



## Ventilation protectrice en urgence

Maxime MAIGNAN  
Urgences SAMU

### Liens d'intérêts

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**Interventions ponctuelles (congrès)**

Sanofi, Boehringer, Astrazeneca, Bayer, Novartis, ResMed, Mundipharma, AGIR à dom.

**Interventions ponctuelles (expertise)**

Vidal, Mundipharma

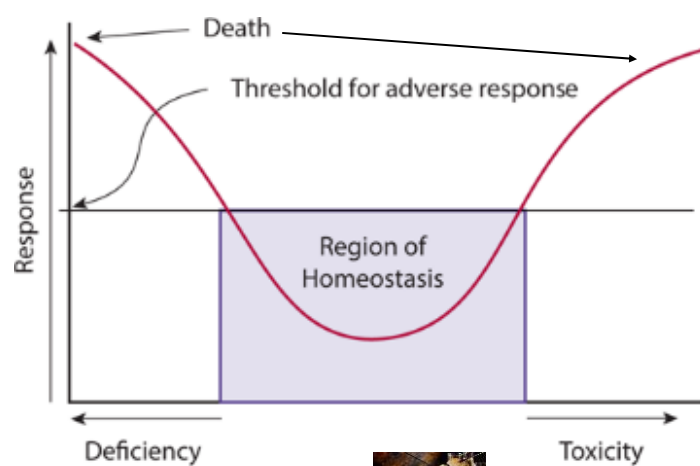
**En rapport avec cette intervention**

Aucun





### Loi en U de l'homéostasie





## Oxygénation et homéostasie

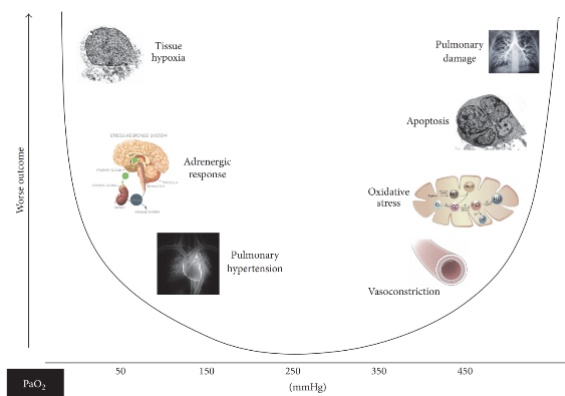
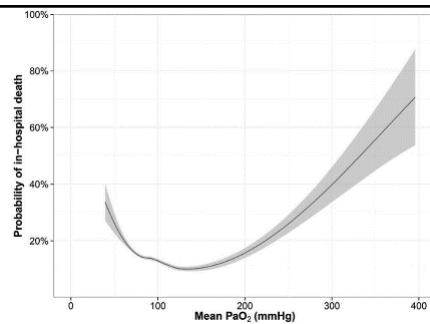
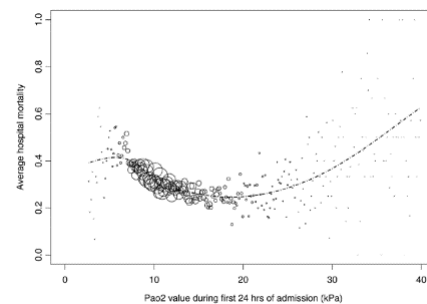


FIGURE 1: Schematic showing U-shaped association of PaO<sub>2</sub> with outcome.

