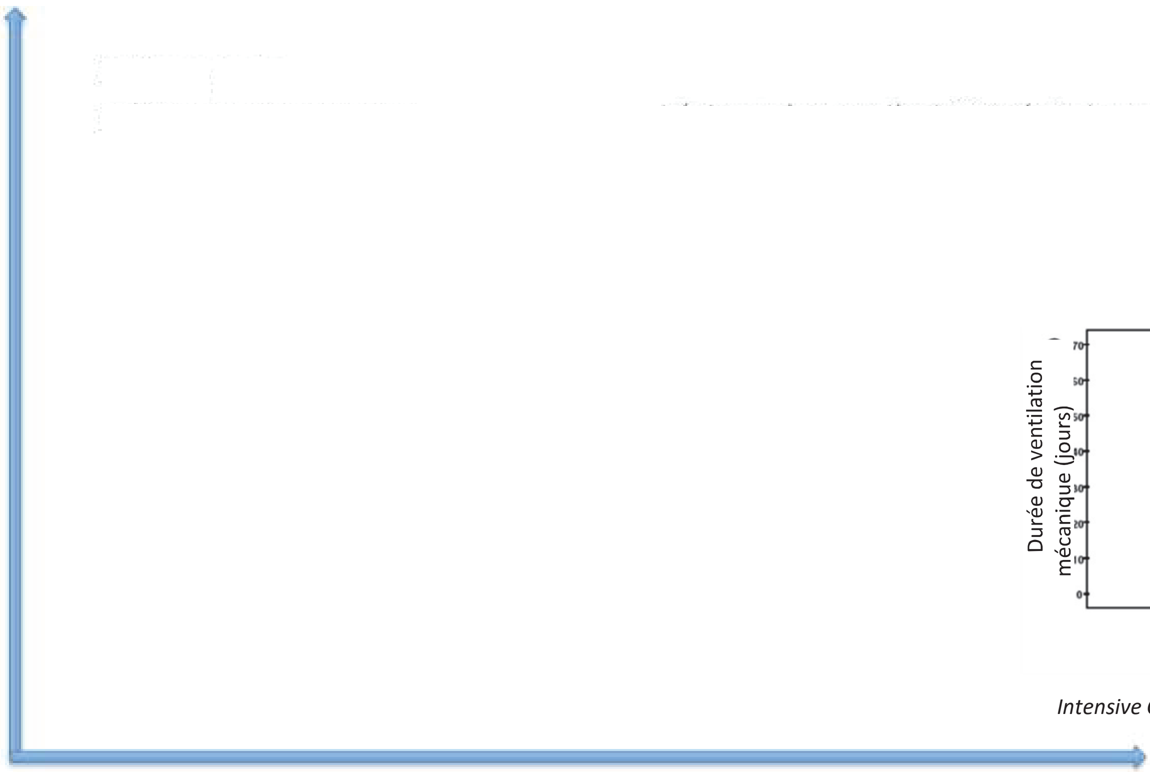
Surdistension

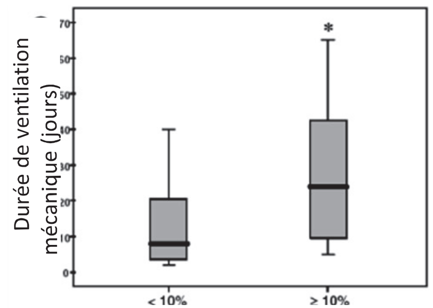
N Engl J Med 2013;369:2126-36



JAP 2002;92:2585-2595

Dysfonctions





Index d'asynchronies

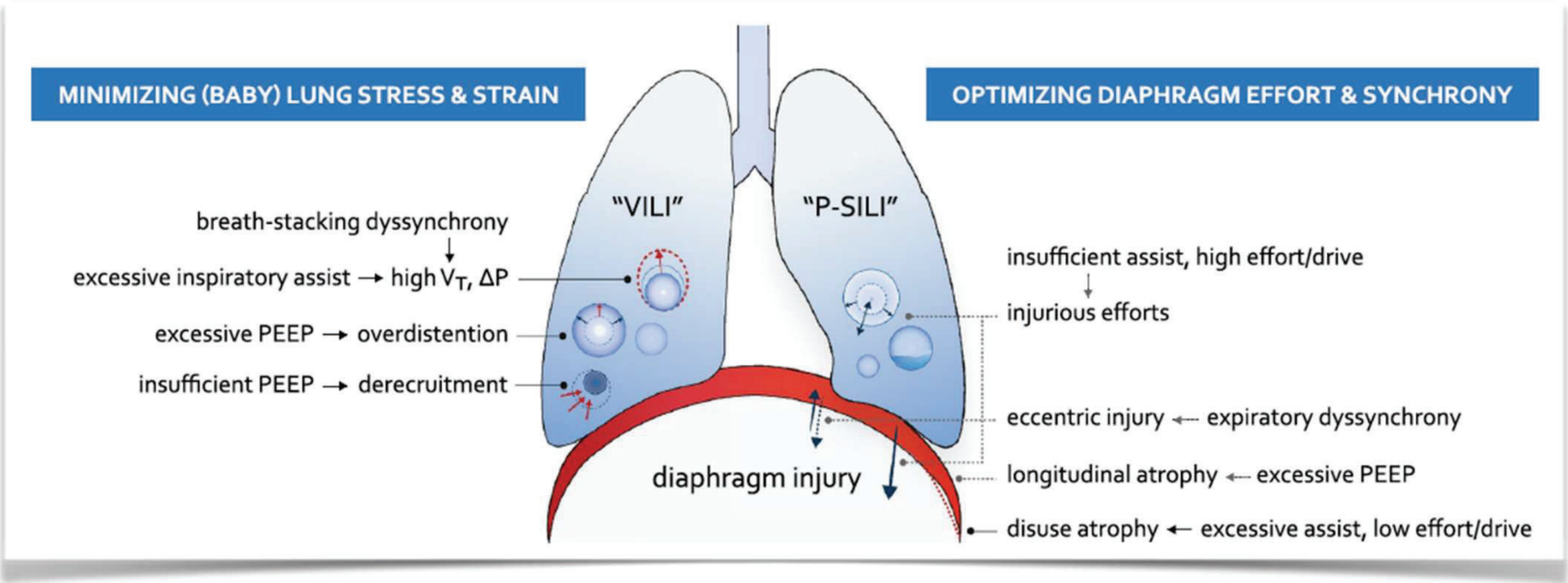
Intensive Care Med 2006;32:1515-1522

Niveau d'assistance

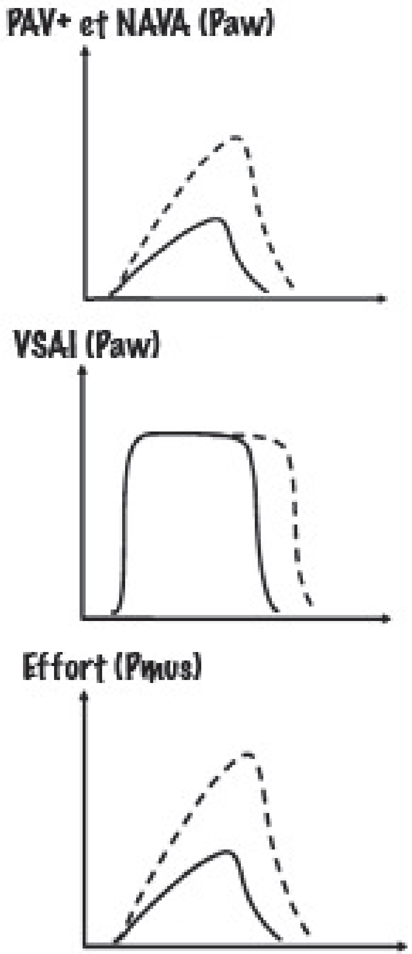
Intensive Care Med (2020) 46:2314–2326
https://doi.org/10.1007/s00134-020-06288-9

NARRATIVE REVIEW

Clinical strategies for implementing lung and diaphragm-protective ventilation: avoiding insufficient and excessive effort



Pmus + Pvent = Volume x E + Débit x R

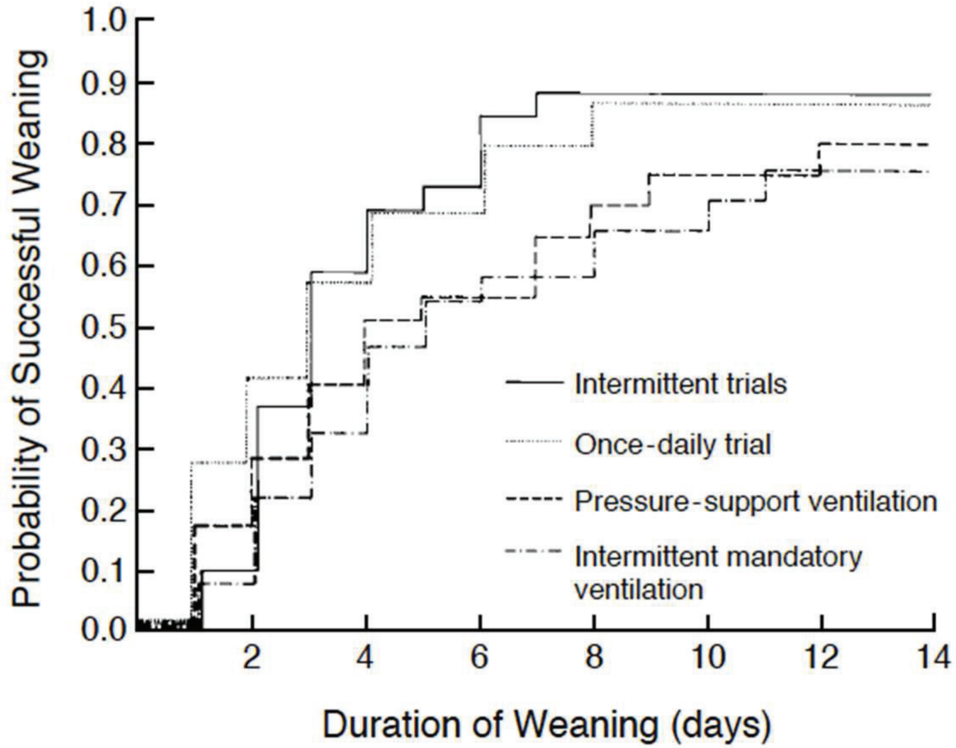


The New England
Journal of Medicine

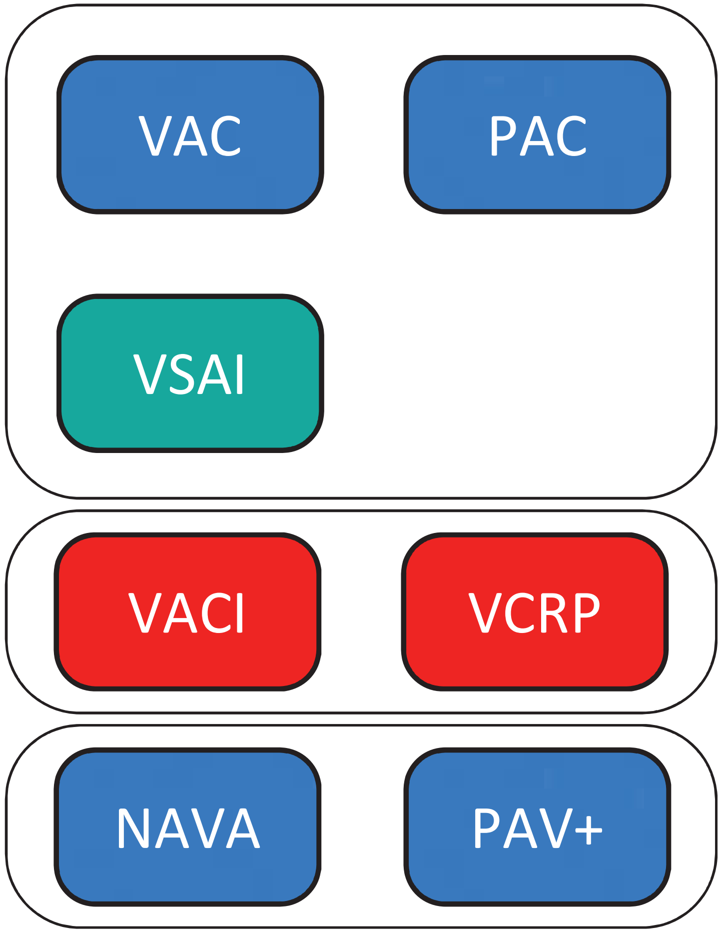
Volume 332 FEBRUARY 9, 1995 Number 6

A COMPARISON OF FOUR METHODS OF WEANING PATIENTS FROM MECHANICAL VENTILATION

ANDRÉS ESTEBAN, M.D., PH.D., FERNANDO FRUTOS, M.D., MARTIN J. TOBIN, M.D., INMACULADA ALÍA, M.D.,
JOSÉ F. SOLSONA, M.D., INMACULADA VALVERDÚ, M.D., RAFAEL FERNÁNDEZ, M.D.,
MIGUEL A. DE LA CAL, M.D., SALVADOR BENITO, M.D., PH.D., ROSER TOMÁS, M.D.,
DEMETRIO CARRIEDO, M.D., SANTIAGO MACÍAS, M.D., AND JESÚS BLANCO, M.D.,
FOR THE SPANISH LUNG FAILURE COLLABORATIVE GROUP*

