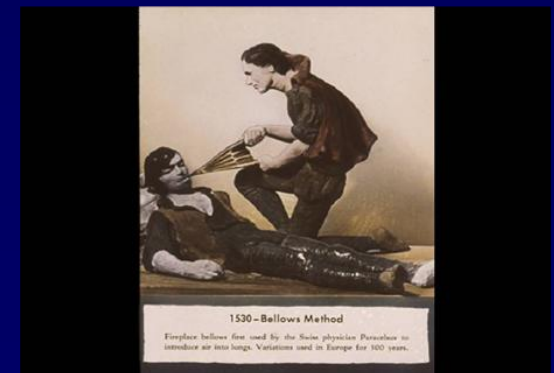


NIV..... Dovunque ?



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SERIES "NONINVASIVE VENTILATION IN ACUTE AND CHRONIC RESPIRATORY FAILURE"

Edited by M.W. Elliott and N. Ambrosino

Number 3 in this Series

Where to perform noninvasive ventilation?

M.W. Elliott*, M. Confalonieri[#], S. Nava[†]

Should noninvasive ventilation be started in the emergency department?

and for whom intubation is not considered appropriate. If it is normal policy for patients to receive the first 24-h treatment in the emergency department, then NPPV should be started there in those who remain acidotic and tachypnoeic a short time after standard medication has been administered and oxygen therapy optimized. Noninvasive CPAP or bilevel ventilation for patients with acute CPO will usually be delivered in the emergency department. For these reasons it is necessary for staff working in the emergency department to be trained in, and to develop skills in NPPV. This may best be achieved by attachment and rotation

Staff training and experience is more important than location, and adequate numbers of staff skilled in noninvasive positive-pressure ventilation must be available throughout the 24-h period. Because of the demands of looking after these acutely-ill patients, and to aid training and skill retention, noninvasive positive-pressure ventilation is usually best carried out in one single sex location with one nurse responsible for no more than three to four patients in total. Basic monitoring should be available. Whether this is called an intensive care unit, a high dependency unit or is part of a general ward is largely irrelevant. Avail-

The ideal location

- Staff number
- Safety
- Monitoring
- Equipment
- Familiarity with NIV

Location

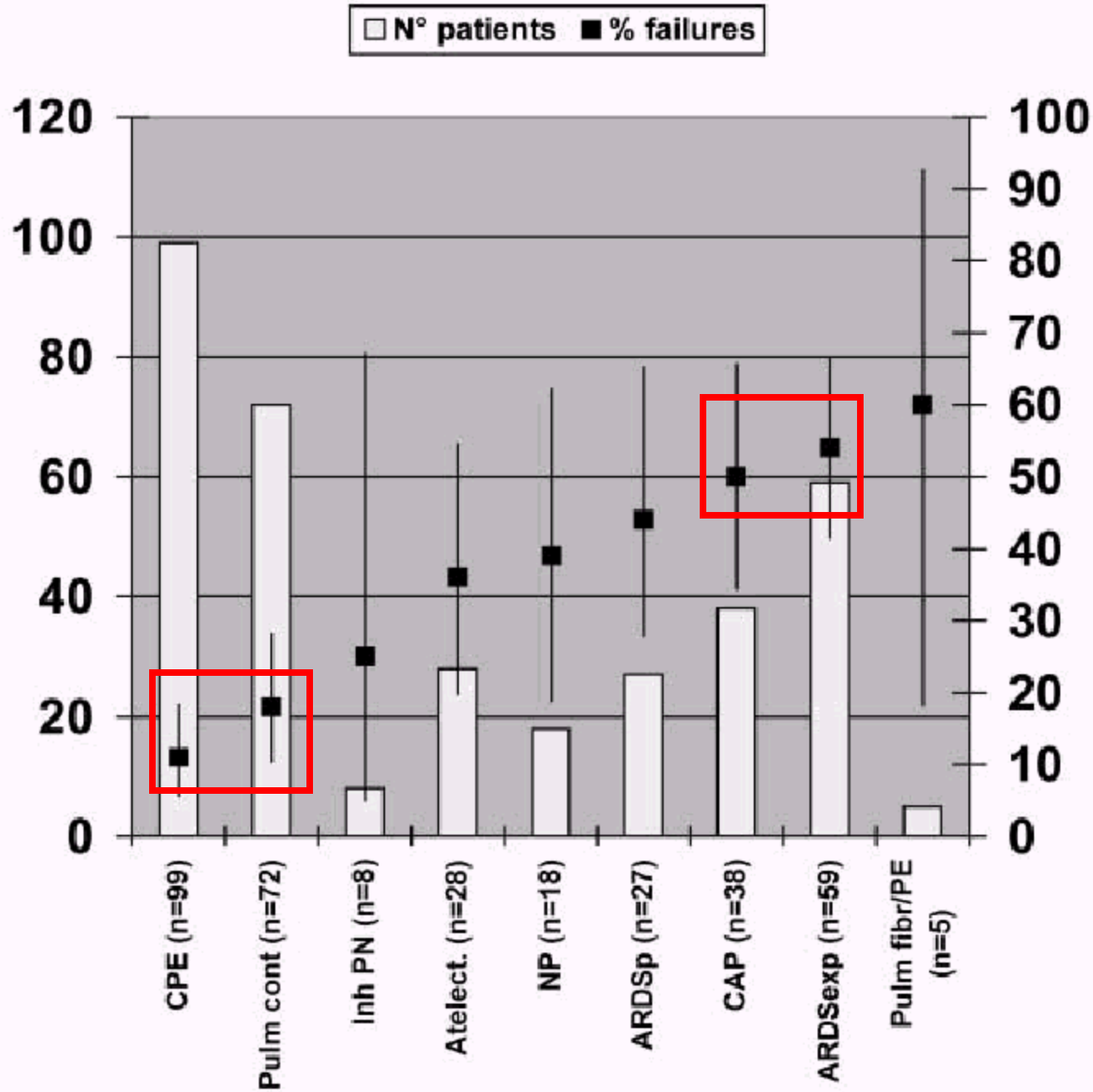
The concept of the traffic light

	ICU	RICU/ HDU	WARD	ED
Staff number	Green	Yellow	Red	Yellow
Safety	Green	Yellow	Red	Green
Monitoring	Green	Yellow	Red	Yellow
Equipment	Yellow	Green	Yellow	Yellow
Familiarity with NIV	Yellow	Green	Green	Yellow

