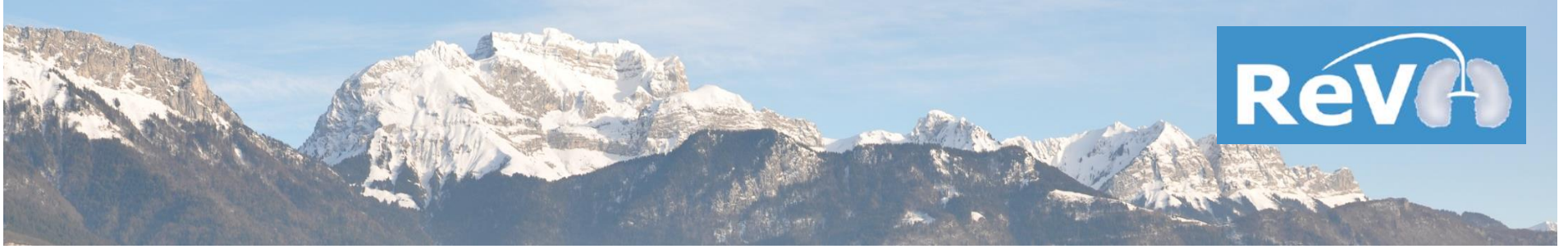


LA VENTILATION SPONTANEE AU COURS DU SDRA

Jean-Christophe M Richard, MD PhD

Emergency and Pre-Hospital divisions SAMU 74
INSERM UMR 955 Eq13
REVA: European Network on Mechanical Ventilation
ALMS: Medical Advisor

CONFLICTS OF INTEREST

Part Time:

Air Liquide Medical Systems

SAU Emergency and ICU department Annecy France

Research from our laboratory in Geneva was supported:

- VYGON
- MAQUET (NAVA)
- COVIDIEN (PAV+)
- DRAGER (SmartCare)
- GE (FRC)

DEFINITION

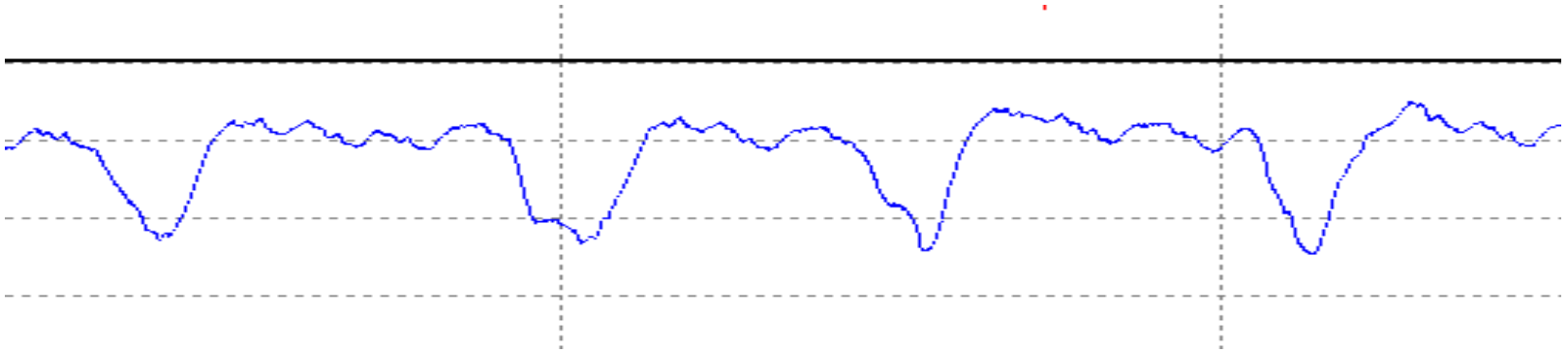
Spontaneous Ventilation : meaning what?

Spontaneous Ventilation refers to the spontaneous and sustained contraction of respiratory muscles

Paw

Flow

Pes



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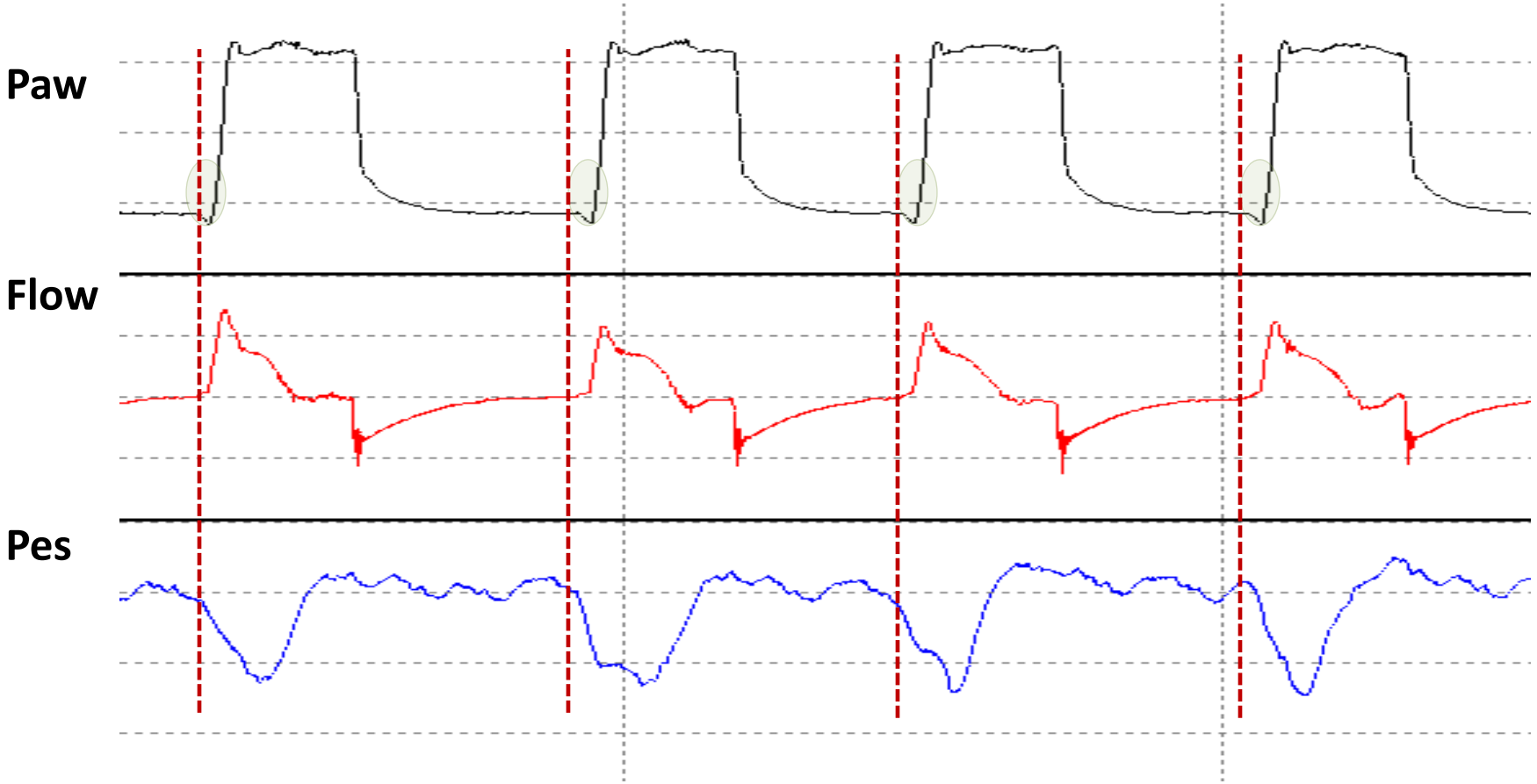
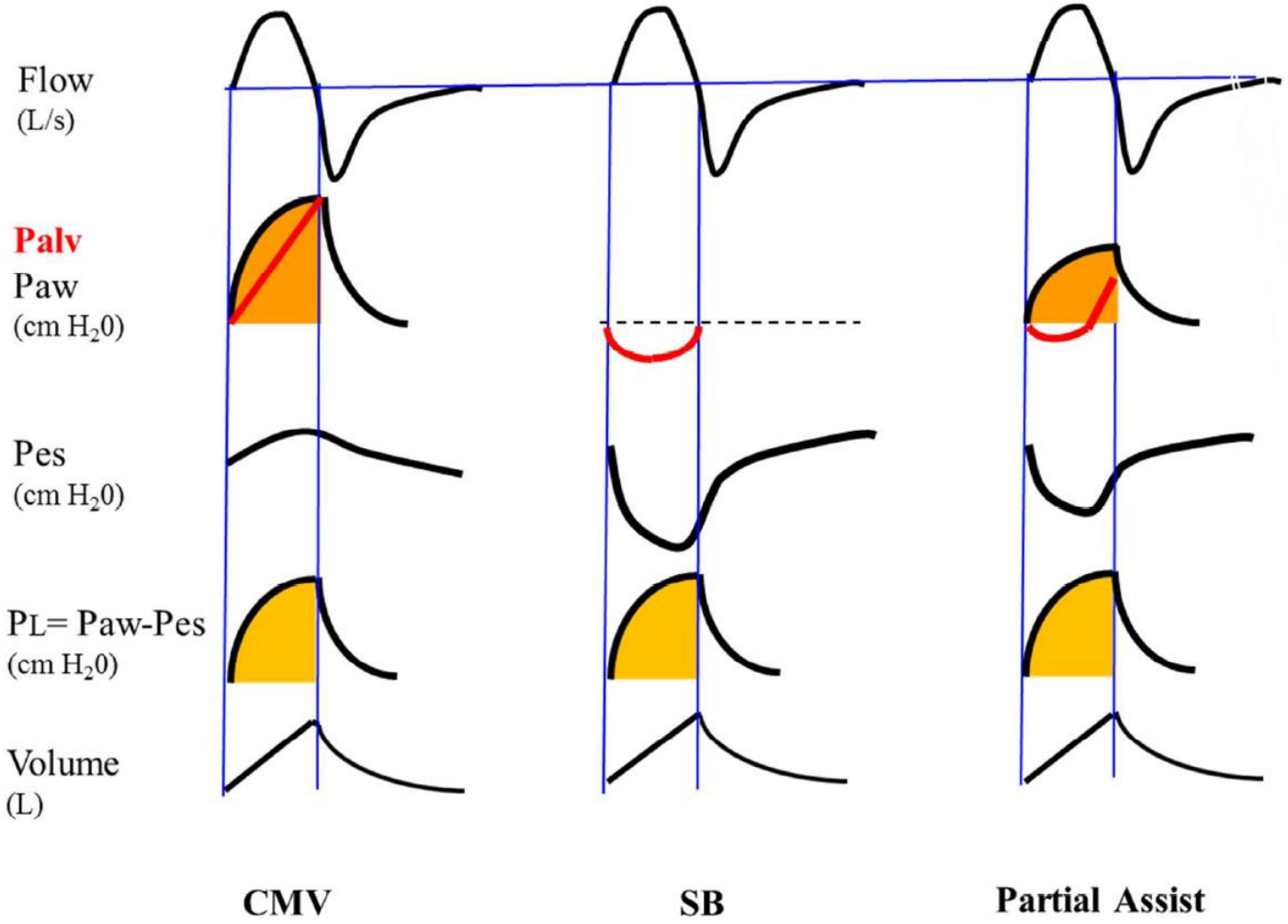


