9èmes Journées Réanimation et Urgences Respiratoires

Ventilation Noninvasive chez le patient hypoxémique

Laurent Brochard

Avril 2012

HUG Hôpitaux Universitaires de Genève

UNIVERSITÉ DE GENÈVE
FACULTÉ DE MÉDECINE

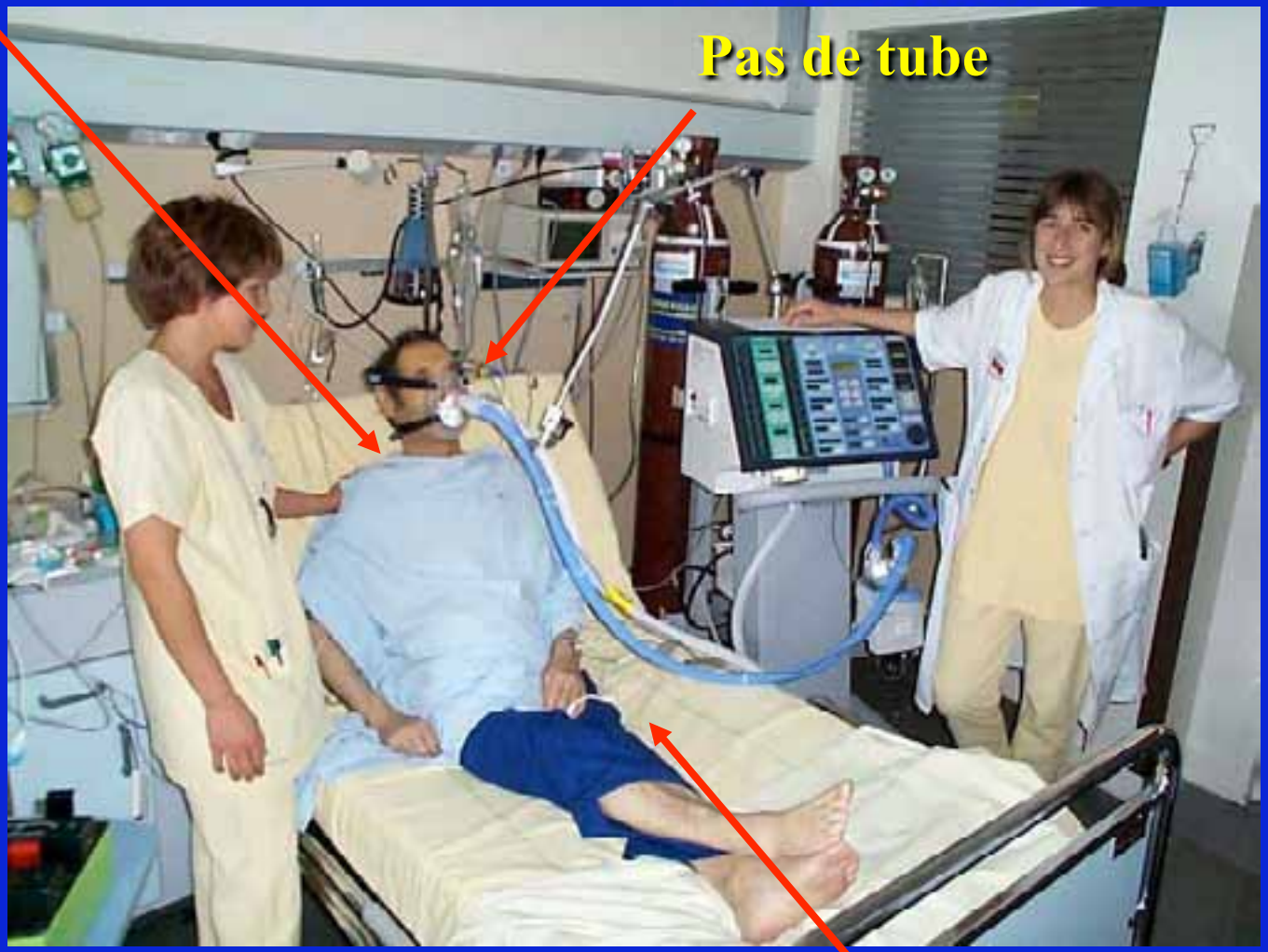
Conflits d'intérêts

- Our clinical research laboratory has received research grants for clinical trials from the following companies:
  - Maquet (NAVA)
  - Covidien (PAV+)
  - Dräger (SmartCare)
  - General Electric (FRC)
  - Philips Respironics (NIV)
  - Fisher Paykel (Optiflow)

Pas de voie centrale

Pas de sédation

Pas de tube



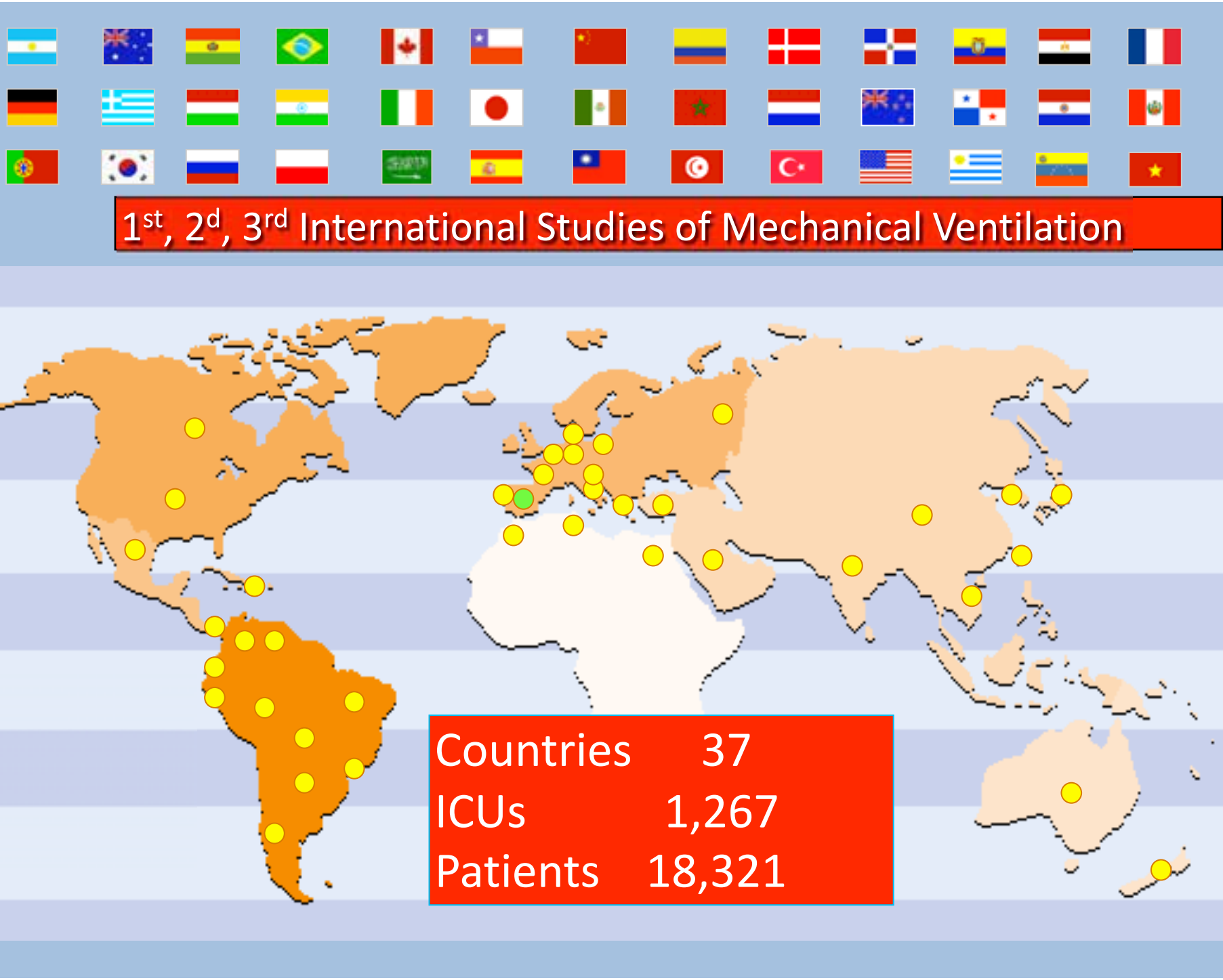
Pas de sonde urinaire

Use of Mechanical ventilation

1998
Incidence study
361 ICU 20 countries
Esteban et al, JAMA 2002

2004
Incidence study
353 ICU 26 countries
Esteban et al, AJRCCM 2008

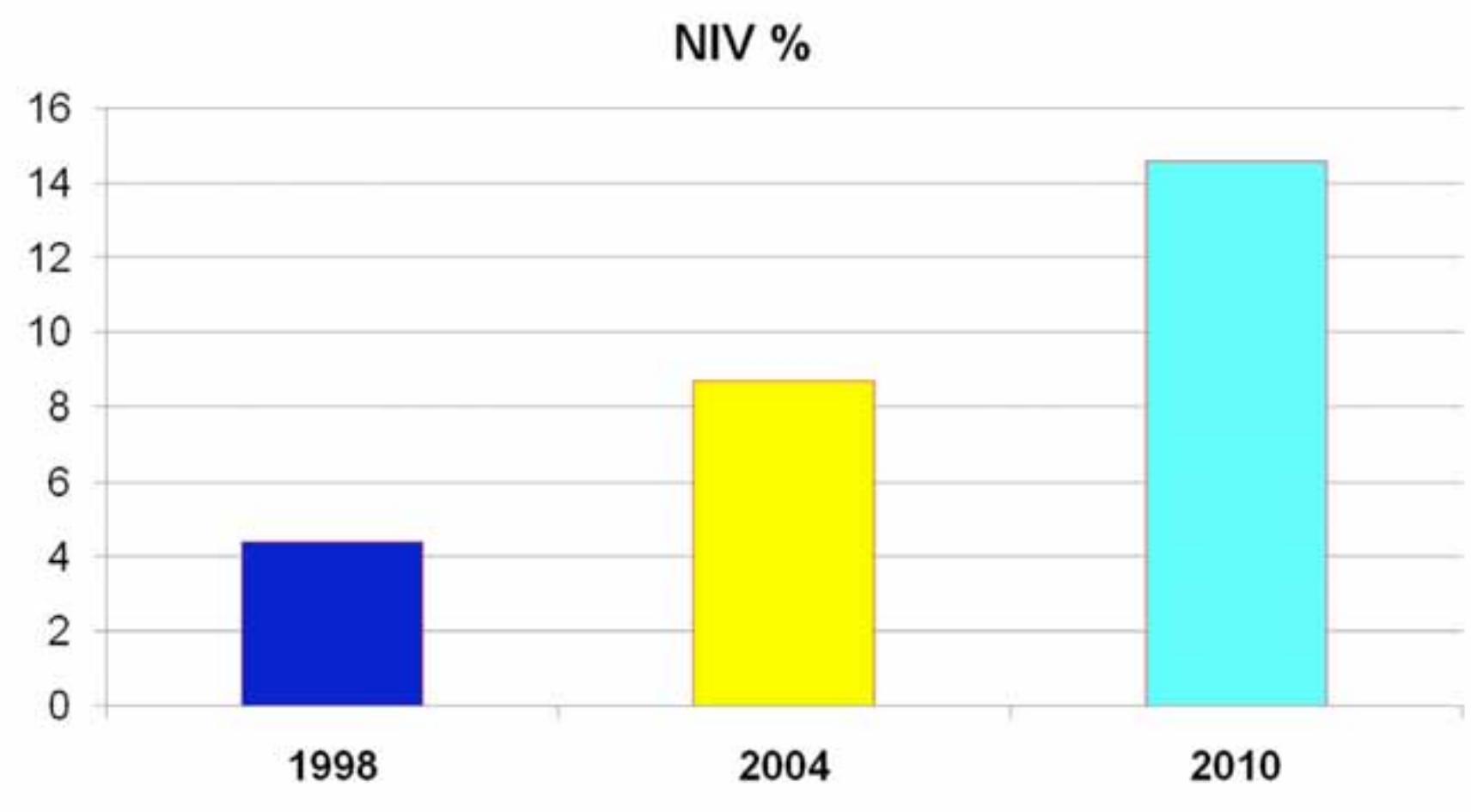
2010
Incidence study
553 ICU 39 countries
Esteban et al


1st, 2d, 3rd International Studies of Mechanical Ventilation
Countries 37
ICUs 1,267
Patients 18,321