The right location

- Model of health care delivery varies markedly
 - From country to country
 - Within a country
 - Within an institution
- Randomised controlled trials performed in one country may not be generalisable to another

no. of patients



Antonelli et al

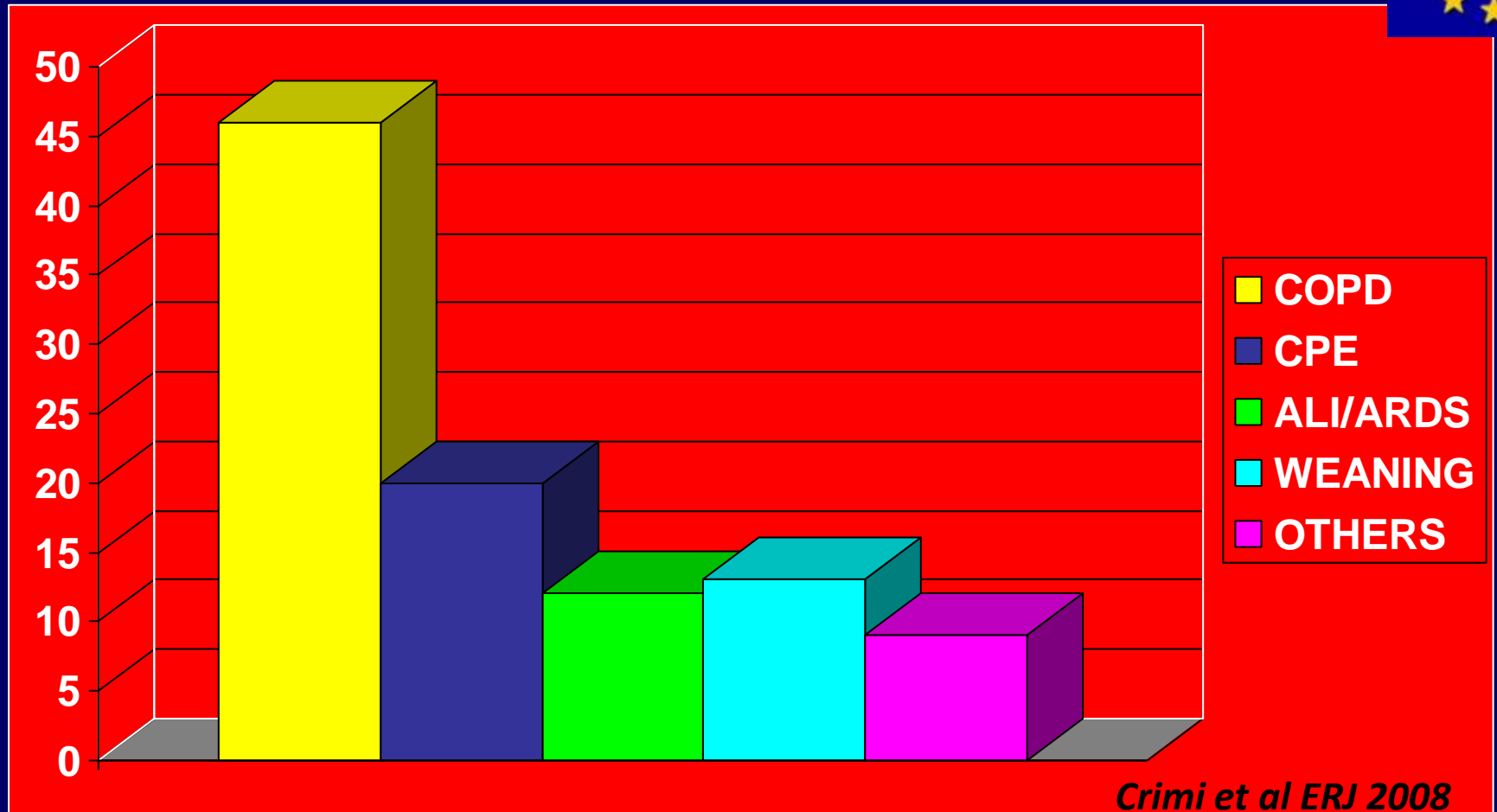
Intensive Care
Medicine

27;2001
pag.1718-28

% NIV use according to different pathologies in Europe



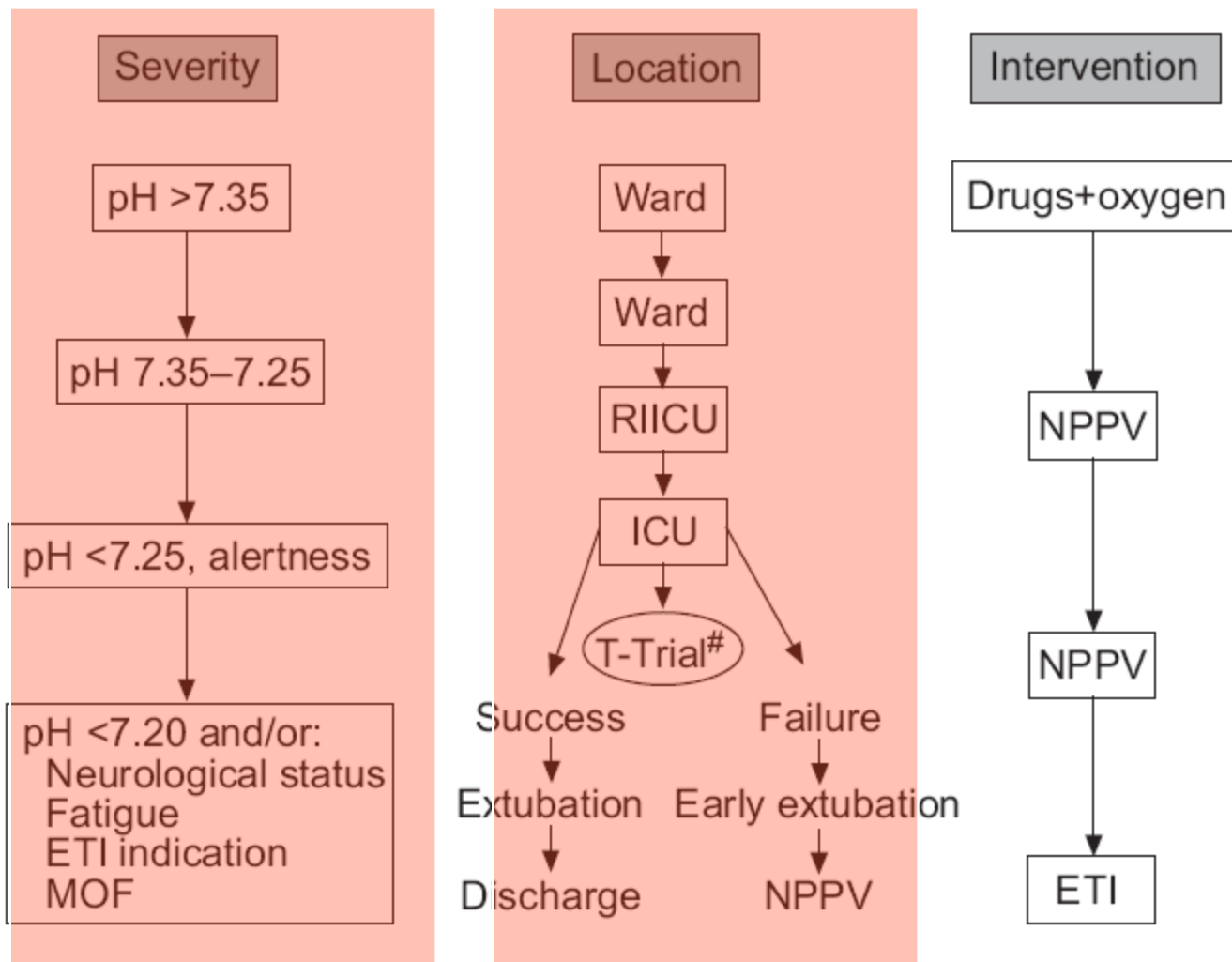
% OF USE



Noninvasive positive pressure ventilation in the acute care setting: where are we?