Vincent JL et al. Can Resp J 2017



Helmerhorst et al. Critical Care Med 2016



De Jonge E et al. Critical Care 2008

BMJ

## RESEARCH

# Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomised controlled trial

Michael A Austin, honorary associate,<sup>1</sup> emergency medicine registrar,<sup>2</sup> wilderness helicopter, intensive care paramedic,<sup>3</sup> Karen E Wills, biostatistician,<sup>1</sup> Leigh Blizzard, senior biostatistician,<sup>1</sup> Eugene H Walters, professorial fellow,<sup>1</sup> Richard Wood-Baker, honorary fellow,<sup>1</sup> director<sup>2</sup>



SpO<sub>2</sub> cible : 88% - 92%

	Control (high flow oxygen)	Active (titrated oxygen)	Treatment effect	P value
<b>Mortality</b>				
All patients	21/226 (9)	7/179 (4)	0.42 (0.20 to 0.89)*	0.02
Confirmed COPD	11/117 (9)	2/97 (2)	0.22 (0.05 to 0.91)*	0.04

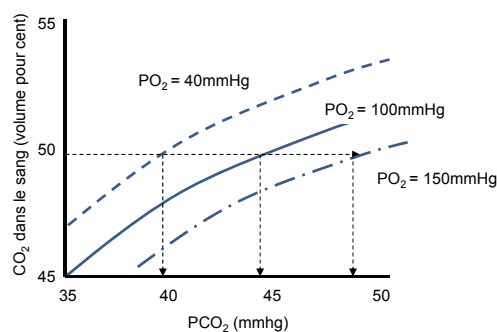
La titration d'oxygène en préhospitalier lors des exacerbations de BPCO permet de réduire la mortalité de 58 %

## Hyperoxie et BPCO

Diminution de la stimulation hypoxique

Effet Haldane

Modification des rapports V/P



Abdo et al. Crit Care 2012

## La titration automatisée d'oxygène diminue la durée d'hospitalisation

**Table 4** Clinical outcome

Outcome	FreeO <sub>2</sub> patients (n=25)	Control patients (n=25)	P-value
<b>Duration of O<sub>2</sub> administration (days)</b>	4.0±2.1	5.8±9.9	0.14
<b>Length of hospital stay</b>			
Randomization to	5.8±4.4	8.4±6.0	0.051
hospital discharge (days)			
Admission to hospital	6.7±4.3	9.5±6.0	0.053
discharge (days)			



SpO<sub>2</sub> cible : 88% - 92%

Lellouche et al. Int J COPD. 2016

## Eviter les effets potentiellement néfastes de l'oxygène dans d'autres pathologies

THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

### Oxygen Therapy in Suspected Acute Myocardial Infarction

Robin Hofmann, M.D., Stefan K. James, M.D., Ph.D.,  
Tomas Jernberg, M.D., Ph.D., Bertil Lindahl, M.D., Ph.D.,  
David Erlinge, M.D., Ph.D., Nils Witt, M.D., Ph.D., Gabriel Arefalk, M.D.,  
Mats Frick, M.D., Ph.D., Joakim Alfredsson, M.D., Ph.D.,  
Lennart Nilsson, M.D., Ph.D., Annica Ravn-Fischer, M.D., Ph.D.,  
Elmir Omerovic, M.D., Ph.D., Thomas Kellerth, M.D., David Sparv, B.Sc.,  
Ulf Ekelund, M.D., Ph.D., Rickard Linder, M.D., Ph.D.,  
Mattias Ekström, M.D., Ph.D., Jörg Lauermann, M.D., Urban Haaga, B.Sc.,  
John Pernow, M.D., Ph.D., Ollie Östlund, Ph.D., Johan Herlitz, M.D., Ph.D.,  
and Leif Svensson, M.D., Ph.D., for the DETO2X-SWEDEHEART Investigators\*

JAMA | Original Investigation

### Effect of Routine Low-Dose Oxygen Supplementation on Death and Disability in Adults With Acute Stroke The Stroke Oxygen Study Randomized Clinical Trial