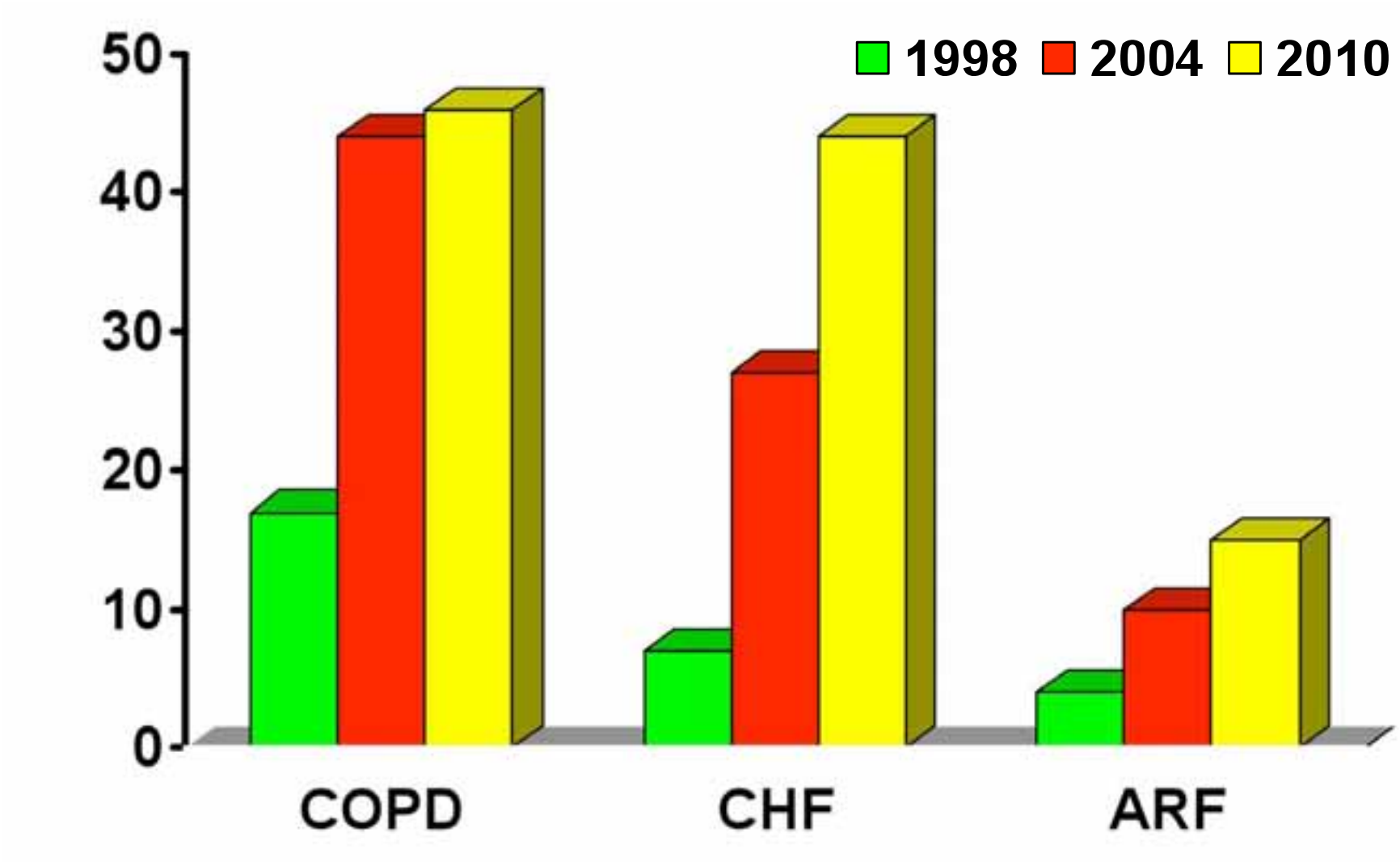
Baseline Demographics

	1998	2004	2010
	n = 5183	n = 4986	n = 8313
Age, mean (SD)	59 (17)	59 /17	61/17
Gender, female (%)	39 %	40 %	38 %
SAPS II, mean (SD)	44 (17)	42 (18)	45 (18)
BMI. mean (SD)			27 (6)

NIV as first attempt



Use of NIV 1998 – 2010



Non-Invasive Ventilation

	1998		2004	2010
NIV rate (%)	4.4	(0.001)	8.7	14.6%
SAPS II	39.5 (16)		39.0 (15)	38.5 (15)
Failure (intubation) (%)	31	(0.39)	37 %	30.5%
Mortality in NIV failure	47%	(0.94)	48%	49%
Mortality in NIV success	21%	(0.36)	15%	9 %

NIV POSTEXTUBATION	11.1 %
FOR PREVENTION	5.9 %
FOR TREATMENT	5.2 %

SRLF - 2012

Evolution du taux d'utilisation et de succès de la VNI dans des réanimation françaises et belges - étude oVNI -

A Demoule, S Jaber, A Kouatchet, J Lambert, F Meziani, S Perbet, L Camous, R Janssen-Langenstein, M Alves, B Zuber, F Collet, J Messika, X Favre, O Guisset, B Misset, A Lafabrie, L Brochard, E Azoulay

pour le groupe oVNI

Justification

- **enquêtes 1997 et 2002**
  - utilisation croissante de la VNI
  - bénéfice de la VNI
    - clair dans OAP et IRA-IRC
    - moins clair dans IRA « de novo »

- **depuis**
  - conférence de consensus 2006
  - nouvelles indication : post-extubation…

- **→ nouvelle enquête de pratiques**

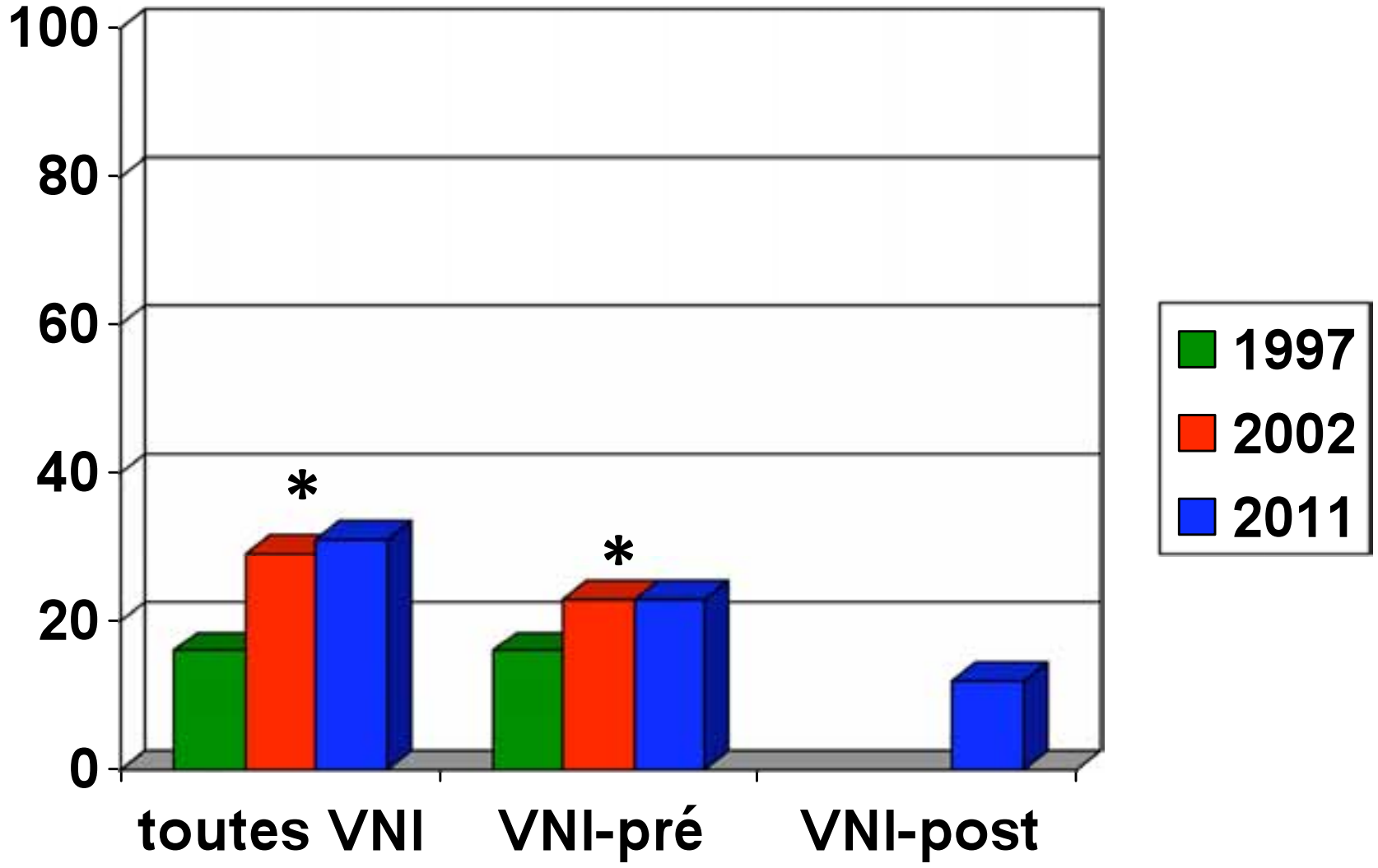
Méthodes

enquête 2010 - 2011

- enquête prospective longitudinale
- 54 services de réanimation
- 2 mois (novembre - avril)
- 2653 patients inclus
- 2445 assistance ventilatoire invasive ou VNI

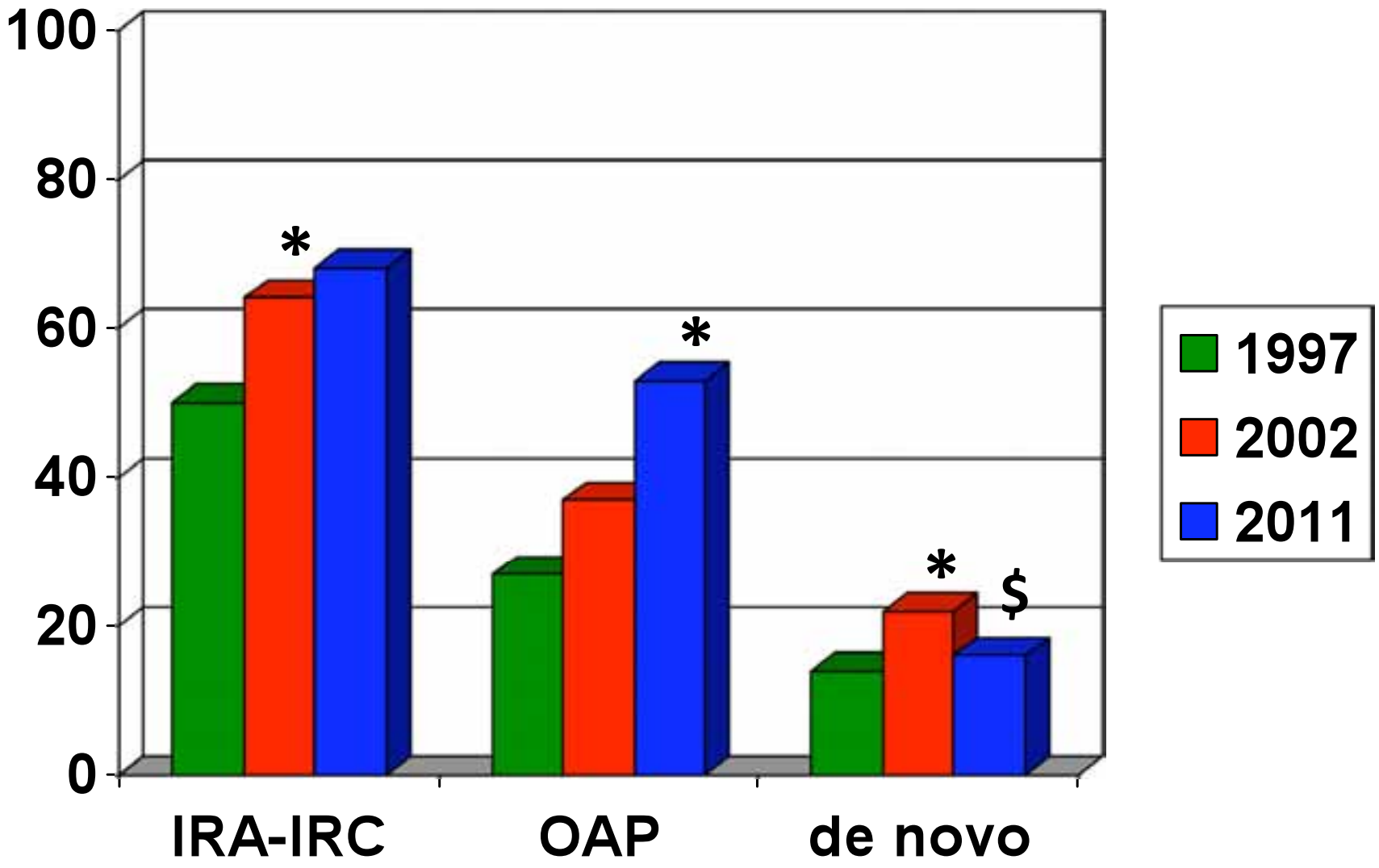
Résultats - 1 - utilisation

VNI 23 vs.31% (pré 23% - post-extub 8%)