N. Ambrosino*^{##} and G. Vaghegini[#]

Eur Respir J 2008; 31: 874–886



Ventilation outside the ICU

- Economic advantage
 - Intensive care = expensive care
- Danger of denying ICU care when it would be more appropriate
 - Clear protocols
- ? NIV less effective on ICU

REVIEW ARTICLE

Non-invasive ventilation outside the Intensive Care
Unit for acute respiratory failure

D. CHIUMELLO¹, G. CONTI², G. FOTI³, M. GIACOMINI MATTEO⁴,
A. BRASCHI⁵, G. IAPICHINO⁶

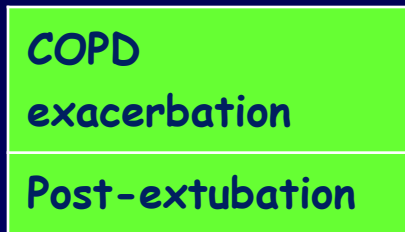
Niv in emergency ?



ARF Severity

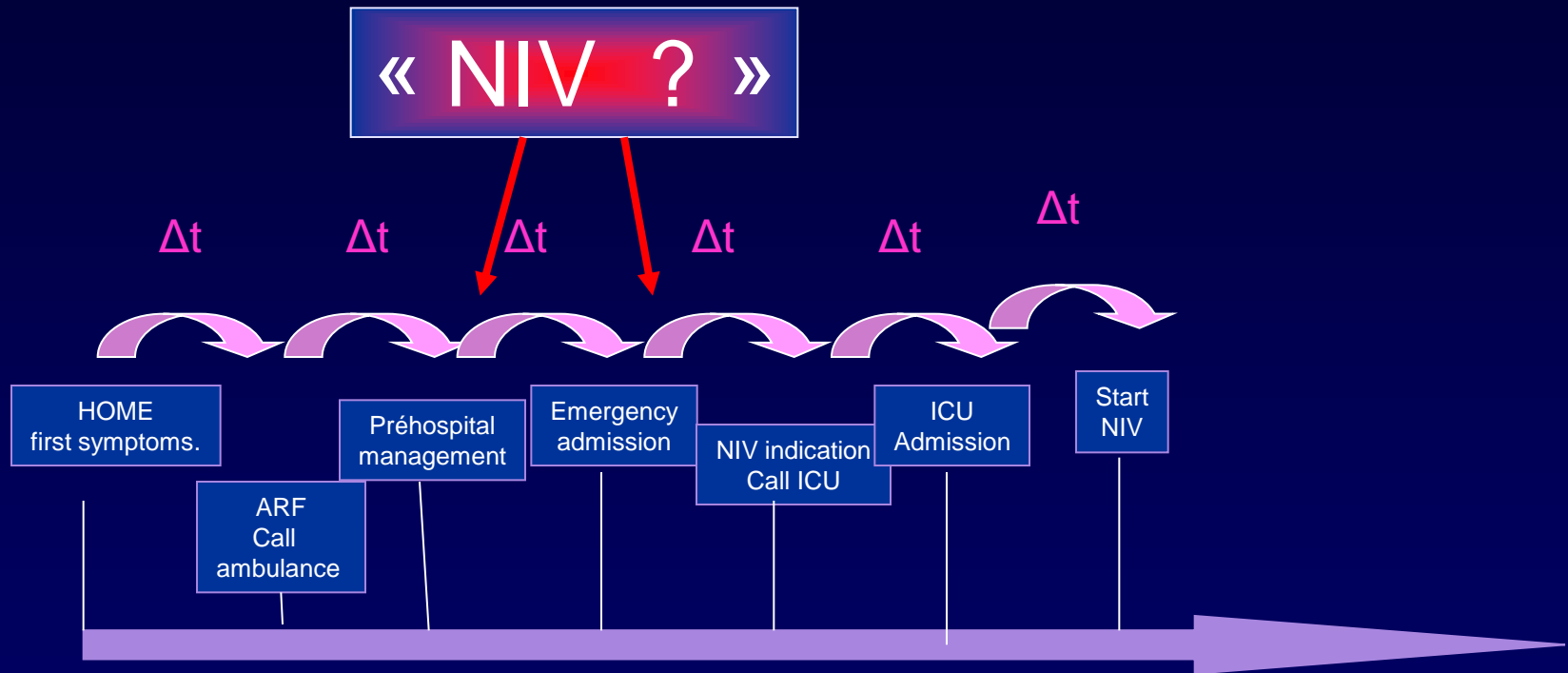
Stefano Nava
Paolo Navalesi
Giorgio Conti

Time of non-invasive ventilation



Use of NIPPV

«Early application, fewer complications...?»



Mechanical ventilation: invasive *versus* noninvasive

L. Brochard

One important factor in success seems to be the early delivery of noninvasive ventilation during the course of respiratory failure. Noninvasive ventilation allows many of the complications associated with mechanical ventilation to be avoided, especially the occurrence of nosocomial infections. The current use of noninvasive ventilation is growing up, and is becoming a major therapeutic tool in the intensive care unit.

Eur Respir J 2003; 22: Suppl. 47, 31s–37s.

Noninvasive ventilation for acute respiratory failure: a prospective randomised placebo-controlled trial

F. Thys*, J. Roeseler[†], M. Reynaert*, G. Liistro[†], D.O. Rodenstein[†]

Early application of bi-level noninvasive positive-pressure ventilation in patients with severe acute respiratory failure, due to chronic obstructive pulmonary disease and acute pulmonary oedema, leads to a rapid improvement in clinical status and blood gases. Noninvasive positive-pressure ventilation had no placebo effect.

Eur Respir J 2002; 20: 545–555.

Where Should Noninvasive Ventilation Be Delivered?

Nicholas S Hill MD

Introduction

Possible NIV Locations

Pre-Hospital Setting

Emergency Department

Intensive Care Unit

Step-Down Unit

General Wards

Long-Term Acute-Care Hospitals

Where is NIV Actually Delivered in Acute-Care Hospitals?

Practical Approach to Determining the Best Location for NIV

The Patient's Need for Monitoring

Monitoring Capabilities of the Unit

Experience and Skill of Personnel

Summary

Noninvasive ventilation (NIV) has assumed an important role in the management of certain types of respiratory failure in acute-care hospitals. However, the optimal location for NIV has been a matter of debate. Some have argued that all patients begun on NIV in the acute-care setting should go to an intensive care unit (ICU), but this is impractical because ICU beds are often unavailable, and it may not be a sensible use of resources. Also, relatively few studies have examined the question of location for NIV. One problem is that various units' capabilities to deliver NIV differ substantially, even in the same hospital. Choosing the appropriate environment for NIV requires consideration of the patient's need for monitoring, the monitoring capabilities of the unit, including both technical and personnel resources (nursing and respiratory therapy), and the staff's skill and experience. **In some hospitals NIV is begun most often in the emergency department, but is most often managed in an ICU. Step-down units are often good locations for NIV, but many institutions do not have step-down units. With ICU beds at a premium, many hospitals are forced to manage some NIV patients on general wards, which can be safely done with more stable patients if the ward is suitably monitored and experienced. When deciding where to locate the patient, clinicians must be familiar with the capabilities of the units in their facility and try to match the patient's need for monitoring and the unit's capabilities.** *Key words: noninvasive ventilation, NIV, respiratory failure, acute care, intensive care, monitoring, emergency department.* [Respir Care 2009;54(1):62–69. © 2009 Daedalus Enterprises]

