ATR 2019 – 24ème Congrès National de Réanimation

Prise en charge ventilatoire des BPCO en réanimation

Pr Alexandre Demoule

Pneumologie – Médecine Intensive – Réanimation

Hôpital Pitié-Salpêtrière – Sorbonne Université

MÉDECINE SORBONNE UNIVERSITÉ

Inserm
La science pour la santé
From science to health

UMR-S 1158

R3S

Liens d'intérêt

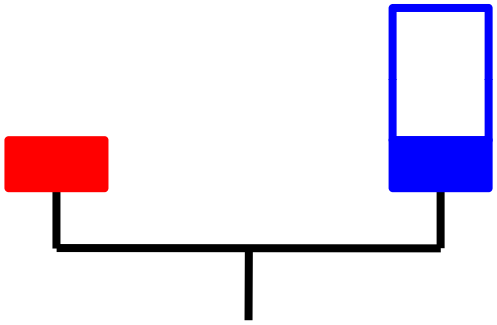
Contrats de recherche, expertise, exposés, inscription à des congrès

- Philips: contrat de recherche
- Getinge: intervention
- Air Liquide santé: contrat de recherche
- Baxter : expertise, intervention
- Hamilton : intervention
- Respinor : contrat de recherche
- Lungpacer : contrat de recherche, expertise
- Fisher & Paykel : congrès, intervention

Charge - Compensation

Sujet sain

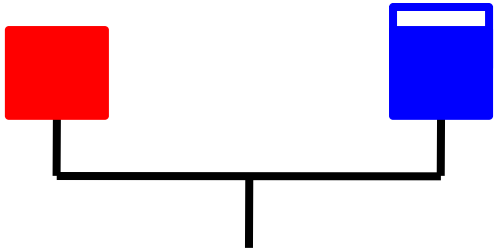
charges ***compensation***



équilibre

BPCO

charges ***compensation***



équilibre

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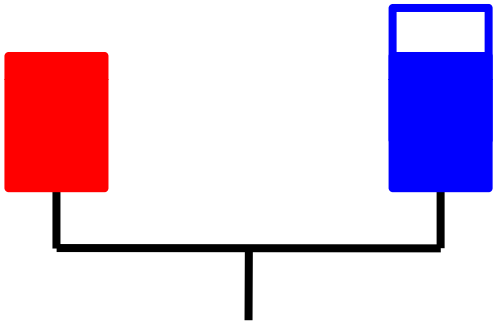
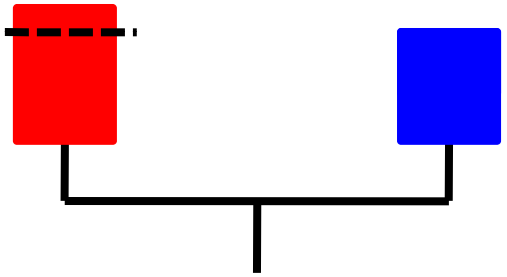


équilibre

BPCO

charges ***compensation***

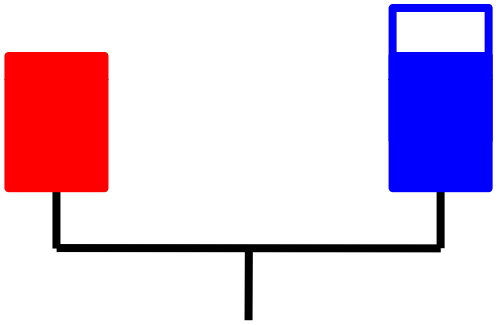


déséquilibre

Charge - Compensation

Sujet sain

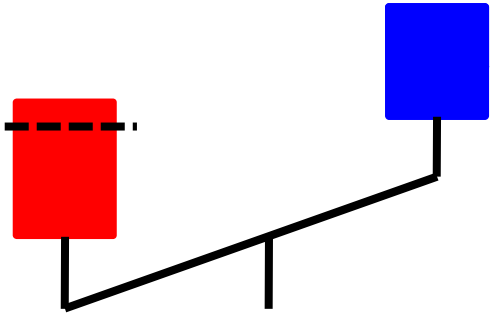
charges ***compensation***



équilibre

BPCO

charges ***compensation***

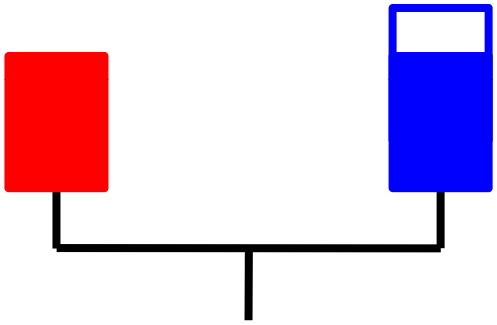


décompensation

Charge - Compensation

Sujet sain

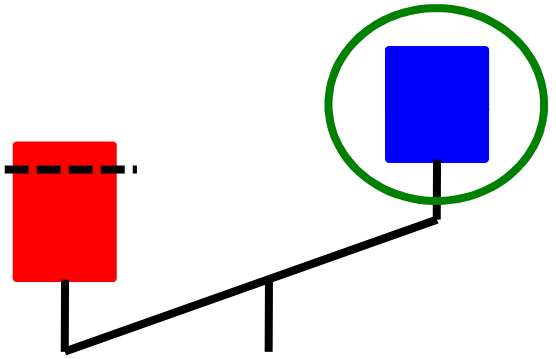
charges ***compensation***



équilibre

BPCO

charges ***compensation***



décompensation

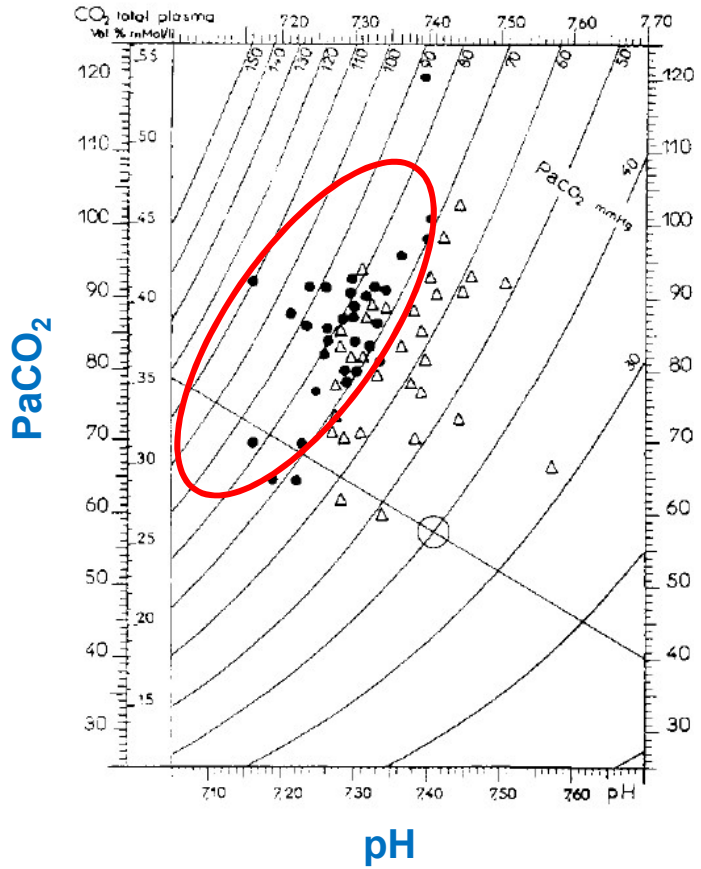
The birth of NIV

TRAITEMENT
PAR VENTILATION INSTRUMENTALE DE 100 CAS
D'INSUFFISANCE RESPIRATOIRE AIGUE SEVERE
($PaCO_2$ égale ou supérieure à 70 mmHg)
CHEZ DES PULMONAIRES CHRONIQUES