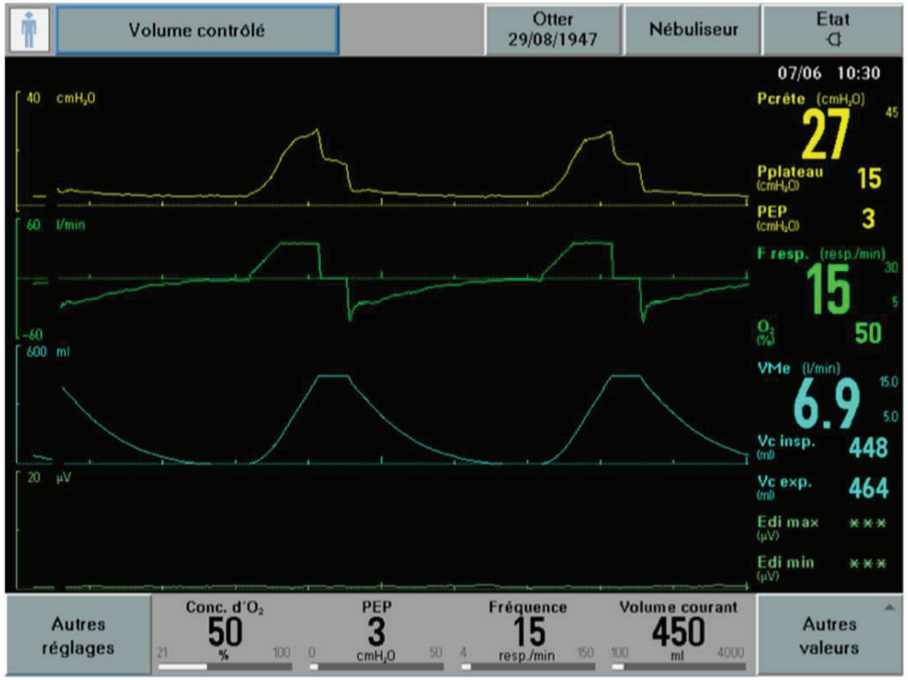


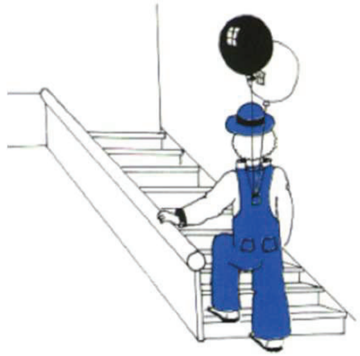
VS et modes



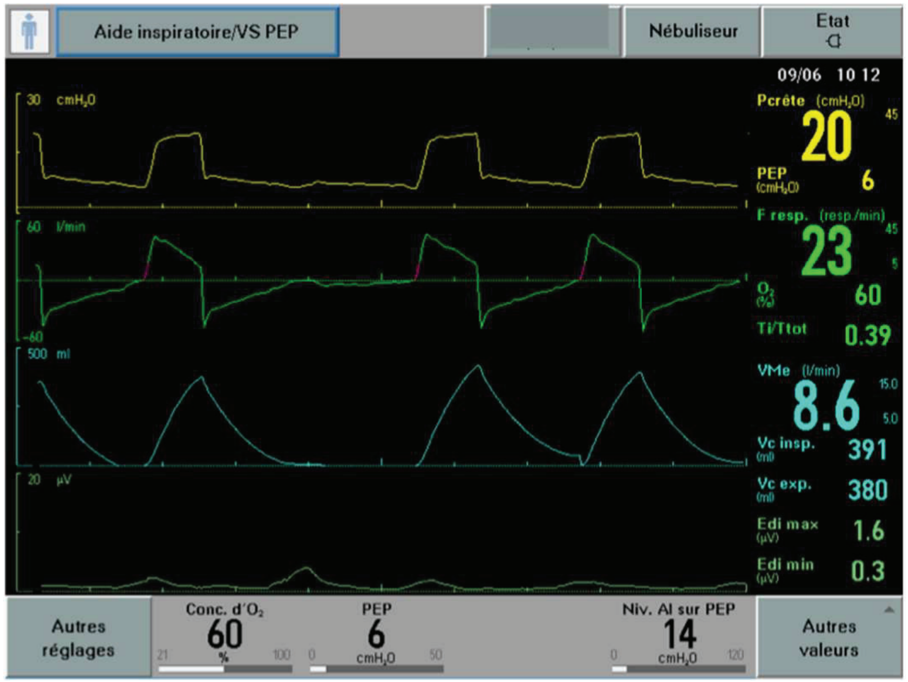
Le Niveau d’Aide

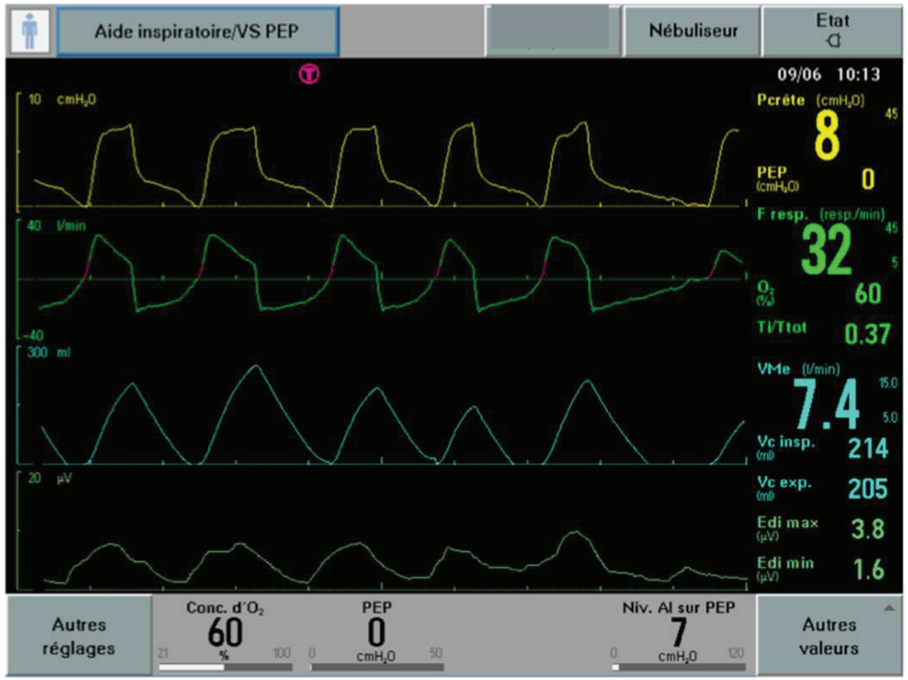
- En fonction du VTE 6 à 8 ml.kg PBW
- En fonction de l’effort: Pocc, P 0,1t, Pmo, EAdi Index Pdi, PTP oeso, Pmus





Le bon niveau d'aide dans le sevrage ?



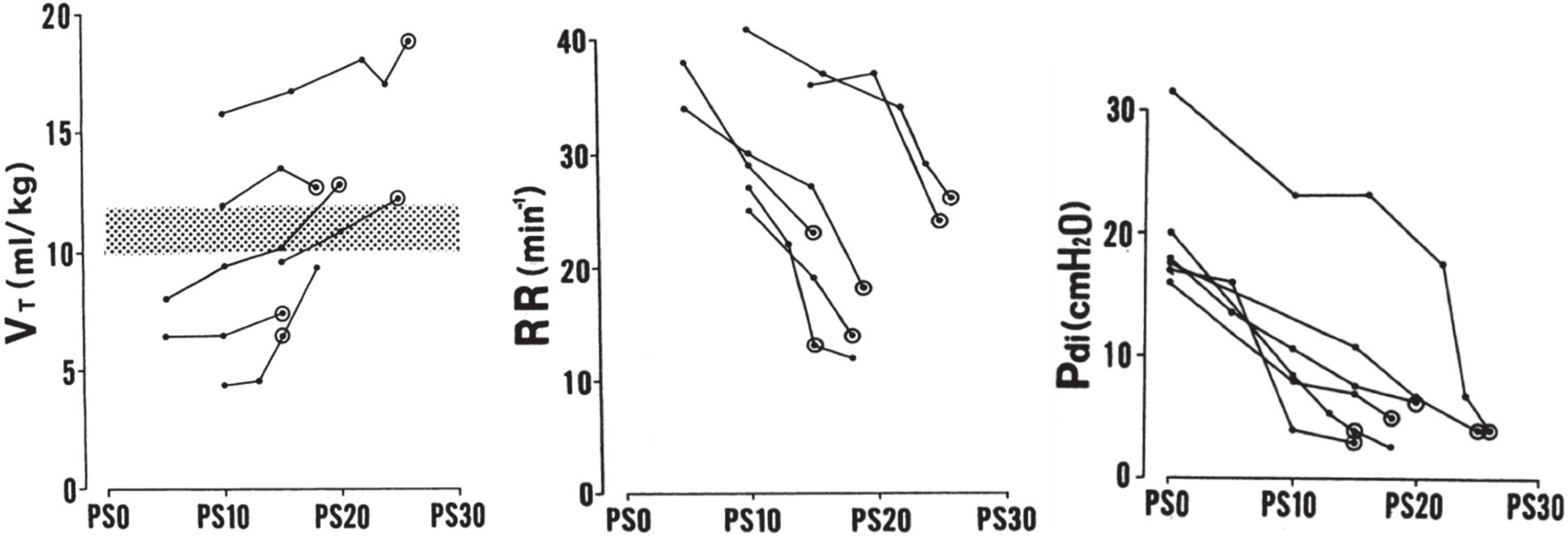


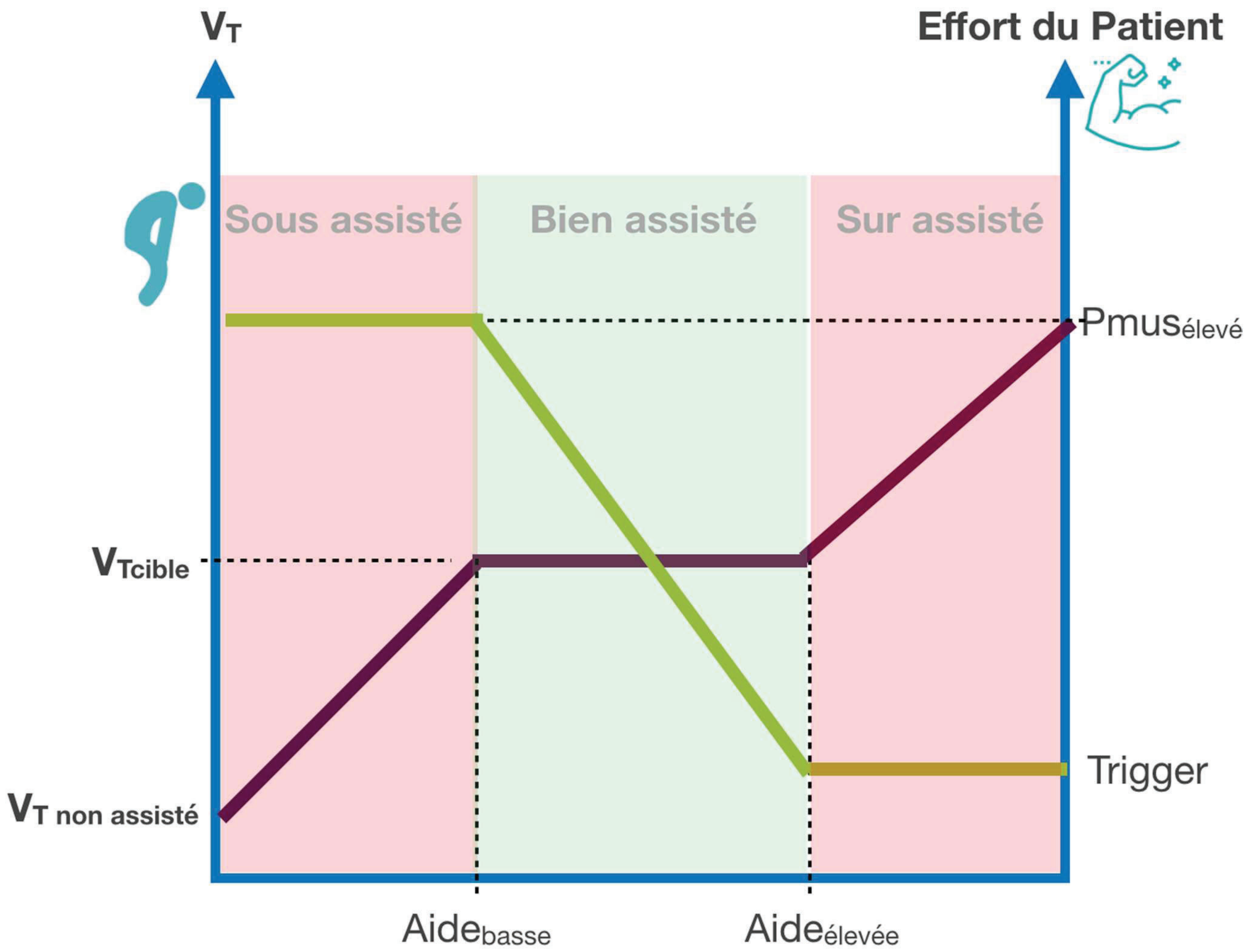
Determination of the optimal pressure support level evaluated by measuring transdiaphragmatic pressure.

T Kimura, J Takezawa, K Nishiwaki and Y Shimada

Chest 1991;100;112-117

Niveau d'aide ?





VT
Effort du Patient
Sous assisté
Bien assisté
Sur assisté
Pmusélevé
VTcible
Trigger
VT non assisté
Aidebasse
Aideélevée

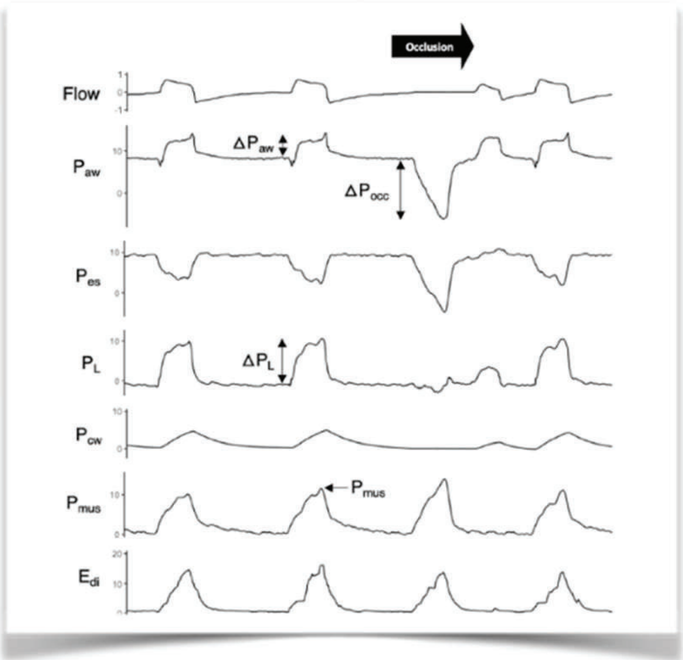
Bertoni et al. Critical Care (2019) 23:346
https://doi.org/10.1186/s13054-019-2617-0

Critical Care

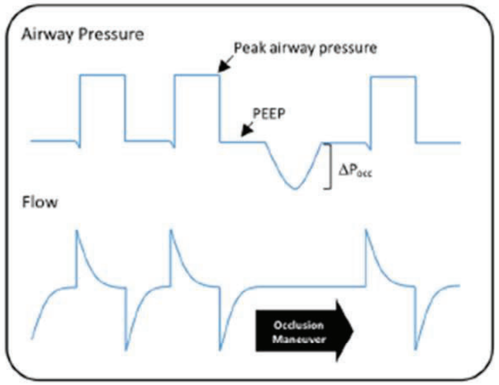
RESEARCH Open Access

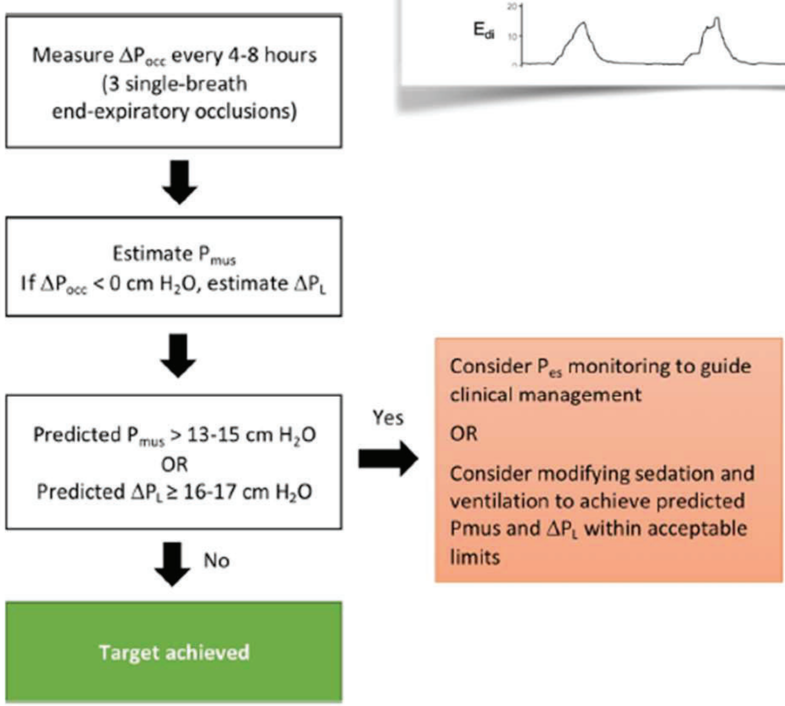
A novel non-invasive method to detect excessively high respiratory effort and dynamic transpulmonary driving pressure during mechanical ventilation

Michele Bertoni[1,2], Irene Telias[3,4], Martin Urner[3,5], Michael Long[6], Lorenzo Del Sorbo[3,5], Eddy Fan[3,5,7], Christer Sinderby[3,4], Jennifer Beck[3,4], Ling Liu[8], Haibo Qiu[8], Jenna Wong[5], Arthur S. Slutsky[3,4], Niall D. Ferguson[3,5,7,9,10], Laurent J. Brochard[3,4] and Ewan C. Goligher[3,5,10,11*]



Ventilator Waveforms





Computations

Predicted Pmus = $-3/4 \times \Delta P_{occ}$

Predicted ΔP_L = (Peak airway pressure - PEEP) - $2/3 \times \Delta P_{occ}$

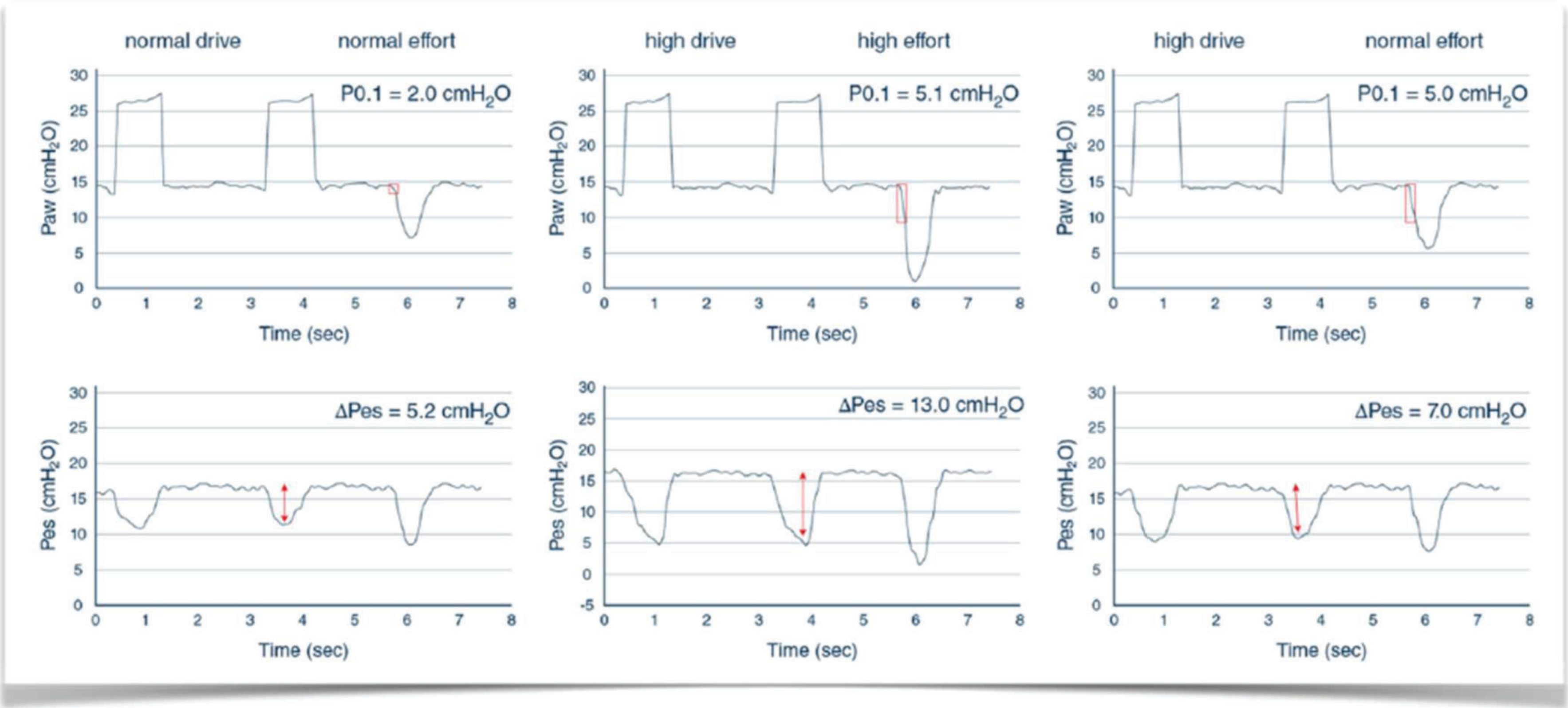
Note: ΔP_{occ} is always ≤ 0 cm H_2O (the magnitude of decrease in airway pressure from inspiratory effort during the occlusion)