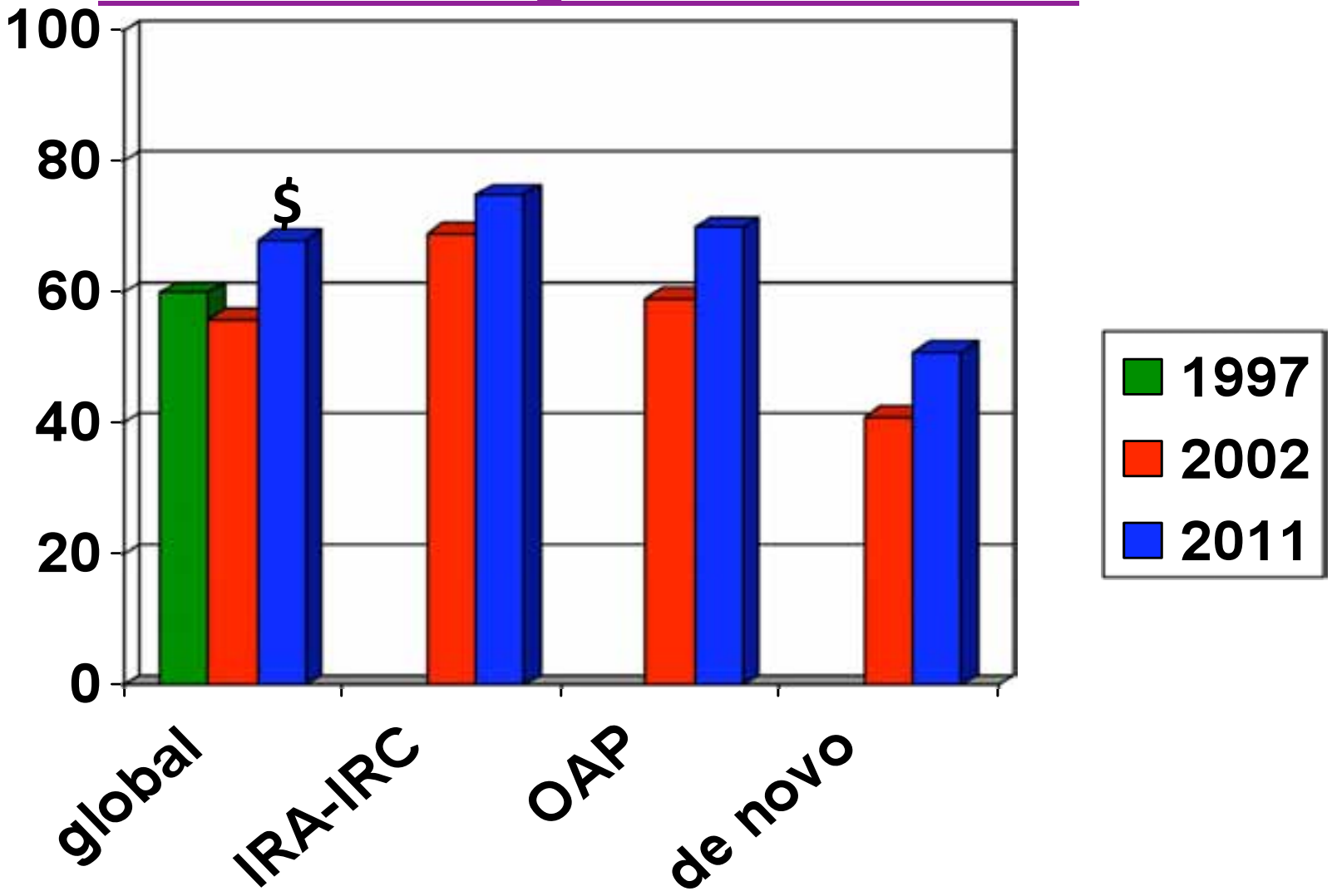
Résultats - 2 - indication

OAP : 53 vs. 37% - « de novo » : 16 vs. 22%



Résultats - 3 - succès

taux de succès global : 68 vs. 56%



Conclusion IIIè enquête

comparé à 2002

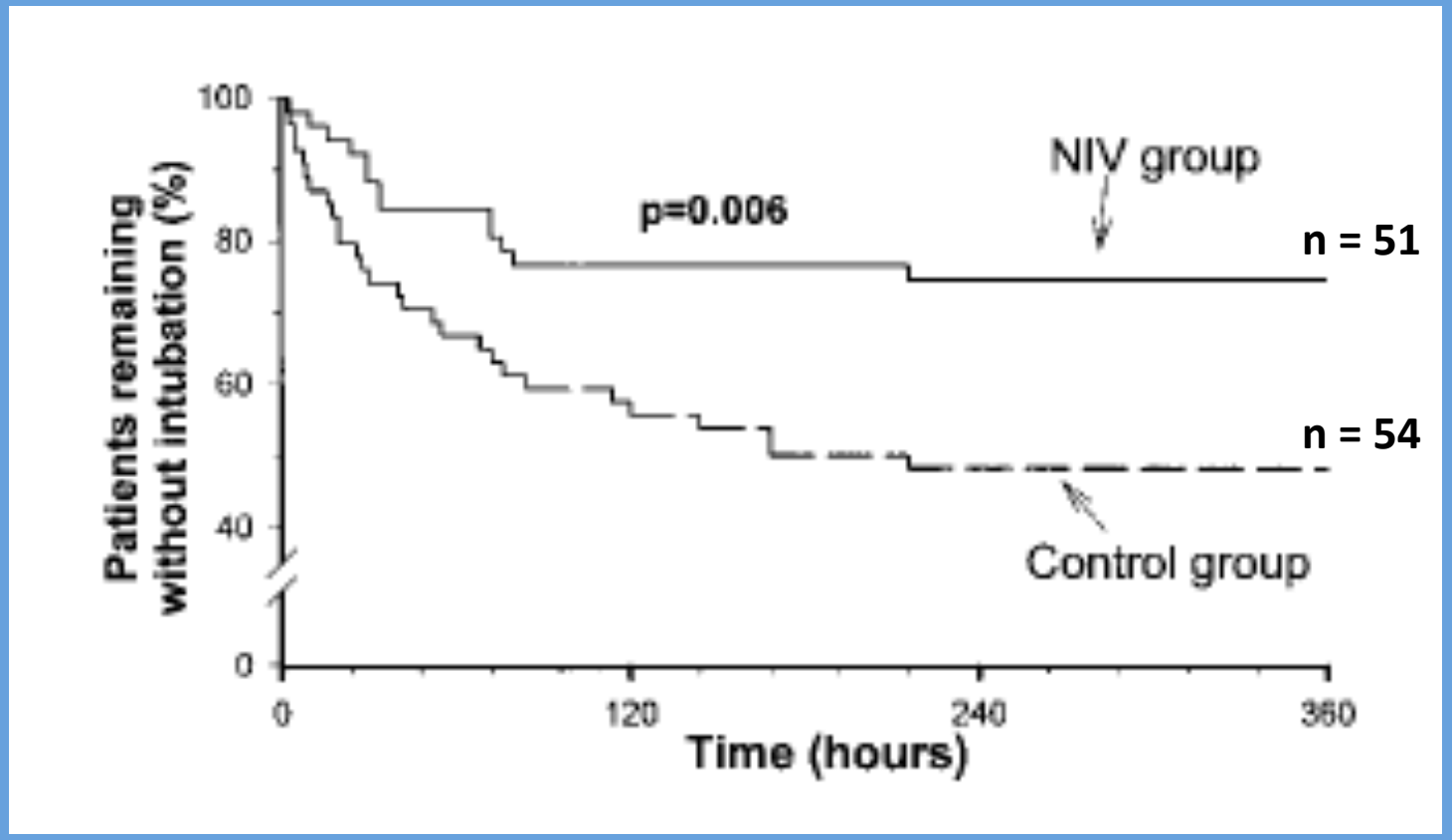
- le taux d'utilisation global de la VNI est stable
  - utilisation croissante de la VNI en post-extubation
  - taux VNI « première ligne » stable
- l'utilisation de la VNI varie selon les indications
  - Augmente dans l'OAP
  - Stable dans l'IRA des IRC
  - Diminue dans l'IRA « de novo »
- taux de succès en augmentation

VNI et insuffisance respiratoire hypoxémique

- Est-ce que la VNI peut permettre d'éviter l'intubation?

Noninvasive Ventilation in Severe Hypoxemic Respiratory Failure

A Randomized Clinical Trial



Ferrer et al. AJRCCM 2003; 168: 1438

VNI et insuffisance respiratoire hypoxémique

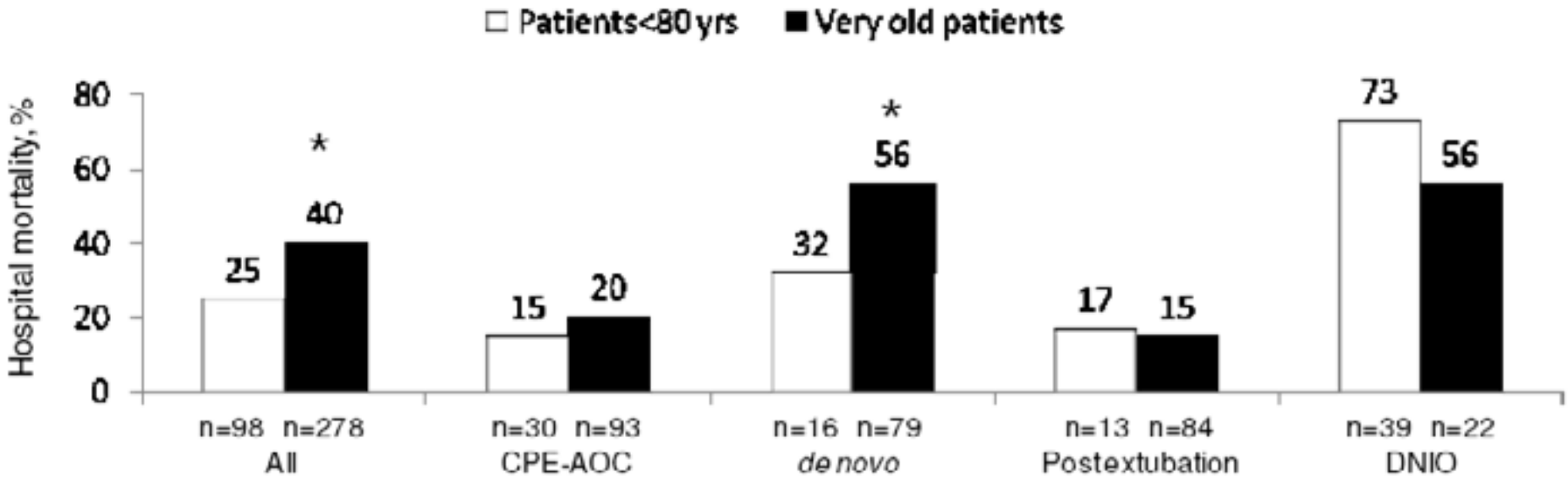
- Est-ce que la VNI peut permettre d'éviter l'intubation?
- Oui, mais…sélection, réglages, équipement

Ferrer et al. AJRCCM 2003; 168: 1438

- Non Hypercapnic Hypoxemic pts (SaO2< 90 % or PaO2 <60 with FiO2>50%)
- No hemodynamic instability, loss of consciousness, lack of cooperation, inability to clear secretions, ischemic heart disease or arrythmias, GI bleeding, several organ dysfunctions, etc.