P. SADOUL, M.-C. AUG, R. GAY

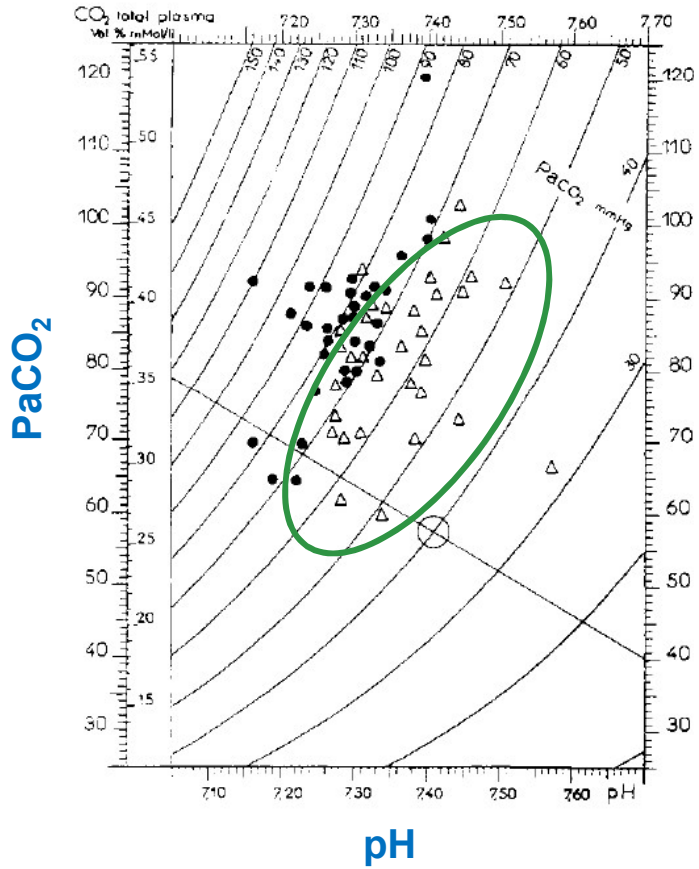
Bulletin Européen de Physiopathologie Respiratoire - 1965-

The birth of NIV



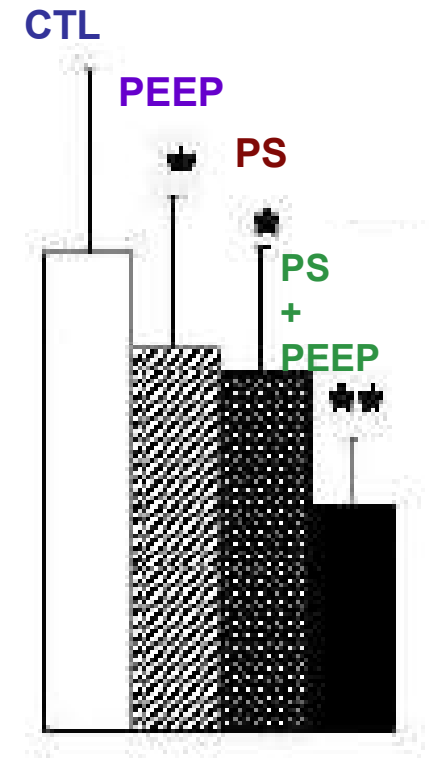
Sadoul et coll. Bull Eur Physiopah Respir 1965

The birth of NIV



Sadoul et coll. Bull Eur Physiopah Respir 1965

Régler le ventilateur



Transdiaphragmatic Pressure
(cmH2O)

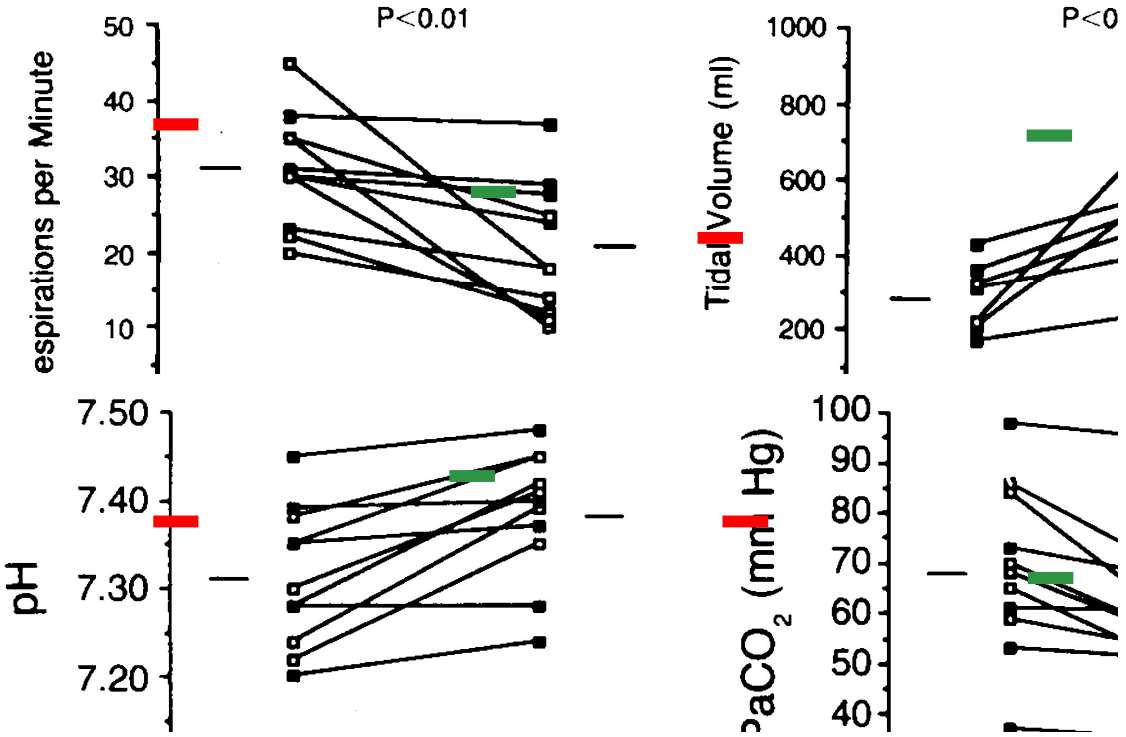
Soyons simples

- **Mode : VS avec aide inspiratoire**
- **Niveau d'aide : viser 6-8 ml/kg IBW**
- **Niveau de PEP : 4-6 cmH_2O**
- **FiO_2 : viser SpO_2 90-92 %**

