



*VNI au cours de l'insuffisance respiratoire aiguë en service de médecine, quelles limites ?*

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Séminaire VNI et troubles respiratoires du sommeil  
Combloux, 2017

# Liens d'intérêt

- Formateur rémunéré :

- . Vitalaire, Agir A Dom, arard, MACS Formation

- Co-investigateur en recherche clinique industrielle :

- . Laboratoires Boehringer, PHILIPS, ResMed

**American Thoracic Society Congress 1988**

Leger P, Jennequin J, Gaussorgues P, Robert D.

Acute respiratory failure in

COPD patients treated with noninvasive intermittent mechanical ventilation (control mode)  
with nasal mask.

Am Rev Respir Dis 1988;137:Suppl:63. abstract

The New England  
**Journal of Medicine**

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Volume 333

SEPTEMBER 28, 1995

Number 13

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**NONINVASIVE VENTILATION FOR ACUTE EXACERBATIONS OF CHRONIC OBSTRUCTIVE  
PULMONARY DISEASE**

LAURENT BROCHARD, M.D., JORDI MANCEBO, M.D., MARC WYSOCKI, M.D., FRÉDÉRIC LOFASO, M.D.,  
GIORGIO CONTI, M.D., ALAIN RAUSS, M.D., GÉRALD SIMONNEAU, M.D., SALVADOR BENITO, M.D.,  
ALESSANDRO GASPARETTO, M.D., FRANÇOIS LEMAIRE, M.D., DANIEL ISABEY, PH.D., AND ALAIN HARF, M.D.

## NIV for ACUTE RESPIRATORY FAILURE

### Level 1 evidence (systematic reviews of RCTs)

- ACUTE EXACERBATION of COPD
  - . ↓ ETI, ↓ in-hospital stay & in-hospital mortality
  - . ↓ Nosocomial infections
- CARDIOGENIC PULMONARY EDEMA with HYPERCAPNIA
  - . ↓ ETI, ↓ in-hospital mortality
- HYPOXAEMIC RESPIRATORY FAILURE
  - . Immunosuppressed patients (early stage) : ↓ ETI, ↓ in-hospital mortality (but not long-term mortality)
  - . Others : heterogeneous causes of respiratory failure, effectiveness ?
- WEANING from INVASIVE MECHANICAL VENTILATION - COPD
  - . ↓ Periods of IMV, ↓ in-hospital stay, ↓ pneumonia, ↑ Survival (2-3 mo)

*Elliott MW. Br Med Bull 2004; 83-97*

*Nava S, Hill NS. Lancet 2009; 374: 250*

*Huang HB. Crit. Care 2017*

## NIV for ACUTE RESPIRATORY FAILURE

Level 2 evidence (systematic reviews of cohorte studies)

- Do-not-intubate status
- End-stage patients as palliative measure
- Extubation failure (COPD or congestive heart failure)
- Community-acquired pneumonia in COPD
- Post-operative respiratory failure
- Prevention of acute respiratory failure in asthma

*Elliott MW. Br Med Bull 2004; 83-97*

*Nava S, Hill NS. Lancet 2009; 374: 250*

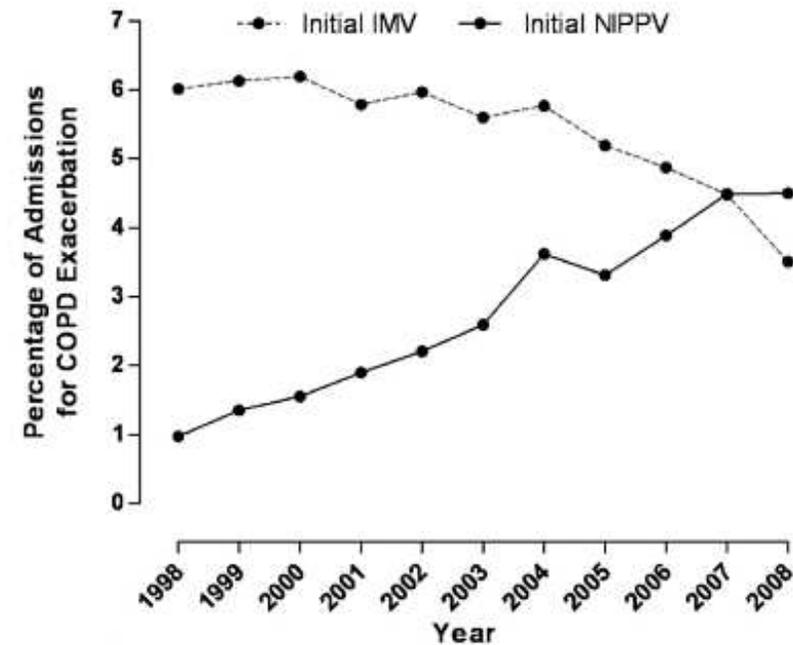
## Outcomes of Noninvasive Ventilation for Acute Exacerbations of Chronic Obstructive Pulmonary Disease in the United States, 1998-2008

De 1998 à 2008 :

Admissions : 7.511.267

VNI : + 462%

VMI : - 42%



*Figure 1.* Temporal trends in the use of noninvasive positive pressure ventilation (NIPPV) and invasive mechanical ventilation (IMV) as the initial form of respiratory support in patients hospitalized with acute exacerbations of chronic obstructive pulmonary disease (COPD) in the United States, 1998–2008.

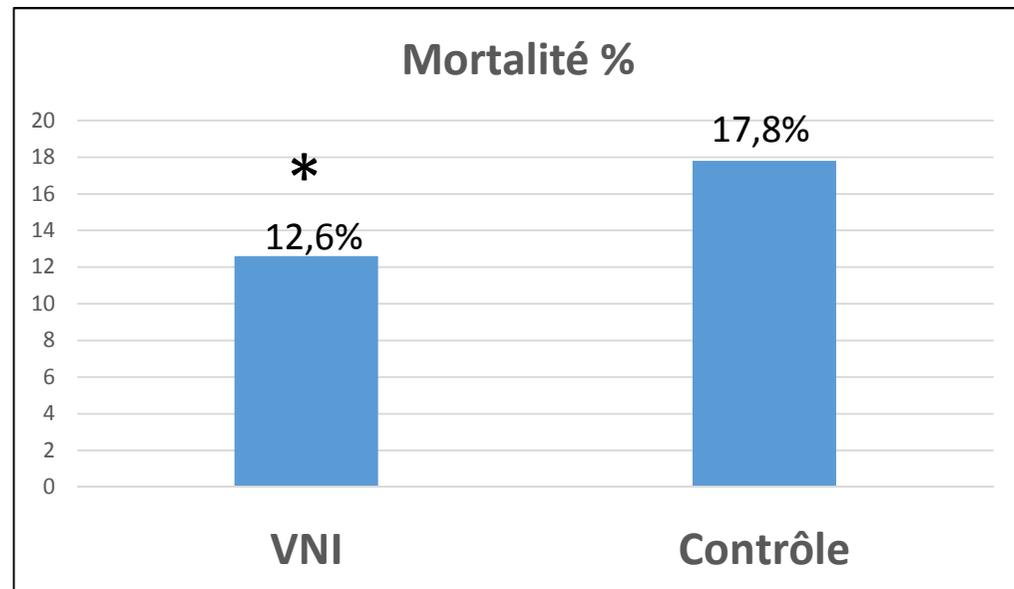
*Chandra D et al.  
AJRCCM 2012; 185 : 152*

## Noninvasive ventilation and survival in acute care settings: a comprehensive systematic review and meta-analysis of randomized controlled trials

**78 Essais randomisés contrôlés**  
**Depuis 20 ans**

### Bénéfice :

- . IRA / BPCO
- . OAP cardiogénique
- . IRA post-opératoire



\* P < 0,001

*Cabrini L et al. Crit Care Med 2015; 43: 880*

## Outcomes Associated With Invasive and Noninvasive Ventilation Among Patients Hospitalized With Exacerbations of Chronic Obstructive Pulmonary Disease

Etude rétrospective USA

n = 25 628 admissions

420 hôpitaux

VM, 1<sup>er</sup> ou 2<sup>ème</sup> jour ?

**VNI : 17 978 pts (70%)**

↓ **Risque de décès**

↓ **Risque de pneumonie**

↓ **Coût de prise en charge**

**Bénéfice identique quelque soit l'âge**

*Lindenauer PK et al. JAMA Intern Med 2014*

## VNI / INSUFFISANCE RESPIRATOIRE AIGUE - REANIMATION

- **Meilleur site (effectif, matériels, monitoring, expertise)**
- Indications nombreuses (IRA, 40% des détériorations aiguës)
- Intérêt prise en charge précoce
- Limitation de places
- Problématique pts "à ne pas intuber" (non admis en REA mais candidats à la VNI)
- Absence de sédation
- Années 80 : coût réanimation = 20% coût hospitalier