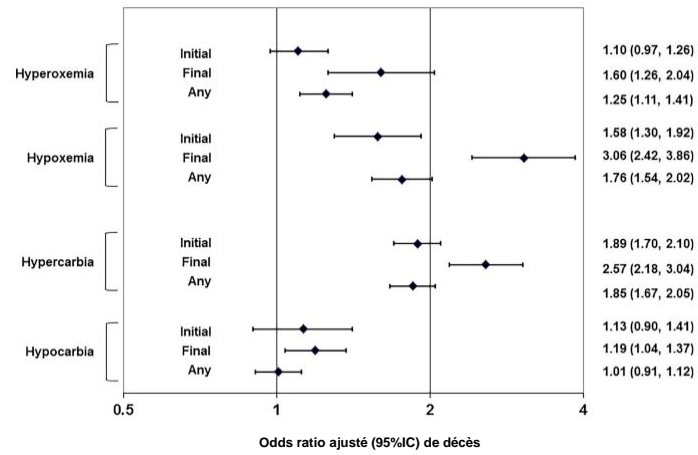
Christine Roffe, MD; Tracy Nevatte, PhD; Julius Sim, PhD; Jon Bishop, PhD; Natalie Ives, MSc;  
Phillip Ferdinand, MRCP; Richard Gray, MSc; for the Stroke Oxygen Study Investigators  
and the Stroke Oxygen Study Collaborative Group

### Oxygen therapy for sepsis patients in the emergency department: a little less?

Renate Stolmeijer<sup>a</sup>, Jan C. ter Maaten<sup>a</sup>, Jan G. Zijlstra<sup>b</sup>  
and Jack J.M. Ligtenberg<sup>a</sup>



## Gaz dans le sang et arrêt cardiaque

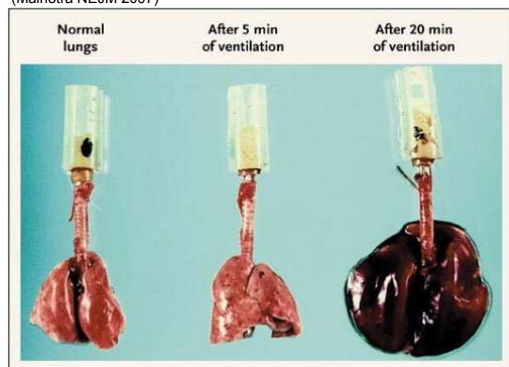


Wang HE et al. Resuscitation 2017

## Concept de ventilation homéostasique



Normal Rat Lungs and Rat Lungs after Receiving High-Pressure Mechanical Ventilation at a Peak Airway Pressure of 45 cm of Water (Malhotra NEJM 2007)



## The New England Journal of Medicine

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VENTILATION WITH LOWER TIDAL VOLUMES AS COMPARED WITH  
TRADITIONAL TIDAL VOLUMES FOR ACUTE LUNG INJURY  
AND THE ACUTE RESPIRATORY DISTRESS SYNDROME