Intensive Care Med (2020) 46:606–618
https://doi.org/10.1007/s00134-020-05942-6

NARRATIVE REVIEW

Respiratory drive in the acute respiratory distress syndrome: pathophysiology, monitoring, and therapeutic interventions

Elena Spinelli[1], Tommaso Mauri[1,2*], Jeremy R. Beitler[3], Antonio Pesenti[1,2] and Daniel Brodie[3]

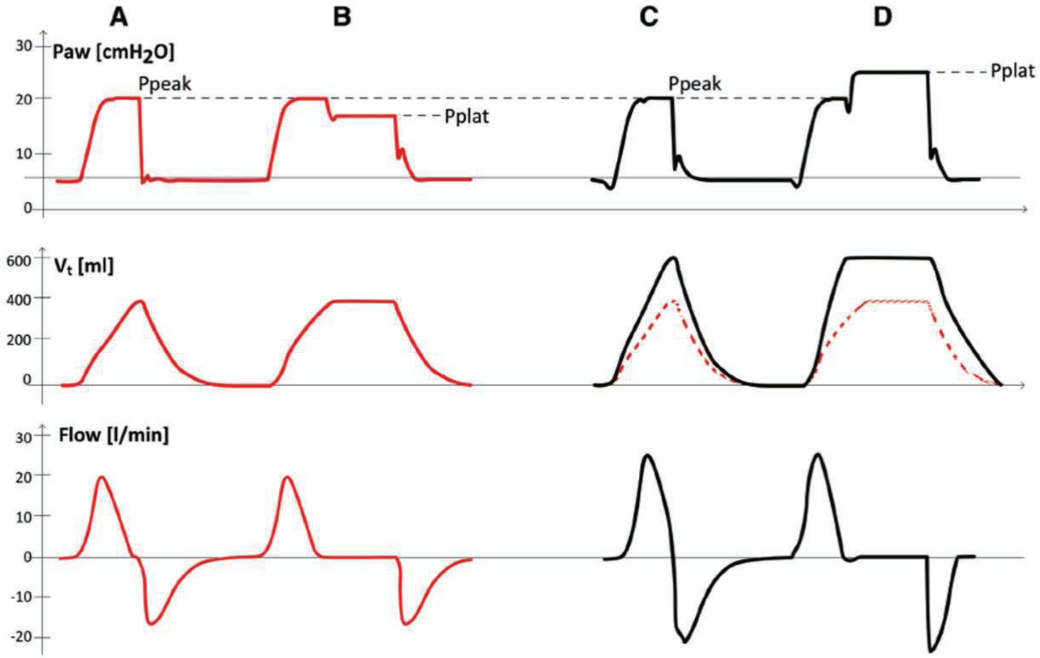


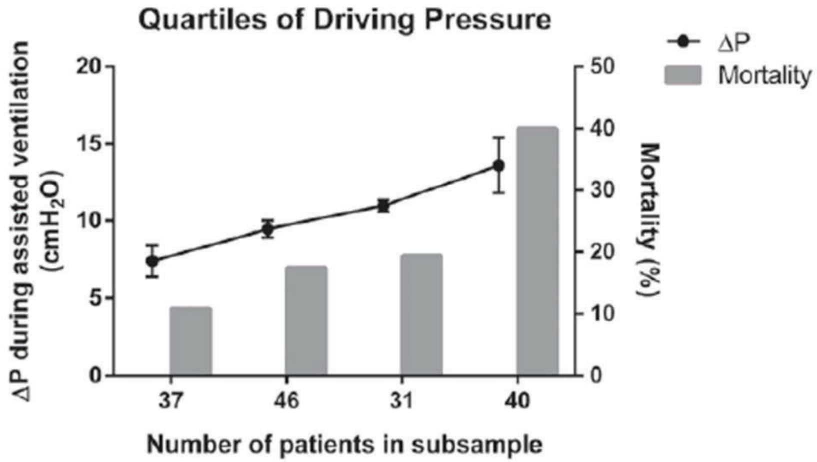
Driving Pressure Is Associated with Outcome during Assisted Ventilation in Acute Respiratory Distress Syndrome

Giacomo Bellani, M.D., Ph.D., Alice Grassi, M.D.,
Simone Sosio, M.D., Stefano Gatti, M.D.,
Brian P. Kavanagh, M.B., Antonio Pesenti, M.D.,
Giuseppe Foti, M.D.

ANESTHESIOLOGY 2019; 131:594–604

Pression Motrice en VSAI





Docci *et al. Critical Care* (2024) 28:358
https://doi.org/10.1186/s13054-024-05144-2

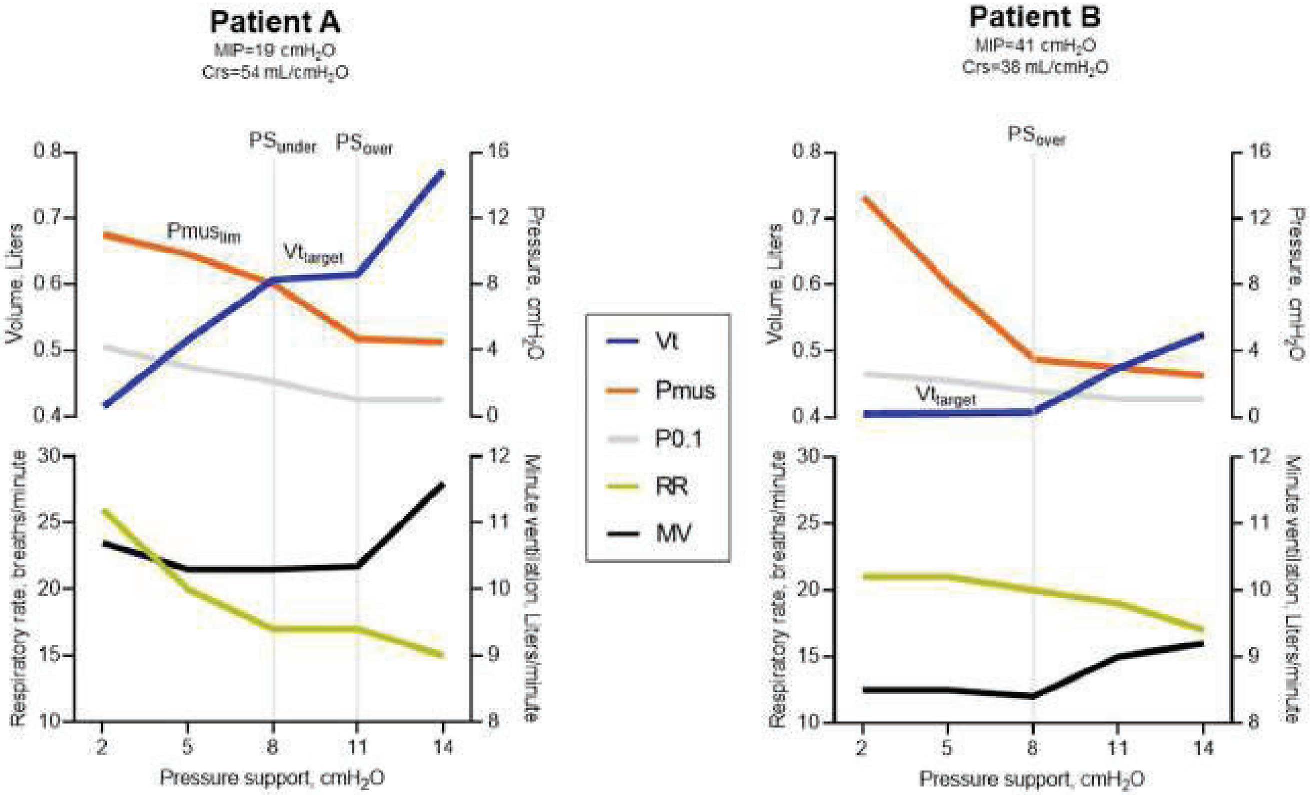
Critical Care

PERSPECTIVE

Open Access

Pressure support, patient effort and tidal volume: a conceptual model for a non linear interaction

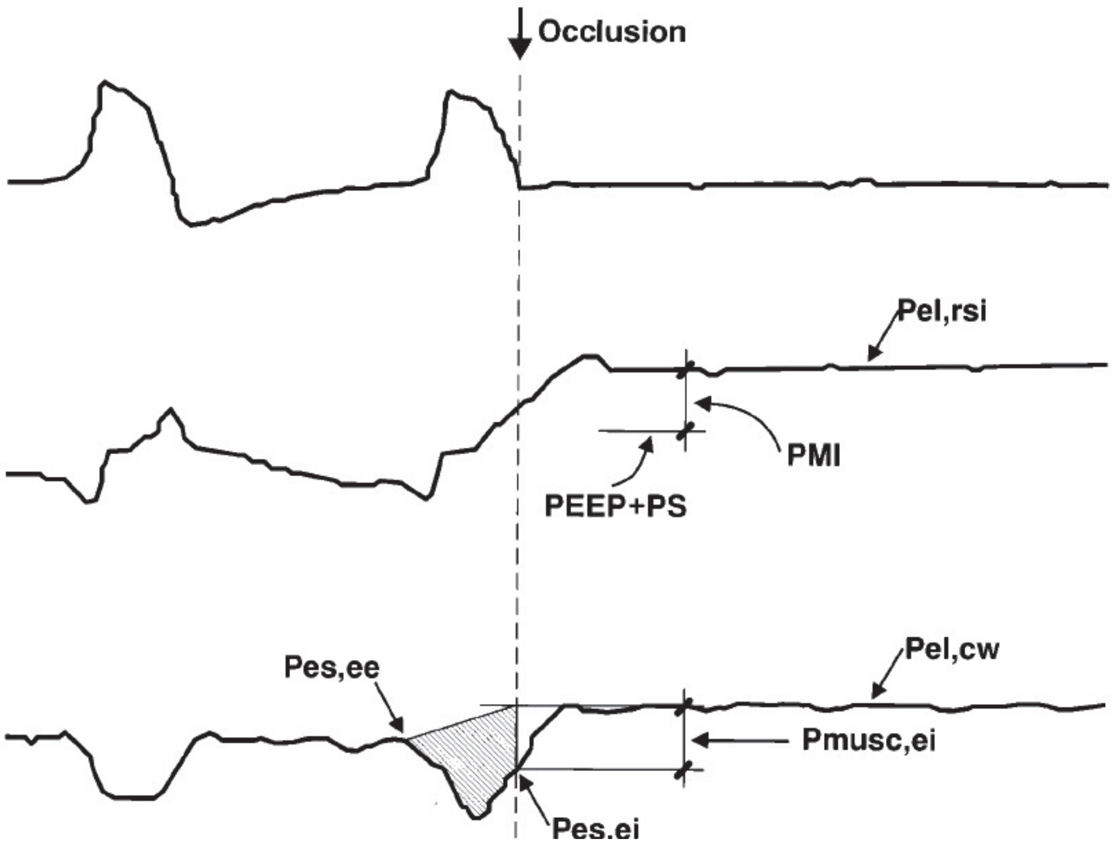
Mattia Docci[1,2,3], Giuseppe Foti[1,4], Laurent Brochard[2,3] and Giacomo Bellani[5,6*]



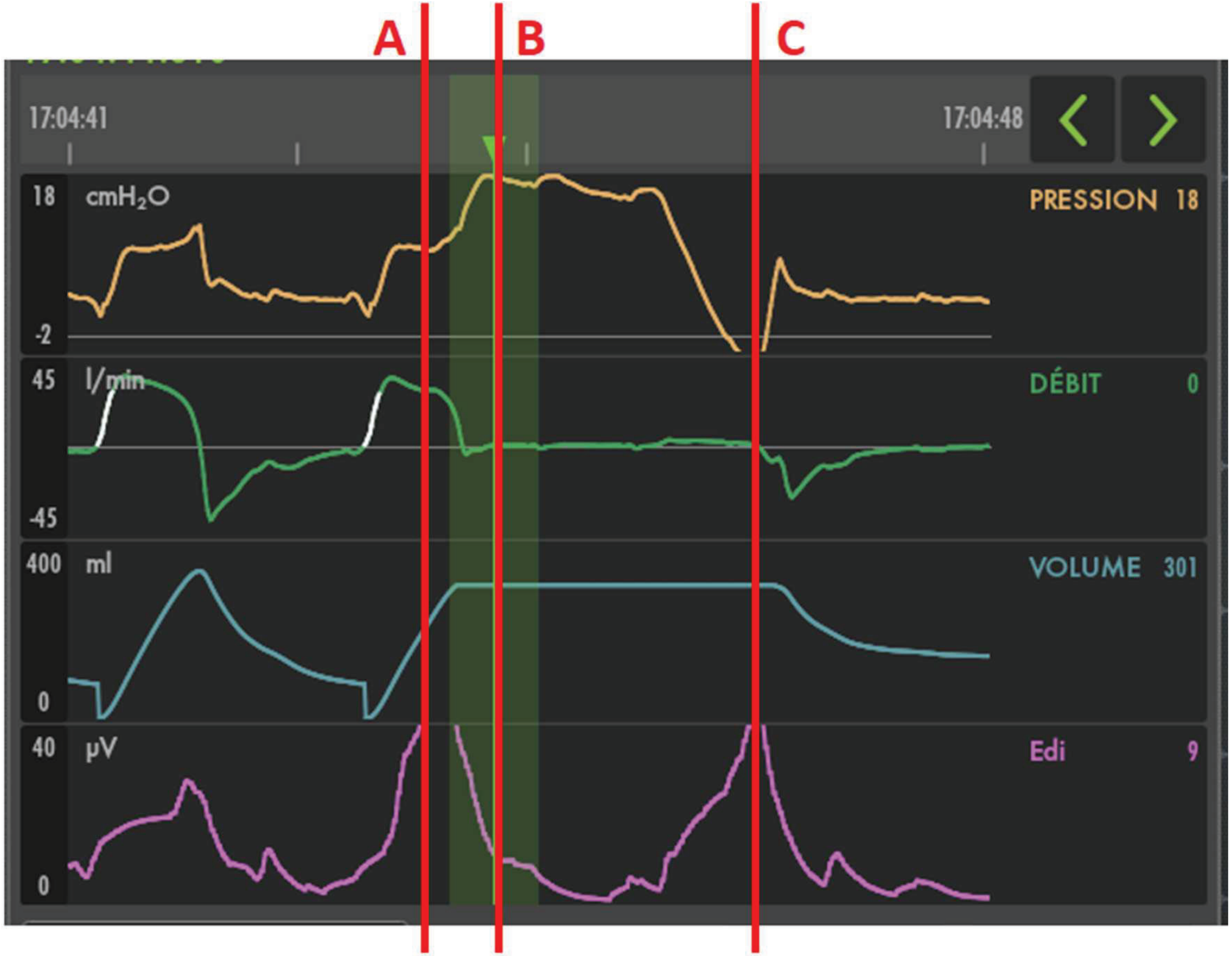
End-Inspiratory Airway Occlusion

A Method To Assess the Pressure Developed by Inspiratory Muscles in Patients with Acute Lung Injury Undergoing Pressure Support

GIUSEPPE FOTI, MAURIZIO CEREDA, GIULIANA BANFI, PAOLO PELOSI, ROBERTO FUMAGALLI, and ANTONIO PESENTI



AM J RESPIR CRIT CARE MED 1997;156:1210–1216.