Results of noninvasive ventilation in very old patients

Annals of Intensive Care 2012, ***2:5*** Schortgen F et al



Annals of Intensive Care
a SpringerOpen Journal

CARING FOR THE CRITICALLY ILL PATIENT

JAMA 2000

Treatment of Acute Hypoxemic Nonhypercapnic Respiratory Insufficiency With Continuous Positive Airway Pressure Delivered by a Face Mask

A Randomized Controlled Trial

Christophe Delclaux, MD, PhD
Erwan L'Her, MD
Corinne Alberti, MD
Jordi Mancebo, MD
Fekri Abroug, MD
Giorgio Conti, MD
Claude Guérin, MD
Frédérique Schortgen, MD
Yannick Lefort, MD
Massimo Antonelli, MD
Eric Lepage, MD
François Lemaire, MD
Laurent Brochard, MD

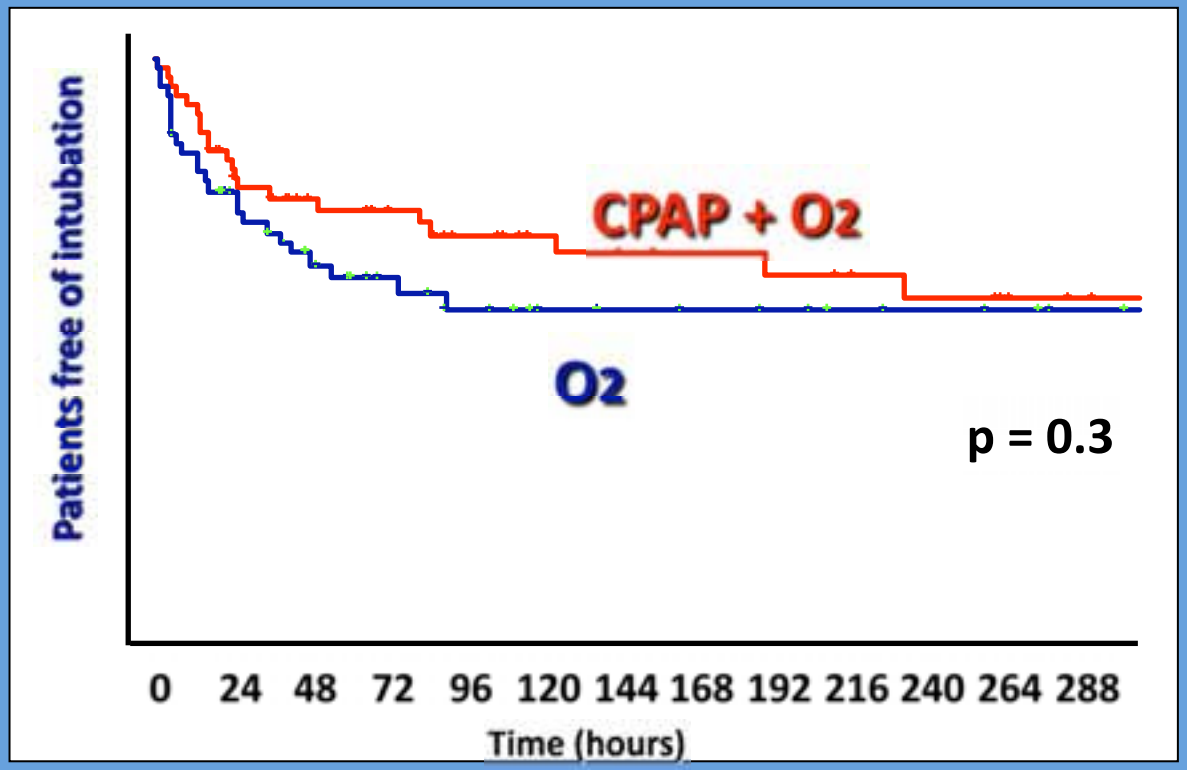


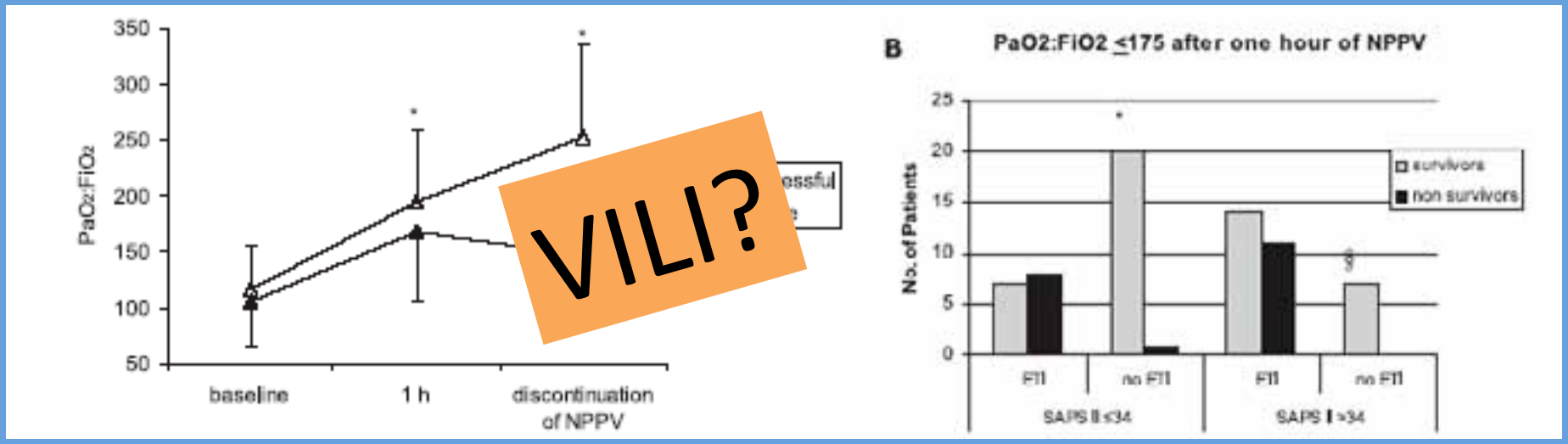
Table 6. Adverse Events Occurring in Patients During Their Intensive Care Unit Stay*

Adverse Event	Oxygen Alone (n = 61)	Oxygen Plus CPAP (n = 62)	*P* Value Between Treatment Groups
During spontaneous ventilation			
Facial skin necrosis	0	2	.50
Gastric distension	0	1	.54
Nosocomial pneumonia	1	0	.97
Cardiac arrest	0	4†	.14
During mechanical ventilation			
Nosocomial pneumonia	4	6	.74
Sinusitis	1	0	.99
Pneumothorax	0	1	.54
Stress ulcer	0	4	.14
Any adverse event, No. (%)	6 (10)	18 (29)	.01
Patients with adverse events, No. (%)	5 (8)	14 (23)	.03

Delclaux C et al. JAMA 2000

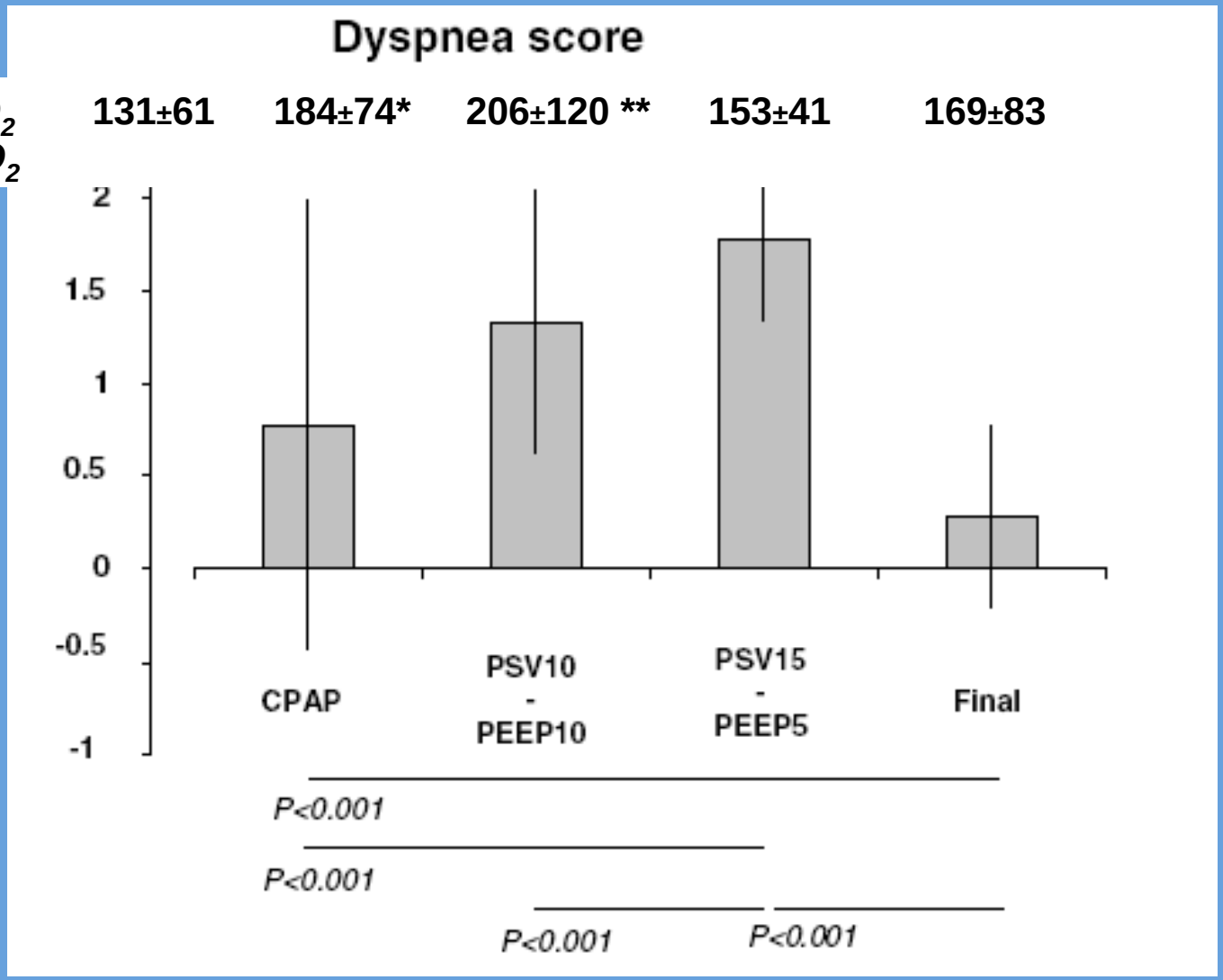
A mulliple-center survey on the use in clinical practice of noninvasive ventilation as a first-line intervention for acute respiratory distress syndrome*

Massimo Antonelli, MD; Giorgio Conti, MD; Antonio Esquinas, MD; Luca Montini, MD; Salvatore Maurizio Maggiore, MD, PhD; Giuseppe Bello, MD; Monica Rocco, MD; Riccardo Maviglia, MD; Mariano Alberto Pennisi, MD; Gumersindo Gonzalez-Diaz, MD; Gianfranco Umberto Meduri, MD



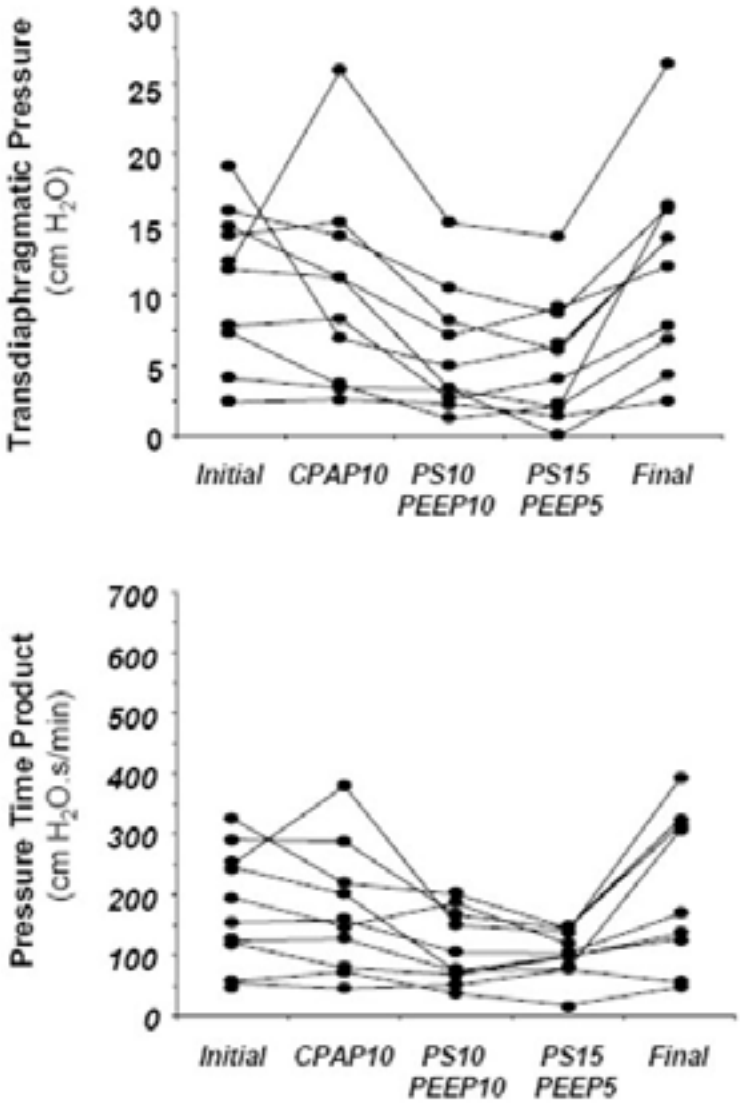
CCM 2007

NIV for ALI



L'Her E et al AJRCCM 2005

NIV for ALI



L'Her E et al AJRCCM 2005

VNI et insuffisance respiratoire hypoxémique

- Est-ce que la VNI peut permettre d'éviter l'intubation?
- Existe-t-il un risque lié au retard de l'intubation?