*Jones D et al. Crit Care 2006; 10: R30*

*Nava S, Hill NS. Lancet 2009; 374: 250*

*Cabrini L et al. Crit Care Med 2015; 43: 1559*

*Stelfox HT et al. Arch Intern Med 2012; 172: 467*

*Plant PK et al. BMJ 2003; 326; 956*

*Hilbert G et al. Intensive Care Med 2015; 41: 1688*

*Conti G et al. Intensive Care Med 2015; 41: 1692*

## VNI - IRA/BPCO - Essais randomisés contrôlés

### Service de médecine - Urgences

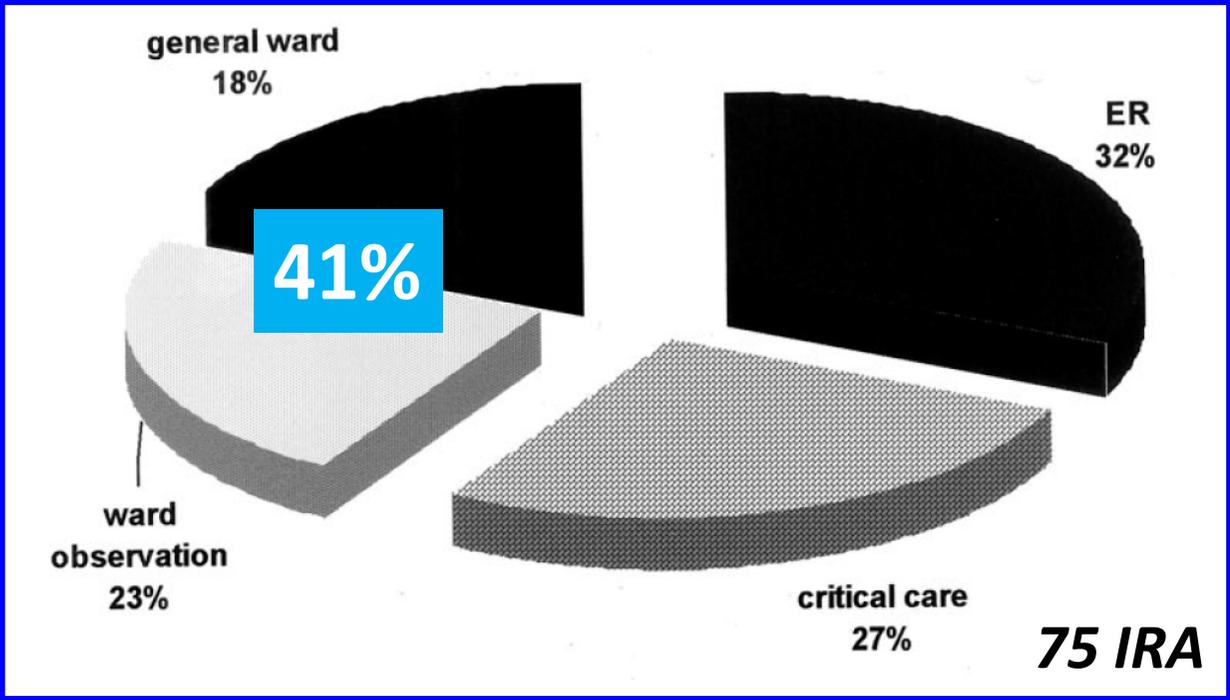
p < 0,05

Bott J. Lancet 1993; 341: 1555  
 Angus RM. Thorax 1996; 51: 1058  
 Plant PK. Lancet 2000; 355: 1931  
 Bardi G. Eur Respir J 2000; 15: 98  
 Thys F. Eur Respir J 2002; 20: 545  
 Keenan S. Respir Care 2005; 50: 610  
 Carrera M. J Crit Care 2009; 24: 473

|                     | n   | Échec (n)                    |           | Mortalité (n) |            |
|---------------------|-----|------------------------------|-----------|---------------|------------|
|                     |     | Contrôle                     | VNI       | Contrôle      | VNI        |
| <b>Bott 1993</b>    | 60  | 5/30                         | 0 ou 4/30 | 9/30          | 1* ou 3/30 |
| <b>Angus 1996</b>   | 17  | 5/8                          | 0/9       | 3/8           | 0/9        |
| <b>Plant 2000</b>   | 236 | 32/118                       | 18/118*   | 24/118        | 12/118*    |
| <b>Bardi 2000</b>   | 30  | 2/15                         | 1/15      | 1/15          | 0/15       |
| <b>Thys 2002</b>    | 20  | 10/10<br>Placebo<br>IOT 3/10 | 0/10*     | 1/10          | 2/10       |
| <b>Keenan 2005</b>  | 52  | 2/27                         | 2/25      | 2/27          | 1/25       |
| <b>Carrera 2009</b> | 75  | 13/38                        | 5/37*     | NS            |            |

Échec : intolérance,  
 VNI de secours, intubation, décès

# The use of noninvasive ventilation in acute respiratory failure at a tertiary care center



## VNI / IRA - Hors REA ou USI - Epidémiologie

|                        | Doherty 1998<br>UK<br>268 Institut. | Vanpee 2002<br>Belgium<br>145 Em. Dpt | Burns<br>2005<br>Ontario<br>15 Institut. | Bierer<br>2009<br>USA<br>63 ICUs | Cabrini<br>2011<br>Italy<br>46 Institut. | Cabrini<br>2014<br>Worldwide Survey<br>51 countries<br>157 questionnaires |
|------------------------|-------------------------------------|---------------------------------------|--|----------------------------------|--|---|
| Pratique VNI (%)       | 48                                  | 49                                    | 63                                       | 49                               | 80                                       |   |
| Urgences (%)           |                                     | 100                                   | 49                                       | 63                               | 72                                       |   |
| Pneumologie (%)        |                                     |                                       | 8  |                                  |  |   |
| Médecine générale (%)  |                                     |                                       | 5  | 39                               | 28                                       | 66  |
| Chirurgie Générale (%) |                                     |                                       |  |                                  |  |   |
| Surveillance (%)       |                                     | Med: 9<br>IDE: 20<br>Med, IDE: 55     |  |                                  |  |   |

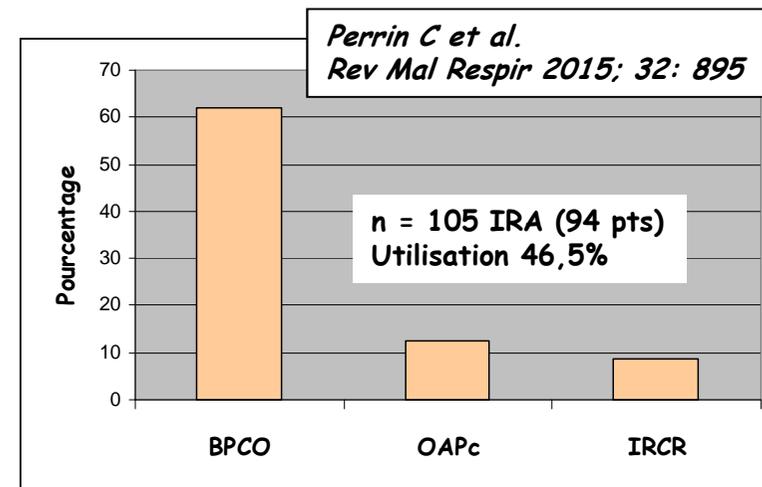
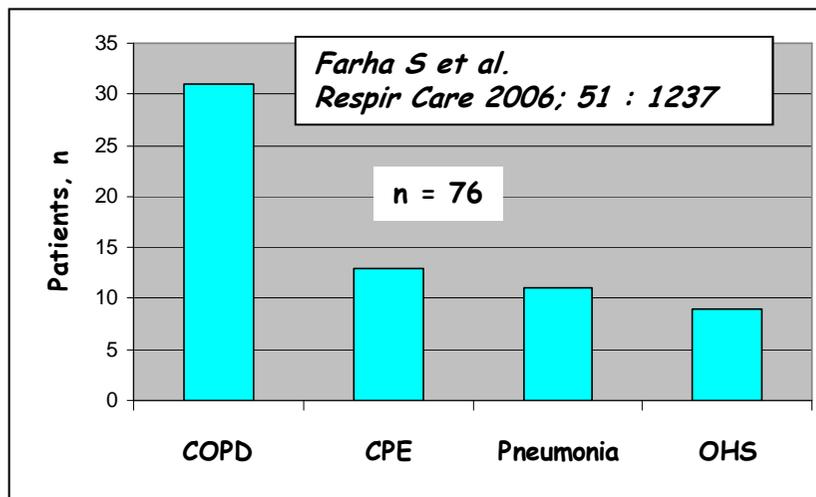
Doherty MJ Thorax 1998;53:863  
 Vanpee D Eur J Emerg Med 2002;9:217  
 Burns KE Crit Care Med 2005;33:1477  
 Bierer GB Respir Care 2009;54:1313  
 Cabrini L Minerva Anesthesiol 2011;77:313  
 Cabrini L Respir Care 2014

Table 3. Conditions Treated With Noninvasive Ventilation

*Bierer GB et al.  
Respir Care 2009; 54 : 1313*

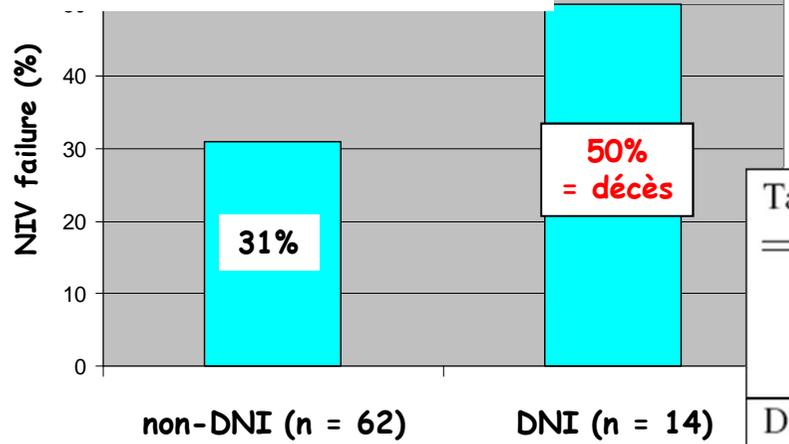
| Condition                | NIV a First-Line Option<br>n (%) |
|--------------------------|----------------------------------|
| COPD                     | 142 (76)                         |
| Obstructive sleep apnea  | 145 (77)                         |
| DNR or DNI patients      | 94 (50)                          |
| Congestive heart failure | 116 (62)                         |

**VNI / IRA**  
Service de Médecine  
Quelles pathologies ?



**DNI** : do not intubate  
**Failure** : transfer to ICU or death

*Farha S Respir Care 2006;51:1237*



**Patients à ne pas intuber  
 « Soins Palliatifs »**

Table 3. Conditions Treated With Noninvasive Ventilation

| Condition           | NIV Use<br>n (%) | NIV a First-Line<br>Option<br>n (%) |
|---------------------|------------------|-------------------------------------|
| DNR or DNI patients | 156 (83)         | 94 (50)                             |

*Bierer GB  
 Respir Care 2009;54:1313*

Table 2—Outcome of Normocarbic vs Hypercarbic Patients

| Variables           | Pco <sub>2</sub> ≤ 45 mm Hg<br>(n = 21) | Pco <sub>2</sub> ≥ 46 mm Hg<br>(n = 47) |
|---------------------|---|---|
| Bilevel ventilation | 16                                      | 41                                      |
| CPAP                | 5                                       | 6                                       |
| DNR                 | 1                                       | 18                                      |
| Mortality           | 7 (33%)                                 | 8 (17%)                                 |

*Paus-Jenssen ES  
 Chest 2004;126:165*

**DNR** : do not resuscitate

**Généralisation de la VNI en aigu  
en dehors des USI ou de la  
Réanimation ?**

## VNI / IRA en dehors USI ou Réanimation

### AVANTAGES

**En faveur !**

- . Faisabilité
- . ↓ complications liées au monitoring invasif de REA - USI
- . Confort du patient avec visites facilitées

# Cost effectiveness of ward based non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease: economic analysis of randomised controlled trial

**Table 3** Cost effectiveness of ward based non-invasive ventilation in reducing mortality in hospital in two groups of patients (n=236)