A
B
C
17:04:41
17:04:48
18
cmH$_2$O
PRESSION 18
-2
45
l/min
DÉBIT 0
-45
400
ml
VOLUME 301
0
40
µV
Edi 9
0

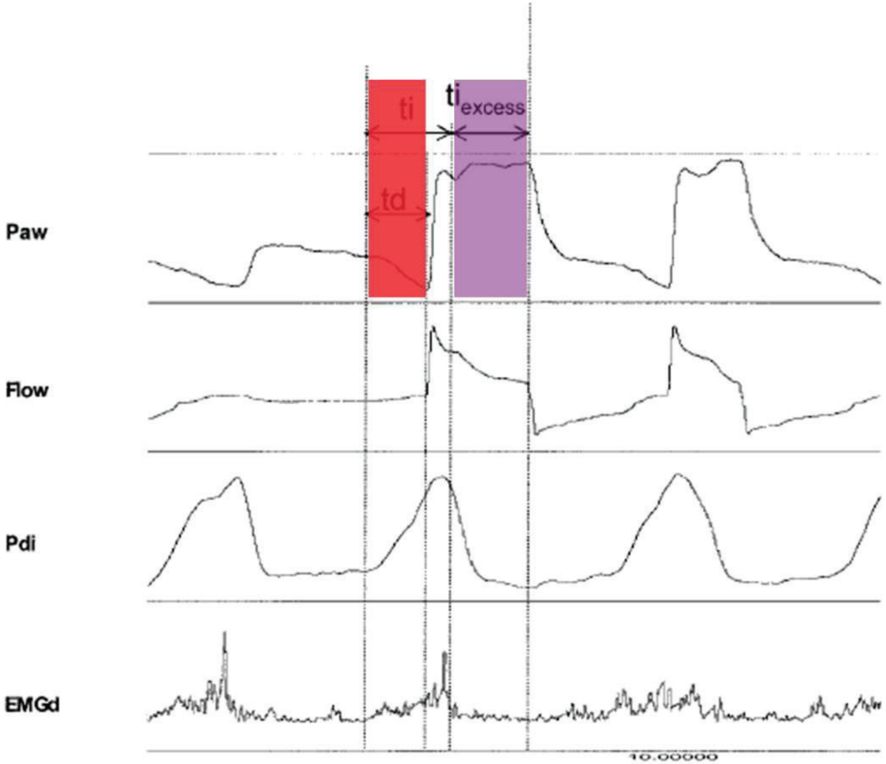
LA SYNCHRONIE PATIENT VENTILATEUR

La synchronie

Impact of Expiratory Trigger Setting on Delayed Cycling and Inspiratory Muscle Workload

Didier Tassaux, Marc Gainnier, Anne Battisti, and Philippe Jolliet

Am J Respir Crit Care Med Vol 172. pp 1283–1289, 2005

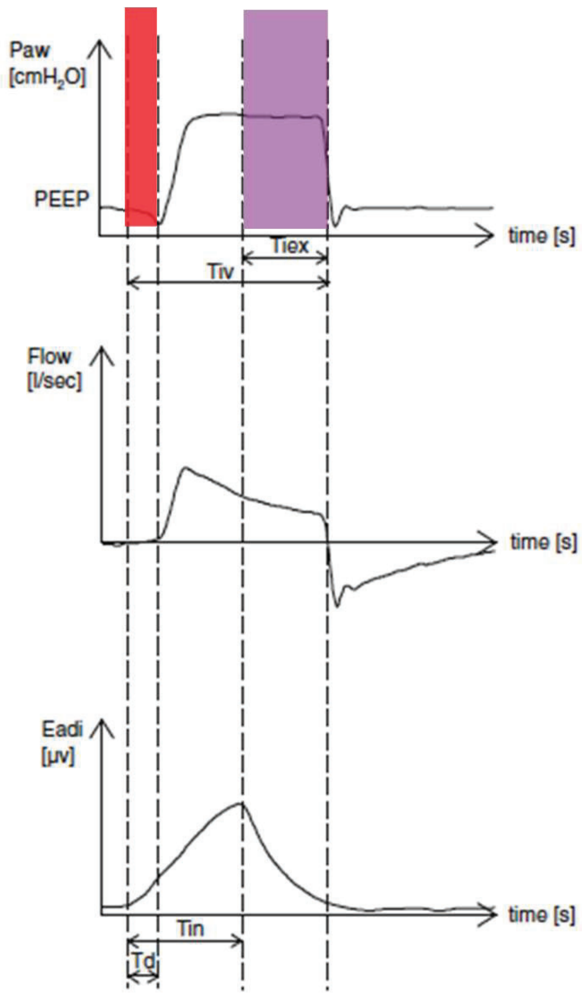


Intensive Care Med
DOI 10.1007/s00134-010-2052-9

ORIGINAL

Lise Piquilloud
Laurence Vignaux
Emilie Bialais
Jean Roeseler
Thierry Sottiaux
Pierre-François Laterre
Philippe Jolliet
Didier Tassaux

Neurally adjusted ventilatory assist improves patient–ventilator interaction



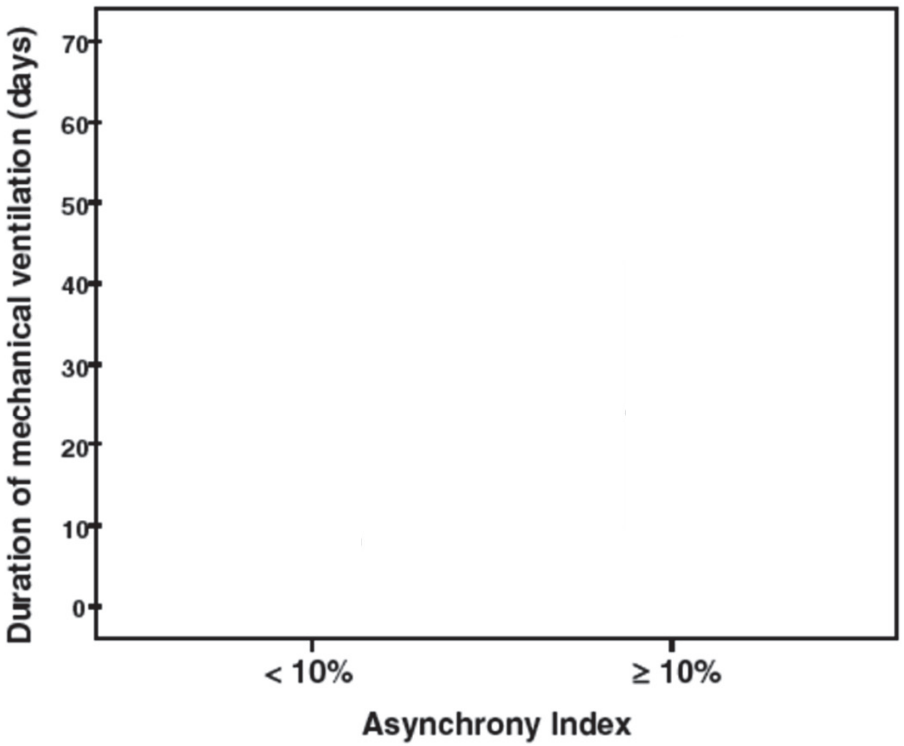
Problématiques des asynchronies?

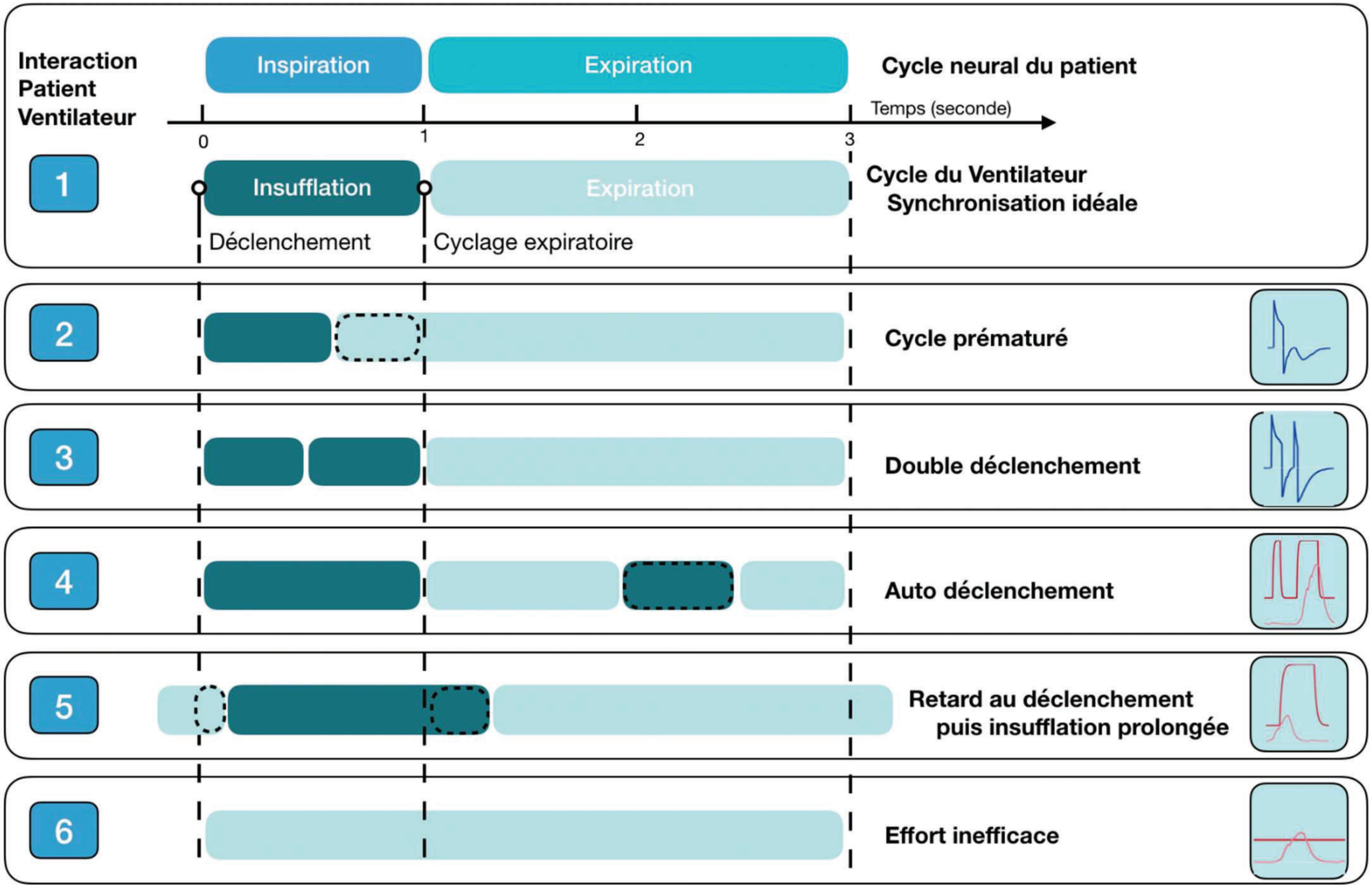
Intensive Care Med (2006) 32:1515–1522
DOI 10.1007/s00134-006-0301-8

ORIGINAL

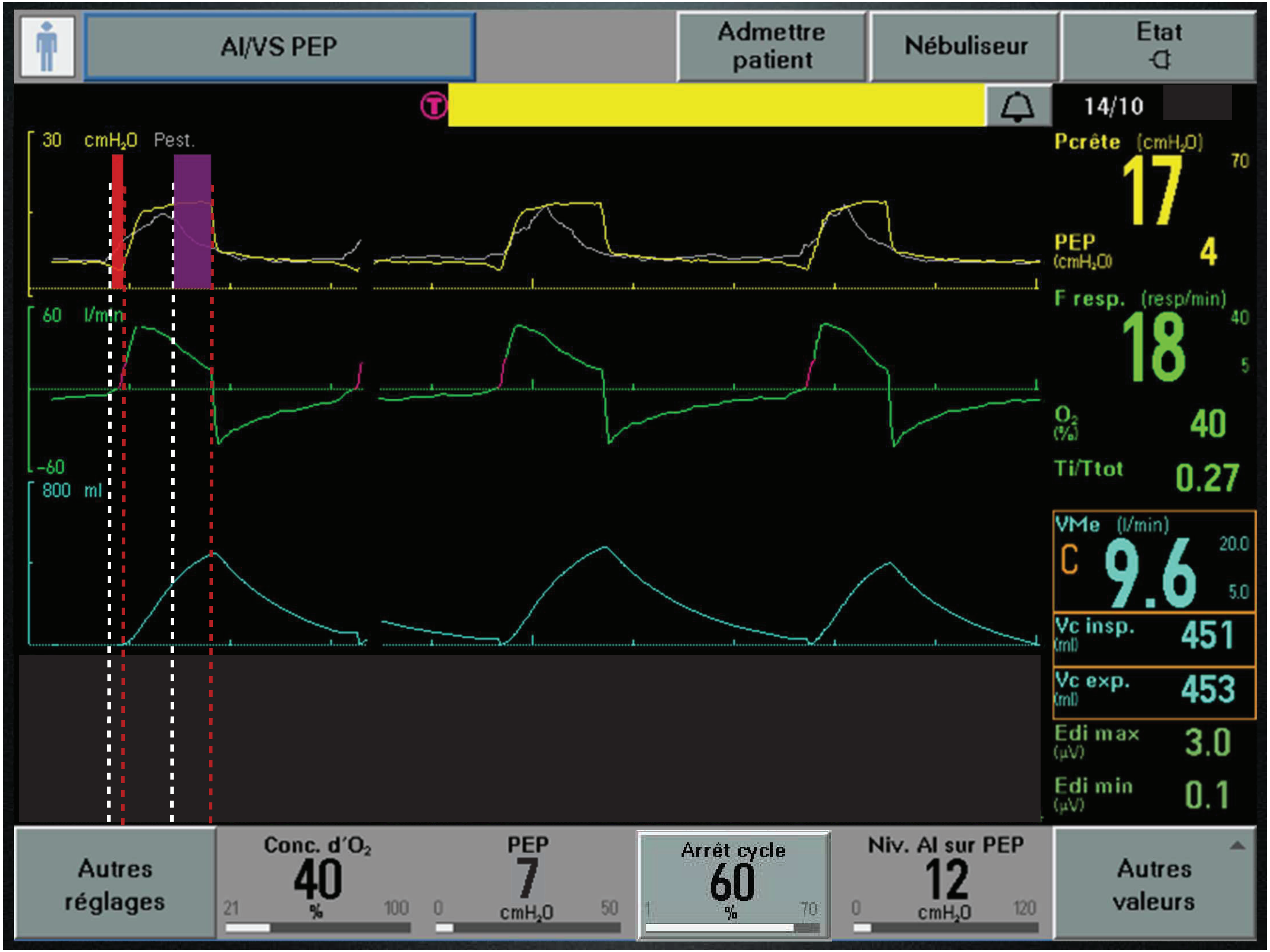
Arnaud W. Thille
Pablo Rodriguez
Belen Cabello
François Lellouche
Laurent Brochard

Patient-ventilator asynchrony during assisted mechanical ventilation





Interaction
Patient
Ventilateur
Inspiration
Expiration
Cycle neural du patient
Temps (seconde)
0
1
2
3
1
Insufflation
Expiration
Cycle du Ventilateur
Synchronisation idéale
Déclenchement
Cyclage expiratoire
2
Cycle prématuré
3
Double déclenchement
4
Auto déclenchement
5
Retard au déclenchement
puis insufflation prolongée
6
Effort inefficace

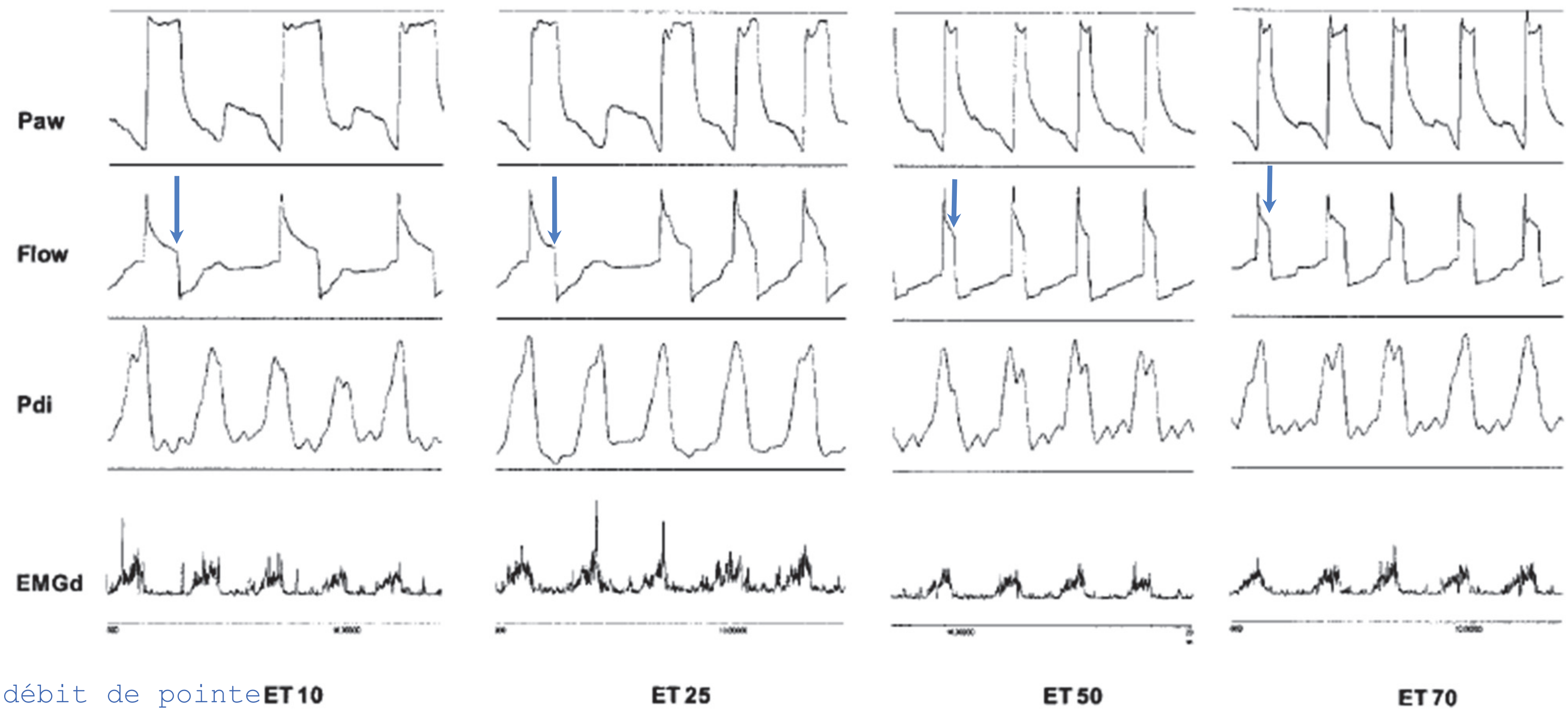


AI/VS PEP
Admettre patient
Nébuliseur
Etat
14/10
30 cmH2O Pest.
60 l/min
-60
800 ml
Pcrête (cmH2O) 17 70
PEP (cmH2O) 4
F resp. (resp/min) 18 40 5
O2 (%) 40
Ti/Ttot 0.27
VMe (l/min) C 9.6 20.0 5.0
Vc insp. (ml) 451
Vc exp. (ml) 453
Edi max (µV) 3.0
Edi min (µV) 0.1
Autres réglages
Conc. d'O2 40 % 21 100
PEP 7 cmH2O 0 50
Arrêt cycle 60 % 1 70
Niv. AI sur PEP 12 cmH2O 0 120
Autres valeurs