Intensive Care Med (2006) 32:1756–1765
DOI 10.1007/s00134-006-0324-1

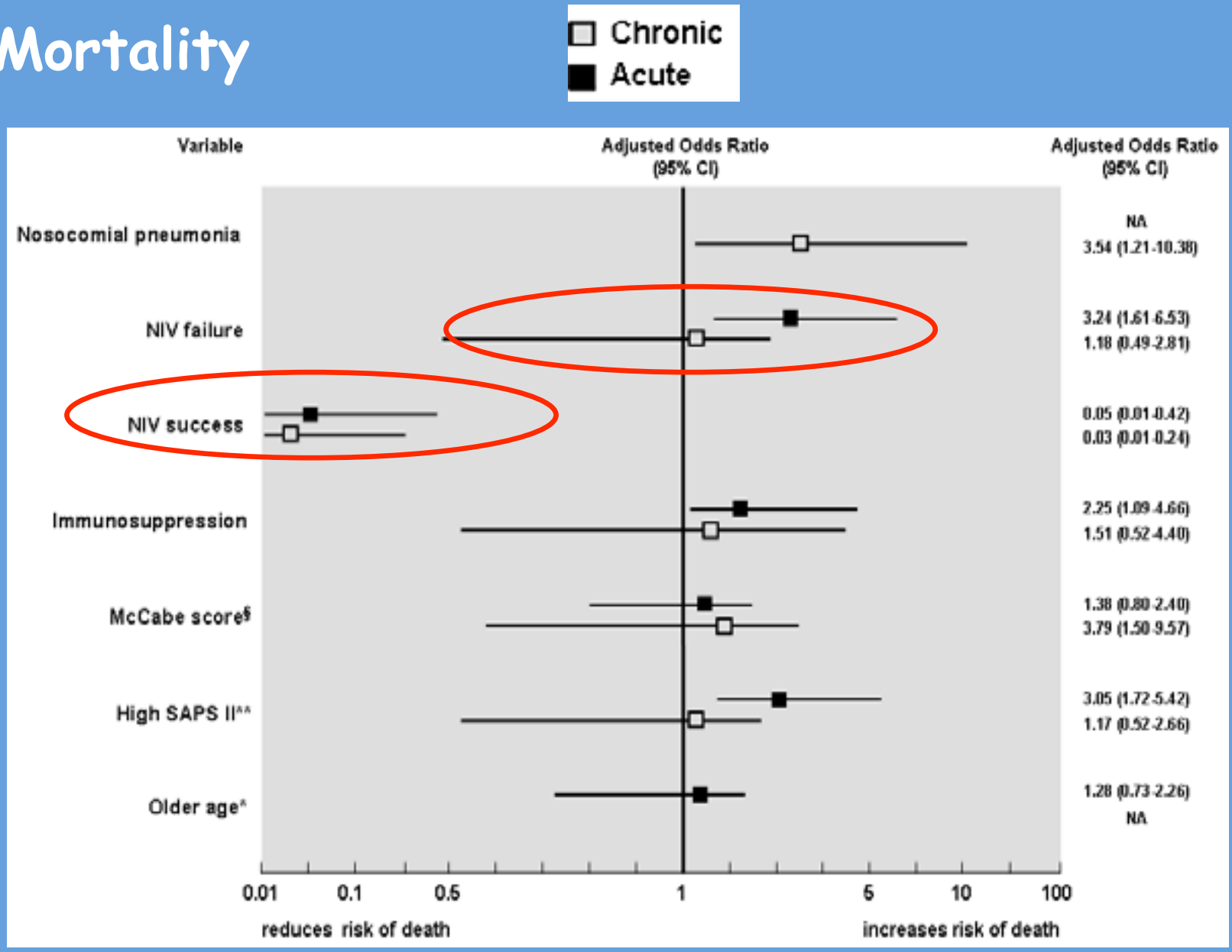
ORIGINAL

Alexandre Demoule
Emmanuelle Girou
Jean-Christophe Richard
Solenne Taille
Laurent Brochard

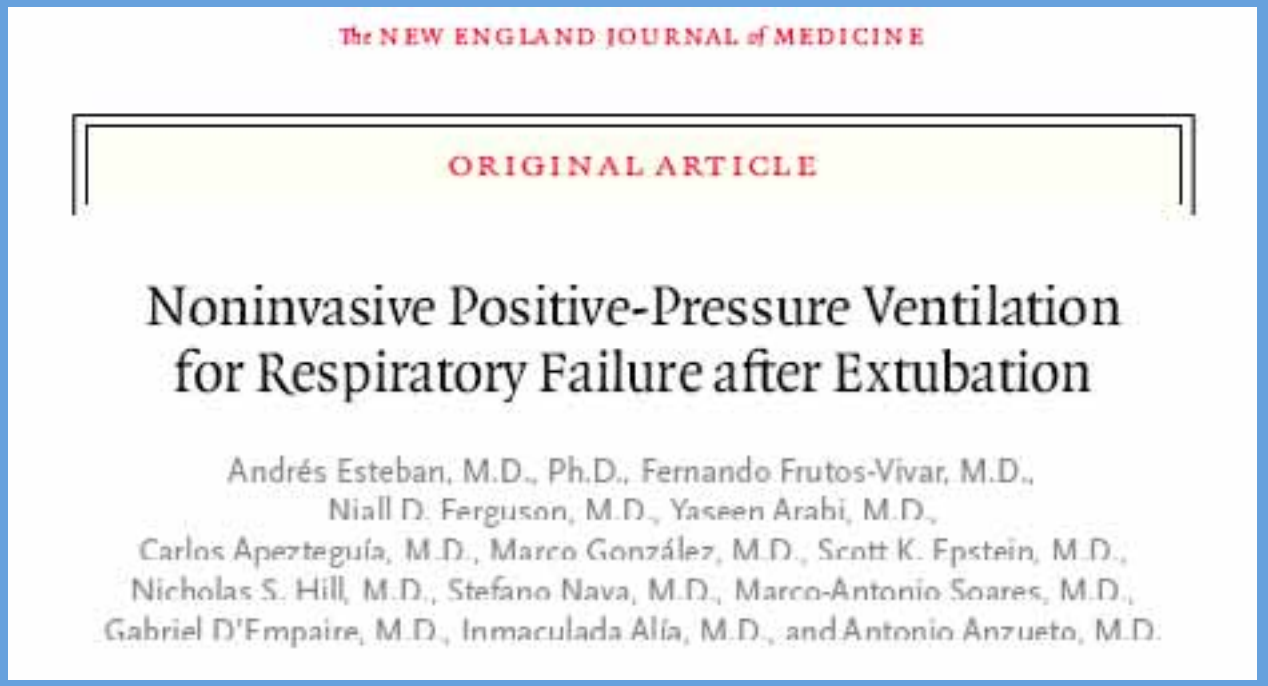
Benefits and risks of success or failure of noninvasive ventilation

NIV in hypoxemic or hypercapnic patients:
Is there a different impact?

Mortality



Demoule A et al ICM 2006



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.

The rate of ICU death was higher in the NIV group than in the standard group

= 25 % vs. 14 % ;

RR 1.78; 95 % CI, 1.03 to 3.20; P=0.048

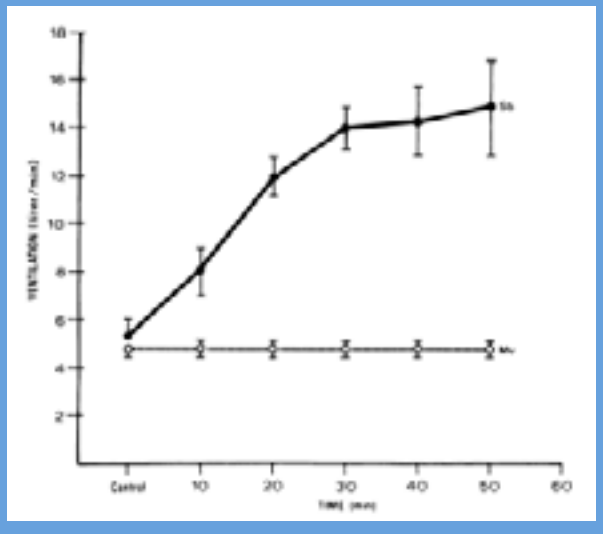
NEJM 2004

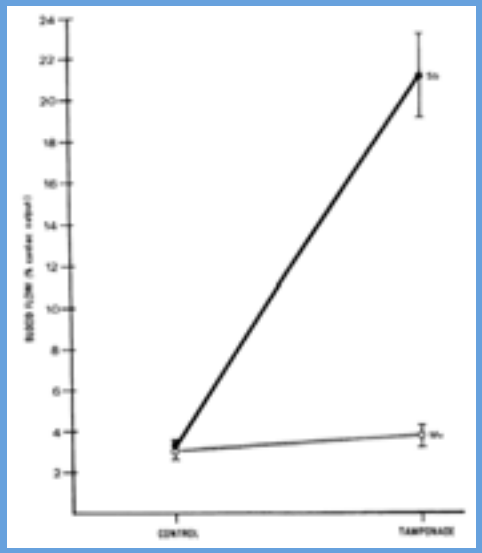
Table 4. Reasons for Reintubation, as Defined in the Protocol Guidelines, According to Study Group.

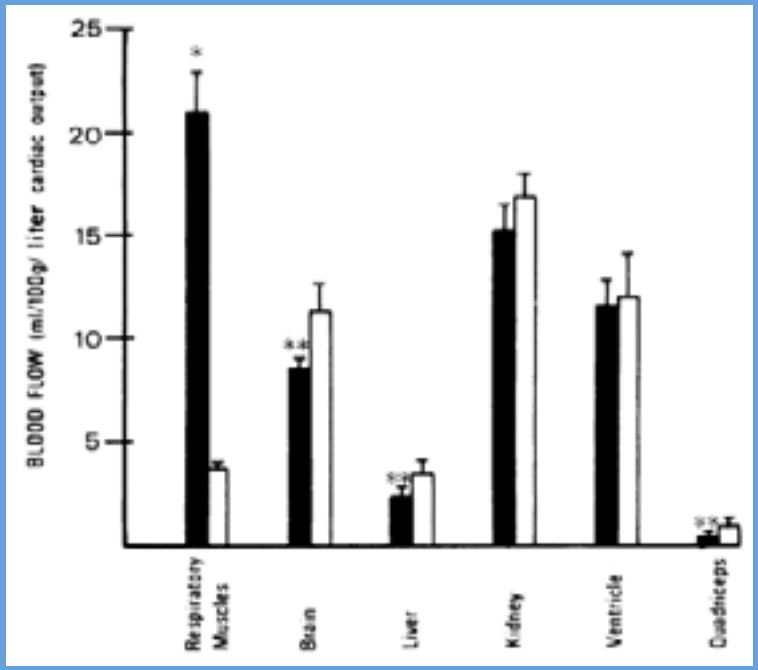
Reason	Non-invasive Ventilation (N=55)	Standard Medical Therapy (N=51)	P Value
	no. (%)		
Hypotension	4 (7)	2 (4)	0.45

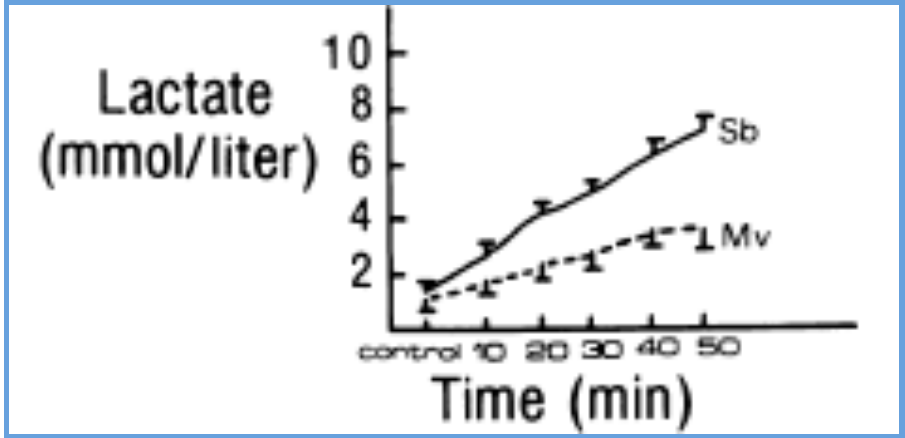
The interval between respiratory failure and reintubation was significantly longer in the NIV group: median, 12 hours, [2 hours 10 minutes to 28 hours] Vs. 2 hours 30 minutes; [45 minutes to 16 hours 30 minutes]; P=0.02).