Appendini et al. Am J Respir Crit Care Med 1994

Monitorer l'efficacité de la VNI

Soyons simples



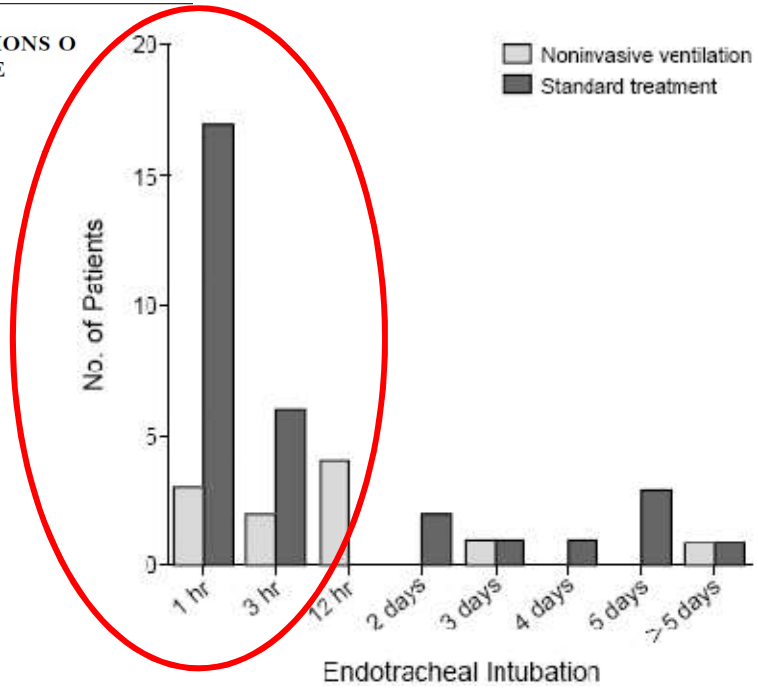
Brochard et coll. New Eng J Med 1990

The period of RCTs

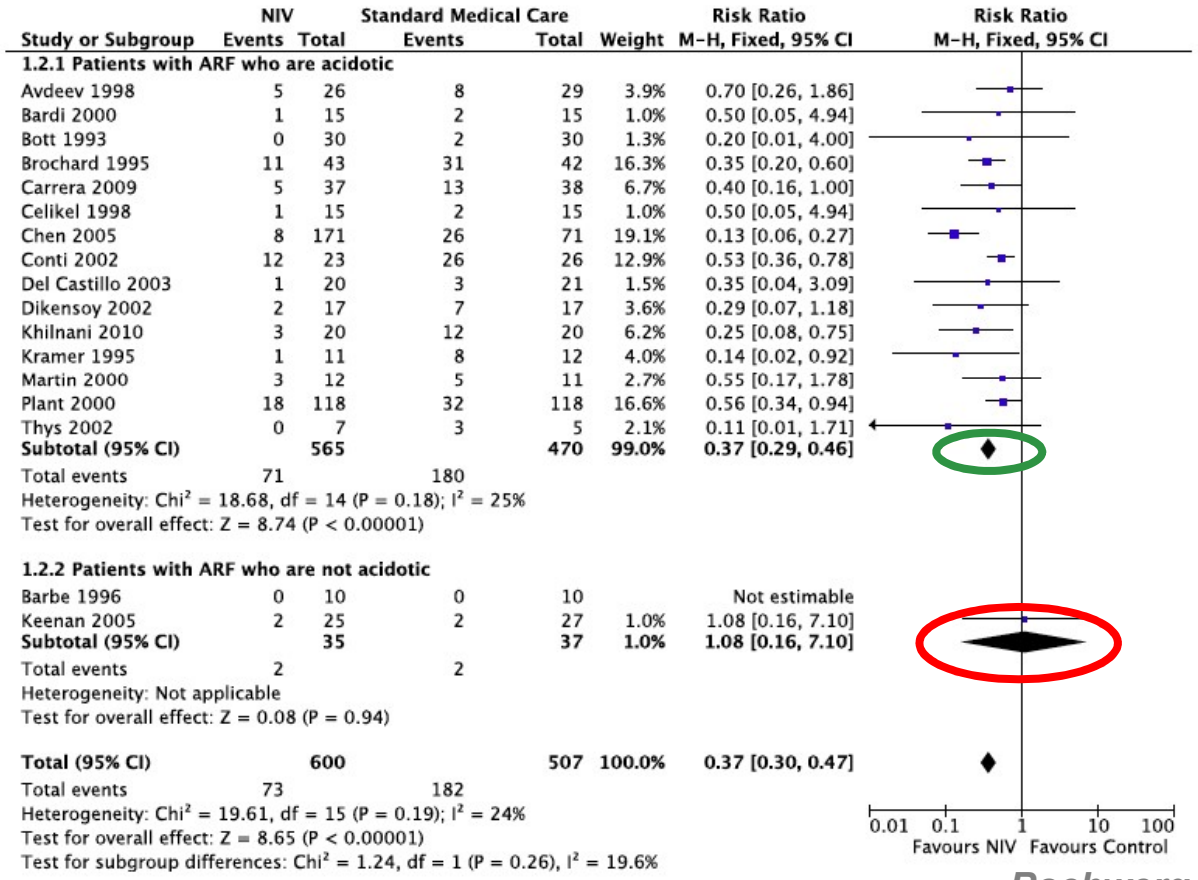
The New England
Journal of Medicine

Volume 333 SEPTEMBER 28, 1995

NONINVASIVE VENTILATION FOR ACUTE EXACERBATIONS O
PULMONARY DISEASE



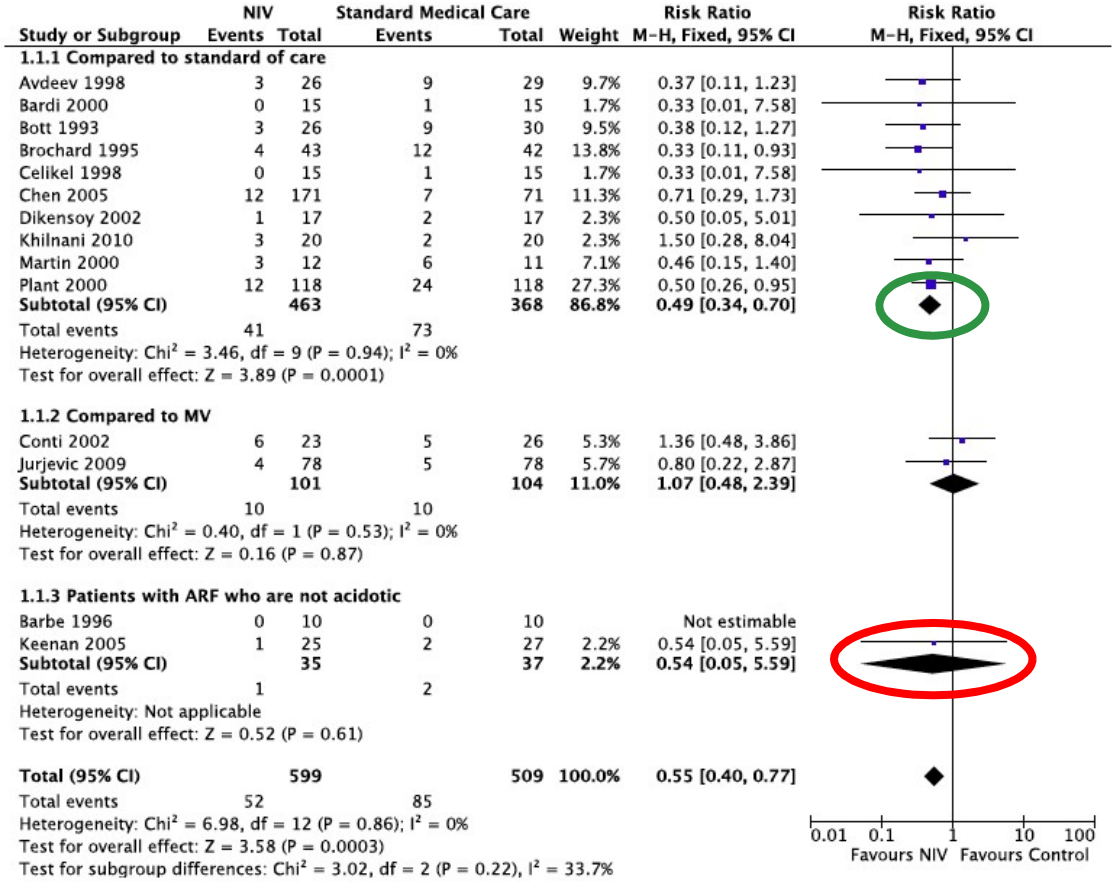
ACRF – COPD – Benefit – Intubation



Study or Subgroup	NIV Events	NIV Total	Standard Medical Care Events	Standard Medical Care Total	Weight	Risk Ratio M-H, Fixed, 95% CI
1.2.1 Patients with ARF who are acidotic						
Avdeev 1998	5	26	8	29	3.9%	0.70 [0.26, 1.86]
Bardi 2000	1	15	2	15	1.0%	0.50 [0.05, 4.94]
Bott 1993	0	30	2	30	1.3%	0.20 [0.01, 4.00]
Brochard 1995	11	43	31	42	16.3%	0.35 [0.20, 0.60]
Carrera 2009	5	37	13	38	6.7%	0.40 [0.16, 1.00]
Celikel 1998	1	15	2	15	1.0%	0.50 [0.05, 4.94]
Chen 2005	8	171	26	71	19.1%	0.13 [0.06, 0.27]
Conti 2002	12	23	26	26	12.9%	0.53 [0.36, 0.78]
Del Castillo 2003	1	20	3	21	1.5%	0.35 [0.04, 3.09]
Dikensoy 2002	2	17	7	17	3.6%	0.29 [0.07, 1.18]
Khilnani 2010	3	20	12	20	6.2%	0.25 [0.08, 0.75]
Kramer 1995	1	11	8	12	4.0%	0.14 [0.02, 0.92]
Martin 2000	3	12	5	11	2.7%	0.55 [0.17, 1.78]
Plant 2000	18	118	32	118	16.6%	0.56 [0.34, 0.94]
Thys 2002	0	7	3	5	2.1%	0.11 [0.01, 1.71]
Subtotal (95% CI)		**565**		**470**	**99.0%**	**0.37 [0.29, 0.46]**
Total events	71		180			
Heterogeneity: $Chi^2 = 18.68$, df = 14 (P = 0.18); $I^2 = 25\%$						
Test for overall effect: Z = 8.74 (P < 0.00001)						
1.2.2 Patients with ARF who are not acidotic						
Barbe 1996	0	10	0	10		Not estimable
Keenan 2005	2	25	2	27	1.0%	1.08 [0.16, 7.10]
Subtotal (95% CI)		**35**		**37**	**1.0%**	**1.08 [0.16, 7.10]**
Total events	2		2			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.08 (P = 0.94)						
Total (95% CI)		**600**		**507**	**100.0%**	**0.37 [0.30, 0.47]**
Total events	73		182			
Heterogeneity: $Chi^2 = 19.61$, df = 15 (P = 0.19); $I^2 = 24\%$						