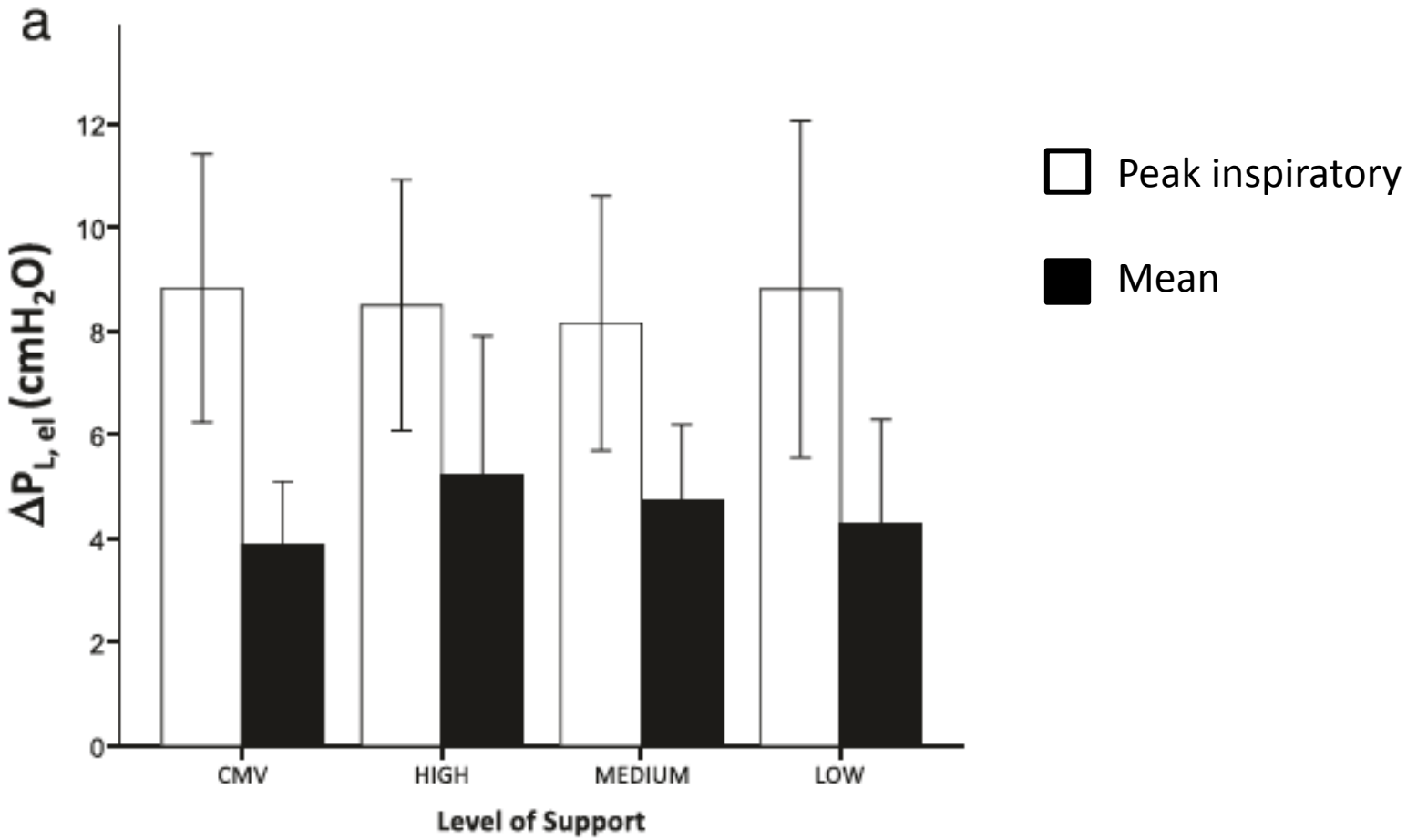
MECHANICAL VENTILATION TO MINIMIZE PROGRESSION OF LUNG INJURY IN ACUTE RESPIRATORY FAILURE

Laurent Brochard[1,2], Arthur Slutsky[1,2], Antonio Pesenti[3,4]

American Journal of Respiratory and Critical Care Medicine/AJRCCM



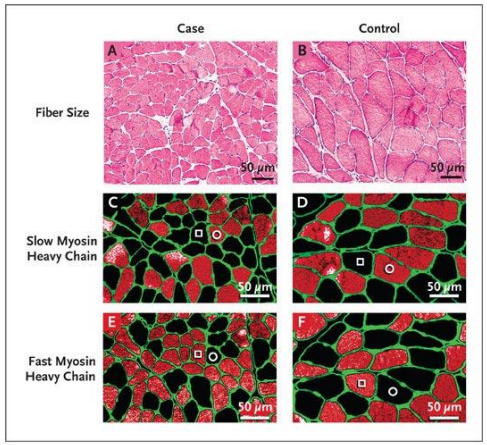
Do spontaneous and mechanical breathing have similar effects on average transpulmonary and alveolar pressure? A clinical crossover study



Bellani et al. Crit Care 2016

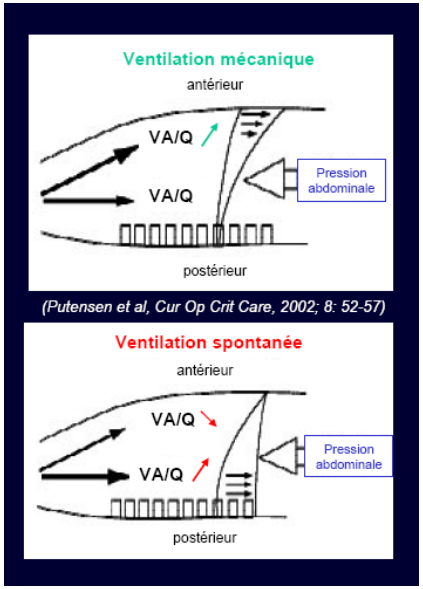
WHY IS SPONTANEOUS BREATHING DESIRABLE?