SB as EXERCICE









Cardiogenic shock / Viires et al, JCI 1983
Septic shock/ Magder et al, JAP 1985

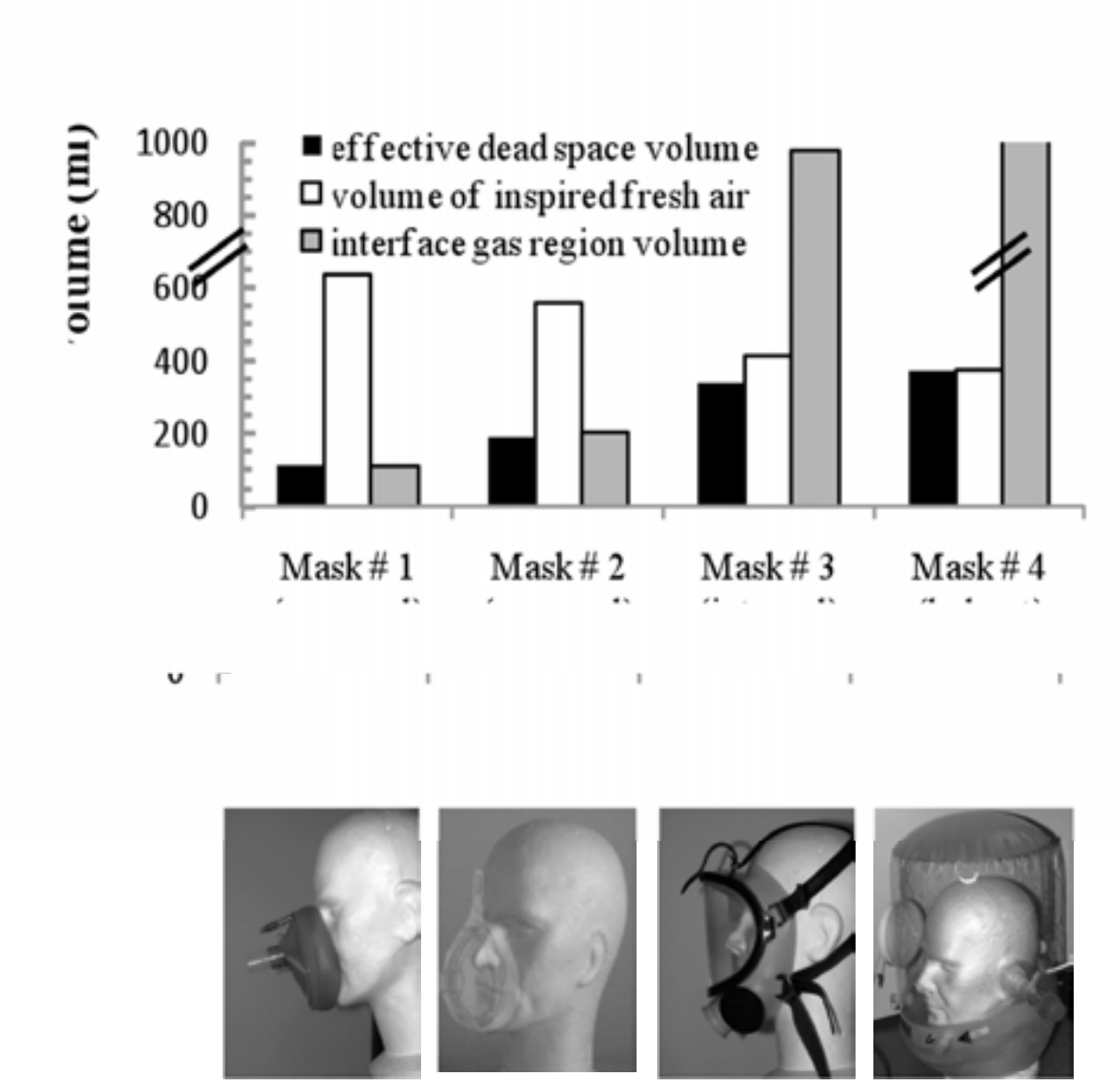
Ventilation Non Invasive : Risques liés au retard à l'intubation?

- Oui
- Risques identifiés lors des IRA *« de novo »* hypoxémiques et en post extubation
- Fenêtre courte (<6 heures?) pour décider de l'intubation
- Risques non identifiés lors des IRA des BPCO, OAP, VNI préventive post extubation

VNI dans les insuffisances respiratoires aiguës *de novo*

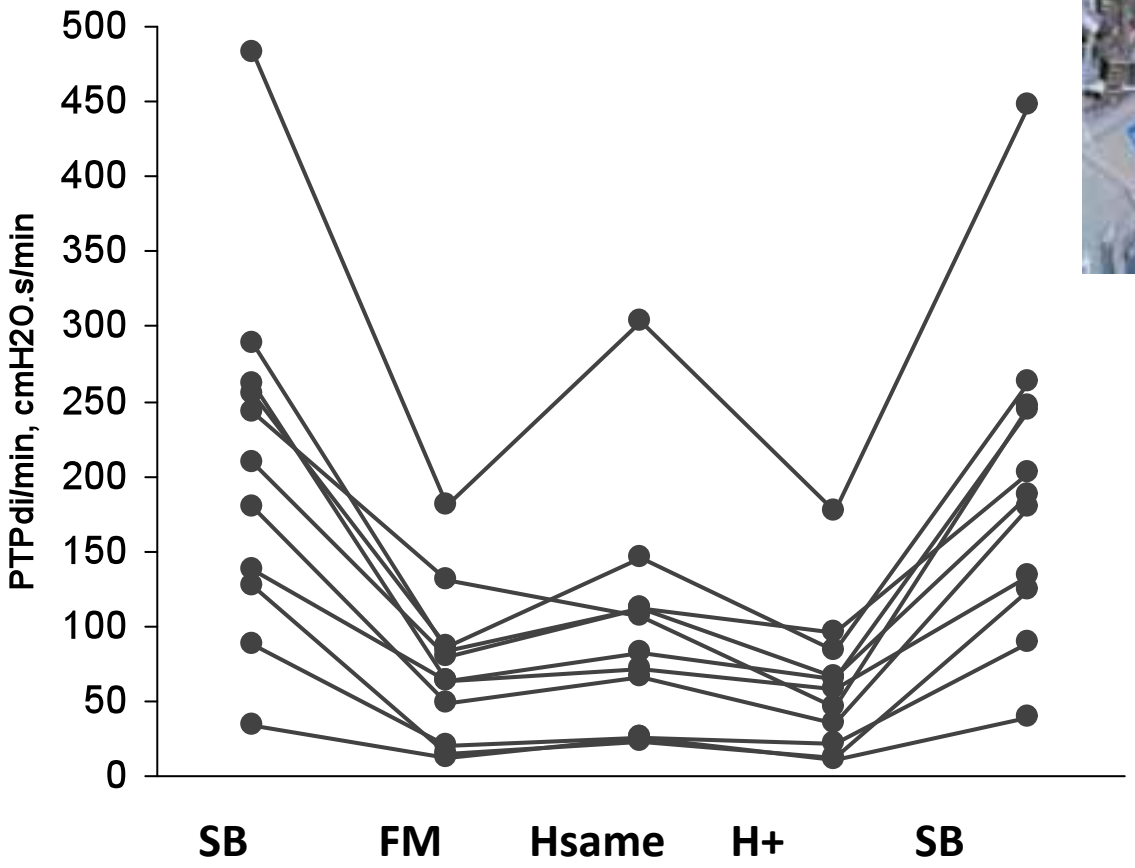
- Alternatives?

COMPARISON OF PATIENT-VENTILATOR INTERFACES BASED ON THEIR COMPUTERIZED EFFECTIVE DEAD SPACE



R. Fodil et al. ICM 2010

Specific settings?



F. Vargas et al. CCM 2009

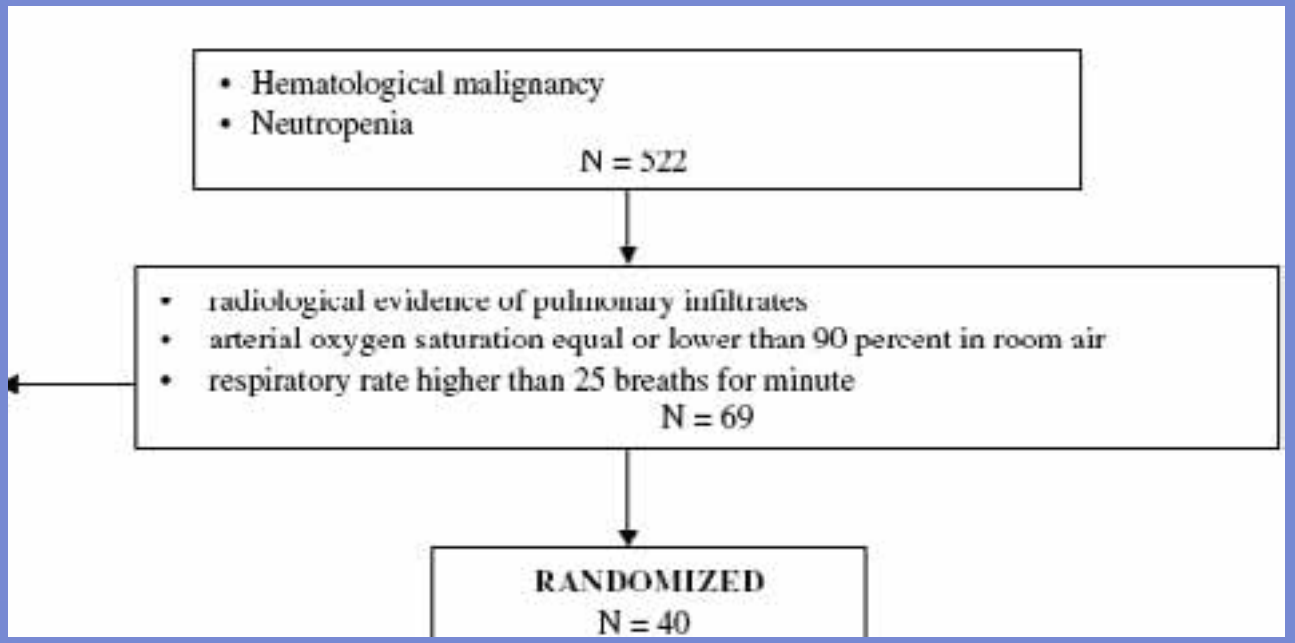
Intensive Care Med (2010) 36:1666–1674
DOI 10.1007/s00134-010-1934-1