Impact of Expiratory Trigger Setting on Delayed Cycling and Inspiratory Muscle Workload

Didier Tassaux, Marc Gainnier, Anne Battisti, and Philippe Jolliet

Am J Respir Crit Care Med Vol 172. pp 1283–1289, 2005



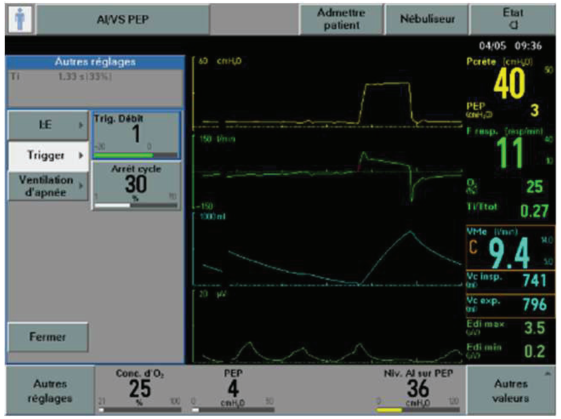

AI/VS PEP
Admettre patient
Nébuliseur
Etat
14/10
30 cmH2O
60 l/min
-60
700 ml
20 µV
Pcrête (cmH2O)
19
70
PEP (cmH2O)
6
F resp. (resp/min)
21
40
5
O2 (%)
40
Ti/Ttot
0.26
VMe (l/min)
C
9.2
20.0
5.0
Vc insp. (ml)
445
Vc exp. (ml)
507
Edi max (µV)
4.3
Edi min (µV)
0.2
Autres réglages
Conc. d'O2
40
21 % 100
PEP
7
0 cmH2O 50
Arrêt cycle
60
1 % 70
Niv. AI sur PEP
12
0 cmH2O 120
Autres valeurs

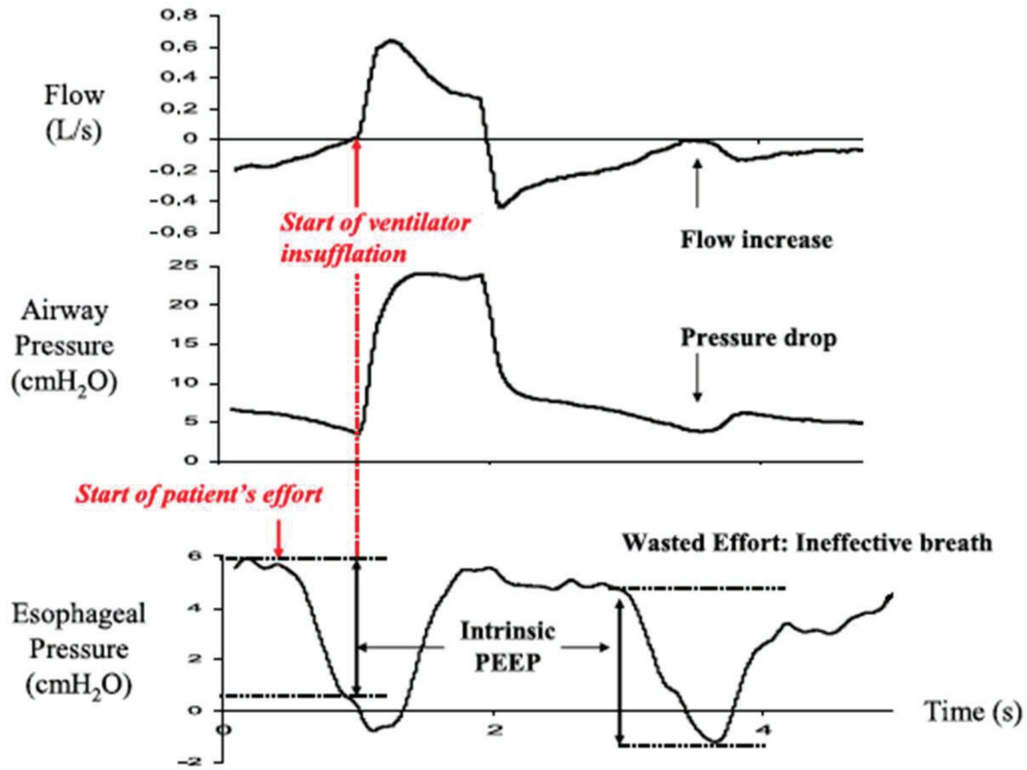
Intensive Care Med (2008) 34:1477–1486
DOI 10.1007/s00134-008-1121-9

ORIGINAL

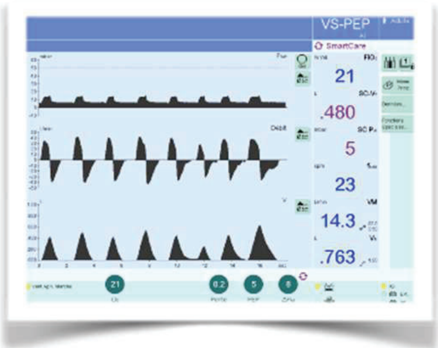
Arnaud W. Thille
Belen Cabello
Fabrice Galia
Aissam Lyazidi
Laurent Brochard

Reduction of patient-ventilator asynchrony by reducing tidal volume during pressure-support ventilation

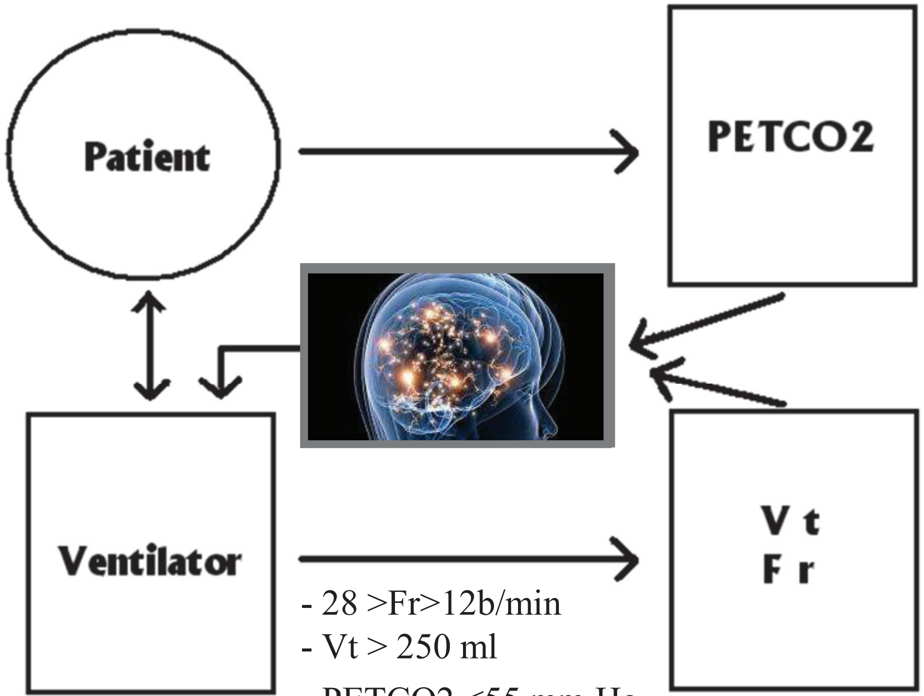




Système Smartcare



- Système Néoganesh: règles, scénarios pour être dans une zone de confort: VTE FR E_TCO_2 évaluation 2-3 min



- 28 >Fr>12b/min
- Vt > 250 ml
- PETCO2 <55 mm Hg

The knowledge base = 142 rules

SOME GENERAL RULES USED IN THE KNOWLEDGE-BASED SYSTEM

1. Never reduce the level of pressure suppor at night, except in case of excessive alveolar ventilation.
2. Try to keep the patient within a zone of "comfort," with a respiratory rate between 12 and 28 breaths per minute, a tidal volume above a minimum threshold, and a P_{ETCO_2} below a maximum threshold.
3. Do not let the tidal volume fall below 300 or 250 ml in patients whose body weight is above or below 55 kg, respectively.
4. Keep the respiratory rate between 12 and 28 breaths/min so that the patient is comfortable. In some patients, the upper limit can be moved up to 32 breaths/min.
5. Do not let the end-tidal CO_2 exceed 60 mm Hg in COPD patients and 50 mm Hg in patients with other disorders.
6. Decrease the level of pressure support by 2 cm H_2O when the patient has a stable ventilation within the comfort zone during at least 30 min with a level of pressure support less than 20 cm H_2O.
7. Decrease the level of pressure support by 4 cm H_2O when the patient has a stable ventilation within the comfort zone during at least 60 min with a level of pressure support of 20 cm H_2O or more.
8. Initiate the preweaning observation period when the level of pressure support is at the minimal value (5 or 9 cm H_2O in tracheotomized or intubated patients, respectively).
9. Consider that the patient is ready to be weaned after 1 or 2 h of stable ventilation at the minimal level of pressure support (1 h in those patients with a level of pressure support of 15 cm H_2O or less after 1 h of observation, 2 h in those with an initial level of pressure support greater than 15 cm H_2O.
10. Adapt the level of pressure support to the physiologic needs of the patient and evaluate every 2 min.
11. Consider that a patient requiring a PEEP level above 5 cm H_2O is not ready to be weaned.
12. The maximal level of pressure support is 40 cm H_2O.
13. In case of severe hypoventilation, switch to assist-control ventilation with preset parameters.

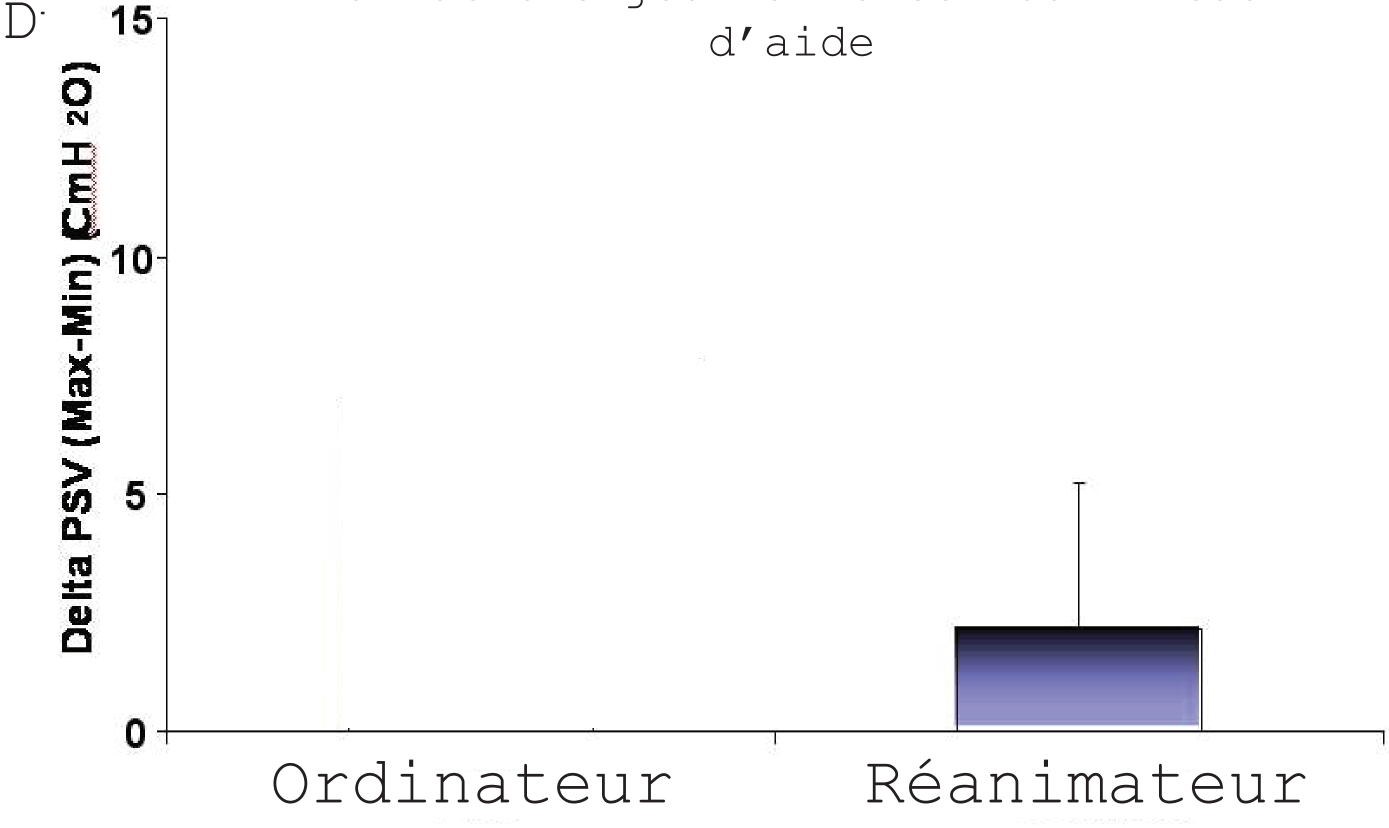
Dojat M - Am J Respir Crit Care Med 1996; 153: 997-1004

A Multicenter Randomized Trial of Computer-driven Protocolized Weaning from Mechanical Ventilation

François Lellouche, Jordi Mancebo, Philippe Jolliet, Jean Roeseler, Fréderique Schortgen, Michel Dojat, Belen Cabello, Lila Bouadma, Pablo Rodriguez, Salvatore Maggiore, Marc Reynaert, Stefan Mersmann, and Laurent Brochard