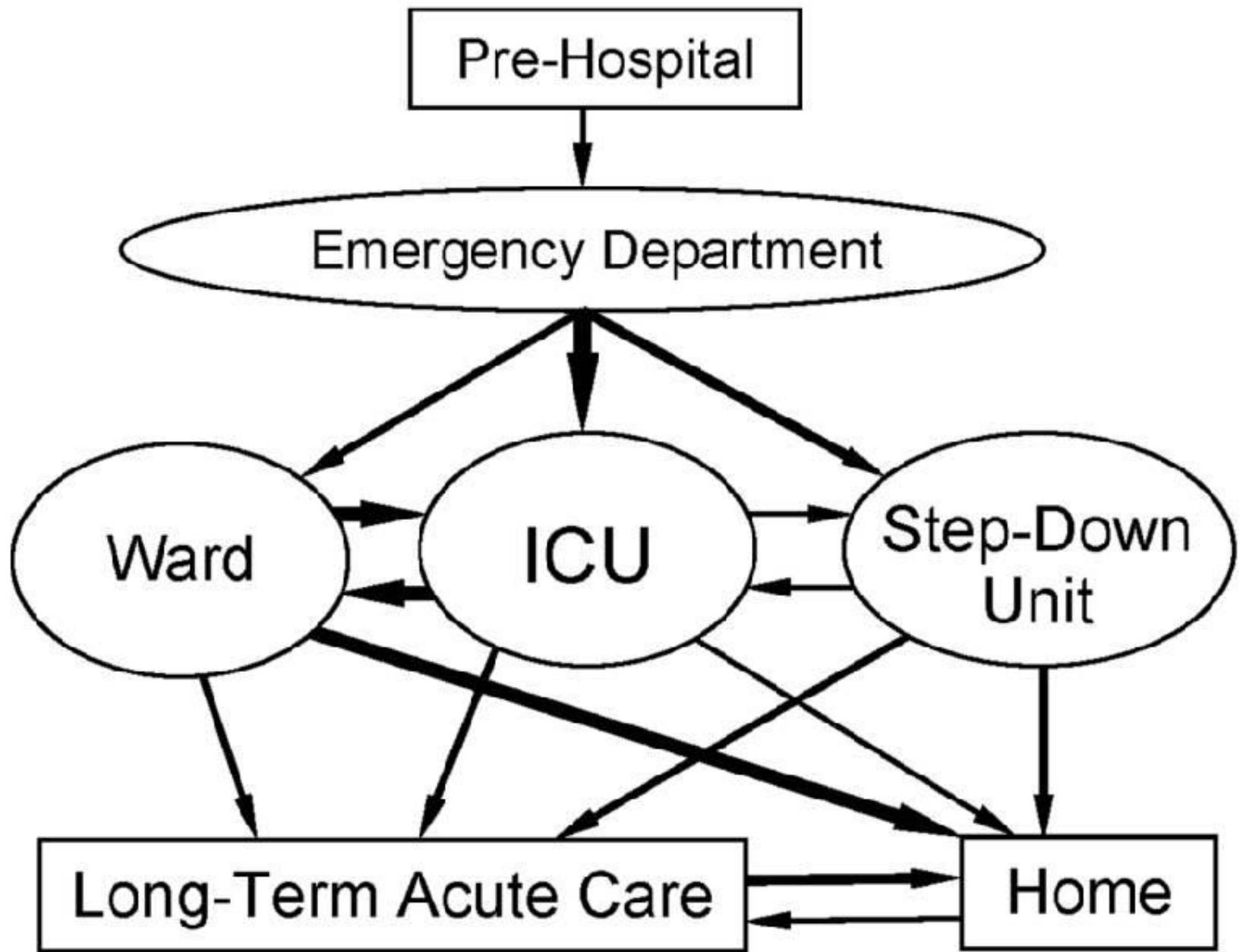
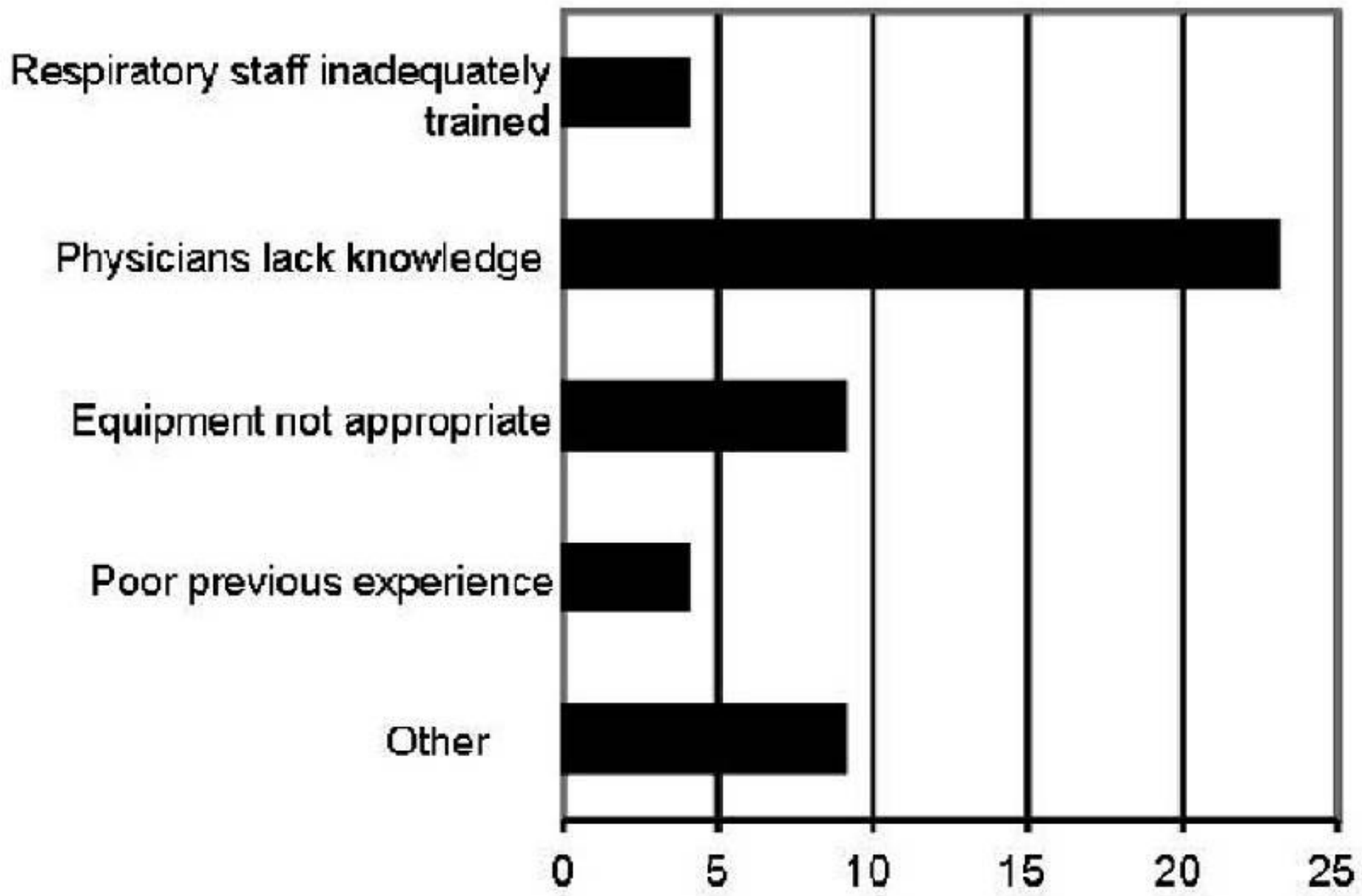