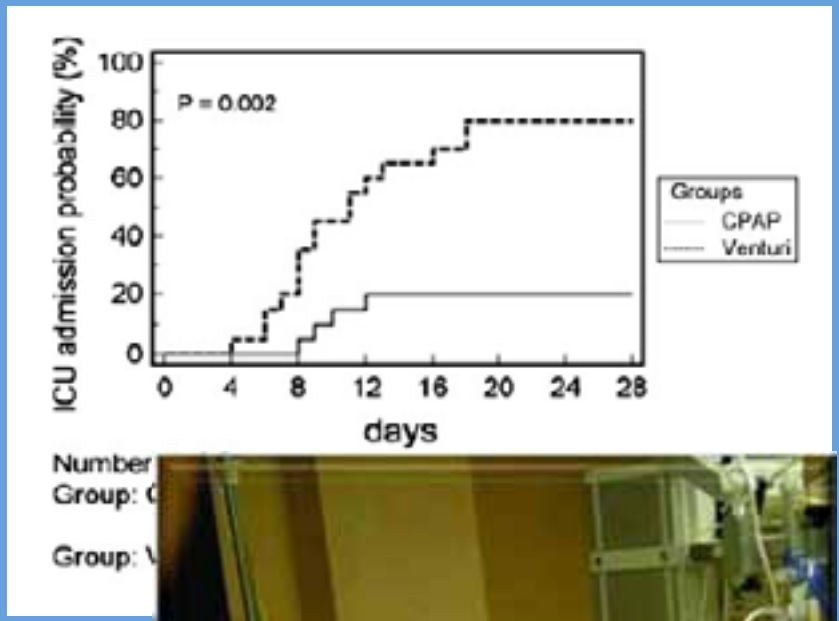
ORIGINAL

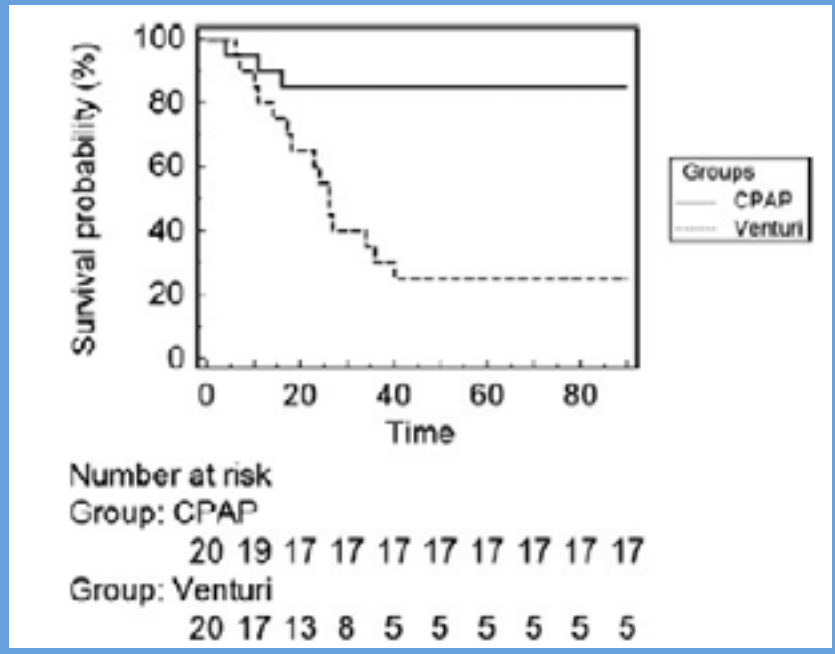
Vincenzo Squadrone
Massimo Massaia
Benedetto Bruno
Filippo Marmont
Michele Falda
Carlotta Bagna
Stefania Bertone
Claudia Filippini
Arthur S. Slutsky
Umberto Vitolo
Mario Boccadoro
V. Marco Ranieri

Early CPAP prevents evolution of acute lung injury in patients with hematologic malignancy

(1) radiological evidence of bilateral pulmonary infiltrates,
(2) pulse oxygen saturation (SaO2) \90% while breathing room air,
(3) respiratory rate >[25 breaths/min







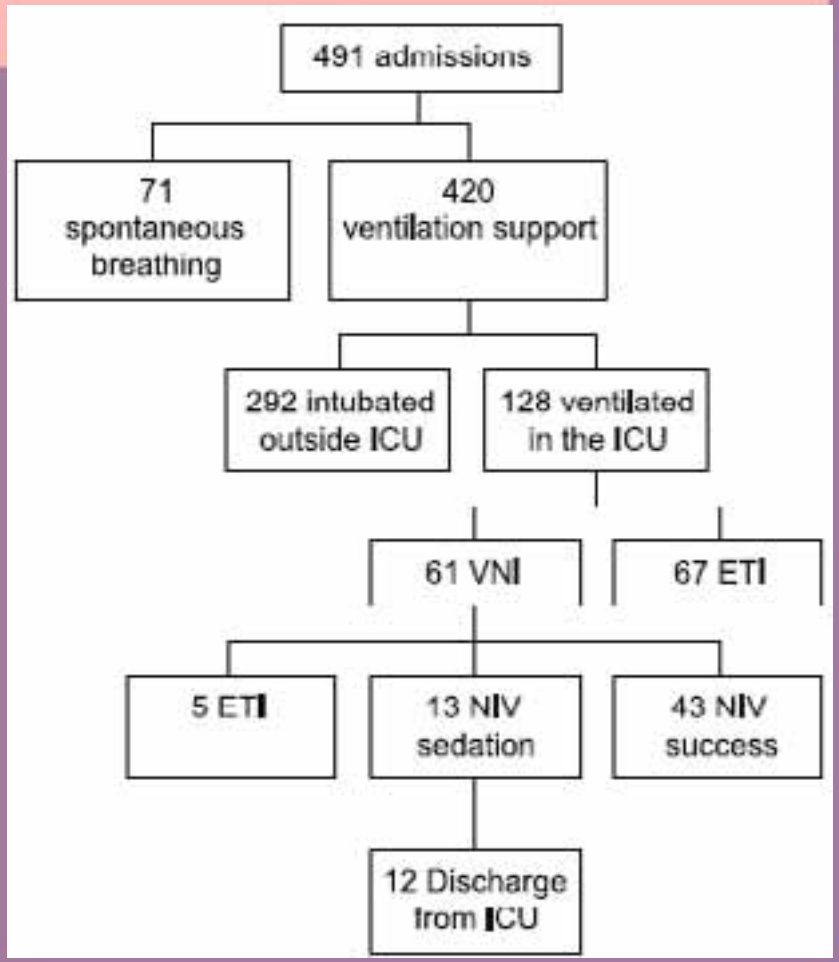
Squadrone ICM 2010

Intensive Care Med (2007) 33:82–87
DOI 10.1007/s00134-006-0447-4

ORIGINAL

Jean-Michel Constantin
Eric Schneider
Sophie Cayot-Constantin
Renaud Guerin
Francois Bannier
Emmanuel Futier
Jean-Etienne Bazin

Remifentanil-based sedation to treat noninvasive ventilation failure: a preliminary study



Intensive Care Med (2010) 36:1675–1680
DOI 10.1007/s00134-010-1904-7

ORIGINAL

Benjamin Clouzeau
Hoang-Nam Bui
Frederic Vargas
Marieke Grenouillet-Delacre
Emmanuelle Guilhon
Didier Gruson
Gilles Hilbert

Target-controlled infusion of propofol for sedation in patients with non-invasive ventilation failure due to low tolerance: a preliminary study

Score	Responsiveness	Speech	Facial expression	Eyes
5	Responds readily to name spoken in normal tone	Normal	Normal	Clear, no ptosis
4	Lethargic response to name spoken in normal tone	Mild slowing or thickening	Mild relaxation	Glazed or mild ptosis (less than half of the eye)
3	Responds only after name is called loudly and/or repeatedly	Slurring or prominent slowing	Marked relaxation (slack jaw)	Glazed and marked ptosis (half of the eye or more)
2	Responds only after mild prodding or shaking	Few recognizable words	-	-
1	Does not respond to mild prodding or shaking	-	-	-

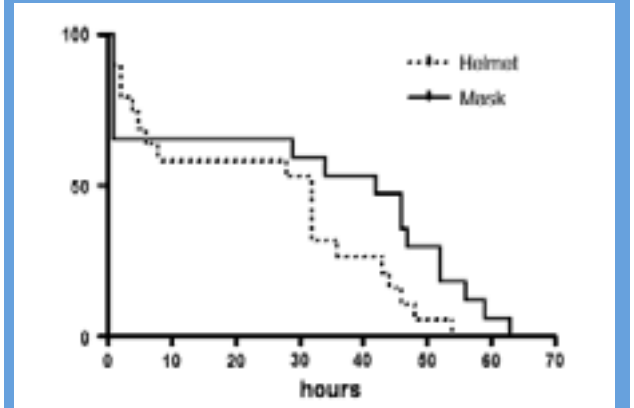
Comfort was evaluated as "good" or "excellent" by all of the 10 patients.

Intensive Care Med
DOI 10.1007/s00134-010-2026-y

ORIGINAL

Monica Rocco
Giorgio Conti
Elisa Alessandri
Andrea Morelli
Gustavo Spadetta
Amalia Laderchi
Carmela Di Santo
Samanta Francavilla
Paolo Pietropaoli

Rescue treatment for noninvasive ventilation failure due to interface intolerance with remifentanil analgosedation: a pilot study



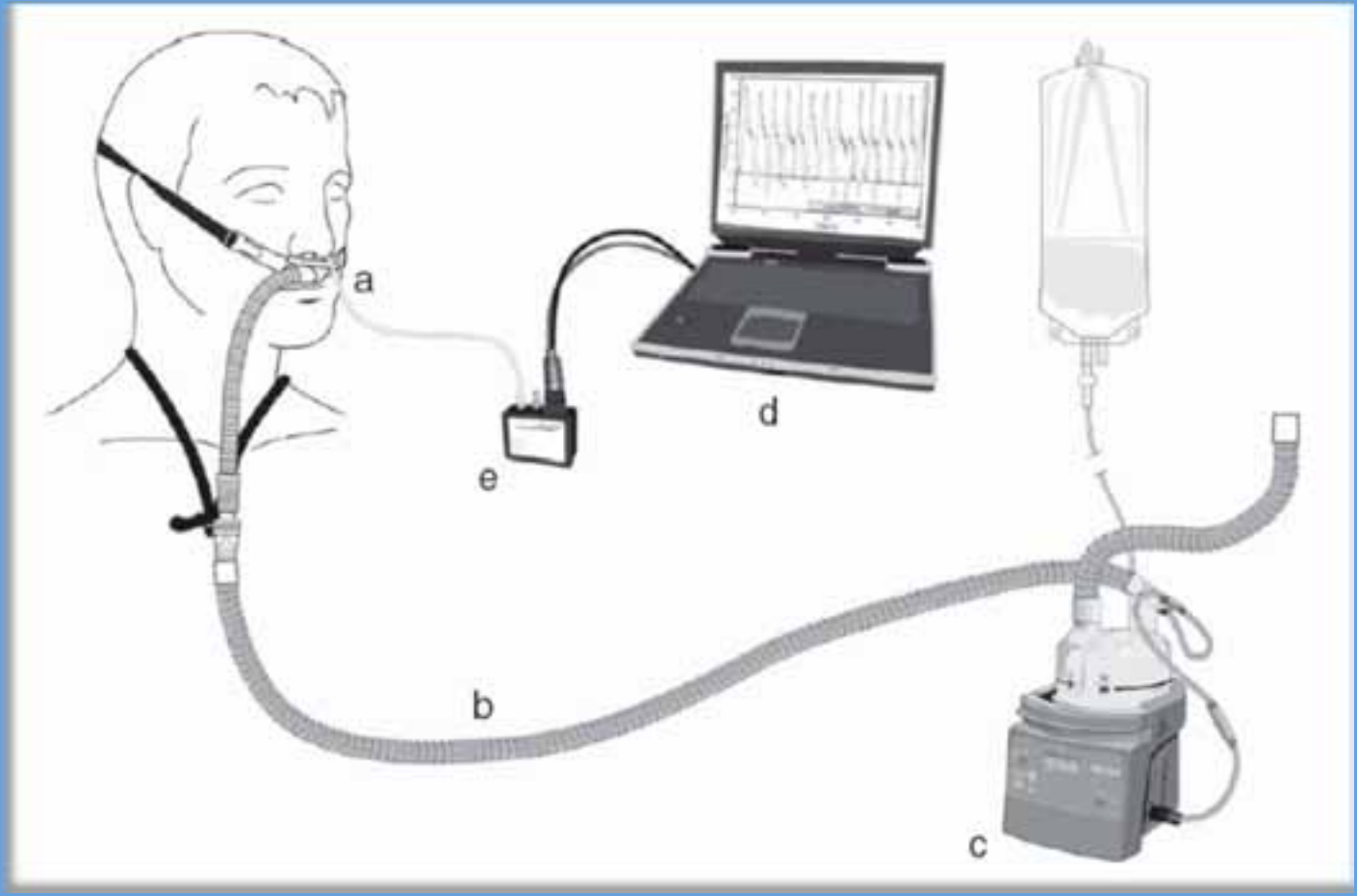
	Overall	Success	Failure
Patients, *N* (%)	36	22 (61)	14 (39)
Gender	16F/20M	10F/12M	6F/8M
Age	57 (43, 65)	59 (44, 66)	50 (37, 66)
Contusion (*N*)	13	8	5
Pancreatitis (*N*)	3	2	1
Pneumonia (*N*)	20	8	12
SAPS	36 (32, 40)	32 (30, 38)	39 (35, 42)#
PaO_2/FiO_2, basal (mmHg)	157 (146, 172)	156 (144, 176)	158 (146, 175)
PaO_2/FiO_2, 1 h (mmHg)	205 (190, 280)	270 (210, 300)*	176 (170, 179)**
RR, basal (breaths min^{-1})	34 (31, 37)	34 (31, 37)	35 (30, 38)
RR, 1 h (breaths min^{-1})	24 (21, 26)	24 (20, 26)*	27 (25, 35)**
Remifentanil ($\mu g\ kg^{-1}\ min^{-1}$)	0.07 (0.05, 0.09)	0.06 (0.04, 0.09)	0.08 (0.04, 0.09)
Mortality (%)	28	14	50§