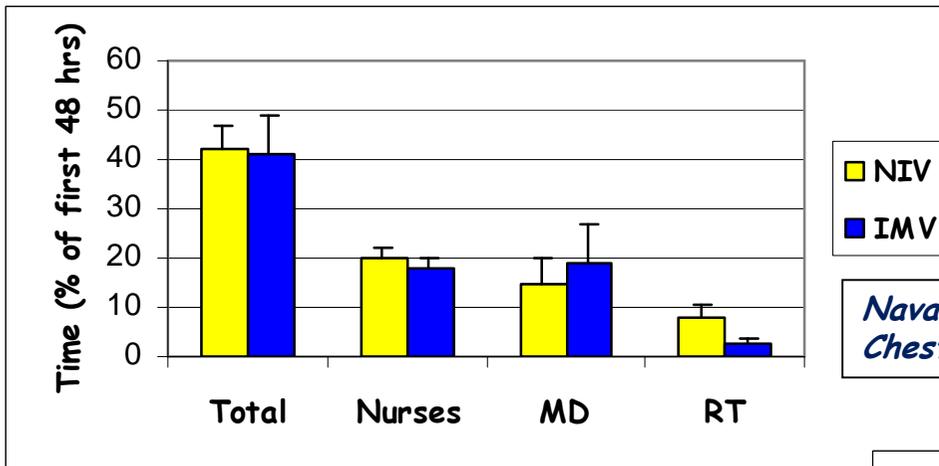
|  | Standard treatment<br>(n=118) | Non-invasive ventilation<br>(n=118) |
|--|-------------------------------|-------------------------------------|
| <b>Costs (£):</b>                            |                               |                                     |
| Ward   | 127 355                       | 139 243                             |
| Non-invasive ventilation                     | 3 390*                        | 26 664                              |
| Additional non-invasive ventilation nursing  | 67*                           | 525                                 |
| Intensive care unit                          | 142 576                       | 52 981                              |
| Total  | 337 435                       | 288 073                             |
| <b>Effectiveness of intervention:</b>        |                               |                                     |
| No of deaths                                 | 24                            | 12                                  |
| No discharged                                | 98                            | 108                                 |
| Saving with non-invasive ventilation (£)     | —                             | 49 362                              |
| Deaths avoided with non-invasive ventilation | —                             | 12                                  |

\*Cost due to the use of non-invasive ventilation after meeting failure criteria.

**En faveur !**

*Plant PK et al. BMJ 2003; 326: 1-5*

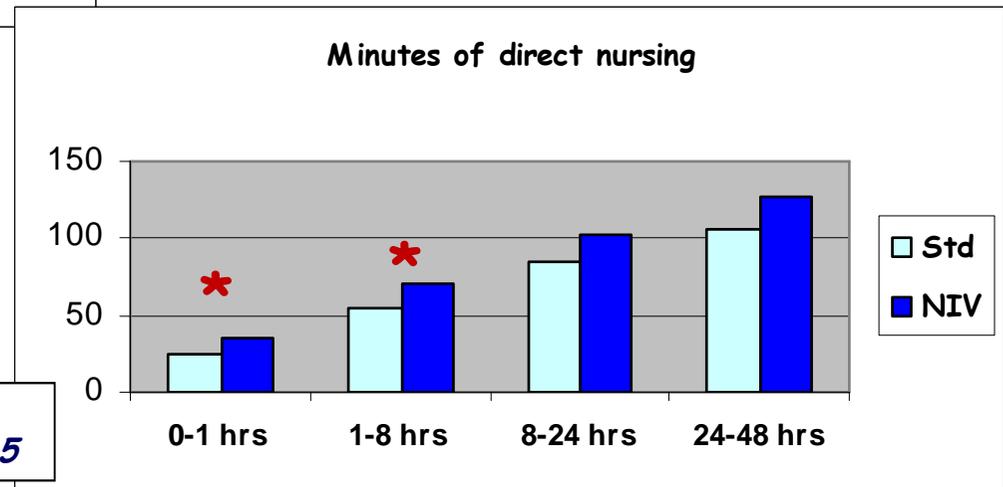
# VNI - IRA/BPCO - Service de médecine



*Nava S et al.  
Chest 1997; 111: 1631*

**Prudence !**

*Plant PK et al.  
BMJ 2003; 326 : 1-5*



# **Noninvasive Ventilation Outside the Intensive Care Unit From the Patient Point of View: A Pilot Study**

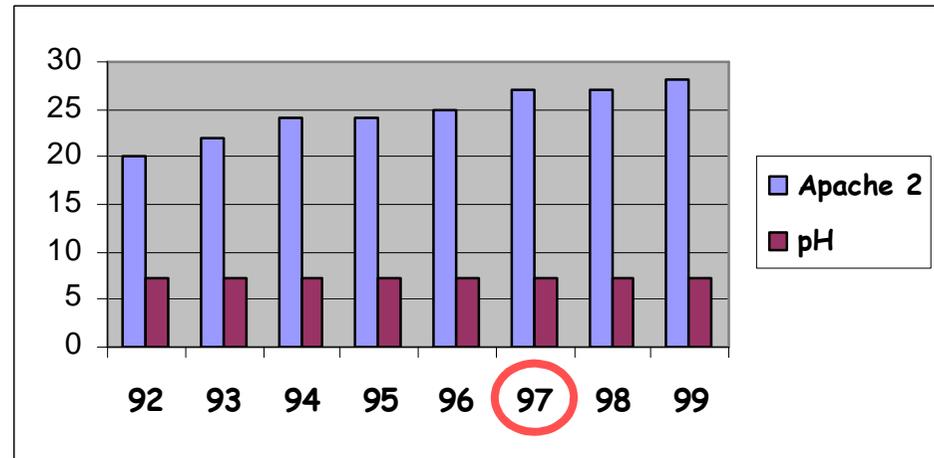
**CONCLUSIONS : Faible investissement des personnels au cours de la mise en place de la VNI, peu d'explication, ..... et un sentiment d'insécurité en cas d'urgence !**

**Prudence !**

*Cabrini L et al. Respir Care 2012; 57 : 704*

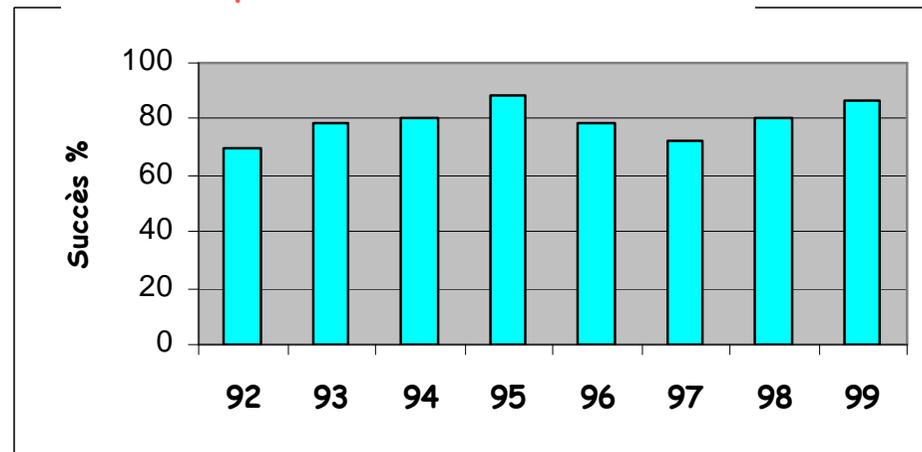
# Expertise en VNI

## Impact sur la Performance



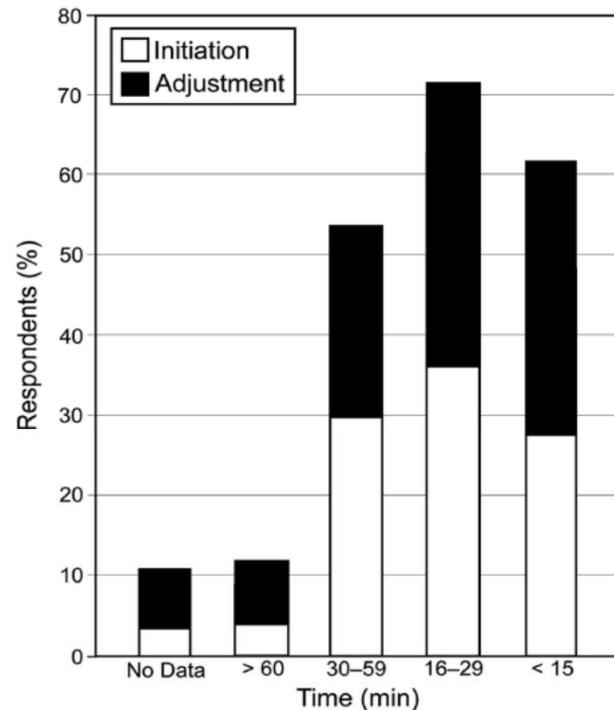
← pH 7.25 → ← 7.20 →

# Prudence !



Carlucci A et al.  
*Intensive Care Med* 2003; 29 : 419

## Noninvasive Ventilation for Acute Respiratory Failure: A National Survey of Veterans Affairs Hospitals

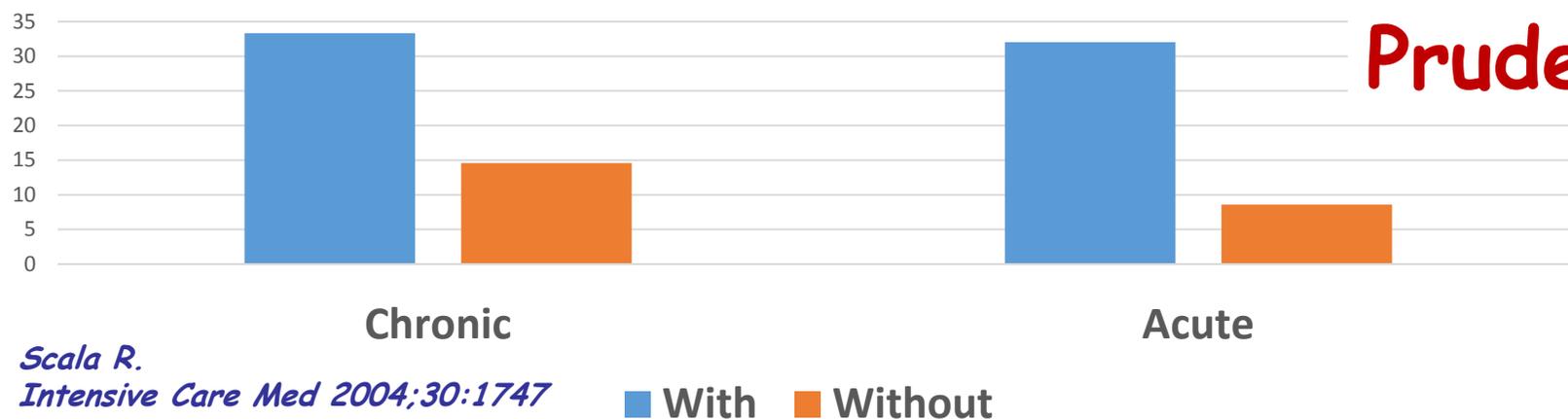


**Expertise en VNI**  
*Impact sur la charge de travail*

**Prudence !**

Fig. 3. Time spent in implementation of noninvasive ventilation. Initial time and time spent in adjusting the mask and ventilator settings.