Table 1. Advantages and Disadvantages of Locations for NIV in Acute and Subacute Conditions

Location	Advantages	Disadvantages
Pre-hospital	Rapid application	Limited equipment and monitoring Lack of evidence
Emergency department	Rapid application Close monitoring in high-intensity room	Temporary location Staff may lack NIV skill and experience
Intensive care unit	1:1 nurse/patient ratio, usually with dedicated respiratory therapist Maximal monitoring capabilities	Resource-intensive and excessively costly for stable patients Beds in short supply
Step-down unit	1:2 to 1:4 nurse/patient ratio and central monitoring available Often have dedicated respiratory therapist Develop specialized NIV skills and suitable for most acute NIV applications	Many hospitals lack such units Excessive resource-use for stable patients NIV skills differ between units
General ward	Suitable for stable patients for more efficient use of resources Beds more often available than in ICU or step-down unit Some offer central monitoring, have NIV skills	Not suitable for patients who require close monitoring Many lack experience or skill with NIV
Long-term acute care	Good location for transitioning from tracheostomy to NIV More time to initiate stable long-term patients on NIV Rehabilitation and physical therapy services available	Not suitable for acutely ill patients Many lack experience and skill with NIV

NIV = noninvasive ventilation



Conditions necessary for the NIV application in this particular setting

- ✓ Depends on staff experience and availability of resources for monitoring, and managing complications
- ✓ For the first few hours, one-to-one monitoring by a skilled and experienced nurse, respiratory therapist, or physician is mandatory.
- ✓ Immediate access to staff skilled in invasive airway management.

PREHOSPITAL SETTING and CPAP ?



Giuseppe Foti
Fabio Sangalli
Lorenzo Berra
Stefano Sironi
Marco Cazzaniga
Gian Piera Rossi
Giacomo Bellani
Antonio Pesenti

Is helmet CPAP first line pre-hospital treatment of presumed severe acute pulmonary edema?

Conclusion

Helmet CPAP was feasible, safe and effective in the pre-hospital treatment of presumed ACPE: it allowed prompt improvement in vital parameters both in association with pharmacological support and as a sole treatment. Out of hospital emergency intubation was avoided and in hospital intubation rate was low. The indication for pharmacologic treatment in ACPE is out of discussion. However, these observations suggest that helmet CPAP (along with drugs and especially before these can be administered) could be used as first line intervention in the pre-hospital treatment of severe presumed ACPE.

CPAP for acute cardiogenic pulmonary oedema from out-of-hospital to cardiac intensive care unit: a randomised multicentre study

Intensive Care Med (2011) 37:1501–1509
DOI 10.1007/s00134-011-2311-4

Laurent Ducros
Damien Logeart
Eric Vicaut
Patrick Henry
Patrick Plaisance
Jean-Philippe Collet
Claire Broche
Papa Gueye
Muriel Vergne
David Goetgheber
Pierre-Yves Pennec

Vanessa Belpomme
Jean-Michel Tartière
Sophie Lagarde
Marius Placente
Marie-Laurence Fievet
Gilles Montalescot
Didier Payen

- **207 patients with CPE**, randomly allocated by emergency mobile medical units (SAMU)
- **Comparison: standard treatment** alone or **standard treatment + CPAP.**
- **CPAP maintained after admission** to the intensive care unit (ICU), until the CPE resolved.
- **Inclusion criteria:** RR > 25 breaths/min, pulse oxymetry < 90% in air and diffuse crackles.

CPAP for acute cardiogenic pulmonary oedema from out-of-hospital to cardiac intensive care unit: a randomised multicentre study

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Marius Placente
Marie-Laurence Fievet
Gilles Montalescot
Didier Payen

The earlier is the best → outside hospital

In conclusion, this multicentre randomised study demonstrated the benefit and the safety of CPAP therapy when started early from the onset of CPE in an out-of-hospital setting and maintained in hospital until CPE resolution. These results strengthen previous data and support the widespread use of CPAP in CPE, as soon as it is diagnosed, whether hypercapnia is present or not and whatever the LVEF.

PREHOSPITAL SETTING and NIV ?



Few studies published !

Very low level of evidence.....

An observational study of noninvasive positive pressure ventilation in an out-of-hospital setting^{☆,☆☆}

Phillipe Bruge MD^a, Patricia Jabre MD^{a,b}, Michel Dru MD^a, Chadi Jbeili MD^a,
Eric Lecarpentier MD^a, Mohamed Khalid MD^a, Alain Margenet MD^a,
Jean Marty MD^c, Xavier Combes MD^{a,*}

Am J Emerg Med. 2008

In conclusion, our observational study has provided valuable information on the feasibility of out-of-hospital BiPAP ventilation. Bilevel positive airway pressure can be initiated very early in patients with respiratory distress, before they reach the hospital. The out-of-hospital failure rate was similar to reported inhospital rates. However, because this was an observational study, no conclusions can be drawn as to whether BiPAP is superior to other respiratory support systems. Randomized studies are now needed that

	Nonintubated patients (n = 103)	Intubated patients (n = 35)	P
Etiology (n)			<.001
CHF	68	9	
COPD	26	13	
ARF	9	13	
Age (y, mean ± SD)	76 ± 11	72 ± 12	.15
Men/women (n)	61/42	21/14	.94
Initial clinical characteristics (mean ± SD)			
Respiratory rate (min ⁻¹)	37 ± 9	36 ± 8	.39
Sp _{o₂} (%) ^a	89 ± 9	84 ± 12	.008
Heart rate (min ⁻¹)	112 ± 24	109 ± 22	.55
Systolic blood pressure (mm Hg)	175 ± 39	147 ± 38	.0004
Air leakage during out-of-hospital time (n)	13	9	.06
Clinical characteristics at arrival at hospital ^b (mean ± SD)			
Respiratory rate (min ⁻¹)	27 ± 7	30 ± 6	.66
Sp _{o₂} (%)	96 ± 5	95 ± 7	.68
Heart rate (min ⁻¹)	99 ± 22	102 ± 18	.20
Systolic blood pressure (mm Hg)	140 ± 28	132 ± 26	.005
Patients with Sp _{o₂} > 90% (n)	96	19	
Blood gas measurements at arrival at hospital (mean ± SD)			
pH (mm Hg)	7.3 ± 0.1	7.3 ± 0.1	.64
Pa _{o₂} (mm Hg)	117 ± 55	129 ± 83	.91
Pa _{c_{o₂}} (mm Hg)	50 ± 14	51 ± 16	.83
Length of intensive care stay (d, mean ± SD)	6 ± 5	21 ± 22	.005