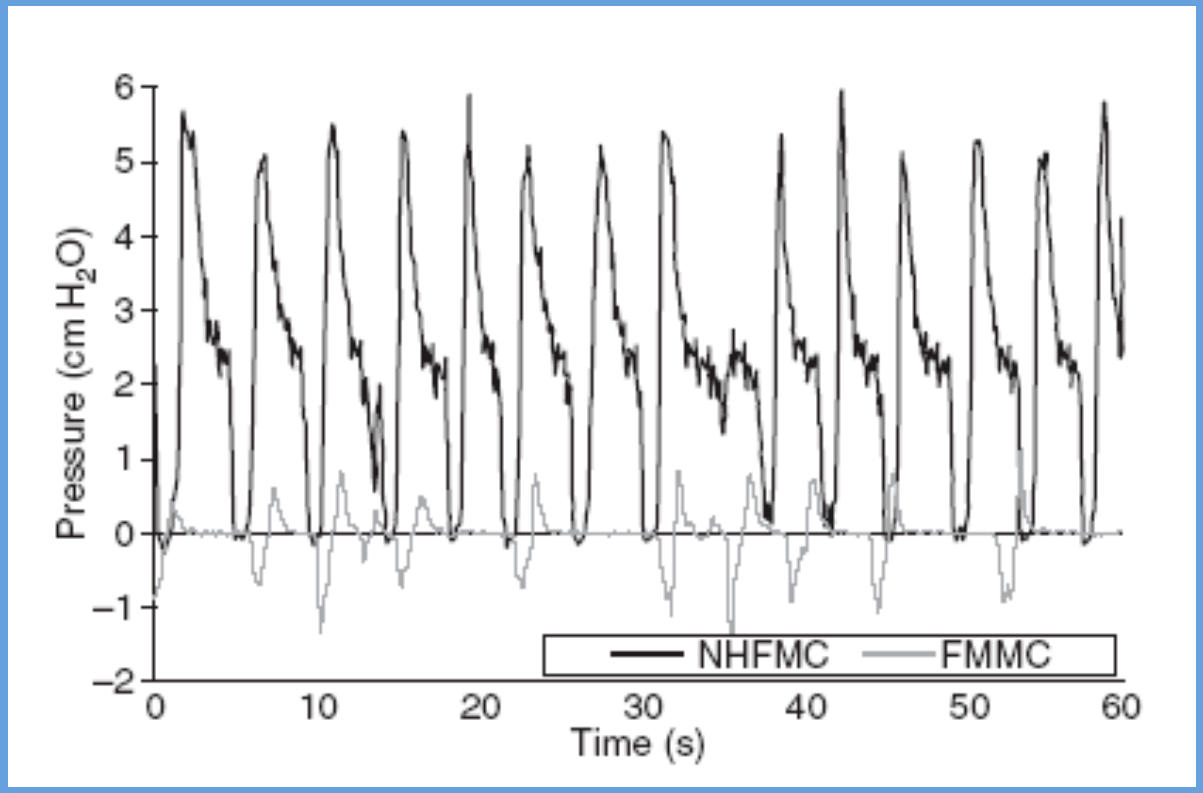
British Journal of Anaesthesia 103 (6): 886–90 (2009)
doi:10.1093/bja/aep280 Advance Access publication October 20, 2009

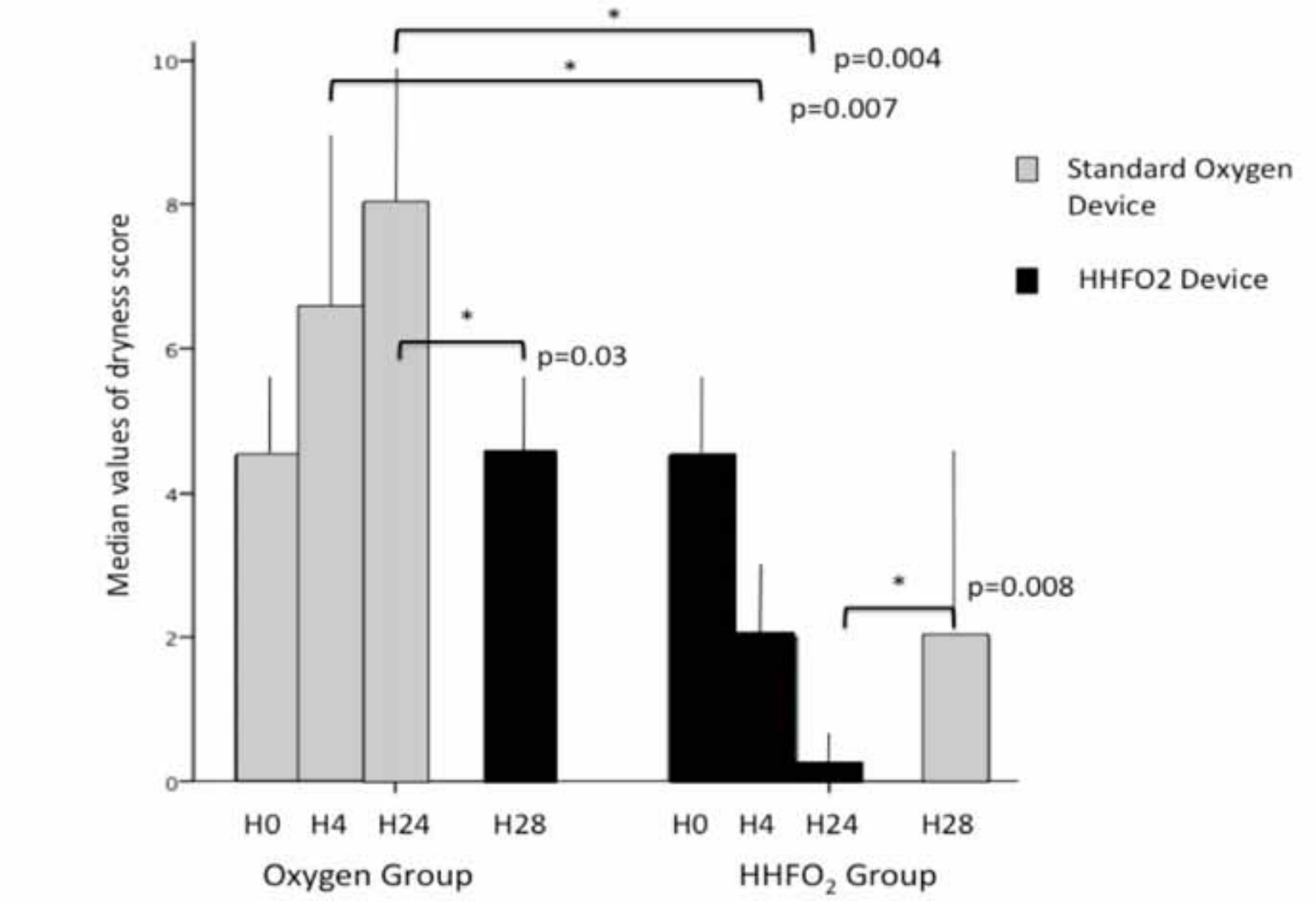
BJA

Nasal high-flow therapy delivers low level positive airway pressure

R. Parke[1]*, S. McGuinness[1] and M. Eccleston[2]†




Pressure (cm H_2O)
6
5
4
3
2
1
0
−1
−2
0
10
20
30
40
50
60
Time (s)
NHFMC
FMMC



Cuquemelle E Resp care 2012

Essai FLORALI

Intérêt de l'oxygénothérapie nasale humidifiée et réchauffée à haut débit (O2-HDN) dans le traitement de l'insuffisance respiratoire aiguë hypoxémique et non hypercapnique de l'adulte. *Etude randomisée.*

Comité scientifique :
JP Frat, R Robert (Poitiers),
C Girault (Rouen),
REVA : L Brochard, A Mercat, JC Richard, A Thille

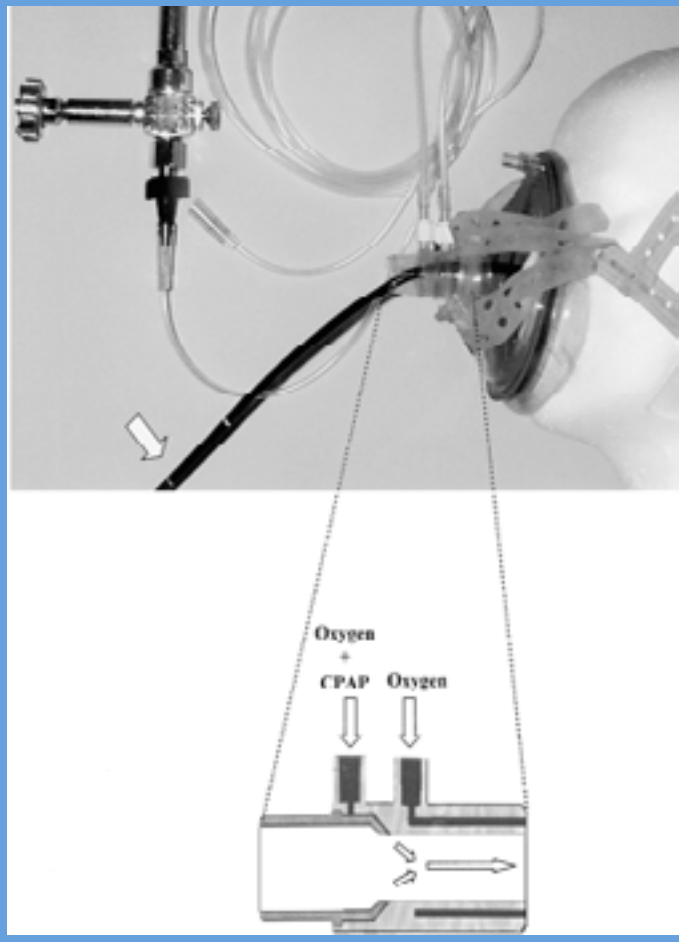
Financement :
PHRC interrégional
Bourse SRLF/SPLF
Fisher-Payckel

Continuous Positive Airway Pressure during Fiberoptic Bronchoscopy in Hypoxemic Patients

A Randomized Double-Blind Study Using A New Device

BERNARD MAITRE, SAMIR JABER, SALVATORE M. MAGGIORE, EMMANUEL BERGOT, JEAN CHRISTOPHE RICHARD, HAMID BAKTHIARI, BRUNO HOUSSET, GEORGES BOUSSIGNAC, and LAURENT BROCHARD

	Oxygen (15)	CPAP (15)	
P/F	169 (71-240)	167 (76-270)	
RR	30 (18-44)	2 (20-60)	
BAL(ml)	66 ± 15	43 ± 19	p<0.03
ETI p<0.03	4	0	
NIV	1	0	



Intensive Care Med (2011) 37:1969–1975
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ORIGINAL

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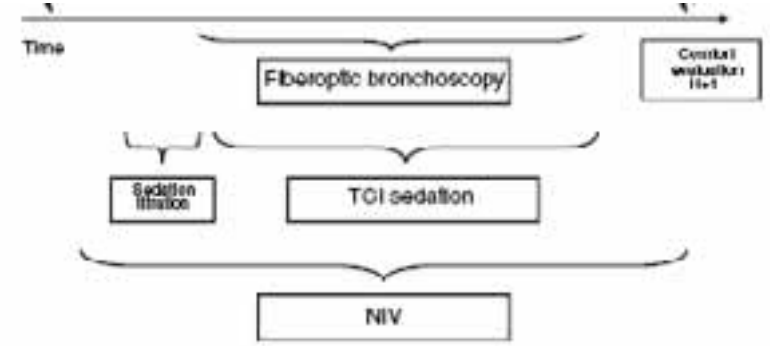
Fiberoptic bronchoscopy under noninvasive ventilation and propofol target-controlled infusion in hypoxemic patients



VNI dans les insuffisances respiratoires aiguës *de novo*

- Efficacité démontrée
- Risque démontré (choc, défaillances, intolérance, âge)
- Influence de l'équipement?
- Décision rapide d'intubation
- Sédation contrôlée? Oxygène humidifié à haut débit?