## NIV Failure (%) – Cardiovascular co-morbidities



**Prudence !**

## Facteurs prédictifs d'échec de VNI

Table 4. Multivariate analysis of NIPPV outcome.

### Nutritional Risk Screening 2002

| Variables                      | OR    | 95% CI      | P value |
|--------------------------------|-------|-------------|---------|
| NRS2002                        | 1.759 | 1.303–2.374 | 0.015   |
| PaCO <sub>2</sub> prior to NIV | 1.251 | 1.172–1.671 | <0.001  |

NIPPV – noninvasive positive pressure ventilation.

*Jinbo Cui. Med Sci Monit 2015;21:2786*

**VNI - IRA/BPCO - CRITERES PREDICTIFS D'ECHEC**  
**Service de médecine**

**Prudence !**

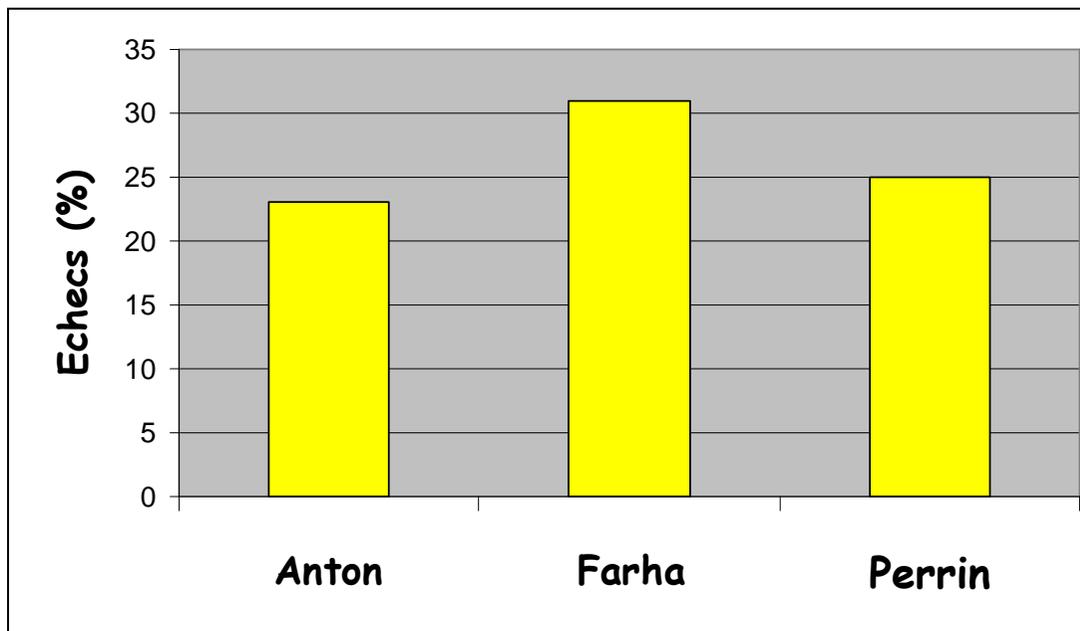
|                   | Plant<br>2000 | Putinati<br>2000   | Grazia Pacilli<br>2014 | Perrin<br>2015   | Yalcinsoy<br>2016 |
|-------------------|---------------|--------------------|------------------------|------------------|-------------------|
| Score gravité     |               | APACHE II<br>élevé |                        | SAPS II<br>élevé |                   |
| Pneumonie         |               |                    | +                      |                  |                   |
| PaO2/FiO2 (mmHg)  |               |                    |                        |                  | < 200             |
| pH                | < 7,30        |                    |                        | < 7,30           | < 7,31            |
| Albuminémie (g/l) |               | Taux bas           | Taux bas               |                  |                   |

**Et surveillance non optimale !!!!**

Plant PK. Lancet 2000; 355: 1931  
 Putinati S. Respir Med 2000; 94: 997  
 Grazia Pacilli AM. Biomed Res Int 2014  
 Perrin C. Rev Mal Respir 2015; 32: 895  
 Yalcinsoy M. Int J COPD 2016; 11: 1151

VNI - IRA/BPCO - Service de médecine  
"VRAIE VIE"

Perte de chance ?



Prudence !

**Échecs :**  
intubation, passage en réanimation,  
décès

*Farha S et al. Respir Care 2006; 51 : 1237*  
*Anton A et al. Chest 2000; 117 : 828*  
*Perrin C et al. Rev Mal Respir 2015; 32: 895*

## Outcomes of Noninvasive Ventilation for Acute Exacerbations of Chronic Obstructive Pulmonary Disease in the United States, 1998-2008

De 1998 à 2008 :

Admissions : 7.511.267

VNI : + 462%

**Prudence !**

*Chandra D et al.*

*AJRCCM 2012; 185: 152*

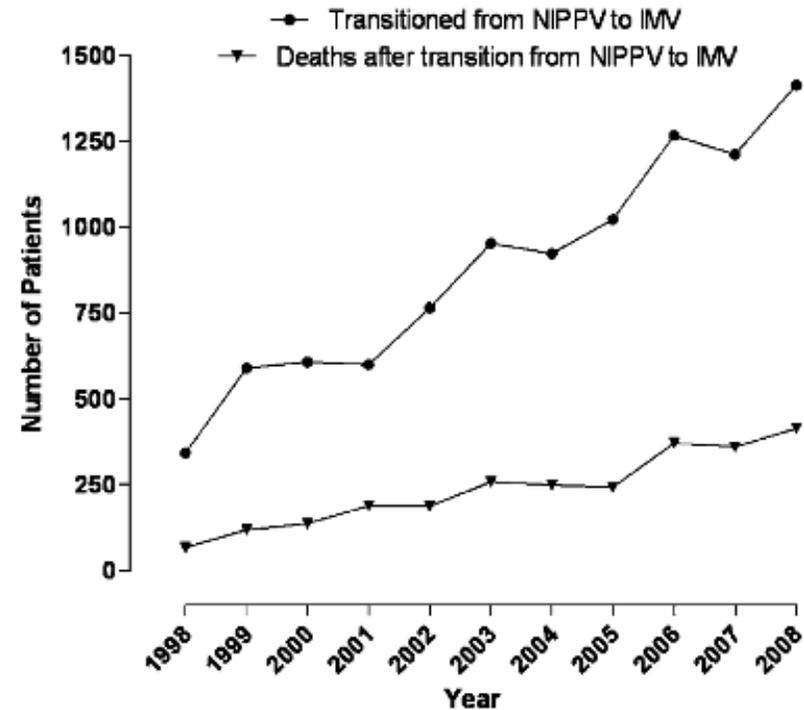


Figure 4. The number of patients and the number of in-hospital deaths among patients requiring transition from noninvasive positive pressure ventilation (NIPPV) to invasive mechanical ventilation (IMV) after admission for acute exacerbation of chronic obstructive pulmonary disease, 1998–2008.

## Outcomes of Noninvasive Ventilation for Acute Exacerbations of Chronic Obstructive Pulmonary Disease in the United States, 1998-2008

De 1998 à 2008 :

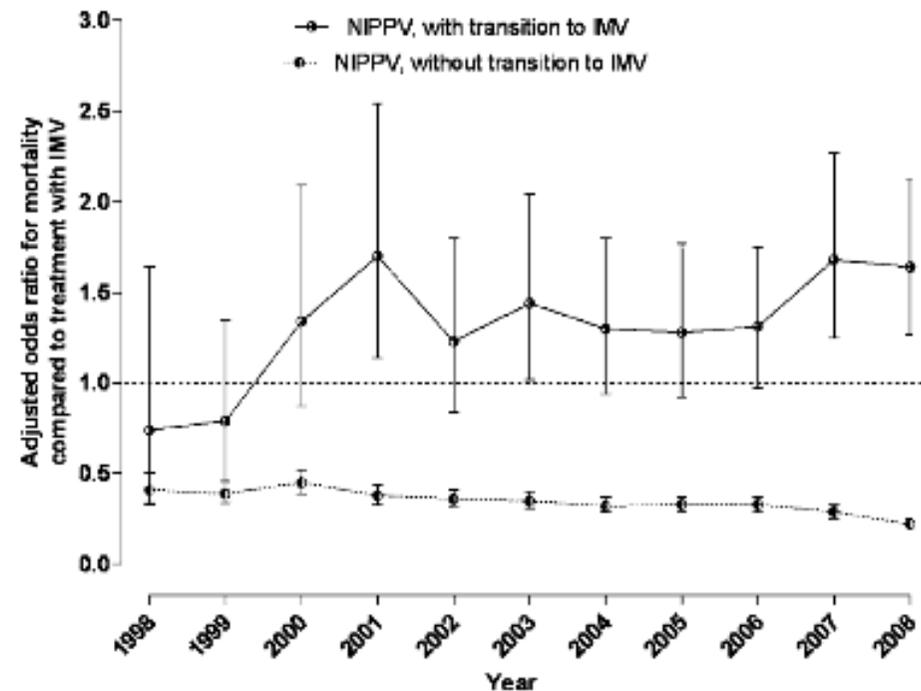
Admissions : 7.511.267

VNI : + 462%

# Prudence !

*Chandra D et al.*

*AJRCCM 2012; 185: 152*



*Figure 6.* Multivariable analysis of in-hospital mortality compared with primary invasive mechanical ventilation (IMV) among patients treated with noninvasive positive pressure ventilation (NIPPV) with and without subsequent transition to IMV for acute exacerbation of chronic obstructive pulmonary disease, 1998–2008. Multivariate analyses are adjusted for sex, age group, income, payor, hospital region, hospital location and teaching status, and the presence of each comorbidity listed in Table 1.