Preserve Respiratory Muscle Function (avoid VIDD)



Levine S et al. N Engl J Med 2008
Jaber et al. Am J Respir Crit Care Med 2013

Improve VA/Q and Regional Ventilation



Putensen et al. Am J Respir Crit Care Med 1999

Reduce sedation and days with MV

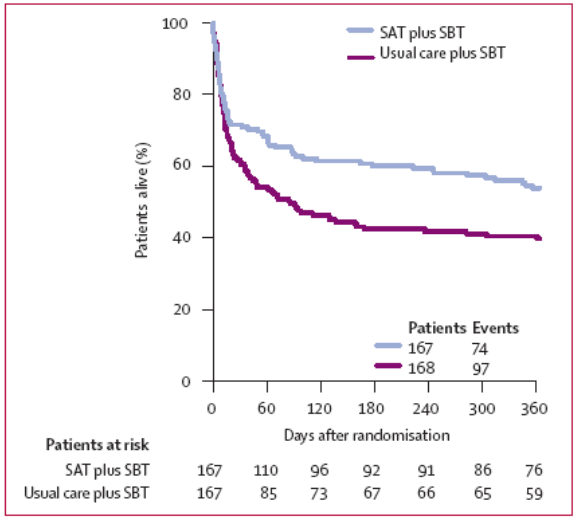


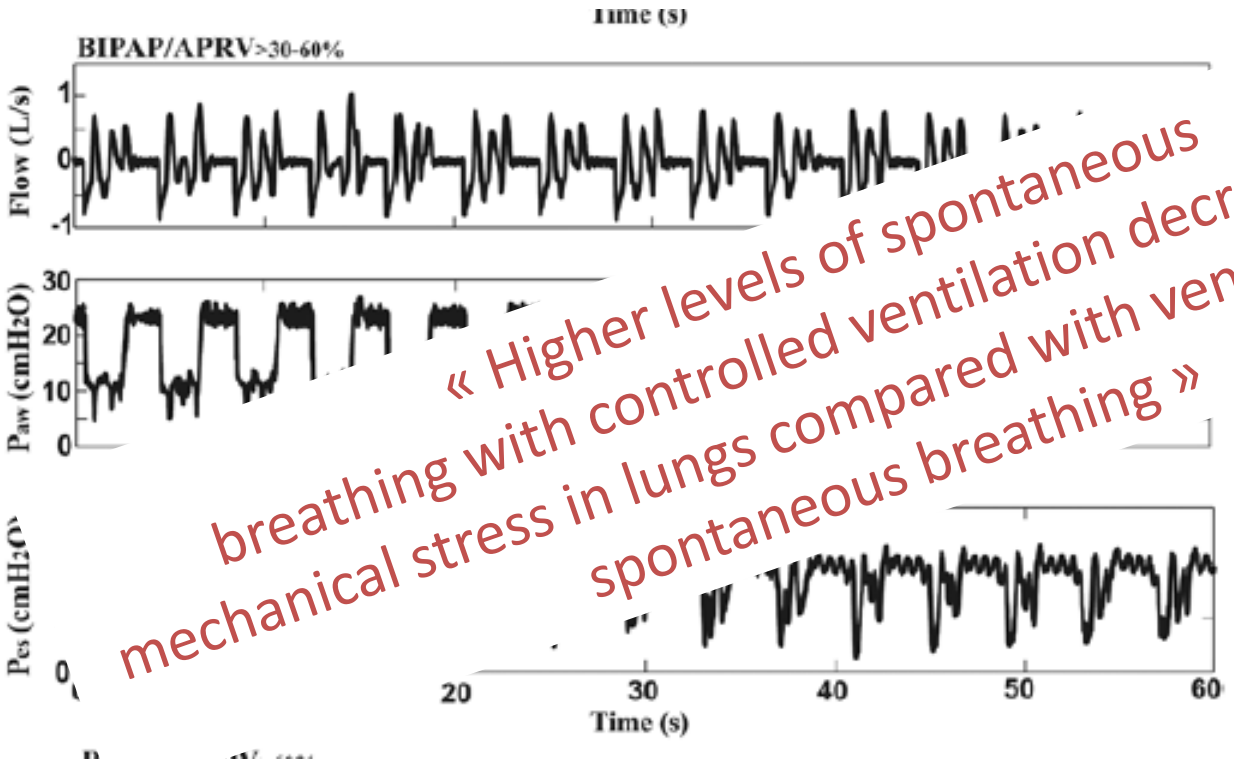
Figure 4: Survival at 1 year
Events indicate the number of deaths in each group in the year after enrolment.

Girard et al. Lancet 2008

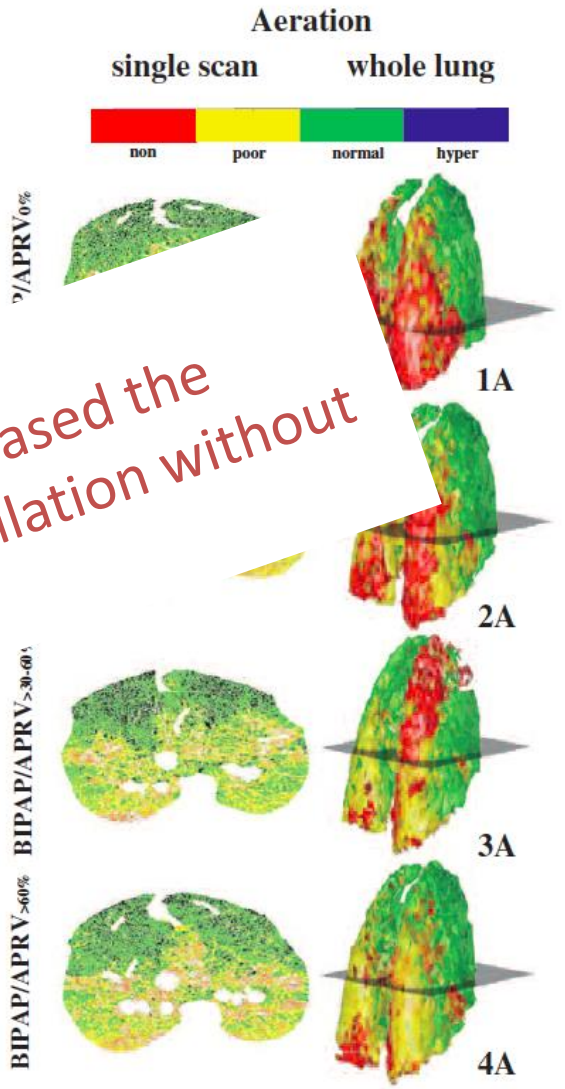
Higher Levels of Spontaneous Breathing Induce Lung Recruitment and Reduce Global Stress/Strain in Experimental Lung Injury

Andreas Güldner, M.D., Anja Braune, M.Sc., Nadja Carvalho, Ph.D., Alessandro Beda, Ph.D., Stefan Zeidler, M.S., Bärbel Wiedemann, Ph.D., Gerd Wunderlich, Ph.D., Michael Andreeff, Ph.D., Christopher Uhlig, M.D., Peter M. Spieth, M.D., Thea Koch, M.D., Ph.D., Paolo Pelosi, M.D., Jörg Kotzerke, M.D., Ph.D., Marcelo Gama de Abreu, M.D., M.Sc., Ph.D., D.E.S.A.

APRV with 1/1 or 1/2 IE ratio



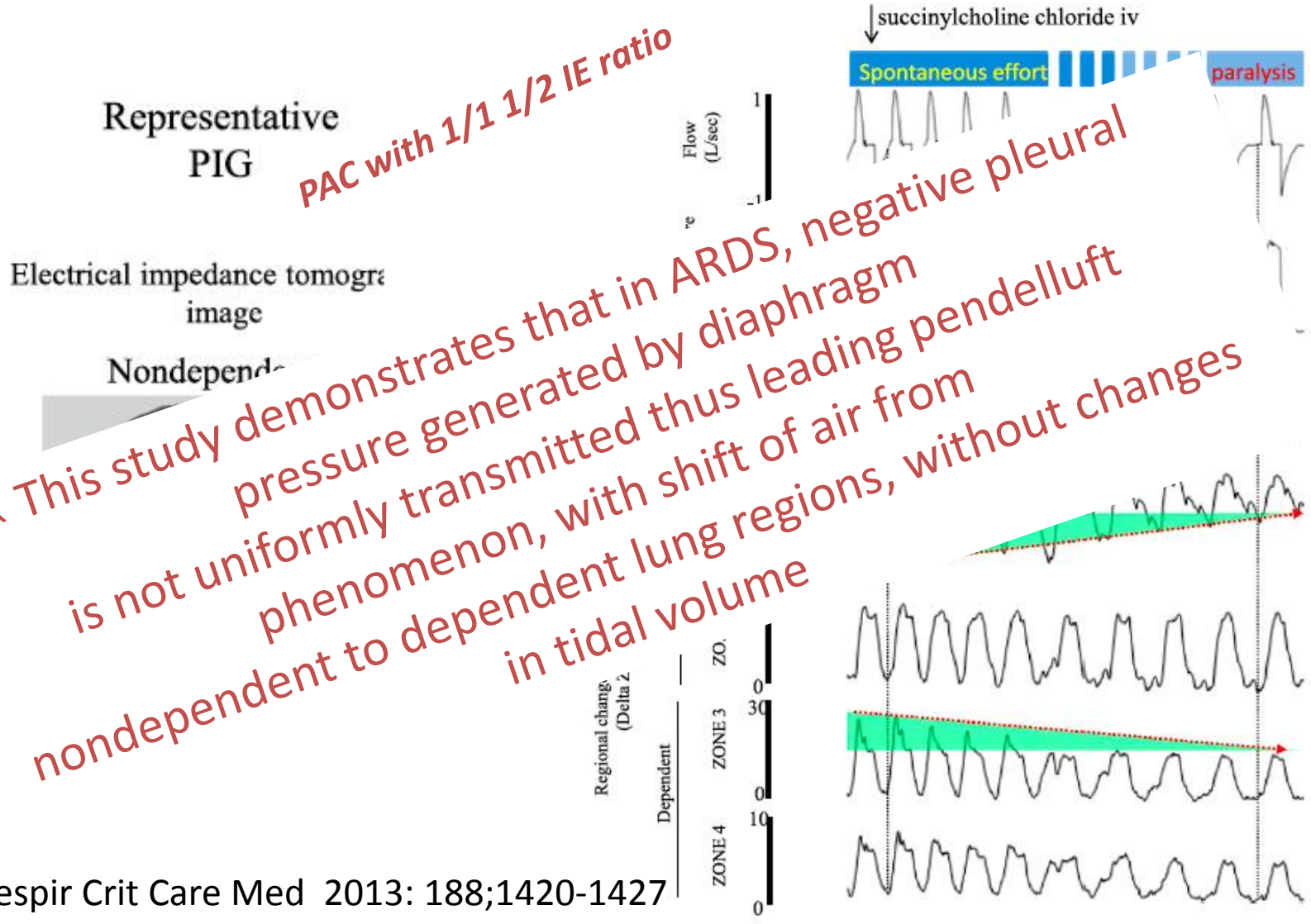
« Higher levels of spontaneous breathing with controlled ventilation decreased the mechanical stress in lungs compared with ventilation without spontaneous breathing »