Test for overall effect: Z = 8.65 (P < 0.00001)						
Test for subgroup differences: $Chi^2 = 1.24$, df = 1 (P = 0.26), $I^2 = 19.6\%$						

Rochwerg et al. Eur Resp J 2017

ACRF – COPD – Benefit – Survival



Study or Subgroup	NIV Events	NIV Total	Standard Medical Care Events	Standard Medical Care Total	Weight	Risk Ratio M-H, Fixed, 95% CI
1.1.1 Compared to standard of care						
Avdeev 1998	3	26	9	29	9.7%	0.37 [0.11, 1.23]
Bardi 2000	0	15	1	15	1.7%	0.33 [0.01, 7.58]
Bott 1993	3	26	9	30	9.5%	0.38 [0.12, 1.27]
Brochard 1995	4	43	12	42	13.8%	0.33 [0.11, 0.93]
Celikel 1998	0	15	1	15	1.7%	0.33 [0.01, 7.58]
Chen 2005	12	171	7	71	11.3%	0.71 [0.29, 1.73]
Dikensoy 2002	1	17	2	17	2.3%	0.50 [0.05, 5.01]
Khilnani 2010	3	20	2	20	2.3%	1.50 [0.28, 8.04]
Martin 2000	3	12	6	11	7.1%	0.46 [0.15, 1.40]
Plant 2000	12	118	24	118	27.3%	0.50 [0.26, 0.95]
Subtotal (95% CI)		**463**		**368**	**86.8%**	**0.49 [0.34, 0.70]**
Total events	41		73			
Heterogeneity: $Chi^2 = 3.46$, df = 9 (P = 0.94); $I^2 = 0\%$						
Test for overall effect: Z = 3.89 (P = 0.0001)						
1.1.2 Compared to MV						
Conti 2002	6	23	5	26	5.3%	1.36 [0.48, 3.86]
Jurjevic 2009	4	78	5	78	5.7%	0.80 [0.22, 2.87]
Subtotal (95% CI)		**101**		**104**	**11.0%**	**1.07 [0.48, 2.39]**
Total events	10		10			
Heterogeneity: $Chi^2 = 0.40$, df = 1 (P = 0.53); $I^2 = 0\%$						
Test for overall effect: Z = 0.16 (P = 0.87)						
1.1.3 Patients with ARF who are not acidotic						
Barbe 1996	0	10	0	10		Not estimable
Keenan 2005	1	25	2	27	2.2%	0.54 [0.05, 5.59]
Subtotal (95% CI)		**35**		**37**	**2.2%**	**0.54 [0.05, 5.59]**
Total events	1		2			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.52 (P = 0.61)						
Total (95% CI)		**599**		**509**	**100.0%**	**0.55 [0.40, 0.77]**
Total events	52		85			
Heterogeneity: $Chi^2 = 6.98$, df = 12 (P = 0.86); $I^2 = 0\%$						
Test for overall effect: Z = 3.58 (P = 0.0003)						
Test for subgroup differences: $Chi^2 = 3.02$, df = 2 (P = 0.22), $I^2 = 33.7\%$						