## Outcomes of Noninvasive Ventilation for Acute Exacerbations of Chronic Obstructive Pulmonary Disease in the United States, 1998-2008

De 1998 à 2008 :

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*Chandra D et al.*

*AJRCCM 2012; 185: 152*

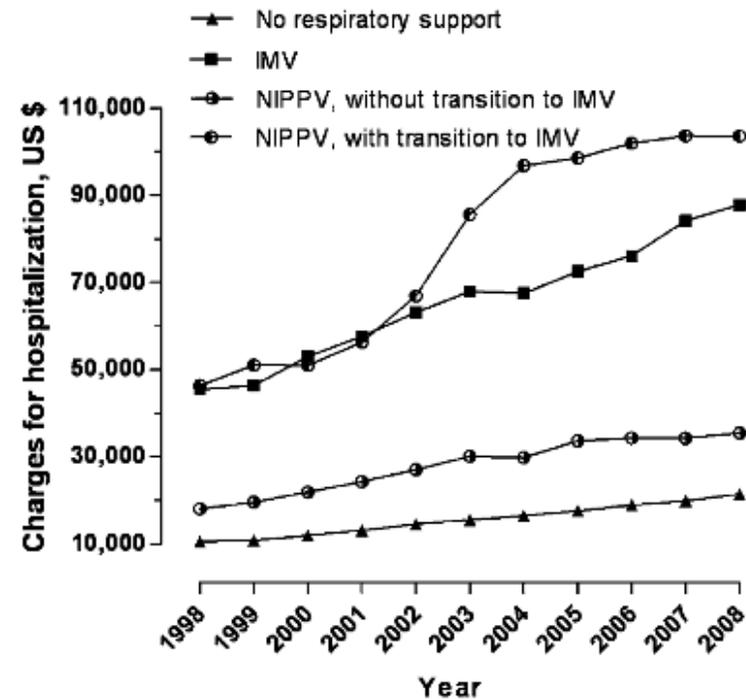
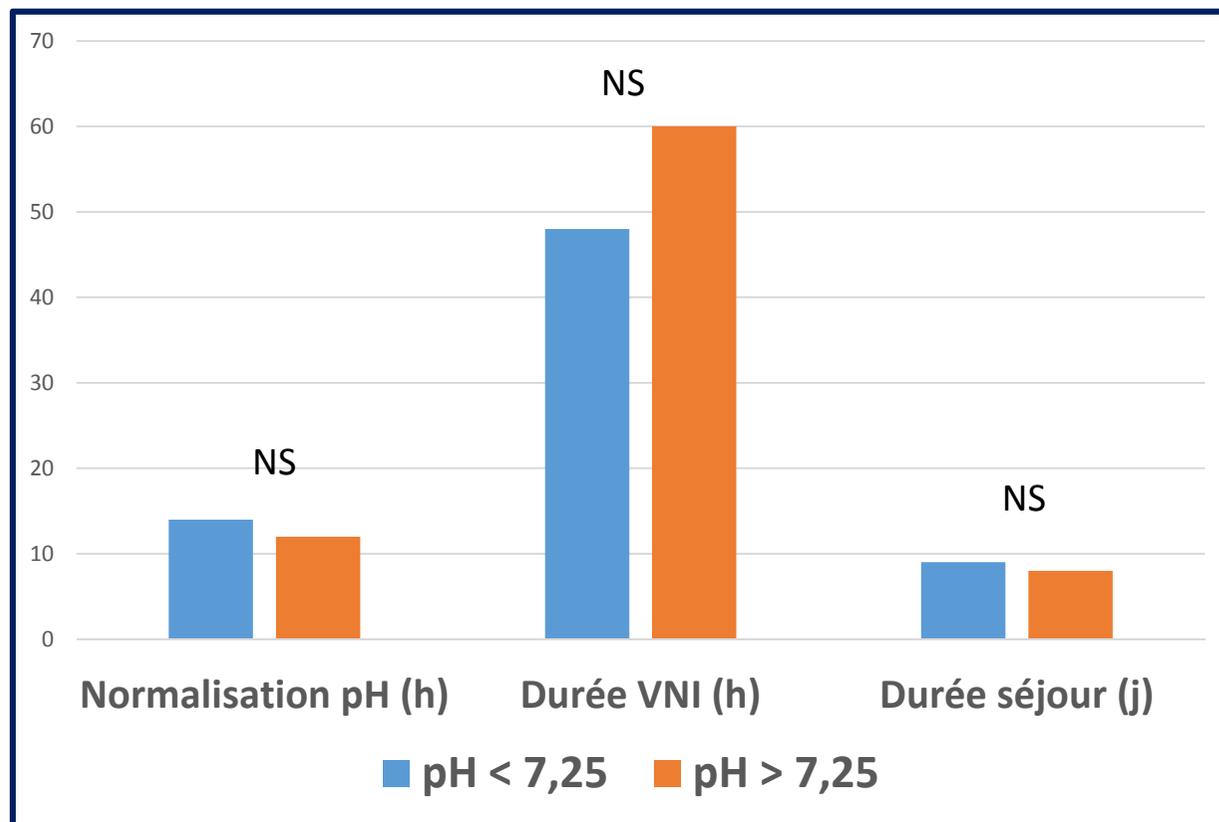


Figure 7. Charges for hospitalization for acute exacerbation of chronic obstructive pulmonary disease grouped by type or respiratory support used, 1998–2008. IMV = invasive mechanical ventilation; NIPPV = noninvasive positive pressure ventilation.

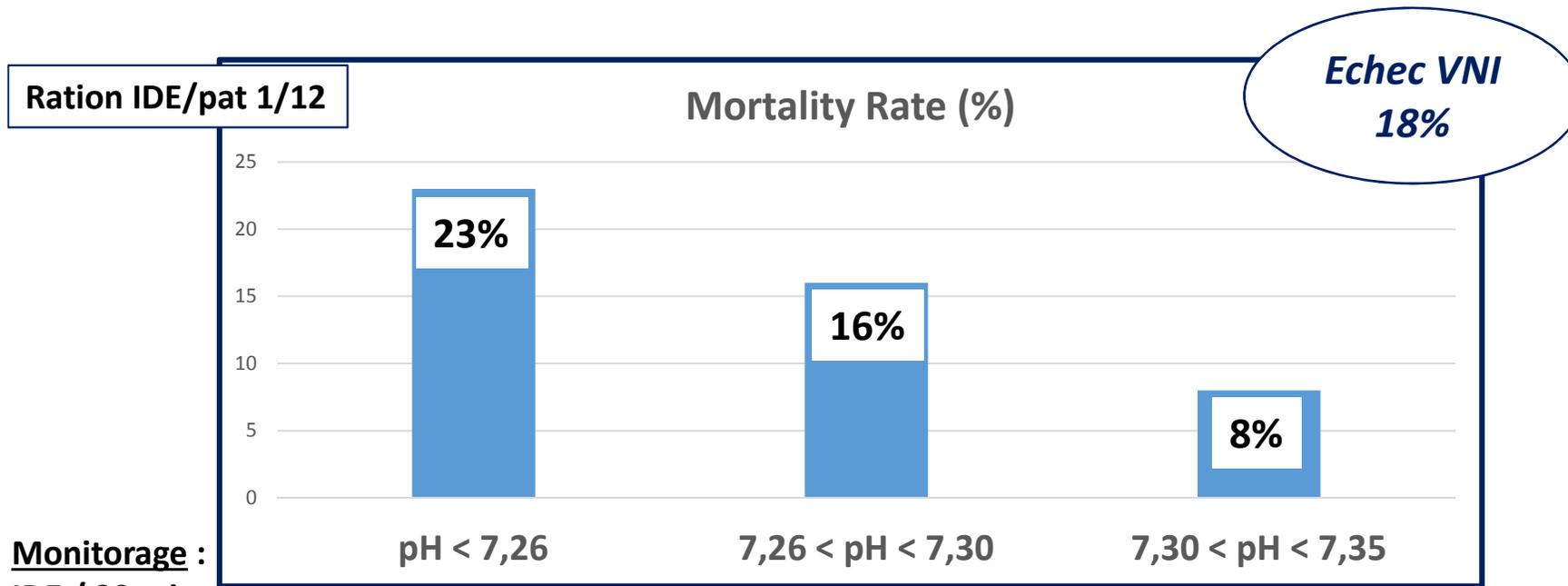
# The use of noninvasive mechanical ventilation in COPD with severe hypercapnic acidosis

*Service de pneumologie*  
*IRA : n = 36*

*Crummy F et al.*  
*Respir Med 2007; 101 : 53*



**Efficacy of non-invasive mechanical ventilation in the general ward in patients with chronic obstructive pulmonary disease admitted for hypercapnic acute respiratory failure and pH < 7,35: a feasibility pilot study**



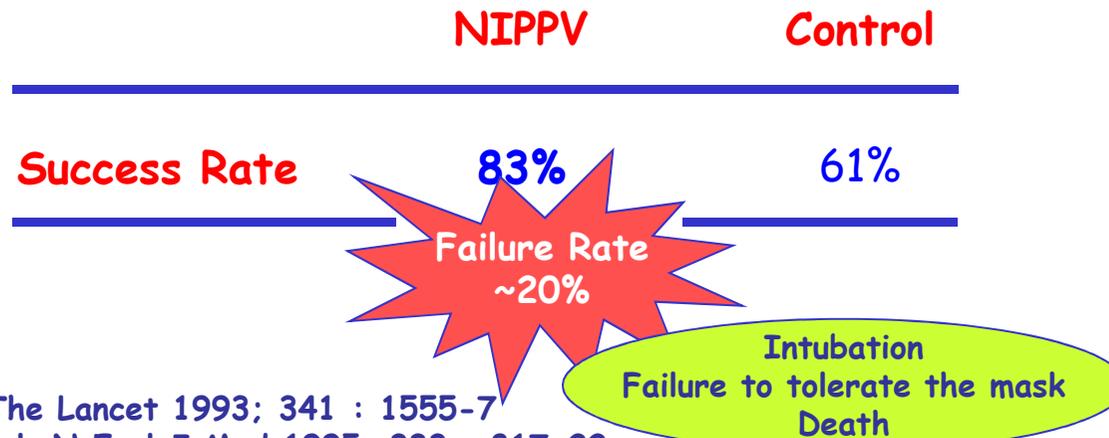
**Monitoring :**  
IDE / 30 min  
Pneumologue / heure  
Proximité REA < 15 min