Anesthesiology 2014

Spontaneous Effort Causes Occult Pendelluft during Mechanical Ventilation

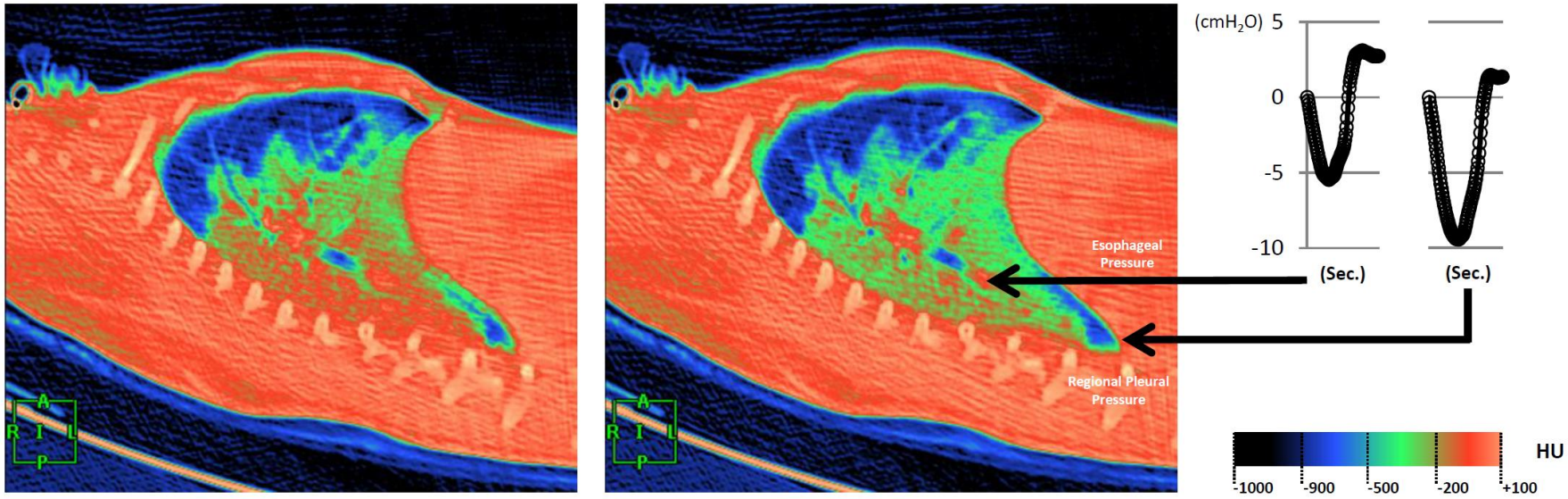
Takeshi Yoshida[1,2], Vinicius Torsani[1], Susimeire Gomes[1], Roberta R. De Santis[1], Marcelo A. Beraldo[1], Eduardo L. V. Costa[1], Mauro R. Tucci[1], Walter A. Zin[3], Brian P. Kavanagh[4,5], and Marcelo B. P. Amato[1]



Am J Respir Crit Care Med 2013: 188;1420-1427

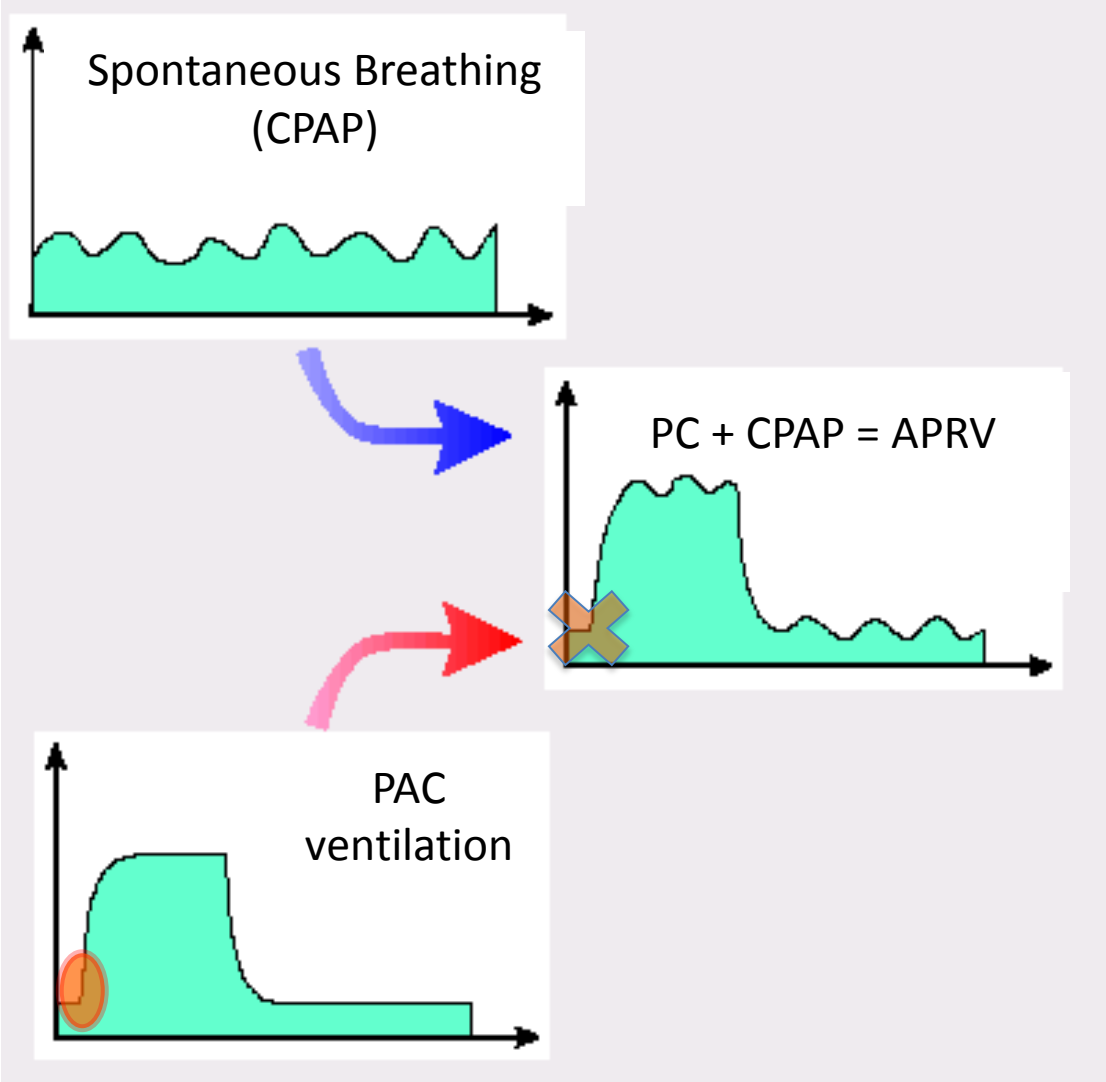
Spontaneous Breath *End-Expiration*

Spontaneous Breath *End-Inspiration*



Yoshida T et AJRCCM 2016

Different working priciple in pressure regulated modes



IS SPONTANEOUS VENTILATION AND RELATED VT AFFECTED BY THE MODE OF VENTILATION ?