Rochwerg et al. Eur Resp J 2017

VNI – alternative à l'intubation

BPCO – VNI en cas de coma

Variable	Success (n = 76)	Failure (n = 19)	p Value
GCS			
Admission	6.5 ± 1.8	6.1 ± 1.5	0.341
First hour	11.2 ± 2.0	7.9 ± 2.2	< 0.0001
pH			
Admission	7.13 ± 0.06	7.11 ± 0.08	0.631
First hour	7.23 ± 0.05	7.17 ± 0.05	< 0.0001
$Paco_2$, mm Hg			
Admission	98 ± 18	102 ± 25	0.513
First hour	78 ± 16	95 ± 25	< 0.0001
Pao_2/Fio_2 ratio			
Admission	138 ± 40	140 ± 50	0.907
First hour	195 ± 40	166 ± 42	0.008

Diaz et coll. Chest 2005

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Diaz et coll. Chest 2005

TASK FORCE REPORT
ERS/ATS GUIDELINES

Official ERS/ATS clinical practice guidelines: noninvasive ventilation for acute respiratory failure

Bram Rochwerg[1], Laurent Brochard[2,3], Mark W. Elliott[4], Dean Hess[5], Nicholas S. Hill[6], Stefano Nava[7] and Paolo Navalesi[8] (members of the steering committee); Massimo Antonelli[9], Jan Brozek[1], Giorgio Conti[9], Miquel Ferrer[10], Kalpalatha Guntupalli[11], Samir Jaber[12], Sean Keenan[13,14], Jordi Mancebo[15], Sangeeta Mehta[16] and Suhail Raoof[17,18] (members of the task force)

Recommendations

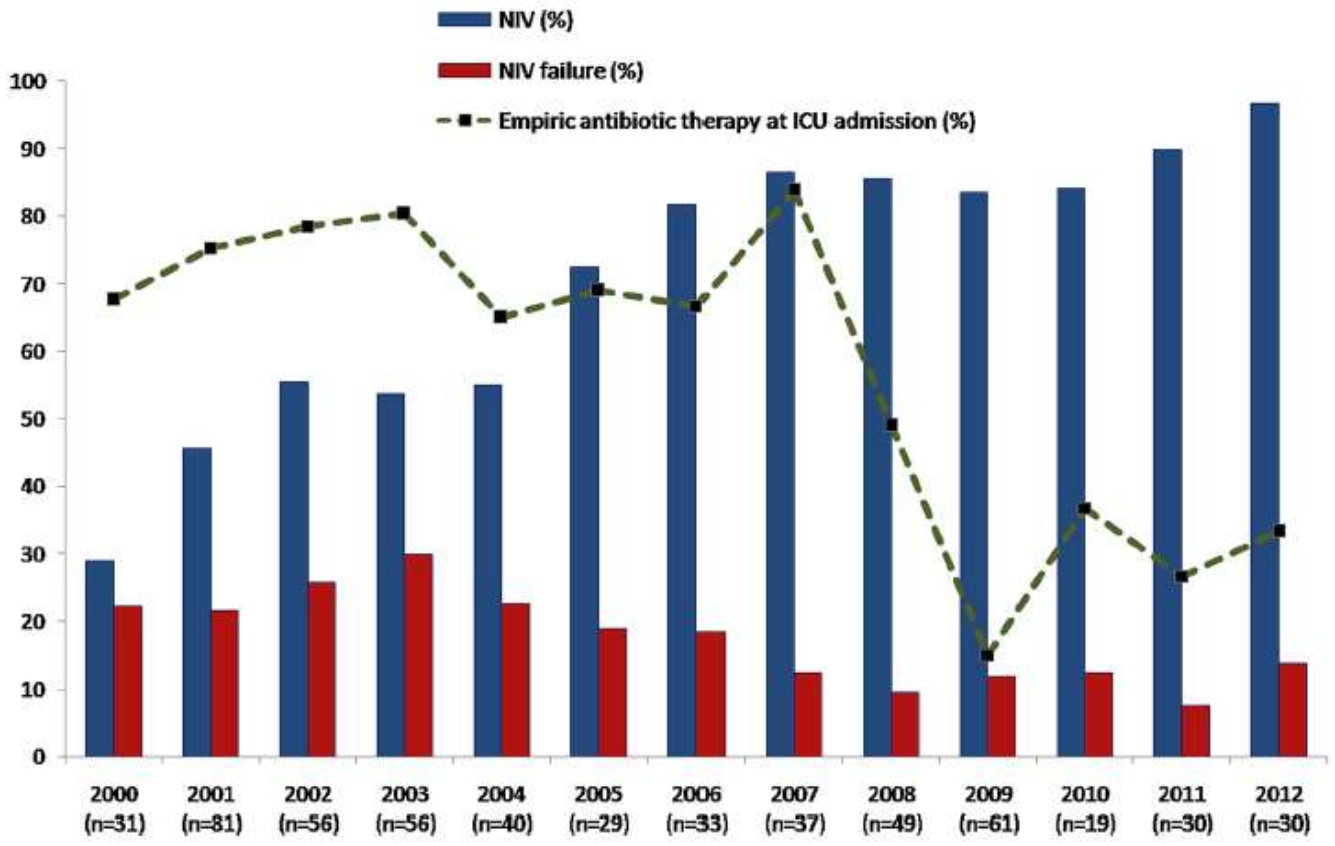
We recommend bilevel NIV for patients with ARF leading to acute or acute-on-chronic respiratory acidosis (pH ⩽7.35) due to COPD exacerbation. (Strong recommendation, high certainty of evidence.)

We recommend a trial of bilevel NIV in patients considered to require endotracheal intubation and mechanical ventilation, unless the patient is immediately deteriorating. (Strong recommendation, moderate certainty of evidence.)