THE ACUTE RESPIRATORY DISTRESS SYNDROME NETWORK\*

La ventilation à 6 ml/kg réduit de 20 % la mortalité



THE NEW ENGLAND JOURNAL OF MEDICINE

### Positive End-Expiratory Pressure Setting in Adults With Acute Lung Injury and Acute Respiratory Distress Syndrome

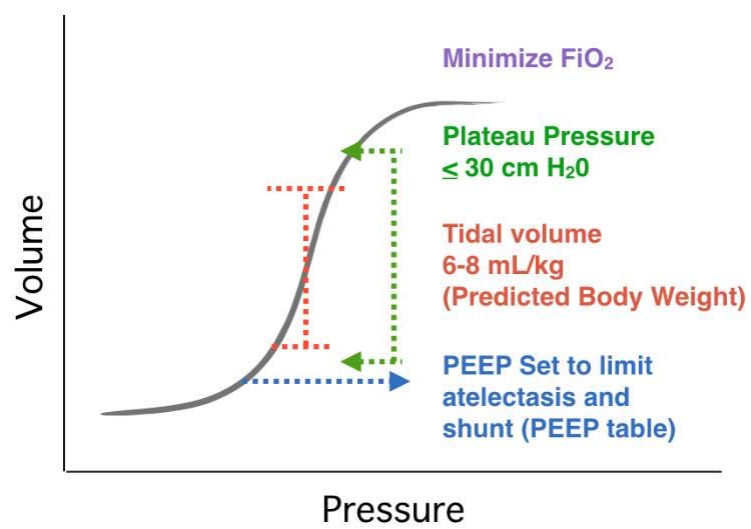
A Randomized Controlled Trial

Mercat et al. JAMA 2008

### Tidal Hyperinflation during Low Tidal Volume Ventilation in Acute Respiratory Distress Syndrome

Pier Paolo Terragni, Giulio Rosboch, Andrea Tealdi, Eleonora Corno, Eleonora Menaldo, Ottavio Davini, Giovanni Gandini, Peter Herrmann, Luciana Mascia, Michel Quintel, Arthur S. Slutsky, Luciano Gattinoni, and V. Marco Ranieri

- Pas d'impact sur la mortalité
- Diminue la durée de ventilation
- Améliore la compliance pulmonaire



Components of Lung Protective Ventilation to reduce Ventilator-Associated Lung Injury (VALI) and decrease incidence of ARDS

La ventilation protectrice a-t-elle un intérêt aux urgences ?



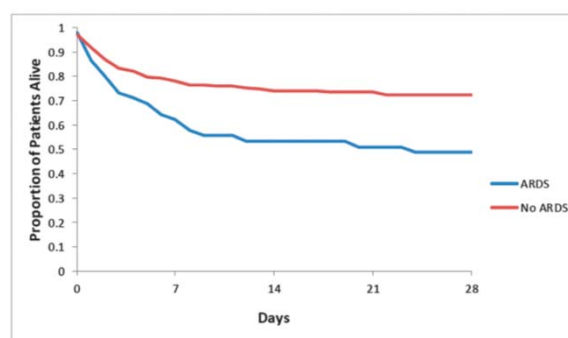
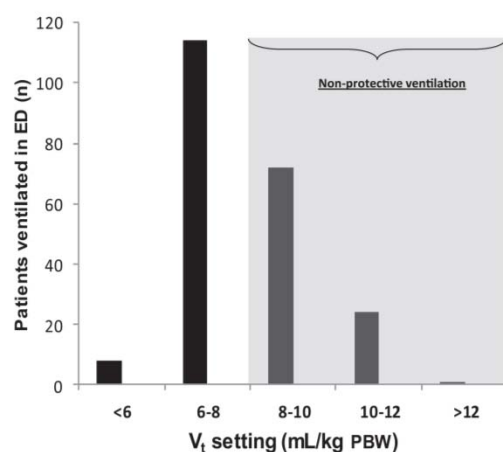


## Ventilation protectrice du SDRA dès l'admission (urgences ou ICU)

Variable	Preintervention Group (n = 186)	Intervention Group (n = 43)	p
Tidal volume, mL	500 (500–550)	434 (385–450)	< 0.01
Tidal volume, mL/kg predicted body weight	8.1 (7.0–9.1)	6.4 (6.1–6.7)	< 0.01
Positive end-expiratory pressure	5 (5–7)	8 (5–10)	< 0.01
Respiratory rate	16.5 (4.4)	20.7 (3.8)	< 0.01
F <sub>O<sub>2</sub></sub>	100 (70–100)	70 (40–100)	< 0.01
Head-of-bed elevation, n (%)	151 (37.1)	67 (91.8)	< 0.01
Lung-protective ventilation, n (%) <sup>a</sup>	12 (11.1)	24 (61.5)	< 0.01
Ventilator mode, n (%)			
Volume control-AC	347 (85.3)	68 (93.2)	0.07
Pressure control-AC	39 (9.6)	2 (2.7)	0.05
Pressure regulated volume control-AC	10 (2.5)	2 (2.7)	0.89
Other	11 (2.7)	1 (1.4)	0.50
Peak pressure, cm H <sub>2</sub> O	33.9 (8.8)	28.9 (7.6)	< 0.01
Plateau pressure, cm H <sub>2</sub> O	22.3 (7.3)	22.4 (6.4)	0.98
Mean airway pressure, cm H <sub>2</sub> O	11.0 (9.0–14.0)	12.0 (9.9–17.0)	0.47