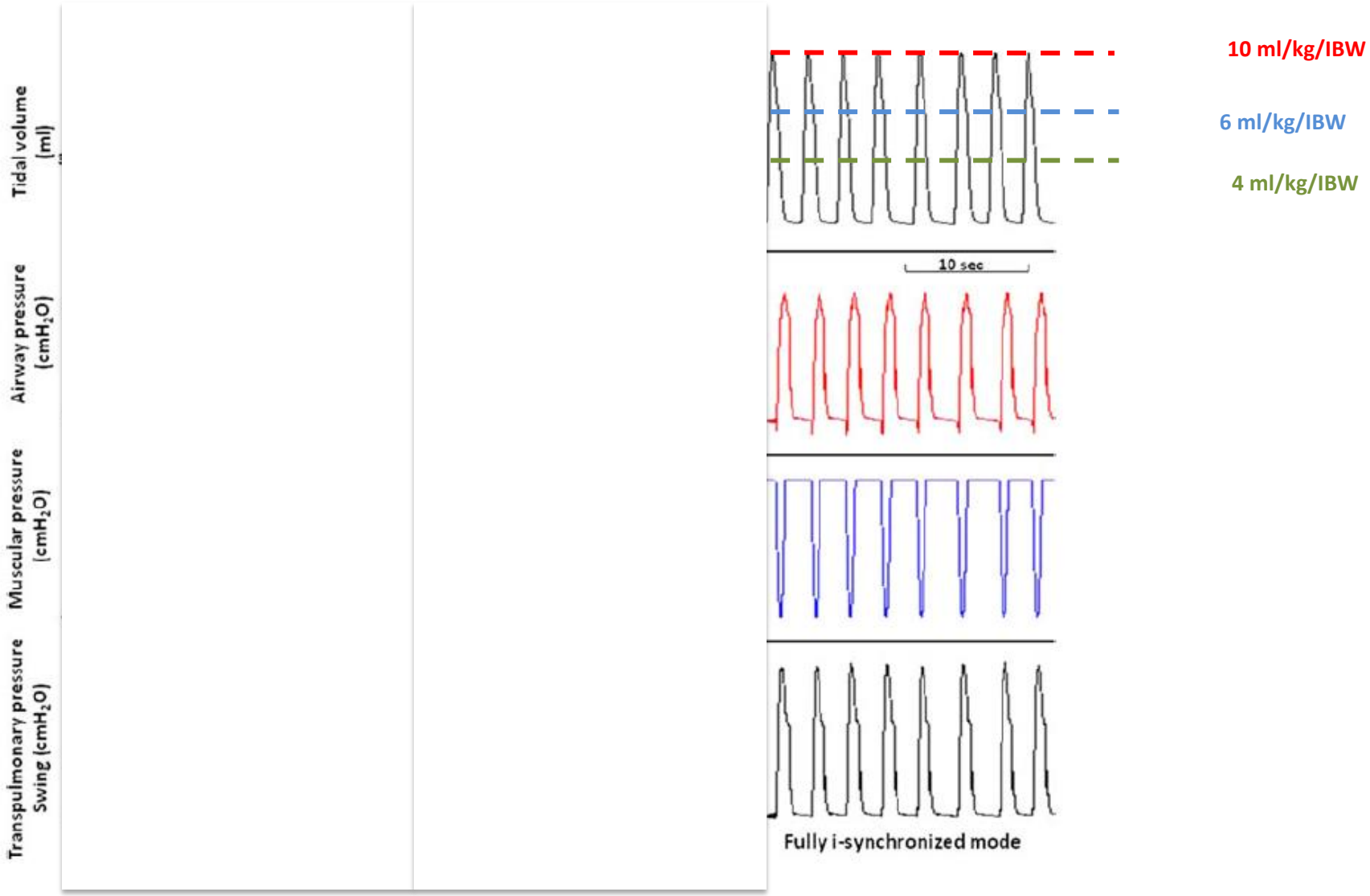
J. C. M. Richard
A. Lyazidi
E. Akoumianaki
S. Mortaza
R. L. Cordioli
J. C. Lefebvre
N. Rey
L. Piquilloud
G. F. Sferrazza-Papa
A. Mercat
L. Brochard

Potentially harmful effects of inspiratory synchronization during pressure preset ventilation

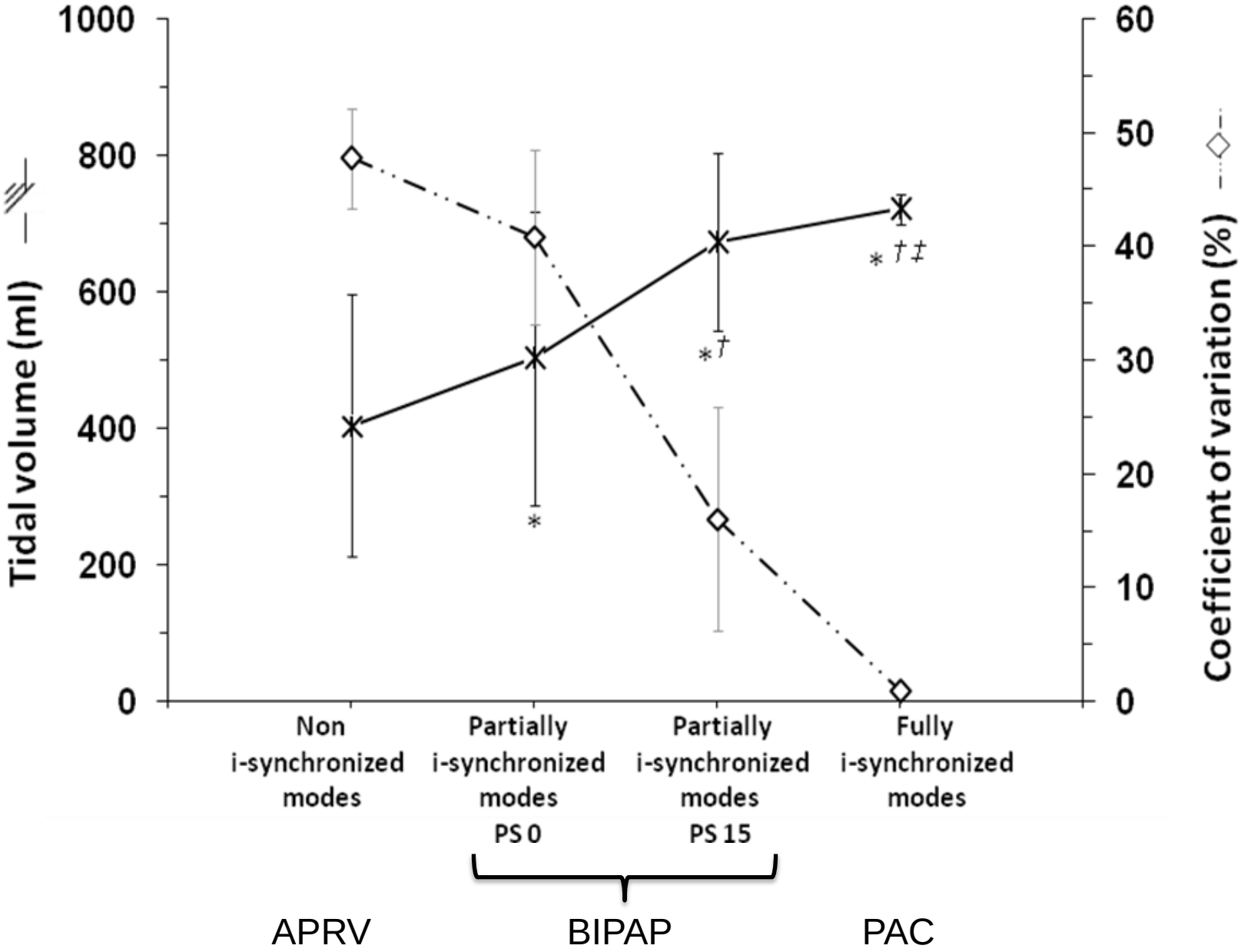
- APRV (Non inspiratory syncronized)
- BIPAP (partially i synchronized)
- PAC (full i synchronized)