→ ***Concept of NIV trial***

Rochwerg et al. Eur Resp J 2017

Effet volume – Impact sur les PAVM



Ouanes et al. Ann Intensive Care 2015

Dyspnoea in patients receiving noninvasive ventilation for acute respiratory failure: prevalence, risk factors and prognostic impact

A prospective observational study

Laurence Dangers[1,2], Claire Montlahuc[3,4], Achille Kouatchet[5], Samir Jaber[6,7], Ferhat Meziani[8], Sébastien Perbet[9,10], Thomas Similowski[1,2], Matthieu Resche-Rigon[3,4], Elie Azoulay[11] and Alexandre Demoule[1,2] for the REVA Network (Research Network in Mechanical Ventilation) and the Groupe de Recherche en Réanimation Respiratoire en Onco-Hématologie (GrrrOH)

Dangers et al. Eur Resp J 2018

Dyspnée après la première séance de VNI

Rating	Intensity of perception
0	No sensation
0,5	Very, very slight
1	Very slight
2	Slight
3	Moderate
4	Somewhat severe
5	Severe
6	
7	Very severe
8	
9	Very, very severe
10	Maximal

Light or no dyspnea

Moderate to severe dyspnea

- **A l'admission = 4 [3 – 5]**
- **Après la première session de VNI = 3 [2 – 4]**

Dyspnée après la première séance de VNI

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0	No sensation
0,5	Very, very slight
1	Very slight
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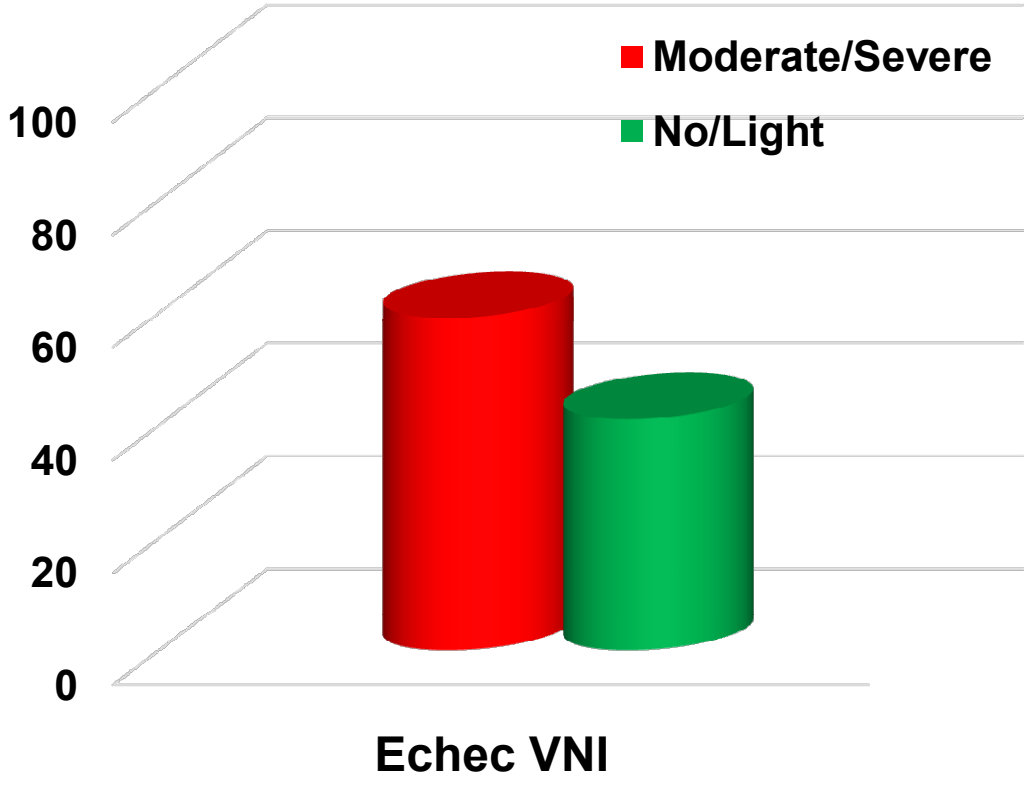
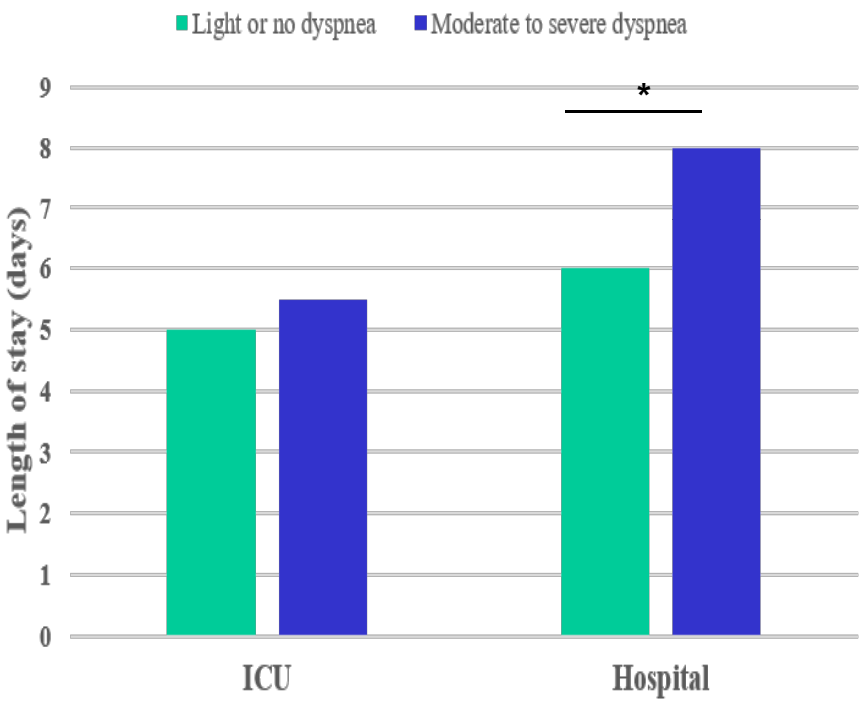
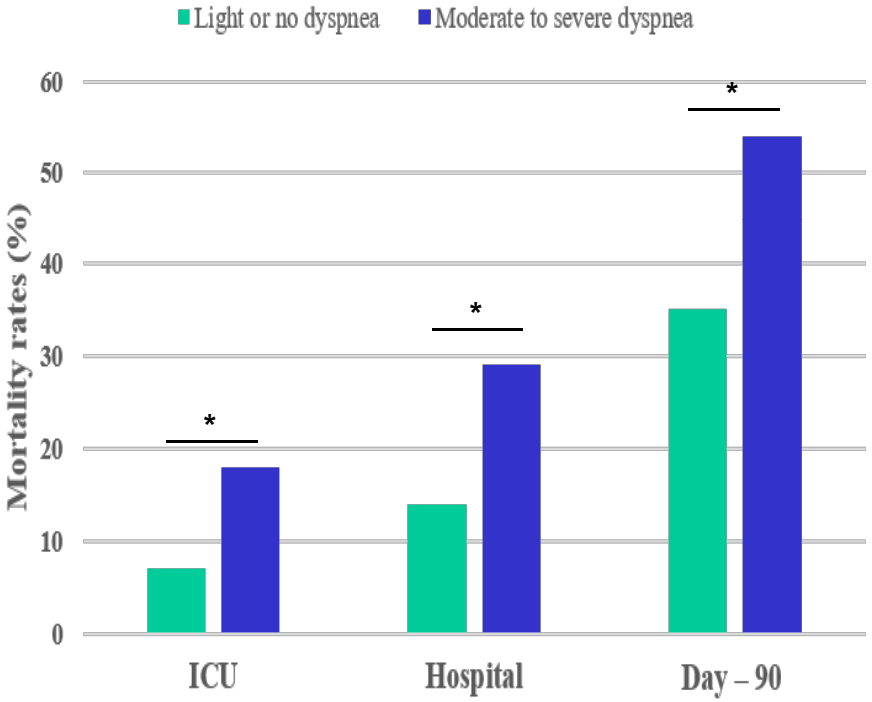