Am J Respir Crit Care Med Vol 174. pp 894–900, 2006

Variations journalières du niveau d'aide



ge

ge + VNI

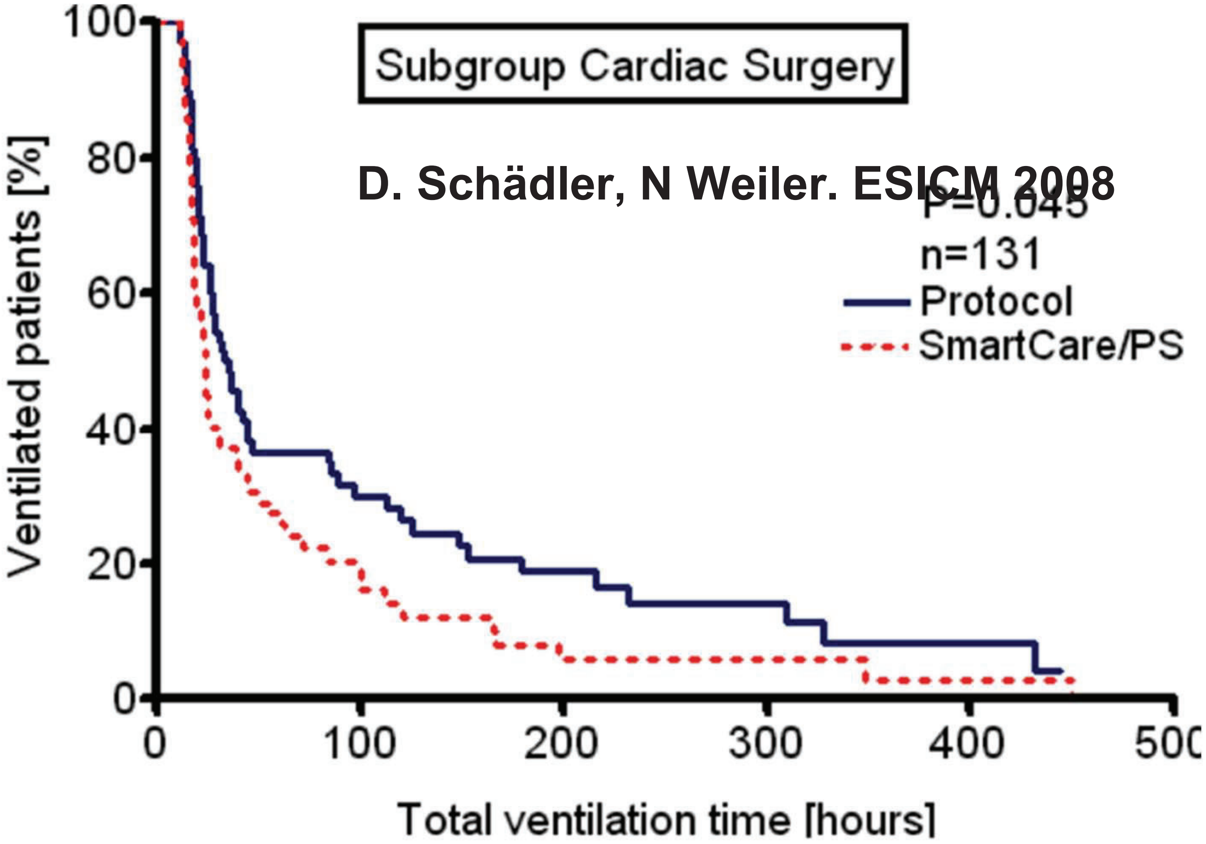
de
lation

Intensive Care Med (2008) 34:1788–1795
DOI 10.1007/s00134-008-1179-4

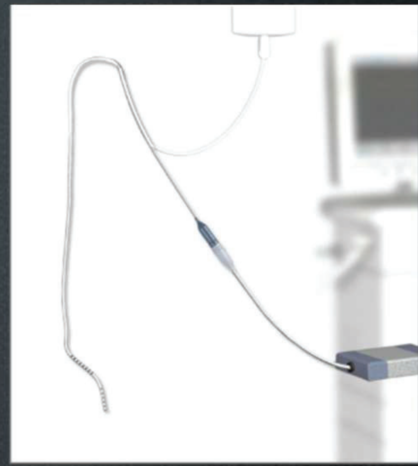
ORIGINAL

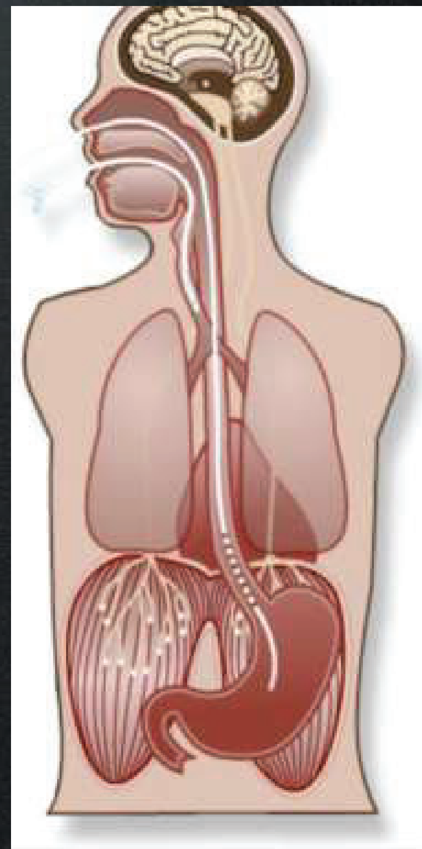
Louise Rose
Jeffrey J. Presneill
Linda Johnston
John F. Cade

A randomised, controlled trial of conventional versus automated weaning from mechanical ventilation using SmartCare™/PS




Aide inspiratoire/VS PEP
FONTANA
14/09/1933
Nébuliseur
Etat
Volume minute expiré: Bas
03/05 19:36
10 cmH2O
40 l/min
-40
400 ml
Pcrête (cmH2O)
8
40
PEP (cmH2O)
1
F resp. (resp./min)
32
40
10
O2 (%)
40
Ti/Ttot
0.41
VMe (l/min)
C
8.7
15.0
8.0
Vc insp. (ml)
338
Vc exp. (ml)
311
Edi max (µV)
32
Edi min (µV)
0.4
Autres réglages
Conc. d'O2
40
%
21
100
PEP
0
cmH2O
0
50
Niv. AI sur PEP
7
cmH2O
0
120
Autres valeurs





SEPARATION DU VENTILATEUR

- INDEX PREDICTIFS
- TEST

The New England
Journal of Medicine

Volume 324 MAY 23, 1991 Number 21

A PROSPECTIVE STUDY OF INDEXES PREDICTING THE OUTCOME OF TRIALS OF WEANING FROM MECHANICAL VENTILATION

KARL L. YANG, M.D., AND MARTIN J. TOBIN, M.D.

Premier Index FR/VT

Table 3. Effect of Duration of Mechanical Ventilation (<8 Days or ≥8 Days) on the Accuracy of Indexes in Predicting Weaning Outcome.*

Index	Sensitivity		Specificity		Positive Predictive Value		Negative Predictive Value	
	<8 days	≥8 days	<8 days	≥8 days	<8 days	≥8 days	<8 days	≥8 days
Minute ventilation	0.79	0.75	0.75	0.08	0.65	0.35	0.40	0.33
Respiratory frequency	0.89	1.00	0.31	0.42	0.69	0.53	0.63	1.00
Tidal volume	1.00	0.88	0.50	0.58	0.78	0.58	1.00	0.88
Tidal volume/patient's weight	0.96	0.88	0.38	0.42	0.73	0.50	0.86	0.83
Maximal inspiratory pressure	1.00	1.00	0.00	0.25	0.64	0.47	1.00	1.00
Dynamic compliance	0.75	0.63	0.69	0.25	0.81	0.36	0.61	0.50
Static compliance	0.82	0.50	0.56	0.08	0.77	0.27	0.64	0.20
PaO_2/PAO_2 ratio	0.79	0.88	0.38	0.17	0.69	0.41	0.50	0.67
Frequency/tidal volume ratio	1.00	0.88	0.63	0.67	0.82	0.64	1.00	0.89
CROP index	0.82	0.75	0.56	0.58	0.77	0.55	0.64	0.78

Identifying patients capable of breathing spontaneously and duration of mechanical ventilation

- **Intervention Group**

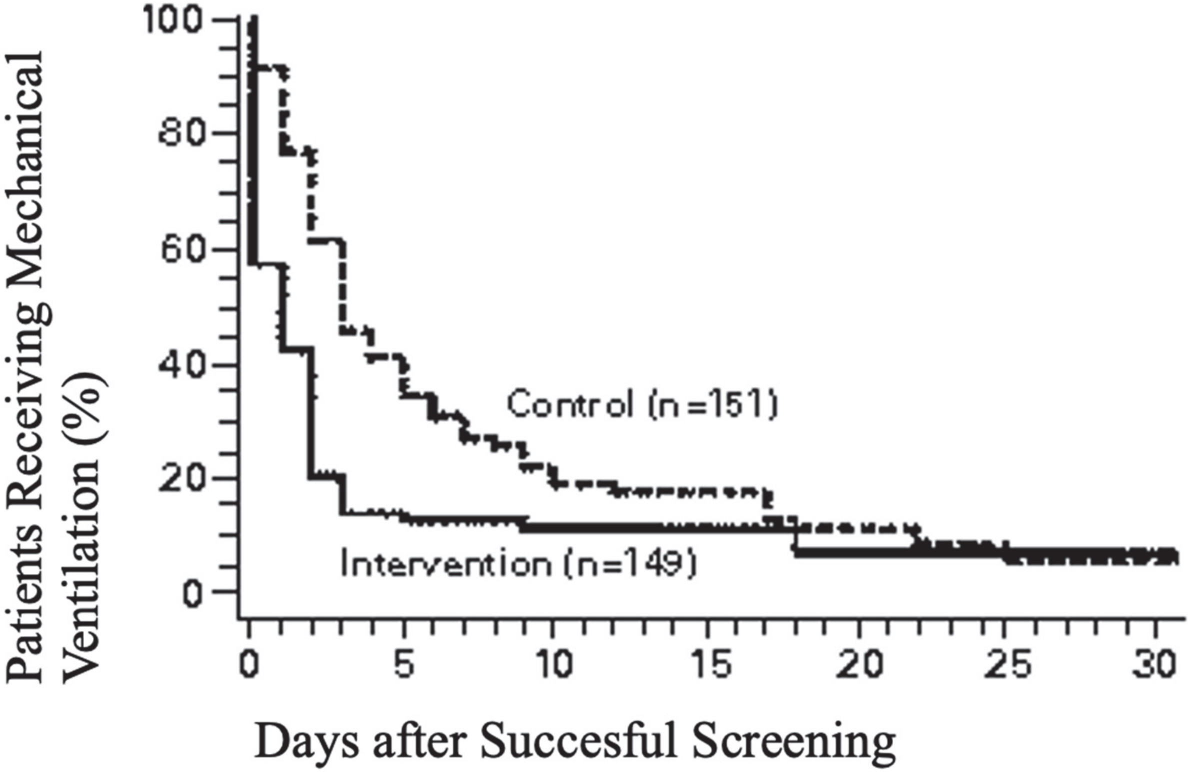
1) A daily screening of respiratory function (by the respiratory therapists of the unit)

- **PaO_2/FIO_2 > 200**
- **PEEP< 5 cm H_2O**
- **Adequate cough**
- **f/V_T < 105 c/min**
- **No vasopressor agents or sedatives**

2) A 2-hour trial of spontaneous breathing

3) Notification of the physician of the successful results

FEUX VERT



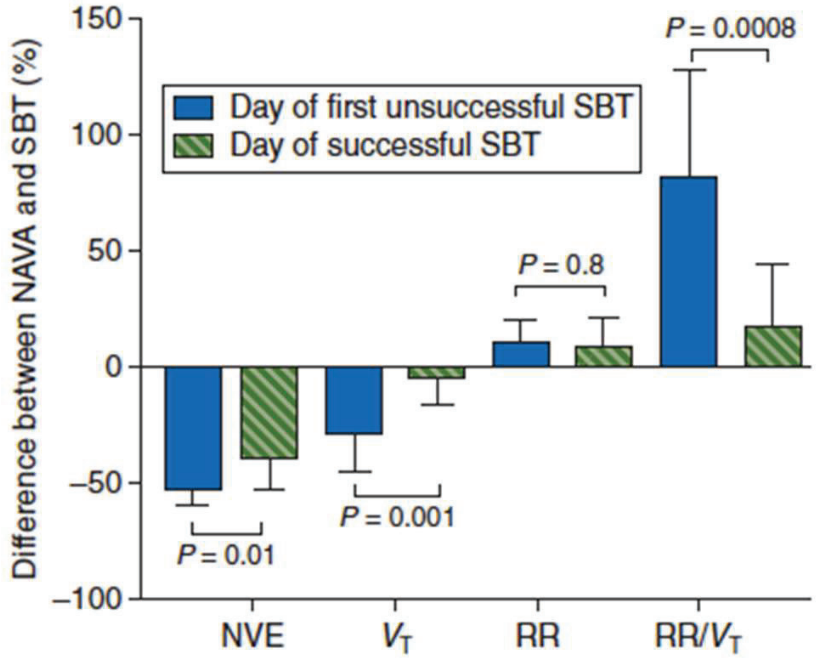
Ely E.W. et coll. N Engl J Med 1996; 335: 1864-9.

British Journal of Anaesthesia Page 1 of 6
doi:10.1093/bja/aet258

BJA

Neuro-ventilatory efficiency during weaning from mechanical ventilation using neurally adjusted ventilatory assist

H. Rozé[1,2,3*], B. Repusseau[1], V. Perrier[1], A. Germain[1], R. Séramondi[1], A. Dewitte[1,3], C. Fleureau[1] and A. Ouattara[1,2]



Augmentation de l'EAdi pour un même niveau de pression entre le début et la fin du sevrage


PP 56 kg
21:17
24/04/14
>45 min
AI/VS PEP ⇄ PC
ATTENTE
MODES
LIMITES D'ALARME
MANŒUVRES
AFFICHAGES
NAVA
DÉBRANCHEMENT /ASPIRATION
TENDANCES & JOURNAUX
PRESSION/P est cmH₂O
DÉBIT l/min
VOLUME ml
Edi µV
Pcrête
27
cmH₂O
PEP
8,2
cmH₂O
Pmoyen.
13
cmH₂O
FR
33
resp/min
Ti/Ttot
0,33
Conc. O₂
40
%
Vce
352
ml
Vci
350
ml
VMe
11,3
l/min
Edimax
8,6
µV
Edimin
0,2
µV
Vc/PP
6,3
ml/kg
100
O₂ SUPP.
Conc. O₂
40
PEP
8,5
Niv. AI sur PEP
18
FR ventil. apnée
15
PC d'apnée sur PEP
15
Durée d'apnée
20

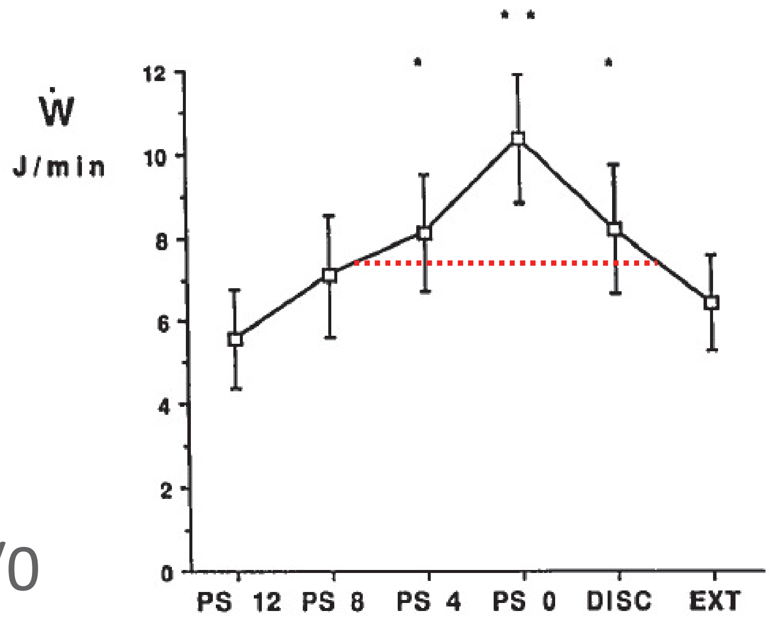
TEST VSAI 7/0


PP 56 kg
20:52
24/04/14
>45 min
AI/VS PEP ⇄ PC
ATTENTE
MODES
LIMITES D'ALARME
MANŒUVRES
AFFICHAGES
NAVA
DÉBRANCHEMENT /ASPIRATION
TENDANCES & JOURNAUX
PRESSION/P est cmH₂O
DÉBIT l/min
VOLUME ml
Edi µV
Pcrête
9
cmH₂O
PEP
1,2
cmH₂O
Pmoyen.
4
cmH₂O
FR
35
resp/min
Ti/Ttot
0,39
Conc. O₂
40
%
Vce
256
ml
Vci
246
ml
VMe
8,6
l/min
Edimax
14,5
µV
Edimin
0,6
µV
Vc/PP
4,6
ml/kg
100
O₂ SUPP.
Conc. O₂
40
PEP
1,0
Niv. AI sur PEP
7
FR ventil. apnée
15
PC d'apnée sur PEP
15

Anesthesiology
75:739–745, 1991

Inspiratory Pressure Support Compensates for the Additional Work of Breathing Caused by the Endotracheal Tube

Laurent Brochard, M.D.,* Fernando Rua, M.D.,† Hubert Lorino, Ph.D.,‡ François Lemaire, M.D.,§
Alain Harf, M.D., Ph.D.¶



TEST VSAI 7/0

TABLE 1. Patient Characteristics

Patient	Age (yr)	Sex	Duration of ventilation (days)	Pa_{O_2} (mmHg)	$F_{I_{O_2}}$	Diagnosis
1	81	F	5	104	0.50	COPD, congestive heart failure
2	50	M	13	96	0.40	Bilateral pneumonia degenerative encephalopathy
3	80	M	3	140	0.40	COPD, vascular surgery
4	56	M	3	129	0.35	COPD, vascular surgery
5	76	F	24	111	0.50	COPD, congestive heart failure
6	78	F	28	97	0.50	Chronic asthma, bacterial pneumonia
7	80	M	3	125	0.40	Abdominal surgery
8	61	M	1	99	0.30	Drug overdose
9	64	F	14	165	0.50	Cardiac surgery (endocarditis)
10	16	M	1	99	0.35	Drug overdose
11	48	M	3	88	0.30	Bacterial meningitis