Intensive Care Med. 2013;39:2003-10

VT change in the presence of spontaneous breaths according to i-synchronization

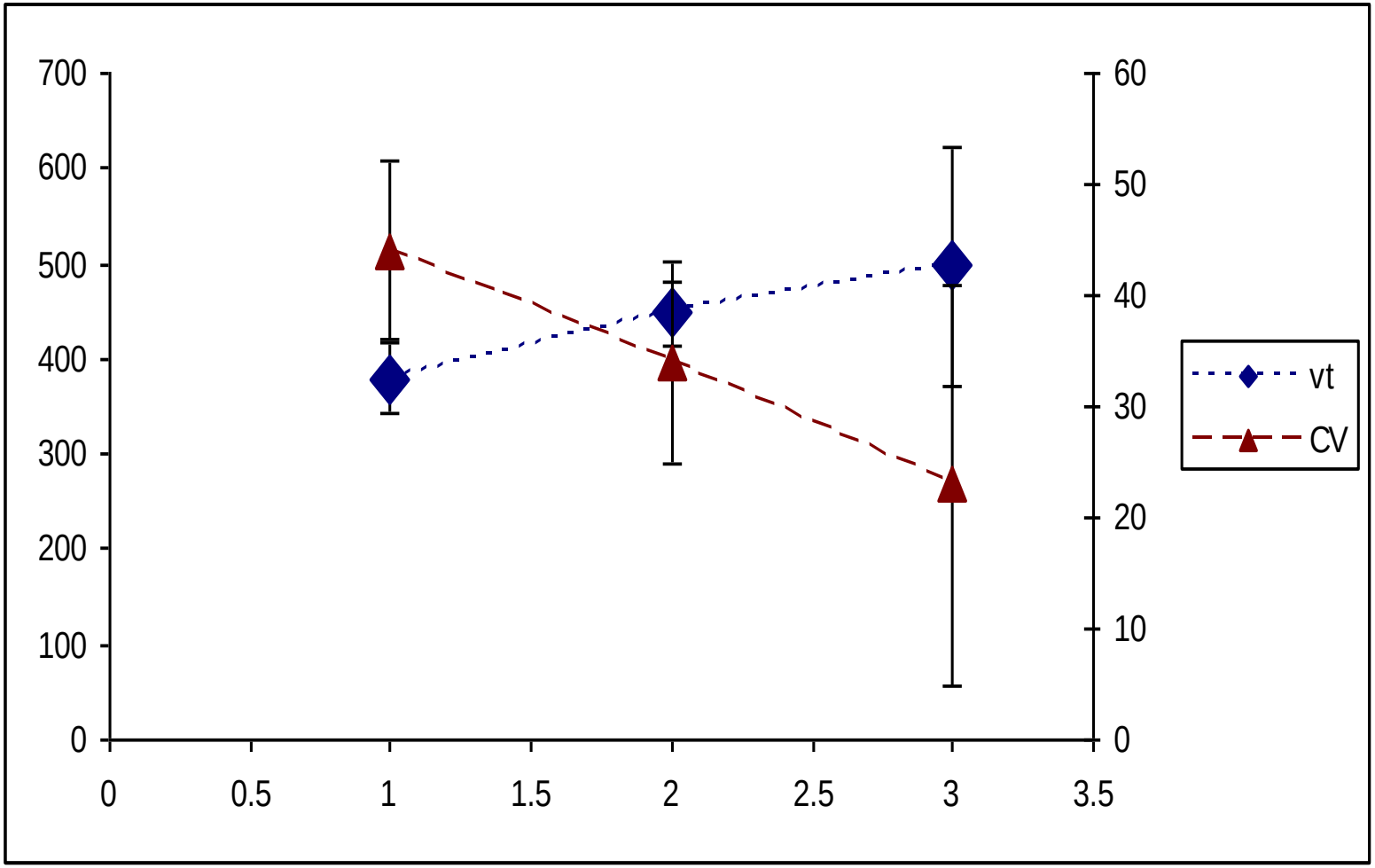


BENCH OBSERVATIONS



Clinical observations :

4 ARDS Patients successively ventilated with APRV and BIPAP and PAC

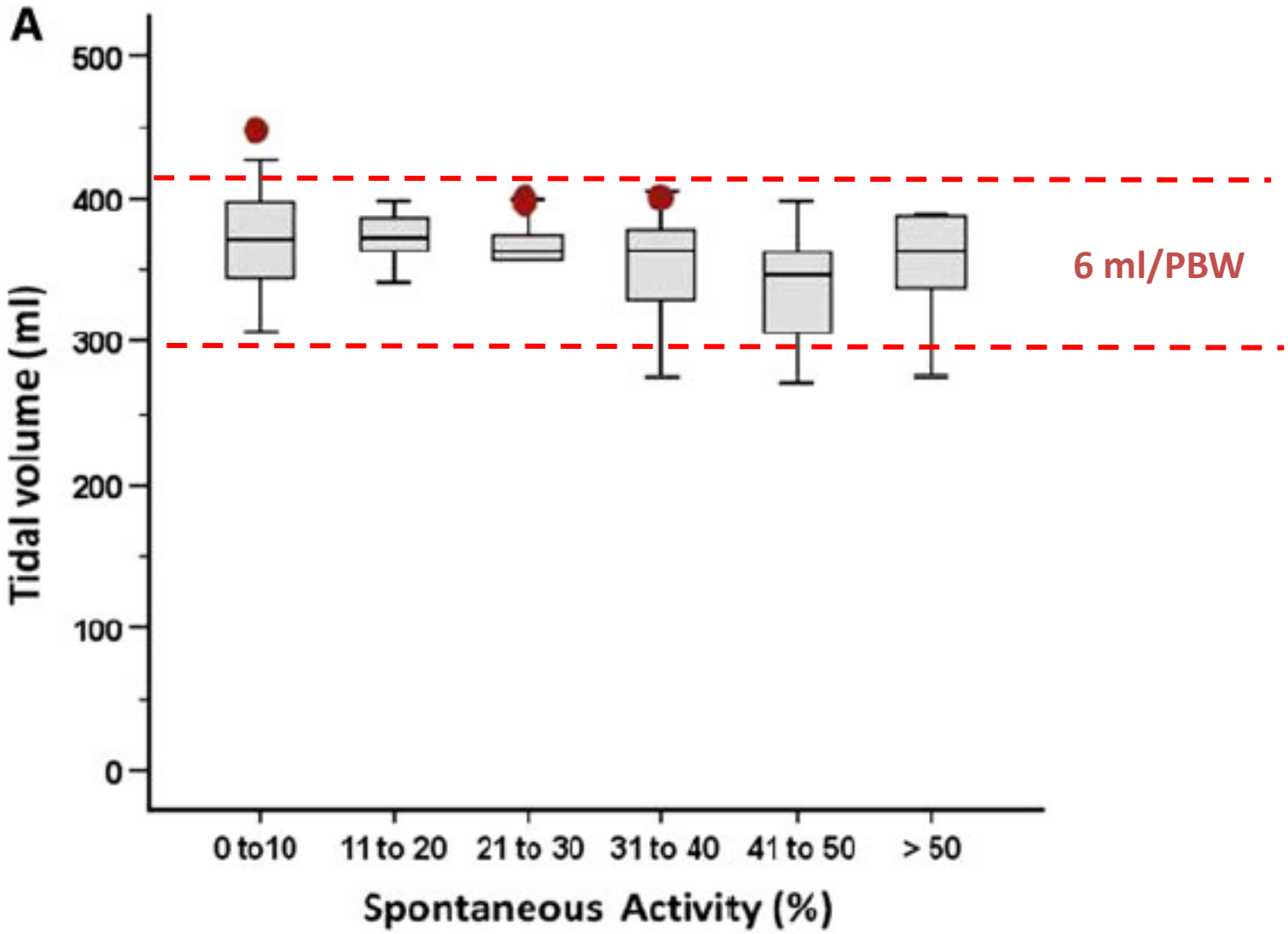


APRV - BIPAP (PS= 0) - PAC

Intensive Care Med. 2013;39:2003-10

Clinical observations :

8 ARDS patients under APRV over 5 days



Intensive Care Med. 2013;39:2003-10

Long-Term Effects of Spontaneous Breathing During Ventilatory Support in Patients with Acute Lung Injury

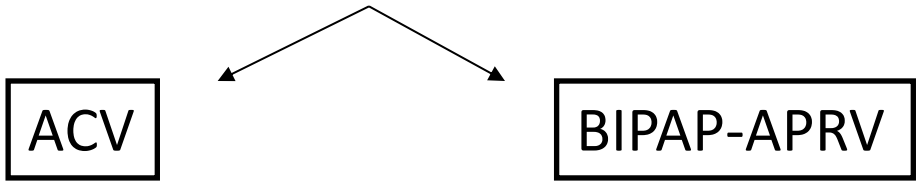
CHRISTIAN PUTENSEN, SABINE ZECH, HERMANN WRIGGE, JÖRG ZINSERLING, FRANK STÜBER, TILMANN VON SPIEGEL, and NORBERT MUTZ