Niv in Emergency Department COPD and CPO



The use of non-invasive ventilation in the emergency department

Dominique Vanpee

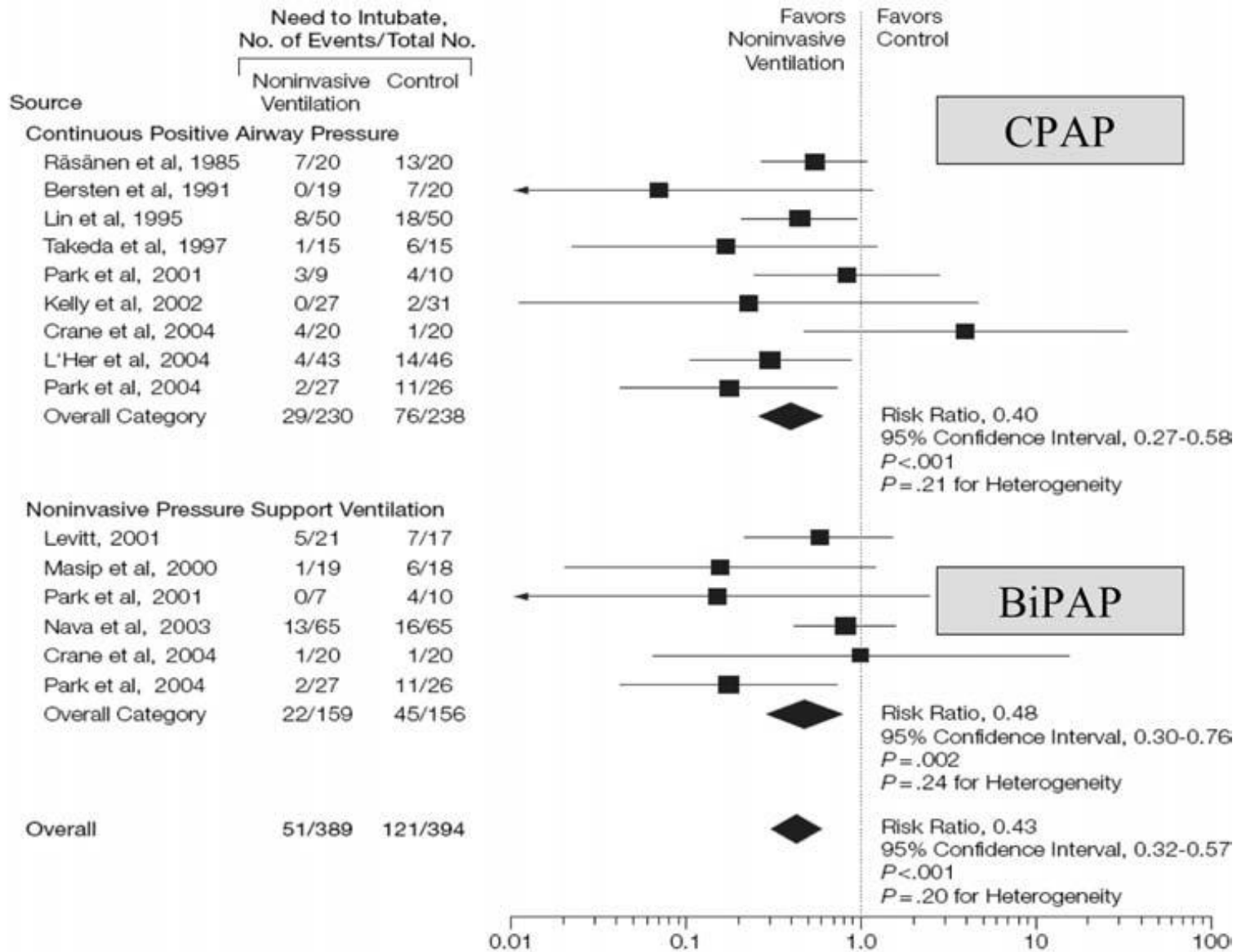
European Journal of Emergency Medicine. 2003, 10:77–78

Université Catholique de Louvain, Emergency Department, Mont-Godinne Hospital, 5530 Yvoir, Belgium.

Conclusion

NIV will probably be one of our first lines of treatment for the emergency care of patients with cardiogenic pulmonary oedema and COPD exacerbation. NIV is a simple and reliable ventilatory technique that can easily be initiated in the emergency department. Investments in equipment and training are necessary. The most important factor for success is that the staff is adequately trained in the technique. This is why within the European Society for Emergency Medicine a group is organizing a European course on NIV in the emergency department. All emergency physicians should become familiar with this technique and use it more often in eligible patients.

Additional studies are needed to define the optimal application of this technique in the emergency department. Patient selection criteria for the optimal administration of NIV in the emergency department need to be developed. The new device proposed by Pelosi *et al.* [3], because of its good tolerability, could possibly expand the use of NIV in the emergency department. A specific reimbursement category for this type of ventilatory assistance is necessary.



Masip J et al: Noninvasive ventilation in acute cardiogenic pulmonary edema: Systematic review and meta-analysis. JAMA 2005

Semir Nouira
Riadh Boukef
Wahid Bouida
Wieme Kerkeni
Kaouther Beltaief
Hamdi Boubaker
Latifa Boudhib
Mohamed Habib Grissa
Mohamed Naceur Trimech
Hamadi Boussarsar
Mehdi Methamem
Soudani Marghli
Mondher Ltaief

Non-invasive pressure support ventilation and CPAP in cardiogenic pulmonary edema: a multicenter randomized study in the emergency department

¹
In conclusion, our data can be added to the accumulating evidence underscoring the same effect of NIPSV compared to CPAP on death and intubation rates in CPE, apart from the fact that NIPSV is associated with a more rapid improvement in respiratory failure. The same results were observed in patients with hypercapnia and in those with severe congestive heart failure.

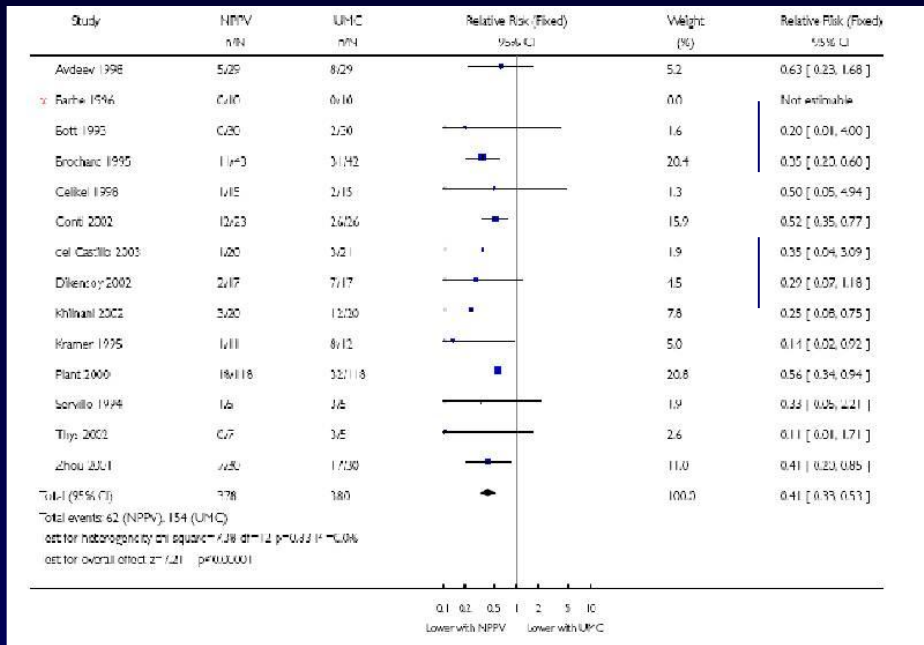
Non-invasive positive pressure ventilation for exacerbation of chronic obstructive pulmonary patients in the emergency department