Diminution de la mortalité: OR 0,38 [0,17 – 0,83]

Fuller et al. Crit Care 2017



60% des patients bénéficient d'une ventilation protectrice aux urgences  
SDRA après ventilation aux urgences : 15%

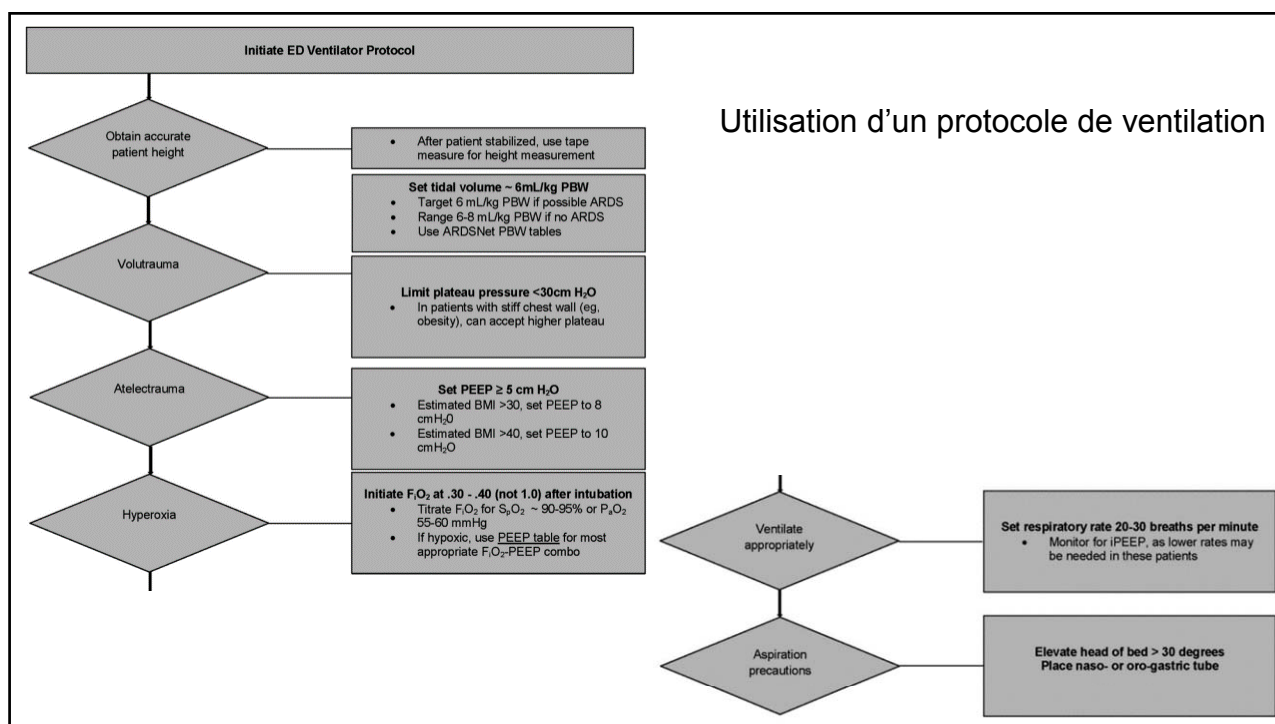
Fuller et al. Chest 2015, Wilcox et al. AM J Emerg Med 2016