MV (days)	21± 2	15± 2	.03
ICU stay (days)	30± 2	23± 2	.03
Mortality	26 %	20 %	ns

Am J Respir Crit Care Med Vol 164. pp 43–49, 2001

Ventilation settings

H0 H3: ACV Vt = 6 ml/kg PBW and PEP : pour Pplat = 28 cmH2O

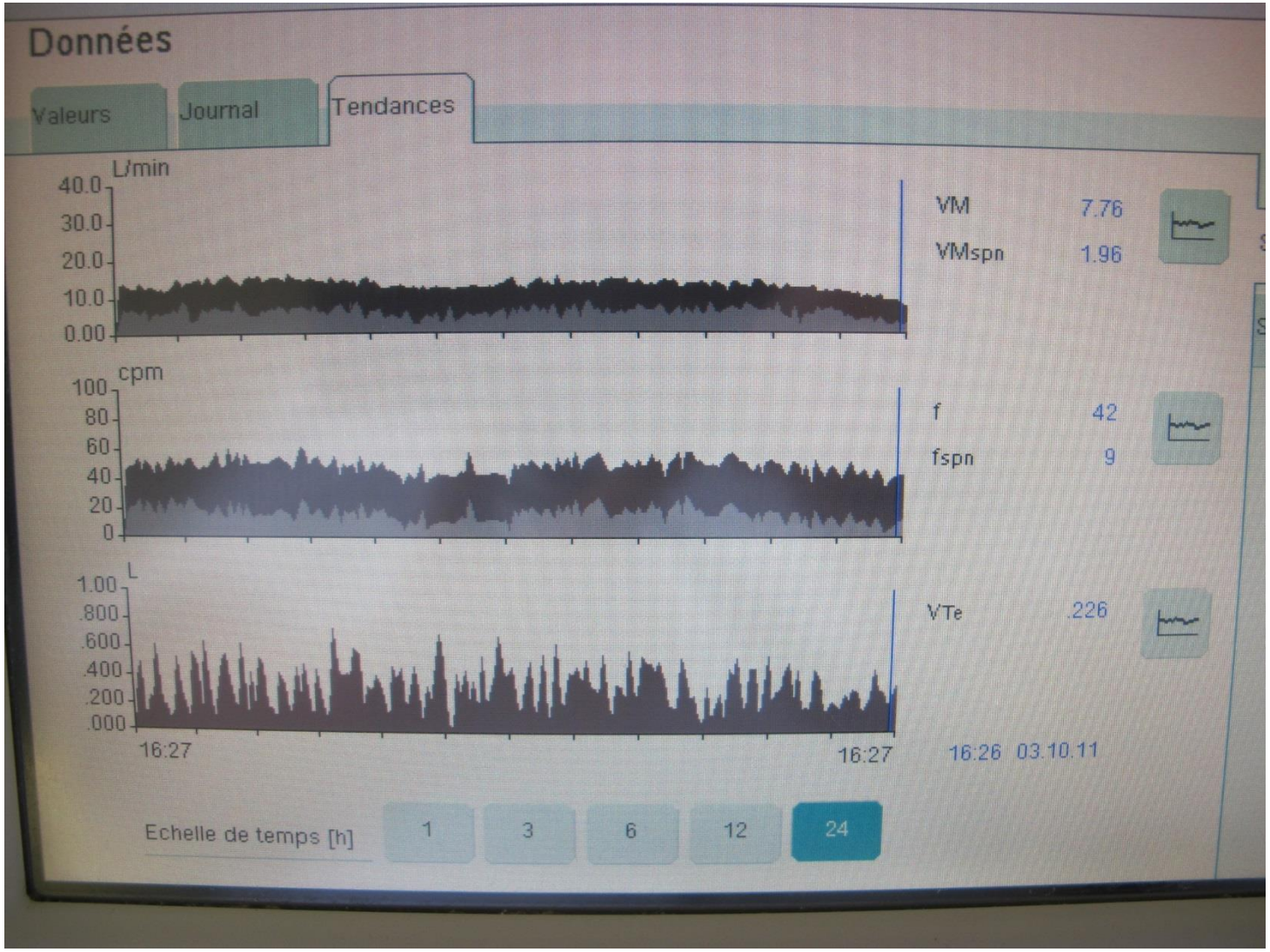


- **Mode : VAC**
- Vt = 6 ml/kg PBW
- Insp flow. : 50 à 70 L/mn
- PEP : pour Pplat = 28 cmH2O

- **Mode : APRV**
- Thigh : 1s
- Tlow : for FR = FR during VAC
- Plow : idem PEEP en ACV
- Phigh : for Vt=6ml/kg PBW and Pplat max = 28 cmH2O

Principal Investigator:
JCM Richard
L Brochard
A Mercat

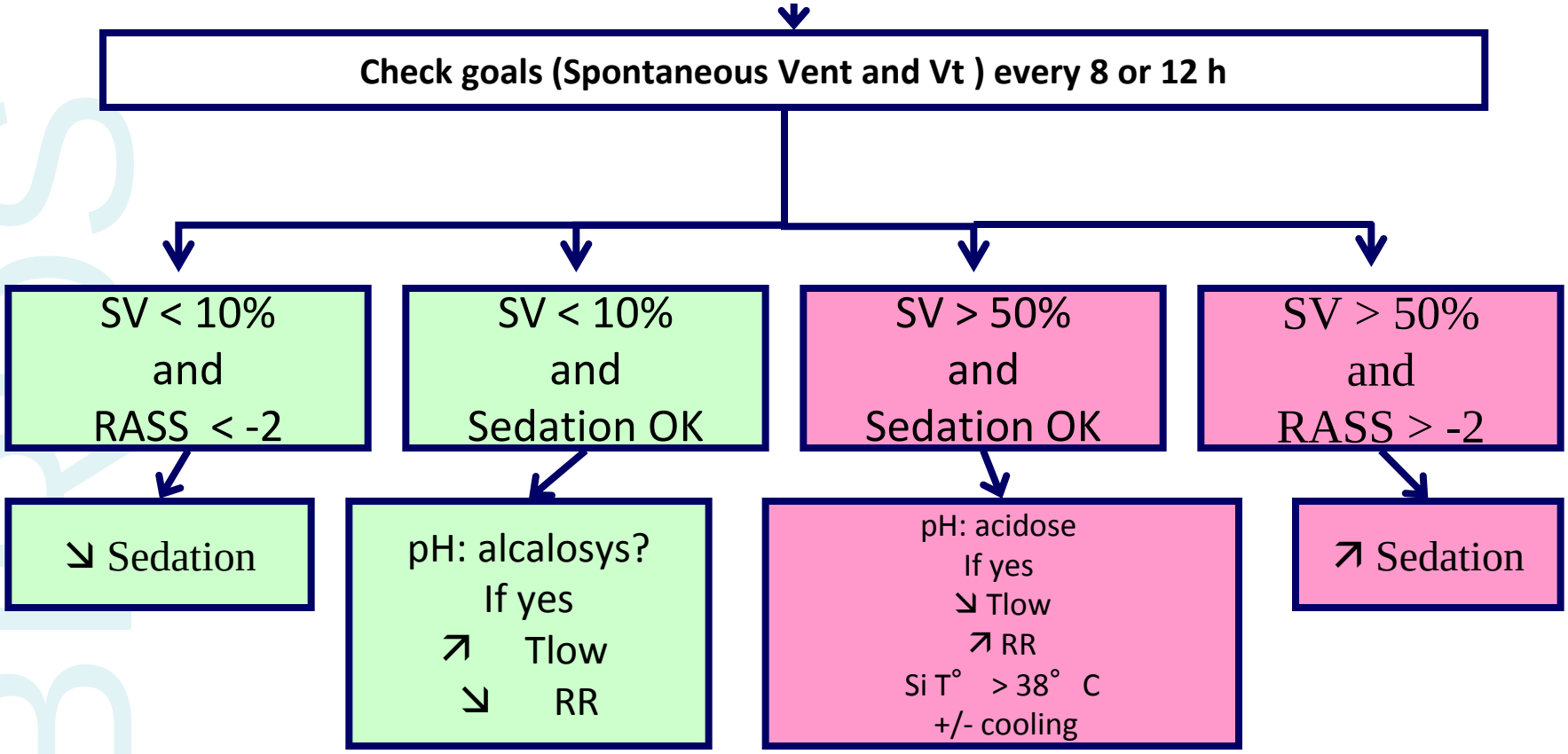
BIPAP-APRV → ventilation spontannée



Management of spontaneous ventilation

BIPAP-APRV

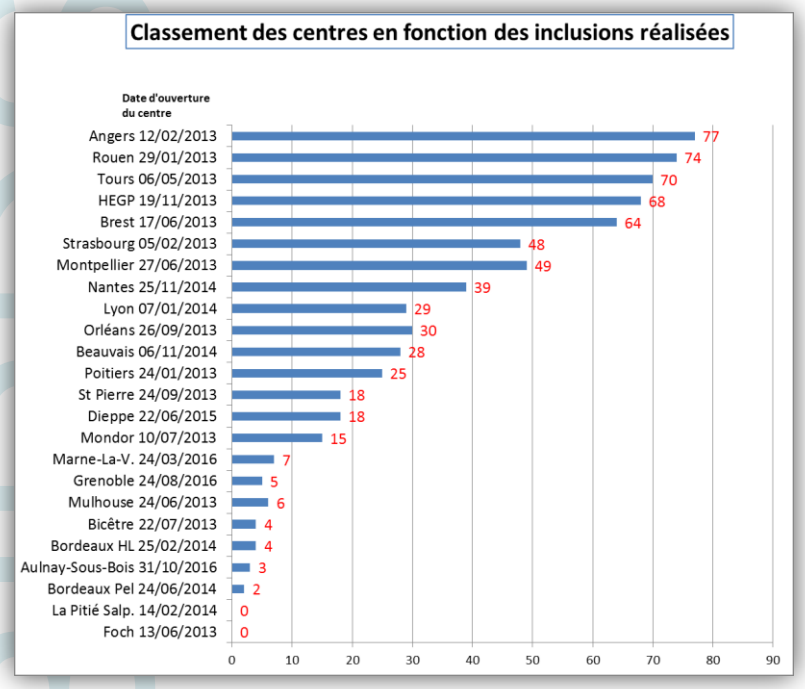
- Spontaneous Ventilation = 10 à 50 % of VM tot