*Fiorino S et al. Intern Med J 2015; 45: 527*

# NIPPV in ACUTE RESPIRATORY FAILURE caused by COPD

Summary of Randomized Controlled Studies

Mehta S, Hill NS. AJRCCM 2001; 163 : 540-77



- Bott J et al. The Lancet 1993; 341 : 1555-7
- Brochard L et al. N Engl J Med 1995; 333 : 817-22
- Kramer N et al. AJRCCM 1995; 151 : 1799-806
- Angus RM et al. Thorax 1996; 51 : 1048-50
- Barbé F et al. Eur Respir J 1996; 9 : 1240-45
- Celikel T et al. Chest 1998; 114 : 1636-42
- Plant PK et al. The Lancet 2000; 355 : 1931-35

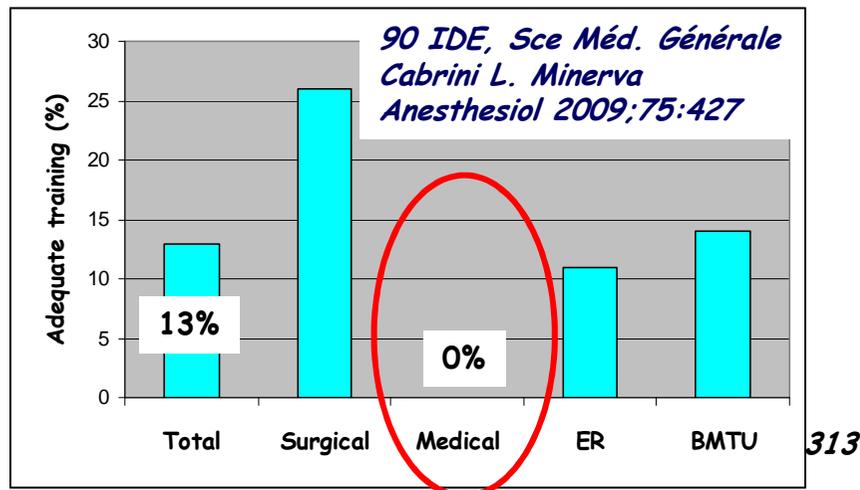
La question n'est donc pas d'interdire  
la généralisation de la VNI en aigu  
en dehors des USI ou de la  
Réanimation, mais de pratiquer cette  
activité sous conditions,

# Effectif, compétence

**Ratio IDE/patient**  
1/10 - 1/11

Plant, Lancet 2000  
Paus-Jenssen, Chest 2004  
Perrin, Rev Mal Respir 2015

**Formation spécifique incluant intubation, CAT  
arrêt circulatoire**



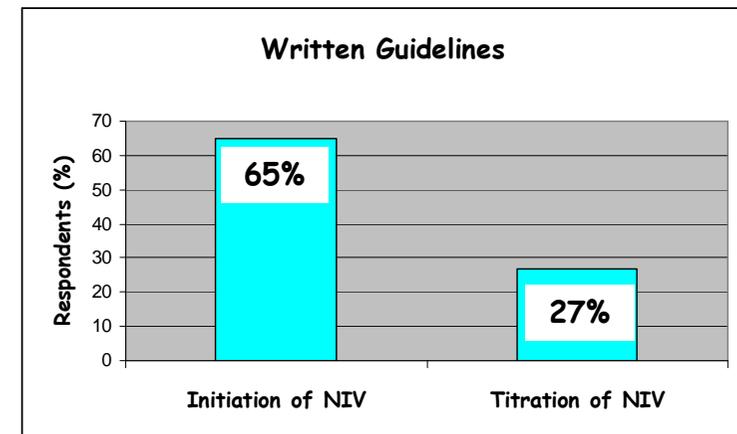
## Surveillance sous VNI :

- Absences de fuites non intentionnelles
- Synchronisme patient-machine à l'aide
  - o Clinique
  - o Courbes Débit-Pression
- SpO2 ~ 92%
- Vte ~ 7ml/kg
- Constantes : pouls, PA, FR

**Protocoles**

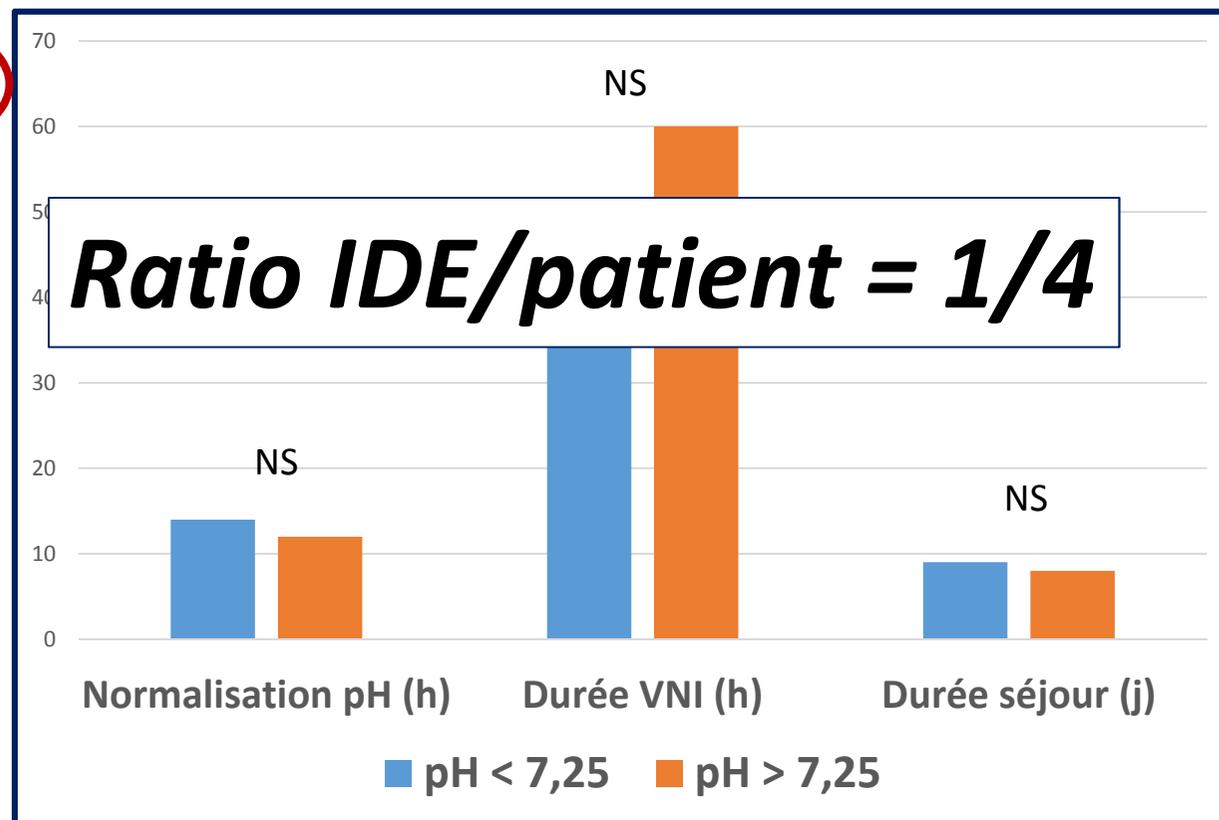
## Alerte médecin :

- Asynchronisme patient-machine
- Tirage inspiratoire
- Agitation et/ou arrachage du masque par le patient
- Désaturation
- Chute de la pression artérielle
- Inconfort, douleurs
- Vte (volume total expiré) inférieur à 250ml



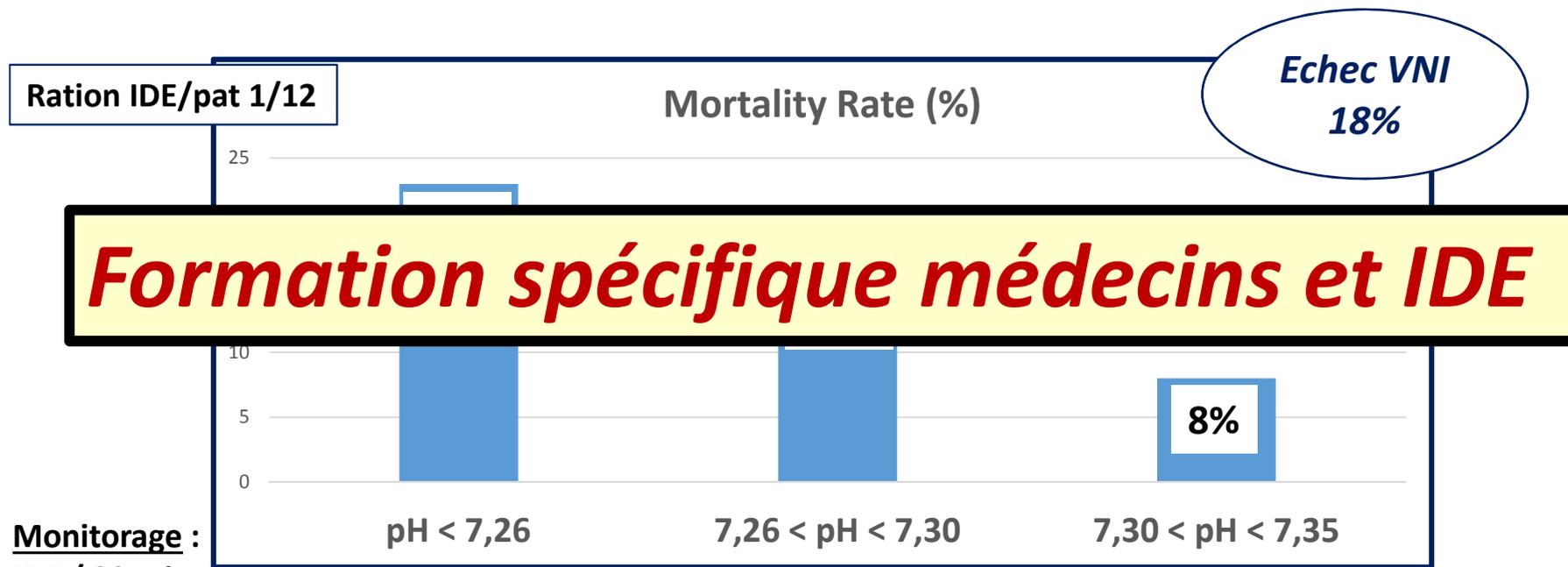
## The use of noninvasive mechanical ventilation in COPD with severe hypercapnic acidosis

*Service de pneumologie*  
*IRA : n = 36*



*Crummy F et al.*  
*Respir Med 2007; 101 : 53*

Efficacy of non-invasive mechanical ventilation in the general ward in patients with chronic obstructive pulmonary disease admitted for hypercapnic acute respiratory failure and  $\text{pH} < 7,35$ : a feasibility pilot study



**Monitoring :**  
IDE / 30 min  
Pneumologue / heure  
Proximité REA < 15 min

*Fiorino S et al. Intern Med J 2015; 45: 527*

# VNI / IRA en service de médecine

## « Lits attentifs »



**Consommable :**  
 Oxygénothérapie  
 Aspiration  
 Nébulisation  
 VNI  
 Trachéotomie

- . Service de médecine à proximité USI ou réanimation
- . Lits identifiés à proximité salle de soins, matériels, monitoring (scope, TA, SpO2, FR, Gds)
- . Flexibilité des personnels



Docteur Christophe PERRIN  
 Chef de Service  
 Pneumologie



CENTRE HOSPITALIER DE CANNES  
 PÔLE SPECIALITES MEDICALES  
 SERVICE DE PNEUMOLOGIE  
 Tél 04 93 69 71 10 – Fax 04 92 18 67 05

### CHARTRE

**Prise en charge de l'insuffisance respiratoire aiguë en service de Pneumologie  
 Horaires non ouvrés**

Nous soussignés, **Dr Annie Freche**, Chef du service de Réanimation, **Dr Christophe Perrin**, Chef du service de Pneumologie proposons pour la **prise en charge des patients atteints d'insuffisance respiratoire aiguë (IRA) sur le service de pneumologie** en dehors des heures ouvrables et en cas de nécessité :

**Paragraphe 1.** L'appel en première intention du médecin urgentiste de garde qui décide selon avis de l'appel du réanimateur de garde, à l'exception du cas cité dans le paragraphe 2.