## PULMONARY/ORIGINAL RESEARCH

# Lung-Protective Ventilation Initiated in the Emergency Department (LOV-ED): A Quasi-Experimental, Before-After Trial



Brian M. Fuller, MD, MSCI\*; Ian T. Ferguson, MPH; Nicholas M. Mohr, MD, MS; Anne M. Drewry, MD, MSCI; Christopher Palmer, MD; Brian T. Wessman, MD; Enyo Ablordeppey, MD, MPH; Jacob Keeperman, MD; Robert J. Stephens; Cristopher C. Briscoe; Angelina A. Kolomiets, BS; Richard S. Hotchkiss, MD; Marin H. Kollef, MD



Baseline Characteristics	Preintervention Group (n=490)	Intervention Group (n=490)
Age, y	58.2 (18.3)	58.0 (24.0)
Male patient, No. (%)	271 (55.3)	288 (58.8)
Height, in	67.4 (4.0)	67.9 (3.9)
Weight, kg	82.0 (27.5)	83.9 (26.5)
BMI, lb/in <sup>2</sup>	28.1 (9.5)	28.2 (8.8)
APACHE II score*	17.0 (8.0)	16.0 (11.0)
Sepsis, No. (%)	165 (33.7)	170 (34.7)
ED LOS, h	6.6 (3.8)	5.1 (3.0)
<b>Vital signs and lab studies</b>		
Temperature, °C		36.9 (1.2) 36.5 (1.2)
Mean arterial pressure, mmHg		86.0 (38.0) 85.3 (54.0)
Lactate, mmol/L		2.5 (1.4–4.7) 2.9 (1.6–5.2)
Creatinine, mg/dl		1.3 (0.8–2.7) 1.1 (0.8–1.7)
Hemoglobin, g/dl		11.2 (2.7) 12.3 (2.5)
WBC count, 10 <sup>9</sup> /L		13.9 (9.9) 13.8 (7.4)
Platelet, 10 <sup>9</sup> /L		219.0 (120.6) 235.2 (105.4)
INR		1.2 (1.1–1.5) 1.1 (1.0–1.3)
<b>Reason for mechanical ventilation, No. (%)</b>		
Asthma		4 (0.8) 9 (1.8)
COPD		23 (4.7) 29 (5.9)
CHF/pulmonary edema		37 (7.6) 11 (2.2)
Sepsis		130 (26.5) 141 (28.8)
Trauma		132 (26.9) 143 (29.2)
Cardiac arrest		41 (8.4) 35 (7.1)
Drug overdose		15 (3.1) 21 (4.3)
Other		108 (22.0) 101 (20.6)

Des patients comme les nôtres

## Effet d'un protocole de ventilation protectrice aux urgences



Complications de ventilation : 0.47 [0,31 – 0,71]

Jours sans ventilation : 3,7 [2,3 – 5,1]

Jours sans réanimation : 2,4 [1,0 – 3,7]

Jours non hospitalisés : 2,4 [1,2 – 3,6]

**Mortalité : 0,47 [0,35 – 0,63]**

## Messages clés

Ventilation homéostasique

Titration d'oxygène chez le patient non intubé

Utiliser un protocole de ventilation

$FiO_2$  30 à 40 %

Volume courant 6 – 8ml/kg

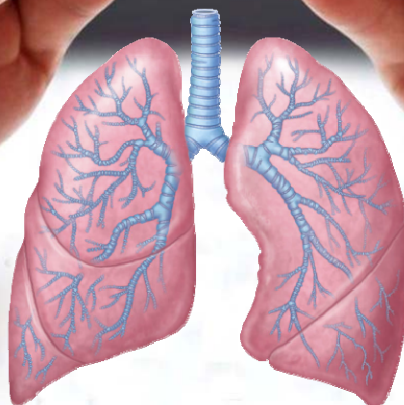
$P_{plat} < 30 \text{ cmH}_2\text{O}$

$PEEP \geq 5 \text{ cmH}_2\text{O}$

FR 20 à 30/min



Protégeons les poumons de nos patients



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