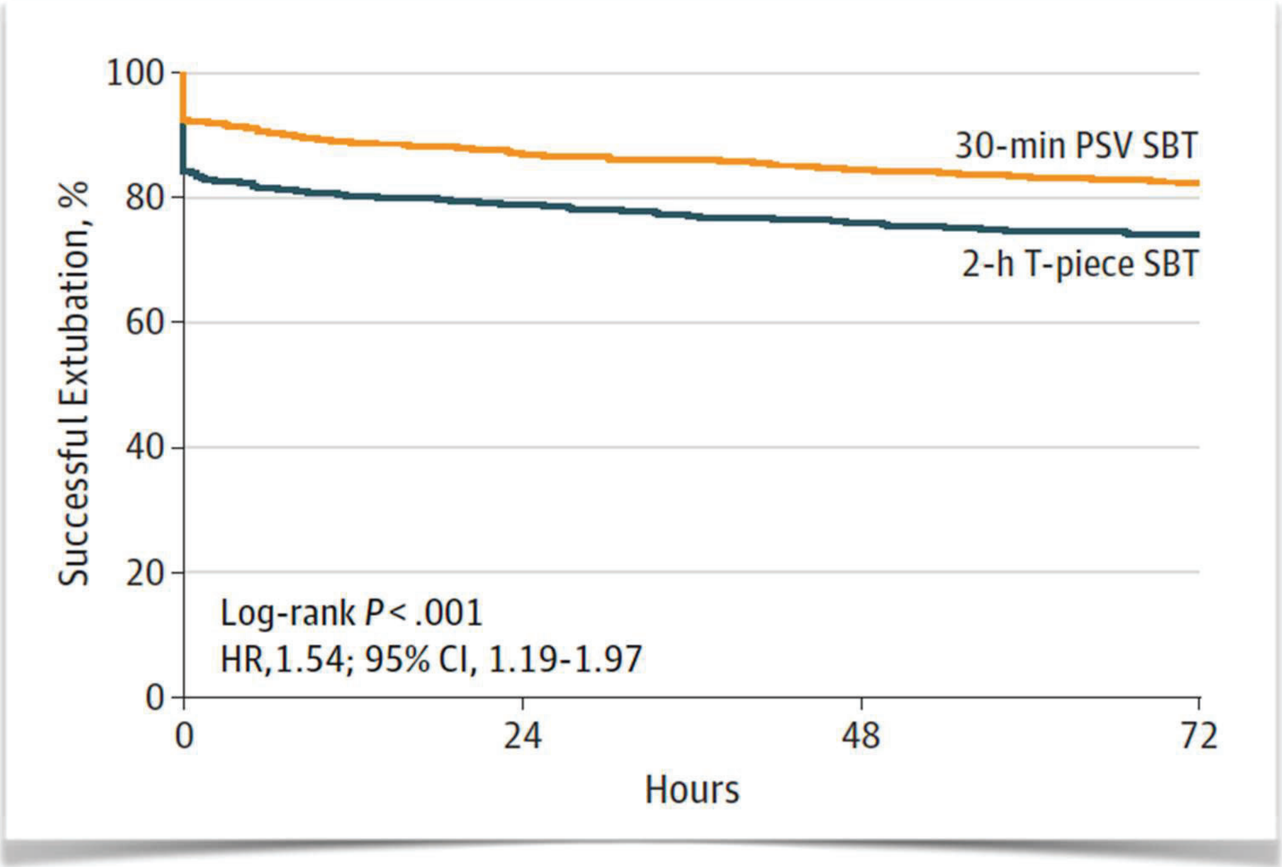
JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

JAMA The Journal of the American Medical Association

Effect of Pressure Support vs T-Piece Ventilation Strategies During Spontaneous Breathing Trials on Successful Extubation Among Patients Receiving Mechanical Ventilation

A Randomized Clinical Trial

Carles Subirà, MD; Gonzalo Hernández, MD, PhD; Antònia Vázquez, MD, PhD; Raquel Rodríguez-García, MD; Alejandro González-Castro, MD; Carolina García, MD; Olga Rubio, MD, PhD; Lara Ventura, MD; Alexandra López, MD; Maria-Carmen de la Torre, MD, PhD; Elena Keough, MD; Vanesa Arauzo, MD; Cecilia Hermosa, MD; Carmen Sánchez, MD; Ana Tizón, MD; Eva Tenza, MD, PhD; César Laborda, MD; Sara Cabañes, MD; Victoria Lacueva, MD; Maria del Mar Fernández, MD, PhD; Anna Arnau, MSc, PhD; Rafael Fernández, RMD, PhD



JAMA. 2019;321(22):2175-2182.

Intensive Care Med (2024) 50:2083–2093
https://doi.org/10.1007/s00134-024-07657-4

ORIGINAL

Spontaneous breathing trials should be adapted for each patient according to the critical illness. A new individualised approach: the GLOBAL WEAN study

Mathieu Capdevila[1,2], Yassir Aarab[1,3], Clement Monet[1], Audrey De Jong[1,2], Aurelie Vonarb[1], Julie Carr[1], Nicolas Molinari[4], Xavier Capdevila[5,6], Laurent Brochard[7,8] and Samir Jaber[1,2*]

VSAI 7/0
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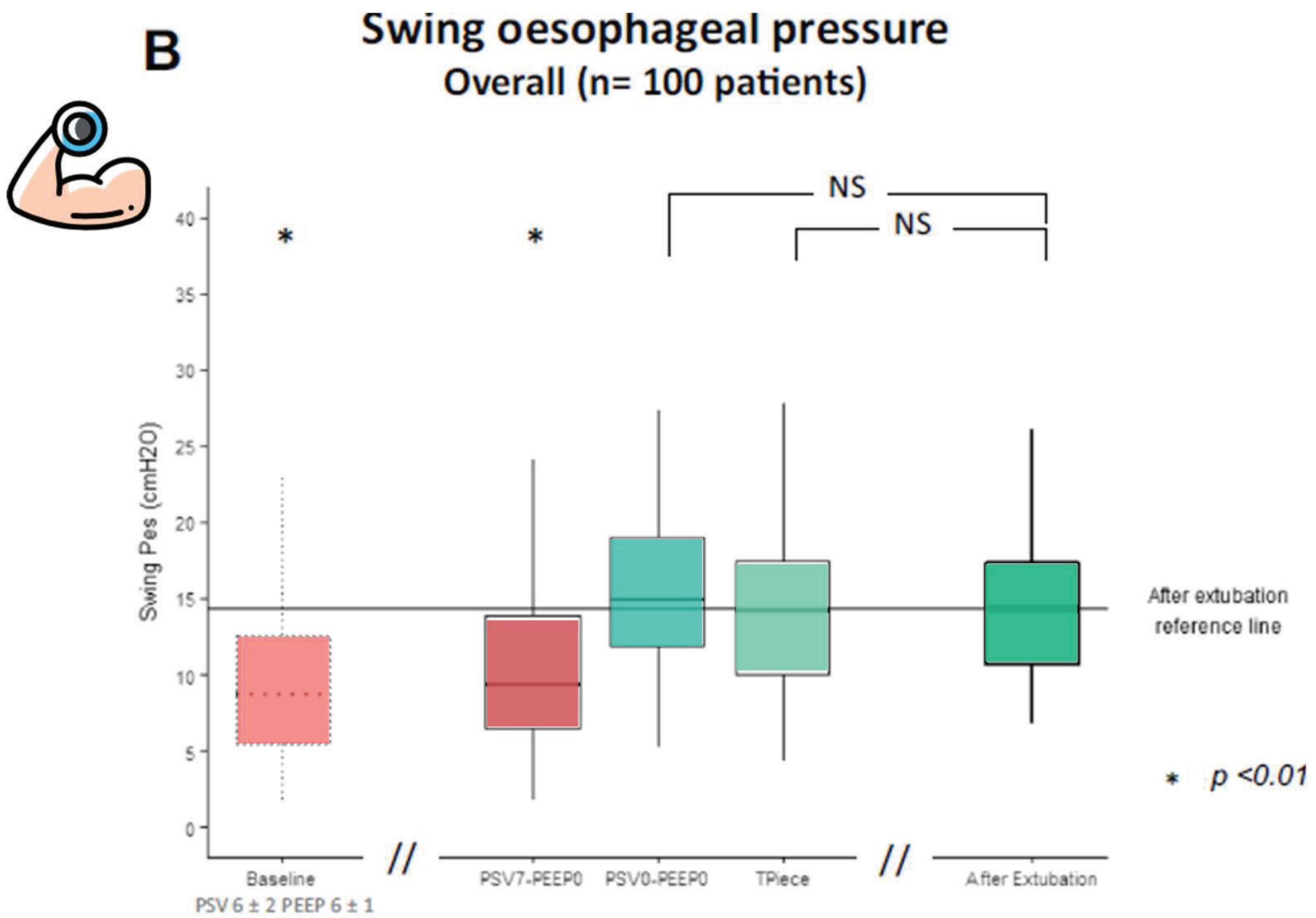
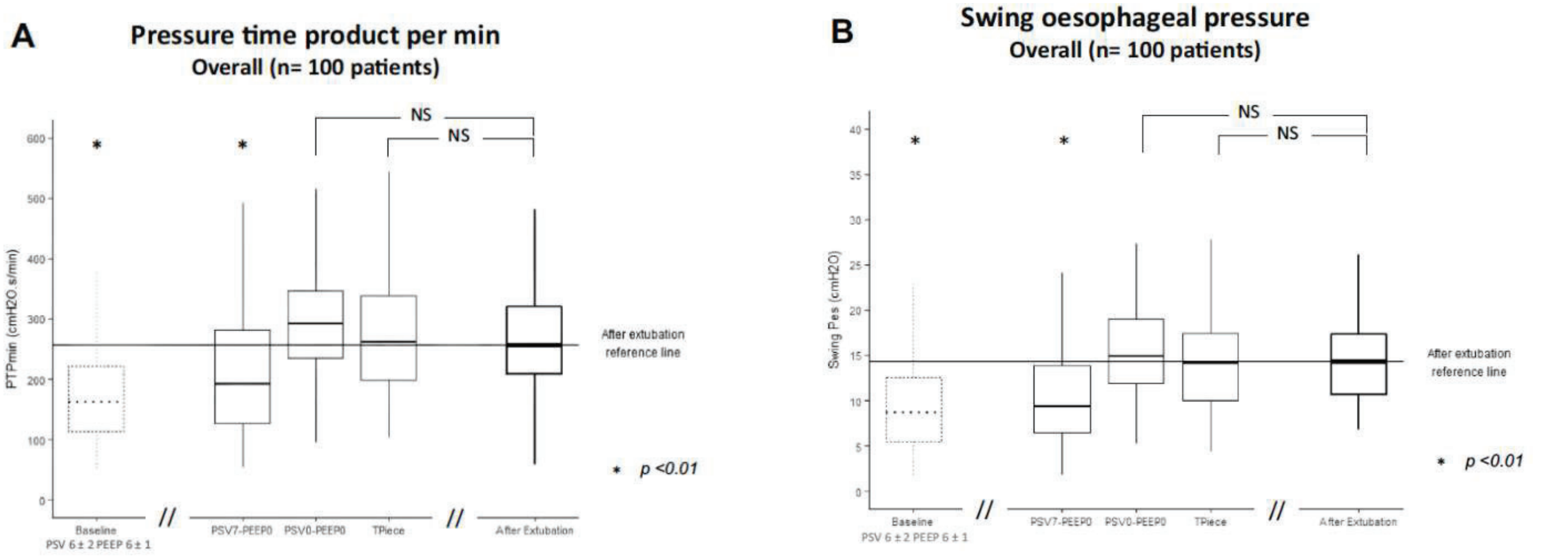
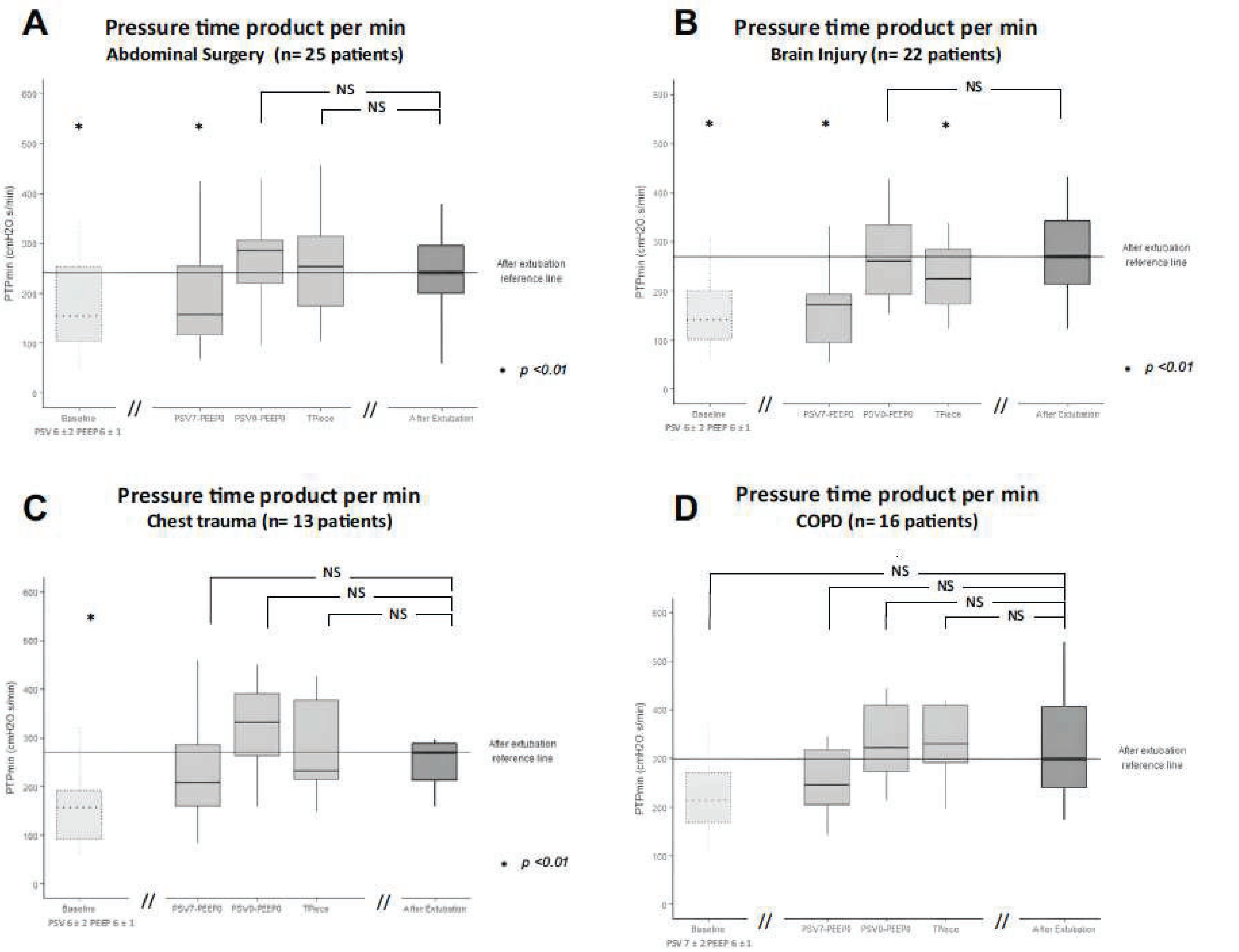




A
Pressure time product per min
Overall (n= 100 patients)
PTPmin (cmH2O.s/min)
NS
NS
After extubation reference line
* p <0.01
Baseline
PSV 6 ± 2 PEEP 6 ± 1
PSV7-PEEP0
PSV0-PEEP0
TPiece
After Extubation
B
Swing oesophageal pressure
Overall (n= 100 patients)
Swing Pes (cmH2O)
NS
NS
After extubation reference line
* p <0.01
Baseline
PSV 6 ± 2 PEEP 6 ± 1
PSV7-PEEP0
PSV0-PEEP0
TPiece
After Extubation

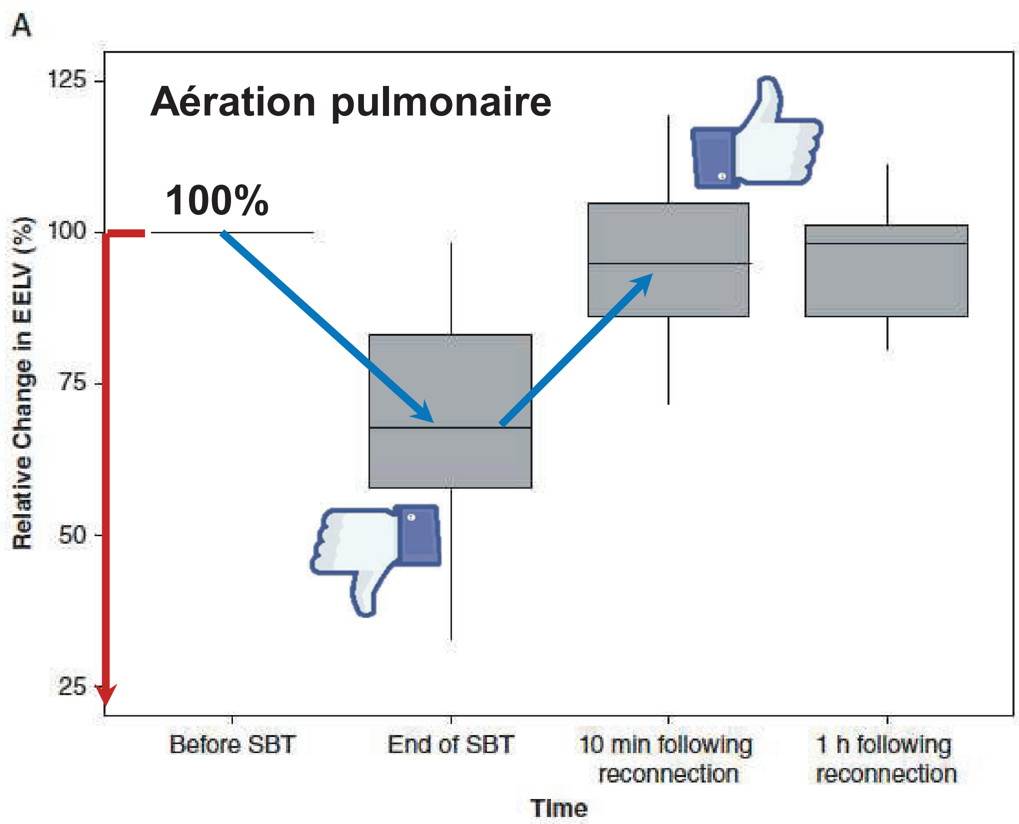
Critical illness	SBT method	Significant difference in comparison to pos-textubation*
Overall (*n* = 100)	PSV7-PEEP0	Yes
	PSV0-PEEP0	No
	TPiece	No
Abdominal surgery (*n* = 25)	PSV7-PEEP0	Yes
	PSV0-PEEP0	No
	TPiece	No
Brain injury (*n* = 22)	PSV7-PEEP0	Yes
	PSV0-PEEP0	No
	TPiece	Yes
Chest trauma (*n* = 13)	PSV7-PEEP0	No
	PSV0-PEEP0	No
	TPiece	No
COPD (*n* = 16)	PSV7-PEEP0	No
	PSV0-PEEP0	No
	TPiece	No
Miscellaneous (*n* = 24)	PSV7-PEEP0	No
	PSV0-PEEP0	Yes
	TPiece	No