**Paragraphe 2.** L'appel direct du réanimateur de garde pour tout patient en IRA traité par VNI dont la gravité a été préalablement signalée par le pneumologue à son collègue réanimateur, avant son départ.

**Paragraphe 3.** En toute circonstance, une astreinte téléphonique nocturne et quotidienne est assurée par les pneumologues pour tout complément d'information sur le patient pris en charge.

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# MATERIELS

Table 6. Advantages of Bi-Level Home Ventilators for Noninvasive Ventilation Outside the Intensive Care Unit

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- Easy handling
- Easy transportable
- Light and not cumbersome
- Good air-leak compensation
- Internal battery
- Low-pressure oxygen source
- High technical performance
- Less expensive

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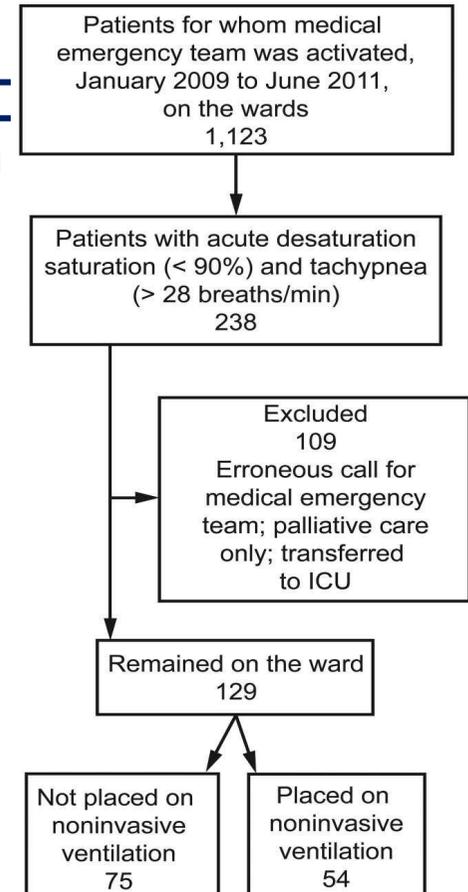
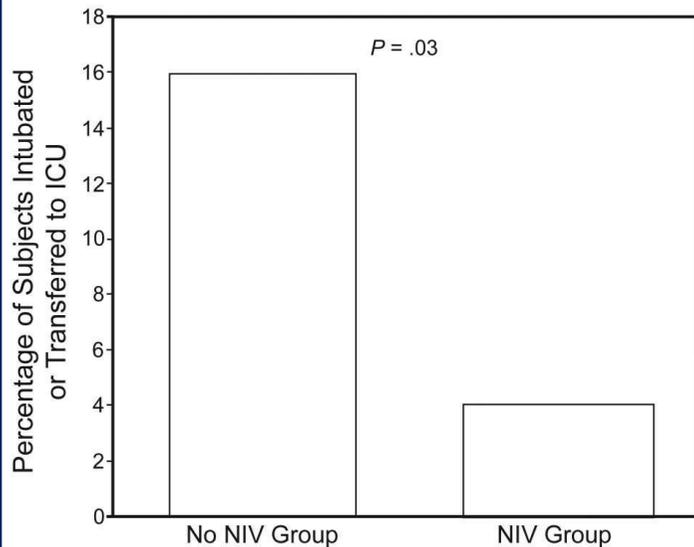
*Scala R, Naldi M. Respir Care 2008; 53: 1054*

# The epidemiology and outcome of medical emergency team call patients treated with non-invasive ventilation

Schneider AG et al. *Resuscitation* 2011; 82: 1218

## Outcomes of Patients Treated With Noninvasive Ventilation by a Medical Emergency Team on the Wards

Khalid I et al. *Respir Care* 2014; 59: 186



**Conférence de Consensus**  
**SFAR, SPLF, SRLF**  
VNI au cours de l'IRA  
(nouveau-né exclu)  
*Paris, 2006*

Tableau 2 – Niveaux de recommandation pour les indications de la VNI

|  |   |
|--|---|
| Intérêt certain<br>Il faut faire (G1+) | Décompensation de BPCO<br>OAP cardiogénique |
|--|---|

**G1+ / G1-** Il faut faire / ne faut pas faire

**G2+ / G2-** Il faut probablement faire / ne faut probablement pas faire

## INDICATIONS for NIV in ACUTE CARE

### *Bedside observations*

- Increased dyspnoea—moderate to severe
- Tachypnoea (>24 breaths per min in obstructive, >30 per min in restrictive)
- Signs of increased work of breathing, accessory muscle use, and abdominal paradox

### *Gas exchange*

- Acute or acute on chronic ventilatory failure (best indication),  
PaCO<sub>2</sub>>45 mm Hg, **pH<7.35**
- Hypoxaemia (use with caution), PaO<sub>2</sub>/F<sub>i</sub>O<sub>2</sub> ratio<200

*Nava S, Hill NS.  
Lancet 2009; 374 : 250*

## VNI - IRA/BPCO - Essais randomisés contrôlés

### Service de médecine - Urgences

| <i>Keenan SP et al. Respir Care 2005; 50 : 610</i> | NPPV<br>(n = 25) |                | Standard Therapy<br>(n = 27) |
|--|------------------|----------------|------------------------------|
| Intubated (number and %)                           | 2/25 (8)         |                | 2/27 (7)                     |
| Failed treatment (number and %)*                   | 2/25 (8)         | <b>pH 7,40</b> | 5/27 (19)                    |
| Nosocomial infection (number)                      | 0/25             |                | 2/27                         |
| Survived hospitalization (number and %)            | 24/25 (96)       |                | 25/27 (93)                   |

|                           | Group A<br>Added Bi-PAP | Group B<br>Control | p-value |
|---------------------------|-------------------------|--------------------|---------|
| <b>Inhospital outcome</b> | <b>pH 7,36</b>          | <b>pH 7,39</b>     |         |
| Drop out n                | 2 (13.3)                | 0 (0)              | NS      |
| Death n                   | 0 (0)                   | 1 (6.7)            | NS      |
| ET intubation n           | 1 (6.7)                 | 2 (13.3)           | NS      |
| Length of stay days       | 18±5                    | 23±13              | NS      |
| Success rate %            | 93.3                    | 80.0               | NS      |

**Absence  
d'indication  
de VNI**

# Acidosis, non-invasive ventilation and mortality in hospitalised COPD exacerbations

232 services, 9716 patients

*Roberts CM et al. Thorax 2011; 66: 43*

| <b>1678 (20%) patients en acidose</b> | Inpatient mortality:               |          |                                |          |   | 90-day mortality*                  |          |                                |          |   |
|---------------------------------------|------------------------------------|----------|--------------------------------|----------|---|------------------------------------|----------|--------------------------------|----------|---|
|                                       | For ALL Patients not receiving NIV |          | For ALL Patients receiving NIV |          | Fishers Exact test (NIV versus not NIV) | For ALL Patients not receiving NIV |          | For ALL Patients receiving NIV |          | Fishers Exact test (NIV versus not NIV) |
|                                       | %                                  | N        | %                              | N        |   | %                                  | N        | %                              | N        |   |
|                                       |                                    |          |                                |          |   |                                    |          |                                |          |   |
| ALL PATIENTS                          | 5                                  | 475/8639 | 25                             | 270/1077 | <0.001                                  | 11                                 | 949/8269 | 33                             | 340/1031 | <0.001                                  |
| Acidotic patients                     | 14                                 | 165/1174 | 26                             | 249/969  | <0.001                                  | 22                                 | 246/1143 | 33                             | 310/932  | <0.001                                  |

**VNI pour acidose métabolique traitée : 11%**

**Absence de VNI malgré acidose respiratoire : 30%**

Table 2—Clinical Status Prior to and 1 h After NIV\*

| Status  | Success (n = 34) |               | Failure (n = 10) |               |
|---|------------------|---------------|------------------|---------------|
|   | Pre-NIV          | 1 h After NIV | Pre-NIV          | 1 h After NIV |
| No. of patients with signs of respiratory infection (%) | 19 (55)          | —             | 4 (40)           | —             |
| APACHE II   | 19 ± 2           | —             | 20 ± 3           | —             |
| LC  | 2.44 ± 0.89†     | 1.58 ± 0.65‡  | 2.8 ± 1.13‡      | 3 ± 1.24‡     |
| Respiratory rate  | 29 ± 6           | 22 ± 6        | 28 ± 5           | 23 ± 7        |
| PaO <sub>2</sub> at FIO <sub>2</sub> < 0.3              | 54 ± 17          | 65 ± 18       | 52 ± 9           | 68 ± 17       |
| Paco <sub>2</sub>                                       | 81 ± 16          | 68 ± 10‡      | 81 ± 11          | 84 ± 8‡       |
| pH  | 7.27 ± 0.03      | 7.34 ± 0.04‡  | 7.28 ± 0.04      | 7.28 ± 0.03‡  |

\*FIO<sub>2</sub> = fraction of inspired oxygen. Values given as mean ± SD, unless otherwise indicated. See Table 1 for other definitions.

†Significant differences between failed and successful groups prior to NIV.

‡Significant differences between failed and successful groups with NIV.