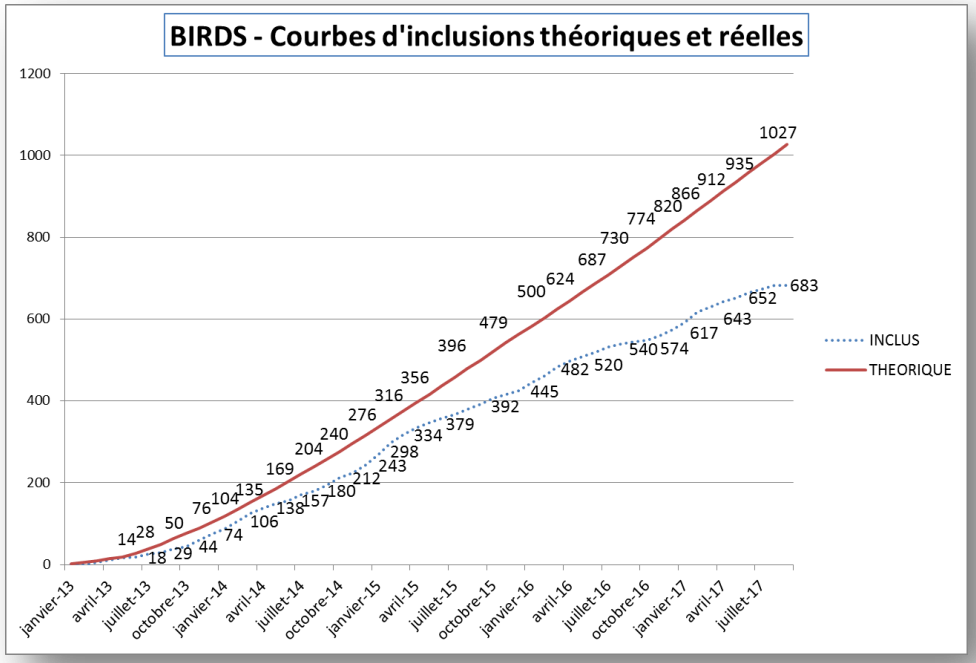


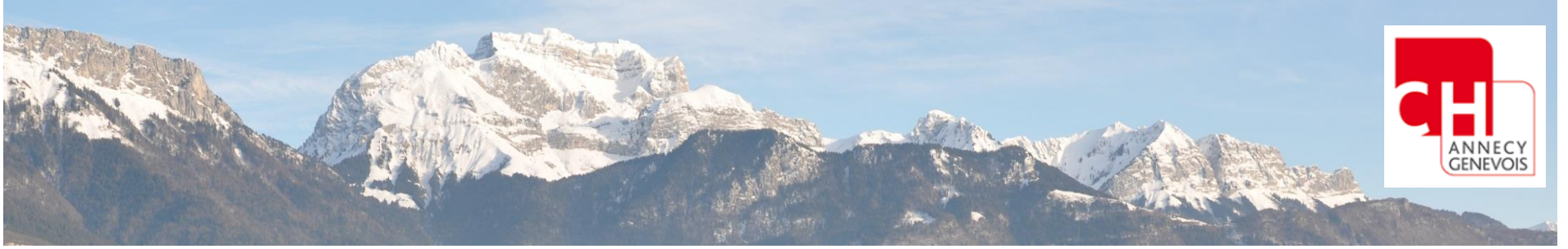
Chers investigateurs, chers collègues, chers amis,

Nous sommes actuellement à **683 patients inclus**.
Plus que **17 patients** à inclure d'ici **décembre 2017** pour atteindre les **700 patients attendus** !

Vous avez réalisé **54 inclusions** entre Avril et Août 2017. **Félicitations !**
Un grand **merci** pour votre **implication et votre motivation !**







CONCLUSIONS

- At the early phase of ARDS Vt and TPP control are the priority
- Moderate level of spontaneous ventilation may be beneficial in these setting.
- Pressure modes of ventilation work differently depending of there level of inspiratory synchronization.
- APRV may be interesting to combine protective ventilation and spontaneous diaphragmatic activity.

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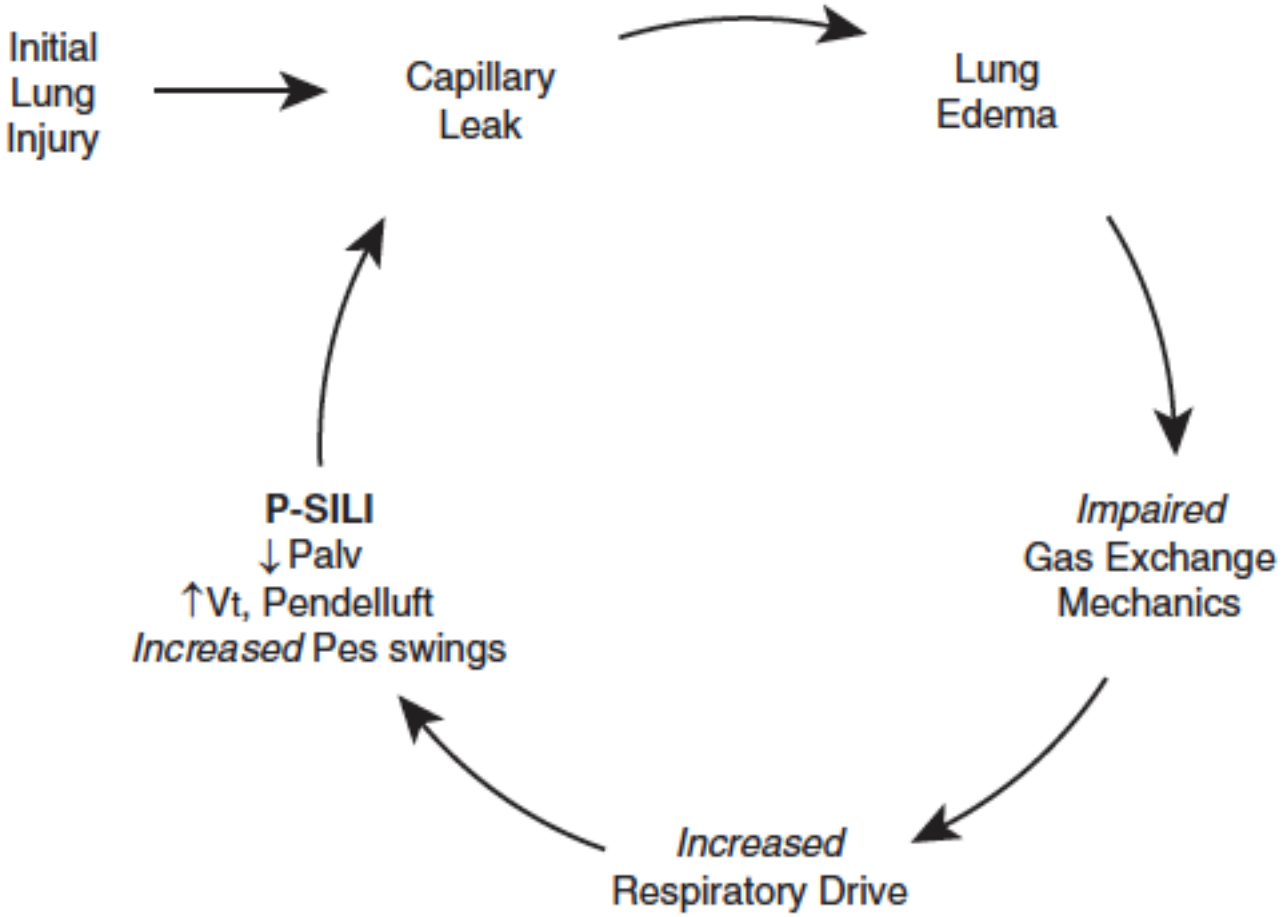
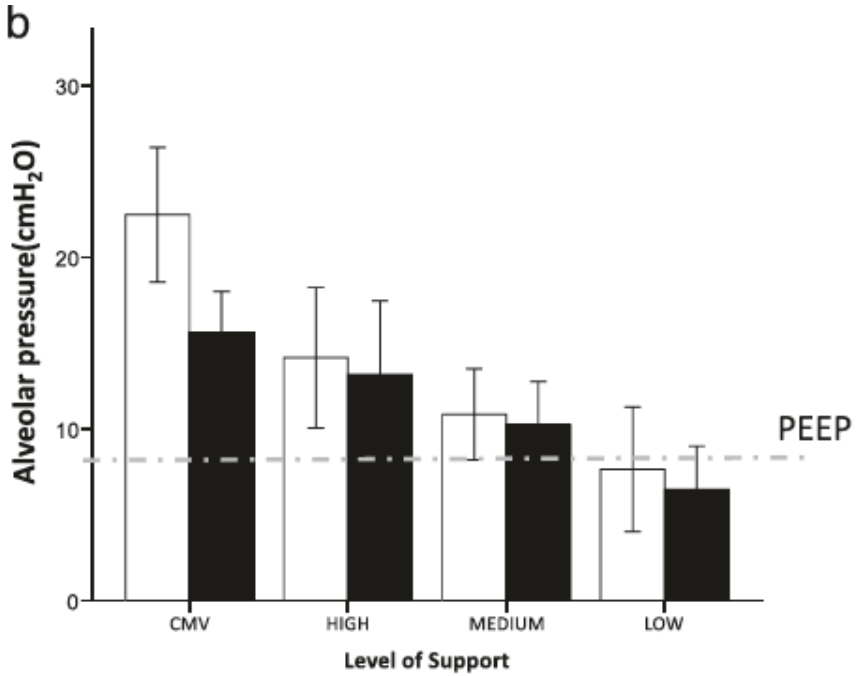


Do spontaneous and mechanical breathing have similar effects on average transpulmonary and alveolar pressure? A clinical crossover study

Peak inspiratory

Mean inspiratory



Bellani et al. Crit Care 2016

Controlled ventilation in ARDS

➔ Heavy sedation +/- paralysis

Advantages	Drawbacks
⬇ VO2 and VCO2 ⬇ventilatory requirements	Impaired hemodynamics
Control of tidal volume and plateau pressure ➔ Prevention of « VILI »	Monotony
Avoid agitation and asynchrony	Atrophy and weakness of respiratory muscles (VIDD)