D. VANPEE^{1*}, L. DELAUNOIS² and J-B. GILLET¹

Departments of ¹Emergency and ²Pneumology, Université Catholique de Louvain, Cliniques Universitaires Mont-godinne, 5530 Yvoir, Belgium

by everyone. For these reasons, we think that emergency physicians should become familiar with this technique and use it more often in eligible COPD patients. Expansion of its use in the emergency department should be considered. A specific allowance of this type of ventilation would be also necessary. Additional clinical studies are needed to best define the optimal application of this technology in the emergency department because the optimal use of NIV could be different in the emergency department compared with the intensive care unit.

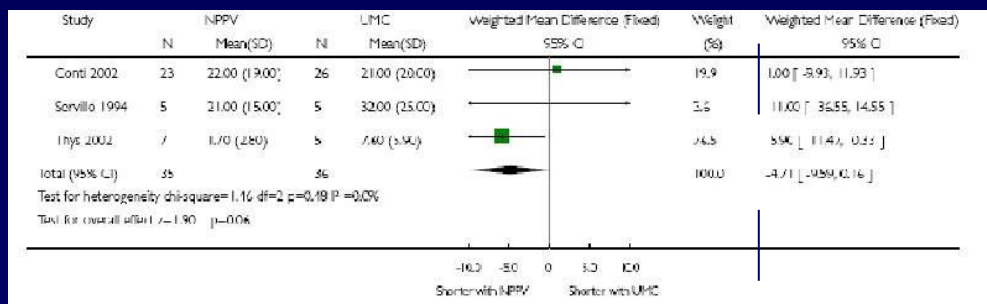
STRONG EVIDENCE: NIV and acute exacerbation COPD



EFFECT + symptoms
EFFECT + ABG

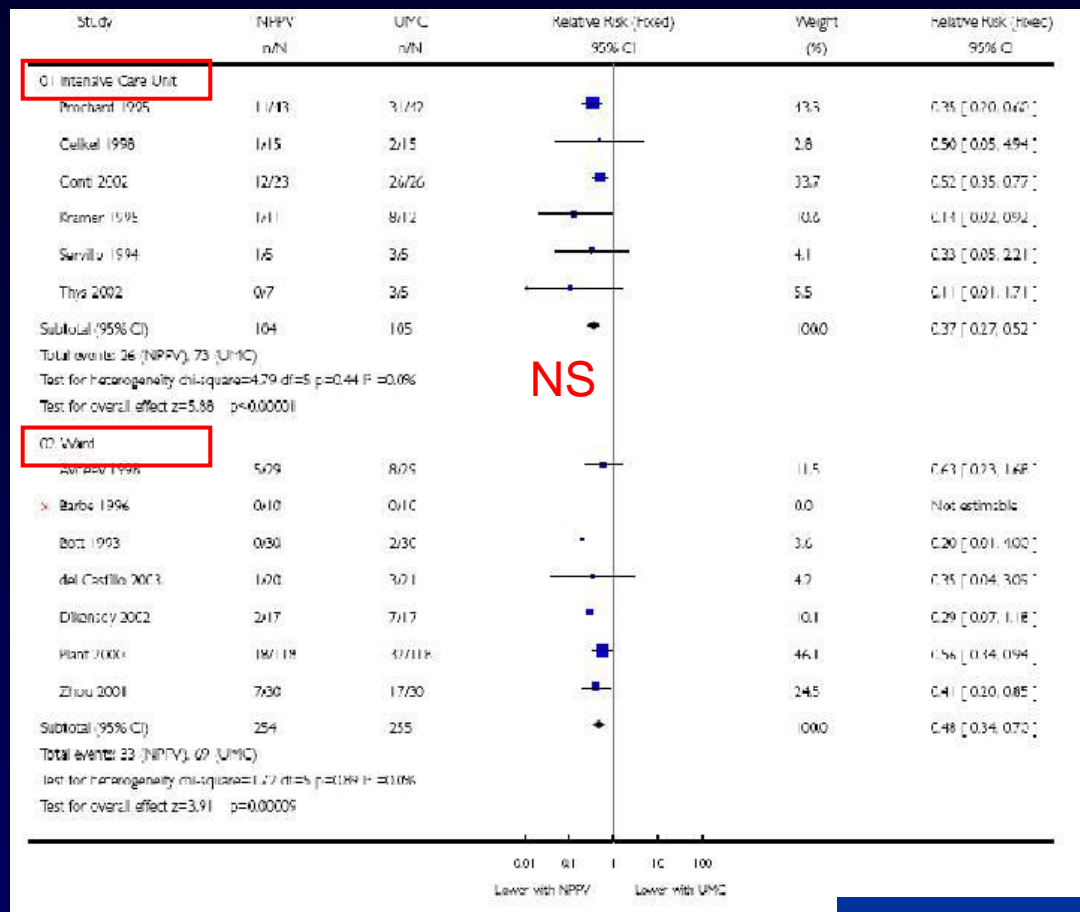
EFFECT [+] ETI:

EFFECT [+] Morb / Mortality:



**EFFECT [+] length of
 hospital stay :**

**EFFECT [+]
 length of ICU stay :**



The Cochrane Database of Systematic Reviews 2004

EARLY NIV APPLICATION IN EMERGENCY SETTING COPD exacerbation

Strong evidence

Noninvasive mechanical ventilation in patients with chronic obstructive pulmonary disease and severe hypercapnic neurological deterioration in the emergency room

Killen Harold Briones Claudett^a, Mónica H. Briones Claudett^b, Miguel A. Chung Sang Wong^b, Michelle Grunauer Andrade^c, Cristhian X. Cruz^d, Antonio Esquinas^e and Gumersindo Gonzalez Diaz^e

Objectives The objective of this study was to assess the effectiveness of noninvasive motion ventilation (NIMV) in patients with chronic obstructive pulmonary disease (COPD), having infectious exacerbation and severe hypercapnic neurological dysfunction in the emergency room.

Design This is a prospective interventional study.

Setting The study setting was the emergency room at the Military Hospital in Guayaquil, Ecuador.

Patients A total of 24 patients were studied. Twelve patients had acute exacerbation of their chronic obstructive pulmonary disease: they presented at the emergency room with severe neurological dysfunction, with a Glasgow Coma Scale (GCS) score of less than 8 and a pH of less than 7.25. These patients were compared with 12 controls who were being treated with invasive mechanical ventilation (IMV), who were then matched according to their GCS scores, pH status, Acute Physiology and Chronic Health Evaluation II (APACHE II) scores, and age.