VNI et dyspnée

Length of stay



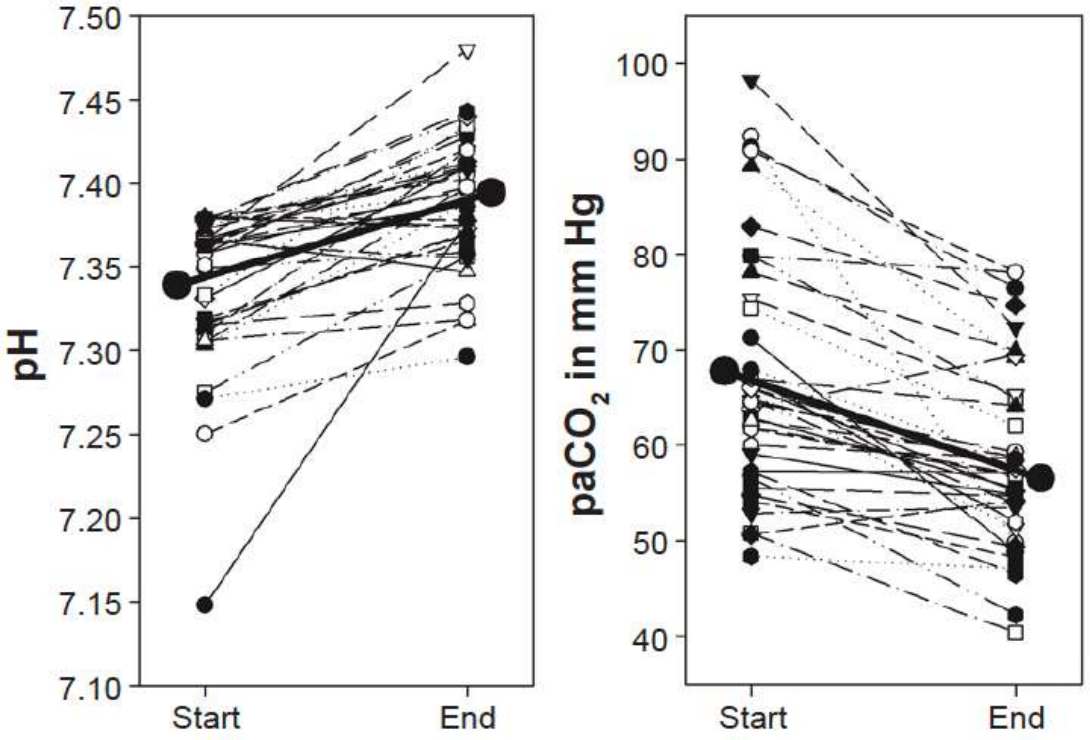
Mortality



Dangers et al. Eur Resp J 2018

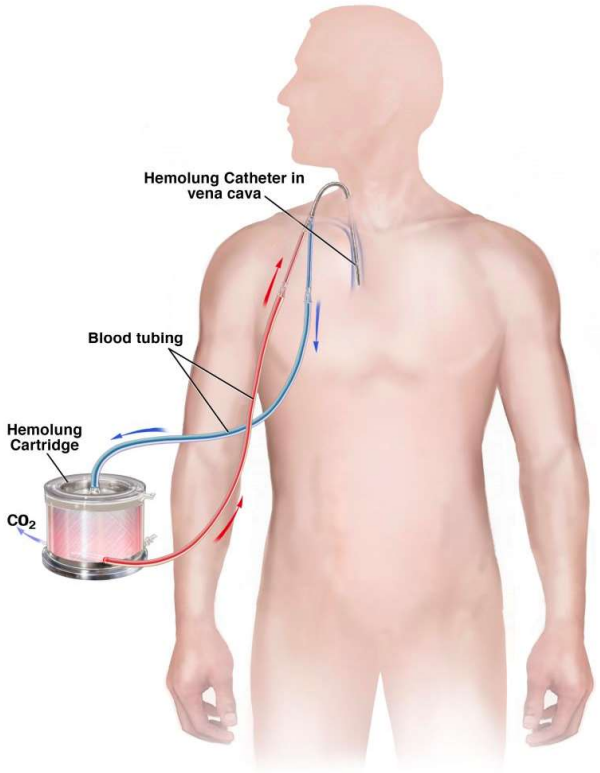
Oxygène humidifié à haut débit

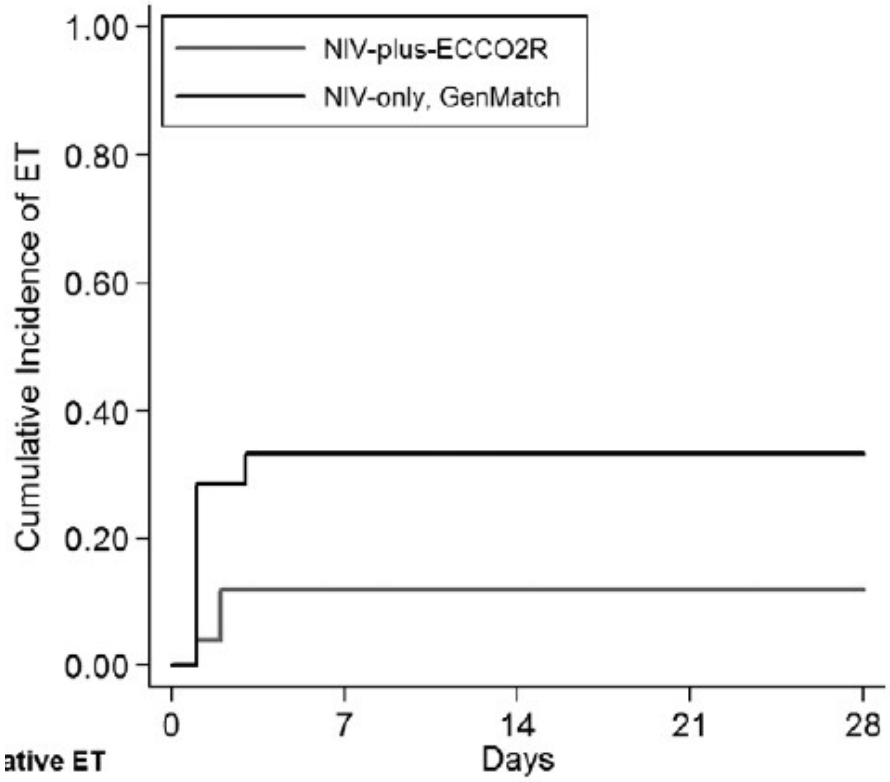
IRA des BPCO – Acidose respiratoire – 38 patients



Bräunlich et al. Int J COPD 2018

BPCO – Echec VNI – ECO2R ?