À la 2<sup>e</sup> heure :  
pH < 7,25,  
FR > 35 cycles/min  
GCS < 11

BPCO  
Risque d'échec  
> 90%

pH < 7.25  
après  
2h de VNI

Conférence Consensus  
SFAR, SPLF, SRLF  
Paris, 2006

Confalonieri M et al.  
Eur Respir J 2005; 25 : 348

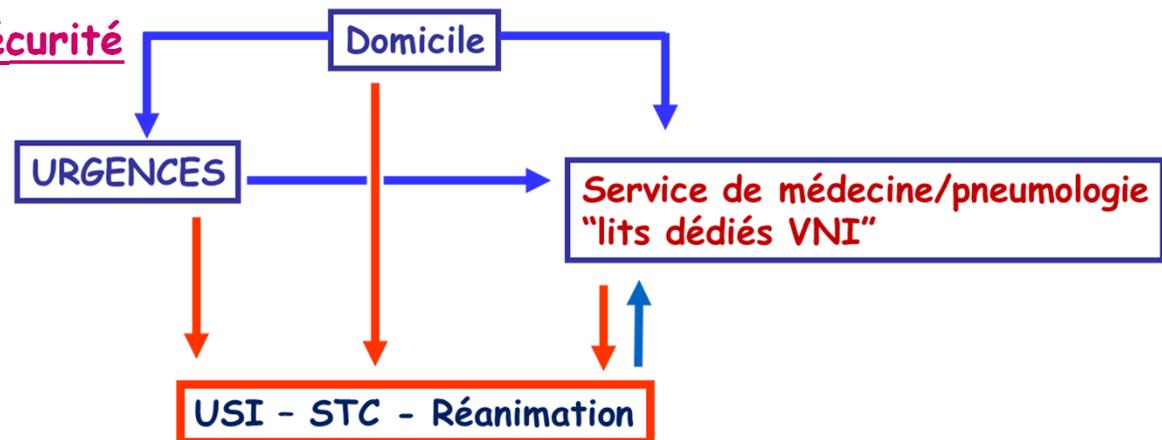
# CONCLUSIONS

## 1- VNI / IRA hors REA ou USI, faisabilité, efficacité

*Cabrini L et al. Rev Mal Respir 2015; 32: 887*

## 2- Conditions :

.Structure de soins adaptée - sécurité  
(locaux, effectif, compétences,  
proximité REA / USI)



.Respect scrupuleux (indications, CI, pathologies)

.Amélioration rapide

## VENTILATION NON INVASIVE INSUFFISANCE RESPIRATOIRE AIGUE - URGENCES

$pH : 7.34 \pm 0.005$   
 $PaCO_2 : 56.4 \pm 0.1$

|                               | VNIPP<br>n = 16 | Contrôle<br>n = 11 | p   |
|-------------------------------|-----------------|--------------------|-----|
| Intubation, n (%)             | 7(44)           | 5(46)              | 0.7 |
| Mortalité Hospitalière, n (%) | <b>4(25)</b>    | 0                  | 0.1 |

**Retard à l'intubation !**

Wood KA et al. Chest 1998; 113 : 1339-46

## Noninvasive Ventilation for Acute Respiratory Failure: A National Survey of Veterans Affairs Hospitals

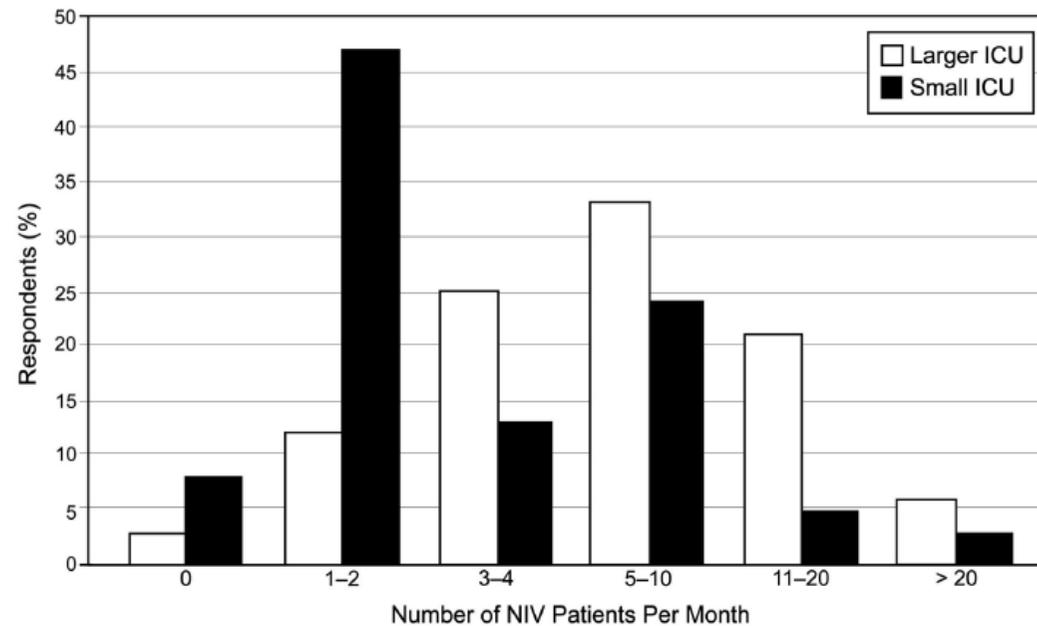


Fig. 2. Monthly experience with noninvasive ventilation (NIV). Responses of small intensive care units (ICUs) ( $\leq 10$  beds) and large ICUs ( $> 10$  beds).

## VENTILATION NON INVASIVE

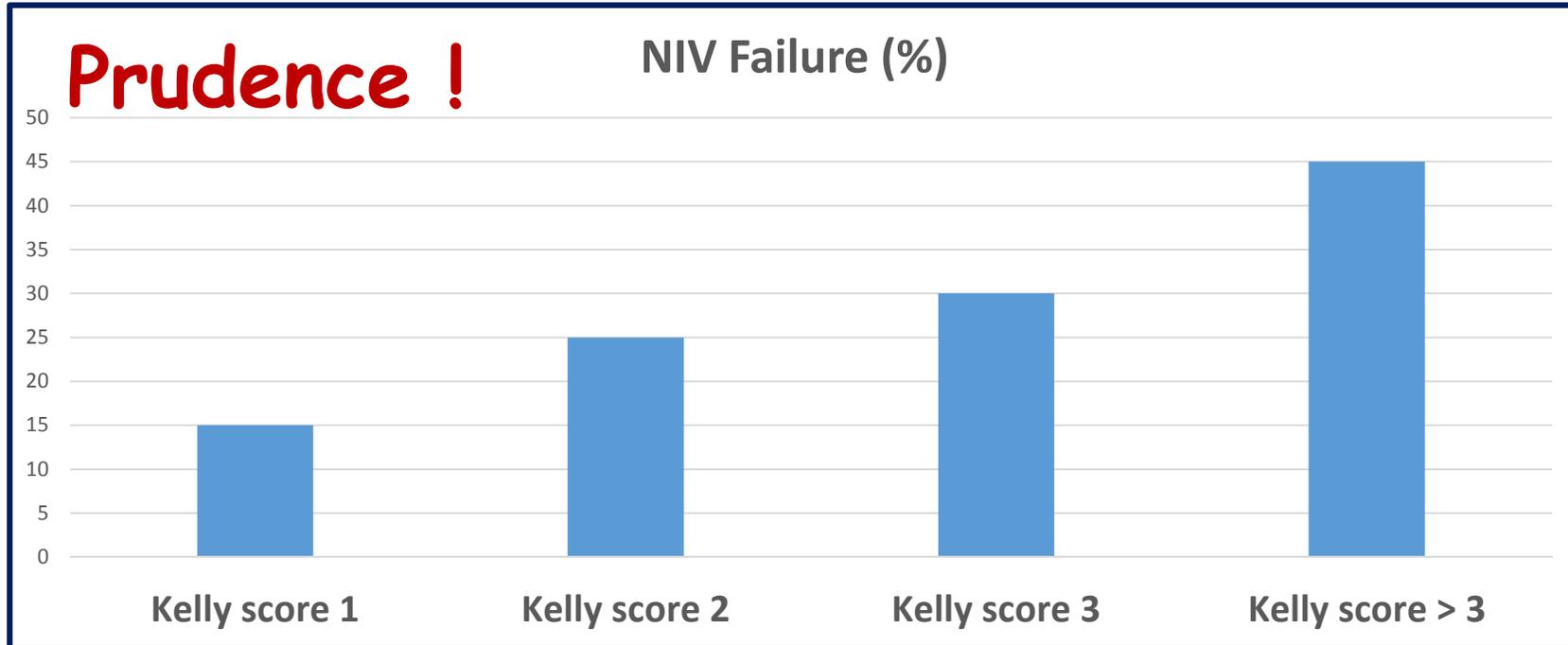
IRA/BPCO - REANIMATION-Essais Randomisés Contrôlés

| Intubation %               | n  | Traitement Standard | VNIPP |
|----------------------------|----|---------------------|-------|
| Brochard 95                | 85 | 74                  | 26*   |
| Kramer 95                  | 23 | 67                  | 9*    |
| Celikel 98                 | 30 | 40                  | 6.5*  |
| Confalonieri 99<br>(P-C-A) | 23 | 54.6                | 0*    |

\*p < 0.05

| Mortalité %                | n  | Traitement Standard | VNIPP |
|----------------------------|----|---------------------|-------|
| Brochard 95                | 85 | 29                  | 9*    |
| Kramer 95                  | 23 | 13                  | 6     |
| Celikel 98                 | 30 | 6.5                 | 0     |
| Confalonieri 99<br>(P-C-A) | 23 | 18.2                | 8.3   |

## Noninvasive Positive Pressure Ventilation in Patients With Acute Exacerbations of COPD and varying levels of Consciousness



Score 1 : alert

Score 2 : alert after simple command

Score 3 : lethargic but arousable

Score > 3 : stuporous

*Scala R et al. Chest 2005; 128: 1657*

## CONTRAINDICATIONS for NIV in ACUTE CARE

### *Absolute*

- Respiratory arrest
- Unable to fit mask

### *Relative*

- Medically unstable—hypotensive shock, uncontrolled cardiac ischaemia or arrhythmia, uncontrolled copious upper gastrointestinal bleeding
- Agitated, uncooperative
- Unable to protect airway
- Swallowing impairment
- Excessive secretions not managed by secretion clearance techniques
- Multiple (ie, two or more) organ failure
- Recent upper airway or upper gastrointestinal surgery

*Nava S, Hill NS.  
Lancet 2009; 374 : 250*