Interventions We evaluated the effectiveness and safety

NIMV groups, respectively ($P=0.01$). Days of IMV were 5.60 ± 1.2 versus 3.6 ± 1.1 for NIMV ($P=0.006$). Days of hospitalization were 11.1 ± 4.7 for the IMV group and 6.5 ± 1.9 for the NIMV group ($P=0.001$). The cumulative survival rates at 6 months were 71.4 and 80% for the IMV and NIMV groups, respectively ($P=0.80$).

Conclusion We consider that severe neurological dysfunction and pH of less than 7.25 do not constitute absolute contraindications to the use of NIMV. This kind of management can be implemented in the emergency room with favorable results. *European Journal of Emergency Medicine* 15:127–133 © 2008 Wolters Kluwer Health | Lippincott Williams & Wilkins.

European Journal of Emergency Medicine 2008, 15:127–133

Keywords: bilevel positive airway pressure, chronic obstructive pulmonary disease, noninvasive mechanical ventilation, severe hypercapnic neurological dysfunction

^aPneumology Department of Military Hospital, ^bPneumology Department and Intensive Care Unit of Military Hospital, ^cIntensive Care Unit of Military Hospital, Guayaquil, Ecuador, ^dUniversity Of San Francisco De Quito in Cumbaya and ^eIntensive Care Unit and Pneumology Services of the Hospital JM Morales, Meseguer Murcia, Spain

Use of noninvasive positive pressure ventilation in emergency departments of public and private hospitals in Lebanon

Mohamad F. El-Khatib^a, Amin N. Kazzi^b, Salah M. Zeinelddine^c, Pierre K. Bou-Khalil^c, Chakib M. Ayoub^a and Ghassan E. Kanazi^a

Noninvasive positive pressure ventilation is increasingly being used in emergency departments across Europe and North America. To our knowledge, no similar data are available from other countries. The aim of this study is to describe the current use of noninvasive positive pressure ventilation in the emergency departments of Lebanese hospitals. A structured and validated questionnaire was sent to all emergency departments in Lebanon. In Lebanon, 48.4% of emergency departments use noninvasive positive pressure ventilation. It is mostly used for patients with chronic obstructive pulmonary diseases and cardiogenic pulmonary edema. Bilevel and continuous positive airway pressures are the two most widely used modalities for noninvasive positive pressure ventilation. Face mask is the most used patient interface. The use of uniform protocols and training is lacking. Noninvasive positive pressure

ventilation in Lebanese emergency departments is underused, with significant potential for improvements in its current practice. *European Journal of Emergency Medicine* 00:000–000 © 2012 Wolters Kluwer Health | Lippincott Williams & Wilkins.

European Journal of Emergency Medicine 2012, 00:000–000

Keywords: bilevel positive airway pressure, continuous positive airway pressure, emergency department, Lebanon, noninvasive positive pressure ventilation

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Clinical practice guidelines for the use of noninvasive positive-pressure ventilation and noninvasive continuous positive airway pressure in the acute care setting

Sean P. Keenan MD MSc, Tasnim Sinuff MD PhD, Karen E.A. Burns MD MSc, John Muscedere MD, Jim Kutsogiannis MD, Sangeeta Mehta MD, Deborah J. Cook MD MSc, Najib Ayas MD, Neill K.J. Adhikari MD CM MSc, Lori Hand BSc RRT, Damon C. Scales MD PhD, Rose Pagnotta RRT, Lynda Lazosky RRT, Graeme Rocker MD, Sandra Dial MD, Kevin Laupland MD MSc, Kevin Sanders MD, Peter Dodek MD MHSc, as the Canadian Critical Care Trials Group / Canadian Critical Care Society Noninvasive Ventilation Guidelines Group

An abridged version of this article appeared in the February 22, 2011 issue of *CMAJ*

See related commentary by Bersten, page 293

KEY POINTS

- Noninvasive positive-pressure ventilation should be the first option for ventilatory support for patients with either a severe exacerbation of chronic obstructive pulmonary disease (COPD) or cardiogenic pulmonary edema.
- Continuous positive airway pressure delivered by mask appears to be just as effective as noninvasive positive-pressure ventilation for patients with cardiogenic pulmonary edema.
- Patients with acute respiratory distress or hypoxemia, either in the postoperative setting or in the presence of immunosuppression, can be considered for a trial of noninvasive positive-pressure ventilation.
- Patients with COPD can be considered for a trial of early extubation to noninvasive positive-pressure ventilation in centres with extensive experience in the use of noninvasive positive-pressure ventilation.

Andres Carrillo
Gumersindo Gonzalez-Diaz
Miquel Ferrer
Maria Elena Martinez-Quintana
Antonia Lopez-Martinez
Noemi Llamas
Maravillas Alcazar
Antoni Torres

Non-invasive ventilation in community-acquired pneumonia and severe acute respiratory failure

Intensive Care Med (2011) 37:918–929
DOI 10.1007/s00134-011-2210-8

REVIEW

D. Chiumello
G. Chevillard
C. Gregoretti

Non-invasive ventilation in postoperative patients: a systematic review

Intensive Care Med (2012) 38:542–556
DOI 10.1007/s00134-012-2508-1

YEAR IN REVIEW 2011

Massimo Antonelli
Marc Bonten
Jean Chastre
Giuseppe Citerio
Giorgio Conti
J. Randall Curtis
Daniel De Backer
Goran Hedenstierna
Michael Joannidis
Duncan Macrae
Jordi Mancebo
Salvatore M. Maggiore
Alexandre Mebazaa
Jean-Charles Preiser
Patricia Rocco
Jean-François Timsit
Jan Wernerman
Haibo Zhang

Year in review in Intensive Care Medicine 2011: III. ARDS and ECMO, weaning, mechanical ventilation, noninvasive ventilation, pediatrics and miscellanea

Intensive Care Med (2011) 37:1250–1257
DOI 10.1007/s00134-011-2263-8

REVIEW

Élie Azoulay
Alexandre Demoule
Samir Jaber
Achille Kouatchet
Anne-Pascale Meert
Laurent Papazian
Laurent Brochard

Palliative noninvasive ventilation in patients with acute respiratory failure

What is the best location for an NIV service?

- Local factors
 - Staff
 - Training / experience
 - Numbers (1:3 to 4)
 - Relationship with Critical Care
- Adequately equipped
 - Ventilators, masks etc
 - Monitoring equipment
- Dedicated NIV Unit



Società Italiana di Medicina d'Emergenza-Urgenza
Società Scientifica dei Medici d'Urgenza, di Pronto Soccorso e dell'Emergenza Territoriale



**SOCIETA' ITALIANA
di MEDICINA D'EMERGENZA-URGENZA**
**Società Scientifica dei Medici d'Urgenza, di Pronto Soccorso
e dell'Emergenza Territoriale**

Corsi di formazione SIMEU

*L'insufficienza respiratoria acuta
e il suo trattamento precoce
mediante CPAP in emergenza*

*Utilizzo della ventilazione meccanica non invasiva
nel trattamento dell'insufficienza respiratoria acuta
in emergenza*

NIV.....Dovunque ??

NIV....Dovunque !!