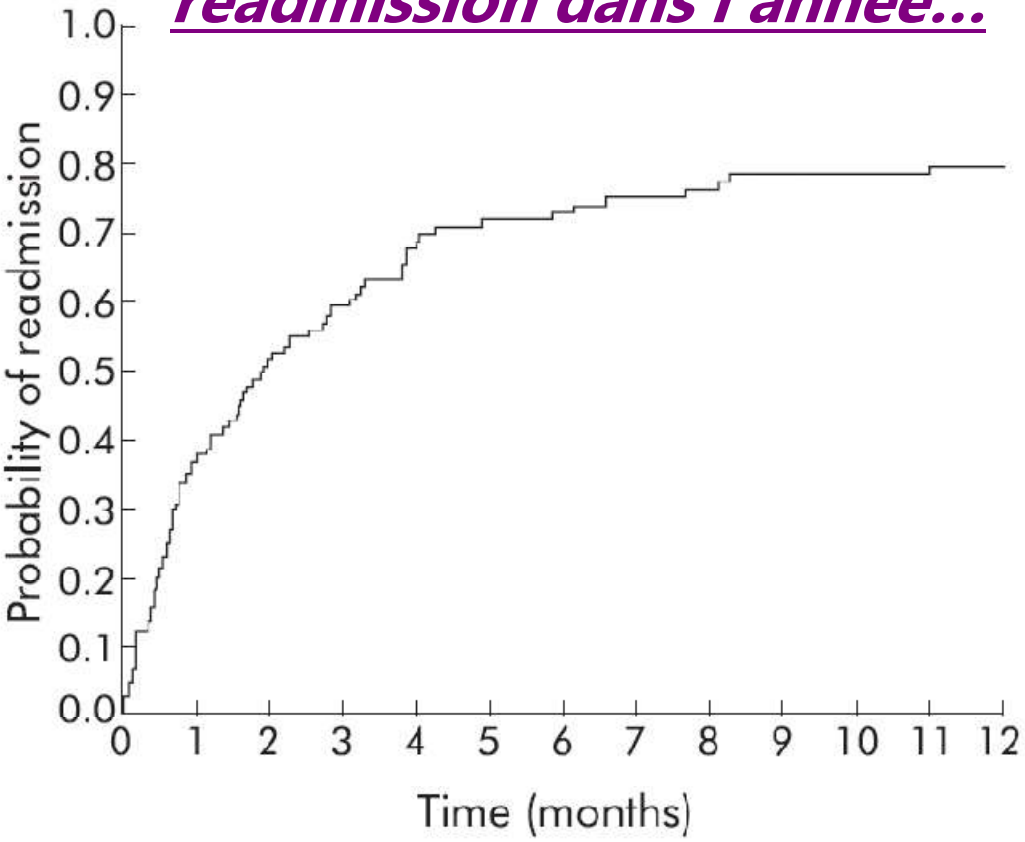




Del Sorbo et coll. Crit Care Med 2014

VNI et BPCO - réadmission

réadmission dans l'année…



Chu et coll. Thorax 2007

Research

JAMA | Original Investigation

Effect of Home Noninvasive Ventilation With Oxygen Therapy vs Oxygen Therapy Alone on Hospital Readmission or Death After an Acute COPD Exacerbation

A Randomized Clinical Trial

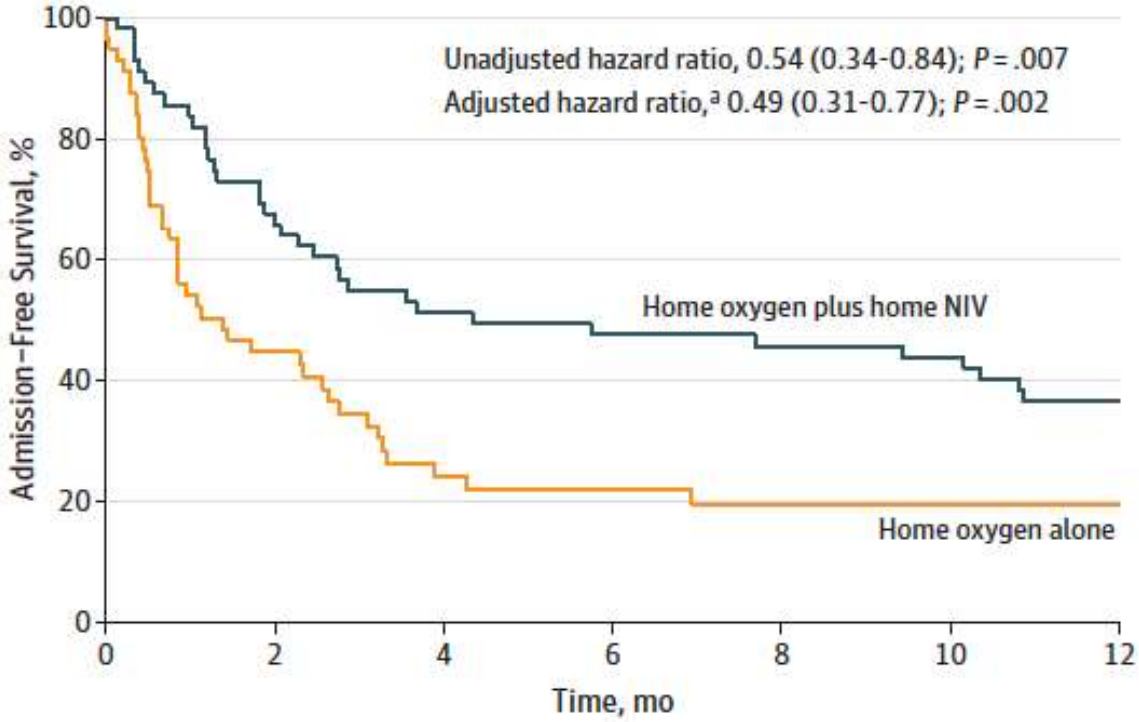
Patrick B. Murphy, PhD; Sunita Rehal, MSc; Gill Arbane, BSc (Hons); Stephen Bourke, PhD; Peter M. A. Calverley, PhD; Angela M. Crook, PhD; Lee Dowson, MD; Nicholas Duffy, MD; G. John Gibson, MD; Philip D. Hughes, MD; John R. Hurst, PhD; Keir E. Lewis, MD; Rahul Mukherjee, MD; Annabel Nickol, PhD; Nicholas Oscroft, MD; Maxime Patout, MD; Justin Pepperell, MD; Ian Smith, MD; John R. Stradling, PhD; Jadwiga A. Wedzicha, PhD; Michael I. Polkey, PhD; Mark W. Elliott, MD; Nicholas Hart, PhD

- **2-4 weeks after the episode**
- **NIV if**
  - hypercapnia > 63 mmHg
  - Hypoxemia < 55-60 mmHg
  - pH > 7.30

Murphy et al. JAMA 2017

Home ventilation after ACRF

Admission-Free Survival



Murphy et al. JAMA 2017

Conclusions

VNI et BPCO

- **Haut niveau de preuve**
  - **Physiologie solide**
  - **Bénéfice indiscutable**
- **Restent des challenges**
  - **Prédiction de l'échec**
  - **Gestion des échecs**
  - **Prévention des récidves**

Thanks for your attention

alexandre.demoule@aphp.fr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