A
Pressure time product per min
Abdominal Surgery (n= 25 patients)
NS
NS
*
*
PTPmin (cmH2O.s/min)
After extubation reference line
* p <0.01
Baseline
PSV 6 ± 2 PEEP 6 ± 1
PSV7-PEEP0
PSV0-PEEP0
TPiece
After Extubation
B
Pressure time product per min
Brain Injury (n= 22 patients)
NS
*
*
*
After extubation reference line
* p <0.01
Baseline
PSV 6 ± 2 PEEP 6 ± 1
PSV7-PEEP0
PSV0-PEEP0
TPiece
After Extubation
C
Pressure time product per min
Chest trauma (n= 13 patients)
NS
NS
NS
*
After extubation reference line
* p <0.01
Baseline
PSV 6 ± 2 PEEP 6 ± 1
PSV7-PEEP0
PSV0-PEEP0
TPiece
After Extubation
D
Pressure time product per min
COPD (n= 16 patients)
NS
NS
NS
NS
After extubation reference line
Baseline
PSV 7 ± 2 PEEP 6 ± 1
PSV7-PEEP0
PSV0-PEEP0
TPiece
After Extubation

CHEST

Physiologic Effects of Reconnection to the Ventilator for 1 Hour Following a Successful Spontaneous Breathing Trial

Rémi Coudroy, PhD; Alice Lejars, MD; Maeva Rodriguez, MD; Jean-Pierre Frat, PhD; Christophe Rault, PhD; François Arrivé, MD; Sylvain Le Pape, PhD; and Arnaud W. Thille, PhD



[Critical Care Original Research]

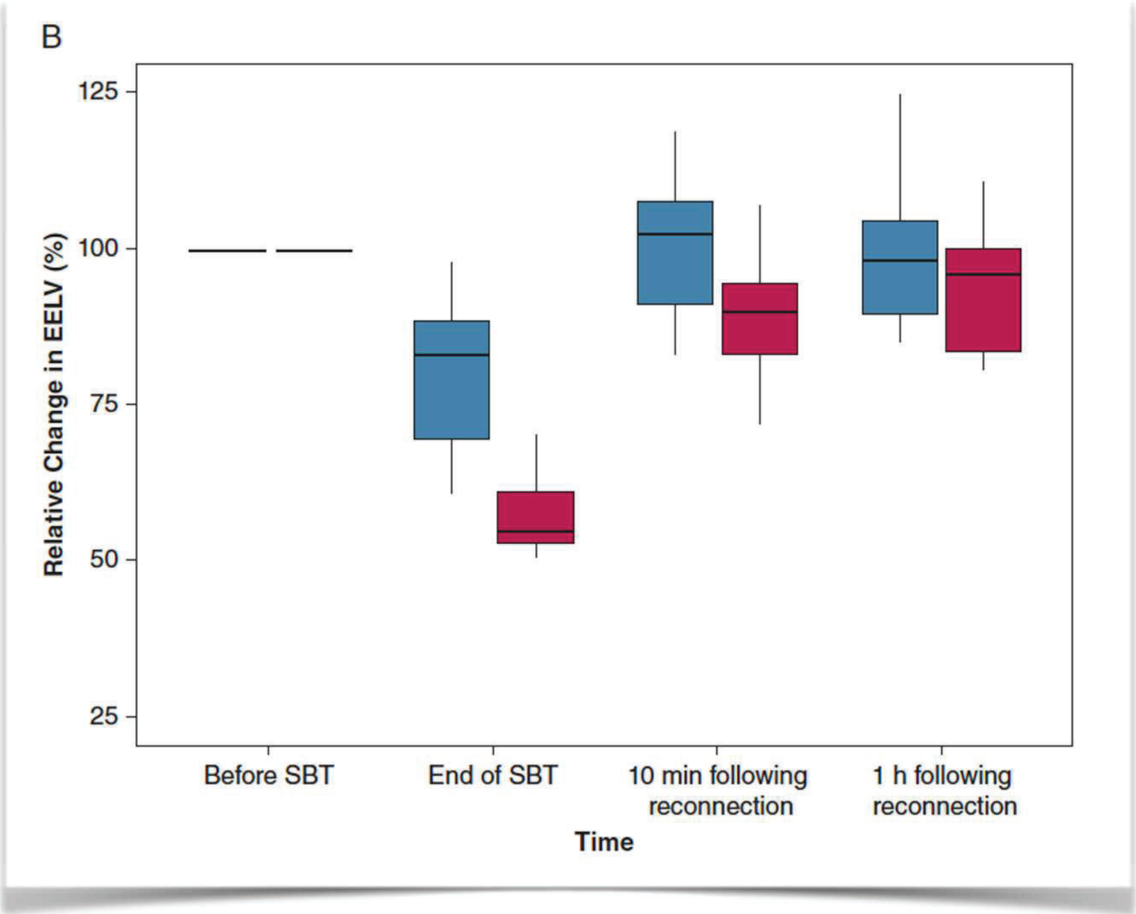
CHEST

Physiologic Effects of Reconnection to the Ventilator for 1 Hour Following a Successful Spontaneous Breathing Trial

Rémi Coudroy, PhD; Alice Lejars, MD; Maeva Rodriguez, MD; Jean-Pierre Frat, PhD; Christophe Rault, PhD; François Arrivé, MD; Sylvain Le Pape, PhD; and Arnaud W. Thille, PhD

VSAI 7/0

Tube en T



CHEST 2024;

The Lancet Respiratory Medicine
Volume 11, Issue 4, April 2023, Pages 319-328

Articles

Continued enteral nutrition until extubation compared with fasting before extubation in patients in the intensive care unit: an open-label, cluster-randomised, parallel-group, non-inferiority trial

A jeun 6 heures = Poursuite Nutrition jusqu'à extubation

Résultats essentiels

- Au total, 1130 patients ont été inclus en intention de traiter.
- L'interruption de la NE pré-extubation (n=513) n'a pas augmenté le risque de réintubation par rapport au groupe « poursuite NE » (n=617). En effet, dans la population en intention de traiter, 106 (17,2%) patients du groupe « poursuite NE » et 90 (17,5%) du groupe « arrêt NE » avaient un échec d'extubation dans les 7 jours suivant l'extubation (−0,4% ; IC95% −5,2 - 4,5).
- De plus, le délai entre test de ventilation spontanée / extubation et sortie de réanimation était raccourci dans le groupe « poursuite NE » ; hazard ratio à 1,39 (IC95%1,13-1,71).

Noninvasive Positive-Pressure Ventilation for Postextubation Respiratory Distress
A Randomized Controlled Trial

Sean P. Keenan, MD, FRCPC, MSc
Caroline Powers, RRT
David G. McCormack, MD, FRCPC
Gary Block, MD, FRCPC

JAMA
The Journal of the American Medical Association

Outcomes	NPPV (n = 39)	Standard Therapy (n = 42)	*P* Value
Reintubation, No. (%)	28 (72)	29 (69)	.79
Pneumonia, No. (%)	16 (41)	17 (40)	.61
Duration of ventilation†			
Mean (SD)	8.4 (7.4)	17.5 (28.0)	.11
Median (range)	6.7 (0.5-28.6)	8.9 (2.0-146.7)	.12
ICU length of stay			
Mean (SD)	15.1 (10.9)	19.4 (25.0)	.32
Median (range)	11.9 (3.6-41.7)	10.8 (2.3-152.7)	.72
Hospital length of stay			
Mean (SD)	32.2 (25.4)	29.8 (28.4)	.69
Median (range)	19 (6-111)	22 (4-162)	.51
ICU survival, No. (%)	33 (85)	32 (76)	.34
Hospital survival, No. (%)	27 (69)	29 (69)	.99

JAMA. 2002;287:3238-3244

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Noninvasive Positive-Pressure Ventilation for Respiratory Failure after Extubation

Andrés Esteban, M.D., Ph.D., Fernando Frutos-Vivar, M.D.,
Niall D. Ferguson, M.D., Yaseen Arabi, M.D.,
Carlos Apezteguía, M.D., Marco González, M.D., Scott K. Epstein, M.D.,
Nicholas S. Hill, M.D., Stefano Nava, M.D., Marco-Antonio Soares, M.D.,
Gabriel D'Empaire, M.D., Inmaculada Alía, M.D., and Antonio Anzueto, M.D.

CONCLUSIONS

Noninvasive positive-pressure ventilation does not prevent the need for reintubation or reduce mortality in unselected patients who have respiratory failure after extubation.

N Engl J Med 2004;350:2452-60.

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

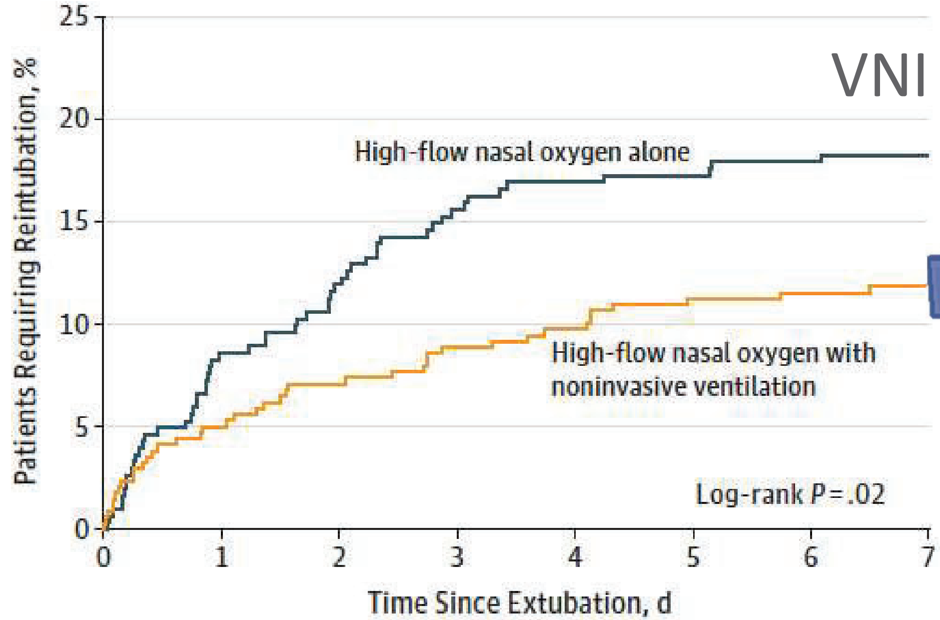
Effect of Postextubation High-Flow Nasal Oxygen With Noninvasive Ventilation vs High-Flow Nasal Oxygen Alone on Reintubation Among Patients at High Risk of Extubation Failure

A Randomized Clinical Trial

Sélection de patients à risque d'échec

Arnaud W. Thille, MD, PhD; Grégoire Muller, MD; Arnaud Gacouin, MD; Rémi Coudroy, MD; Maxens Decavèle, MD; Romain Sonneville, MD, PhD; François Beloncle, MD; Christophe Girault, MD; Laurence Dangers, MD; Alexandre Lautrette, MD, PhD; Séverin Cabasson, MD; Anahita Rouzé, MD; Emmanuel Vivier, MD; Anthony Le Meur, MD; Jean-Damien Ricard, MD, PhD; Keyvan Razazi, MD; Guillaume Barberet, MD; Christine Lebert, MD; Stephan Ehrmann, MD, PhD; Caroline Sabatier, MD; Jeremy Bourenne, MD; Gael Pradel, MD; Pierre Bailly, MD; Nicolas Terzi, MD, PhD; Jean Dellamonica, MD, PhD; Guillaume Lacave, MD; Pierre-Éric Danin, MD; Hodanou Nanadoumgar, MD; Aude Gibelin, MD; Lassane Zanre, MD; Nicolas Deye, MD, PhD; Alexandre Demoule, MD, PhD; Adel Maamar, MD; Mai-Anh Nay, MD; René Robert, MD, PhD; Stéphanie Ragot, PharmD, PhD; Jean-Pierre Frat, MD; for the HIGH-WEAN Study Group and the REVA Research Network

VNI 12H/J 48H



No. at risk	0	1	2	3	4	5	6	7
High-flow nasal oxygen								
Alone	302	276	265	253	248	246	244	243
With noninvasive ventilation	339	321	314	308	305	294	292	291

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

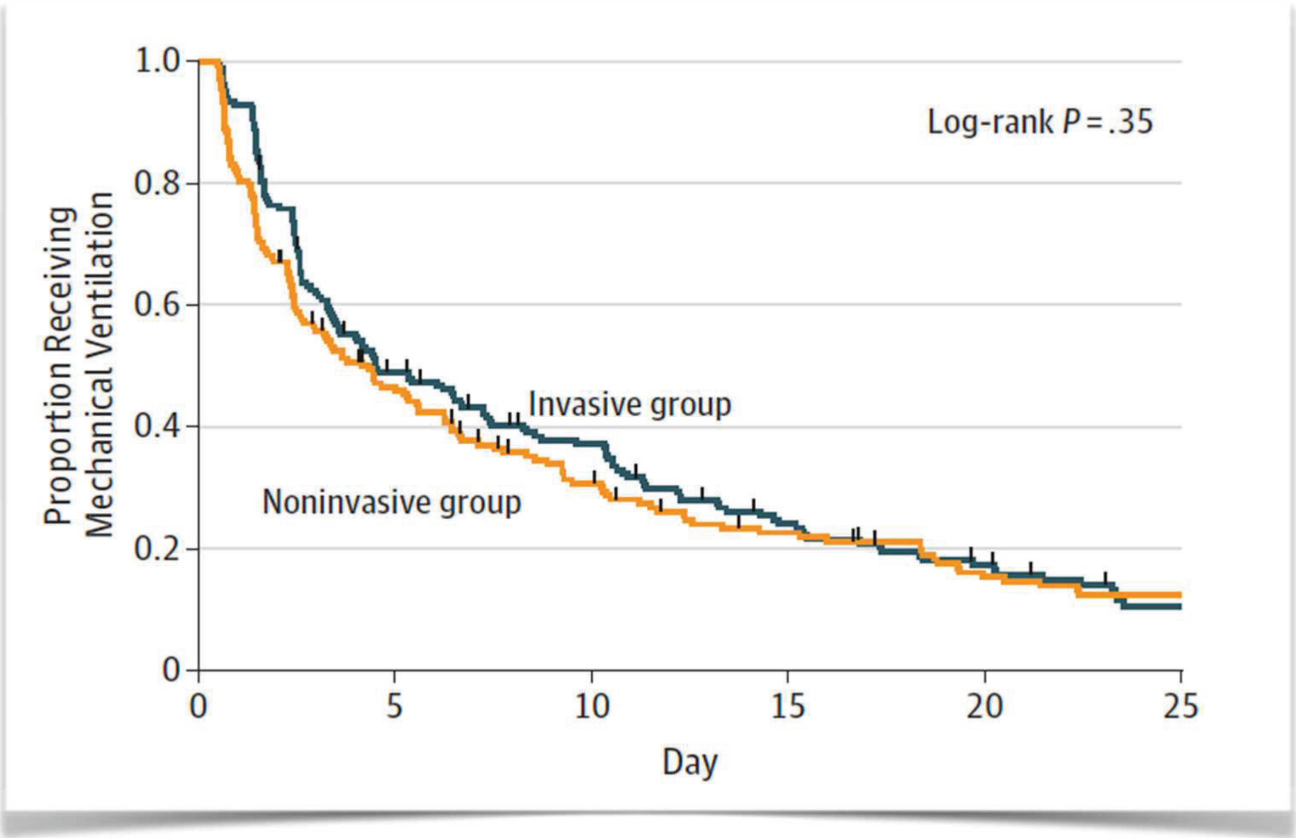
Effect of Protocolized Weaning With Early Extubation to Noninvasive Ventilation vs Invasive Weaning on Time to Liberation From Mechanical Ventilation Among Patients With Respiratory Failure

The Breathe Randomized Clinical Trial

JAMA
The Journal of the American Medical Association

Pas de précipitation

Gavin D. Perkins, MD; Dipesh Mistry, PhD; Simon Gates, PhD; Fang Gao, MD; Catherine Snelson, MB; Nicholas Hart, PhD; Luigi Camporota, PhD; James Varley, MB; Coralie Carle, MB; Elankumaran Paramasivam, MB; Beverley Hoddell; Daniel F. McAuley, MD; Timothy S. Walsh, MD; Bronagh Blackwood, PhD; Louise Rose, PhD; Sarah E. Lamb, DPhil; Stavros Petrou, PhD; Duncan Young, DM; Ranjit Lall, PhD; for the Breathe Collaborators



JAMA. 2018;320(18):1881-1888.

Conclusion

- Protocole de sevrage
- Screening quotidien des patients
- Adapter le niveau d’aide
- Améliorer l'interaction patient ventilateur
  - Synchronisation
  - Proportionnalité
  - Nouvel outil de monitorage au lit du patient: l’EAdi