

# 11° CONGRESSO NAZIONALE



*Quello che le Linee  
Guida Non Dicono*

**Napoli**  
**5-6 aprile 2024**

**VENTILAZIONE NON INVASIVA: LE EVIDENZE SCIENTIFICHE**

Dr.ssa Amelia Ravera

Responsabile UOSD UTIC AOU San Giovanni di Dio e Ruggi d'Aragona  
Salerno

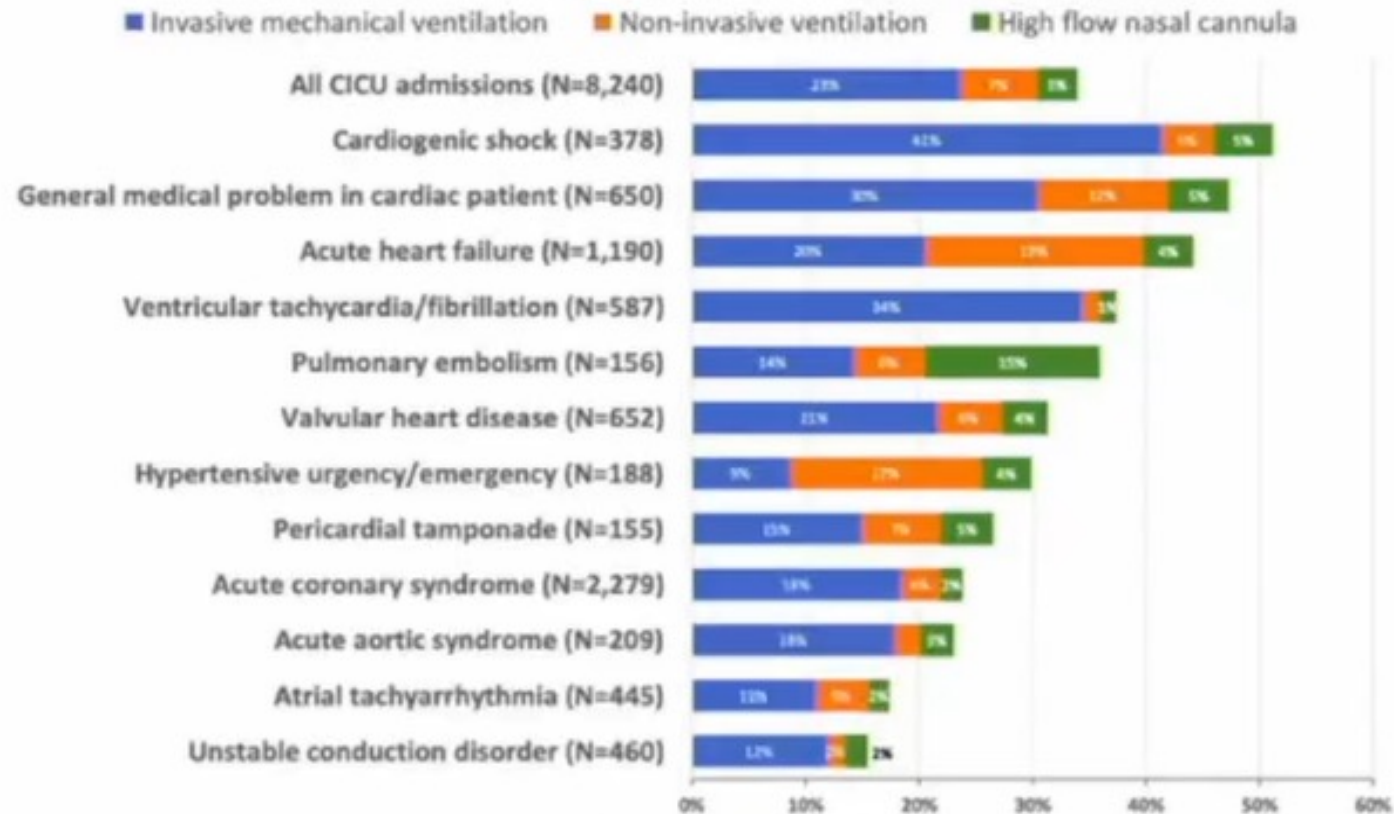
Jentzer et al J Am Heart Assoc. 2019

- M-CARS: Mayo CICU Admission Risk Score
- Derivato da un campione di 10004 pz
- Validato su un campione di 2634 pz
- Sette predittori di mortalità intra-ospedaliera
- L'IRA è uno dei 7 predittori: OR 2.145 (1.745–2.638)

Variable	Value	Points Assigned
Admission value of BUN	>23 mg/dL	1
	≤23 mg/dL	0
Admission value of anion gap	>14	1
	≤14	0
Admission Braden skin score	≤12	2
	13–15	1
	>15	0
Admission value of RDW	>14.3	1
	≤14.3	0
Admission diagnosis of cardiac arrest	Yes	2
	No	0
Admission diagnosis of shock	Yes	2
	No	0
Admission diagnosis of respiratory failure	Yes	1
	No	0

- 8240 pz ammessi consecutivamente in UTIC in un periodo di 2 mesi in 25 ospedali degli US
- 1/3 necessitava di supporto respiratorio: il 3.1% HFNC, il 7% NIV e il 23.5% con ventilazione meccanica invasiva.

Use of respiratory support by CICU admitting diagnosis



Metkus TS et al *Crit Care Expl* 2020

# THE FABULOUS FOUR

- Riaccutizzazione di BPCO
- EPA cardiogeno
- IRA in pazienti immunocompromessi
- Estubazione precoce nei pz BPCO

# Cos'è l'insufficienza respiratoria

**L'insufficienza respiratoria** è definita come la presenza di  $\geq 2$  criteri tra i clinici ed emogasanalitici:

**Esame clinico** (distress respiratorio):

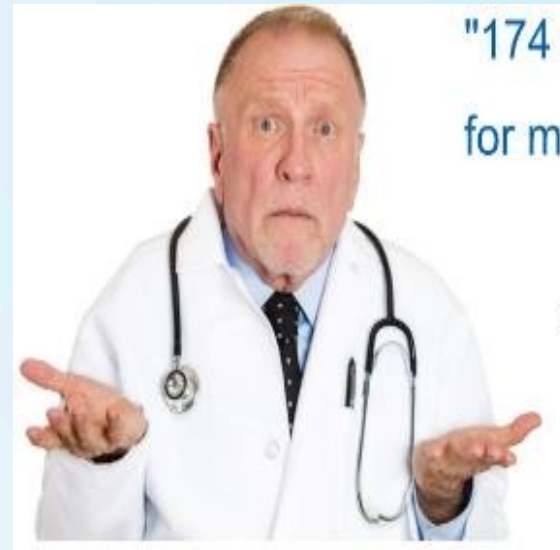
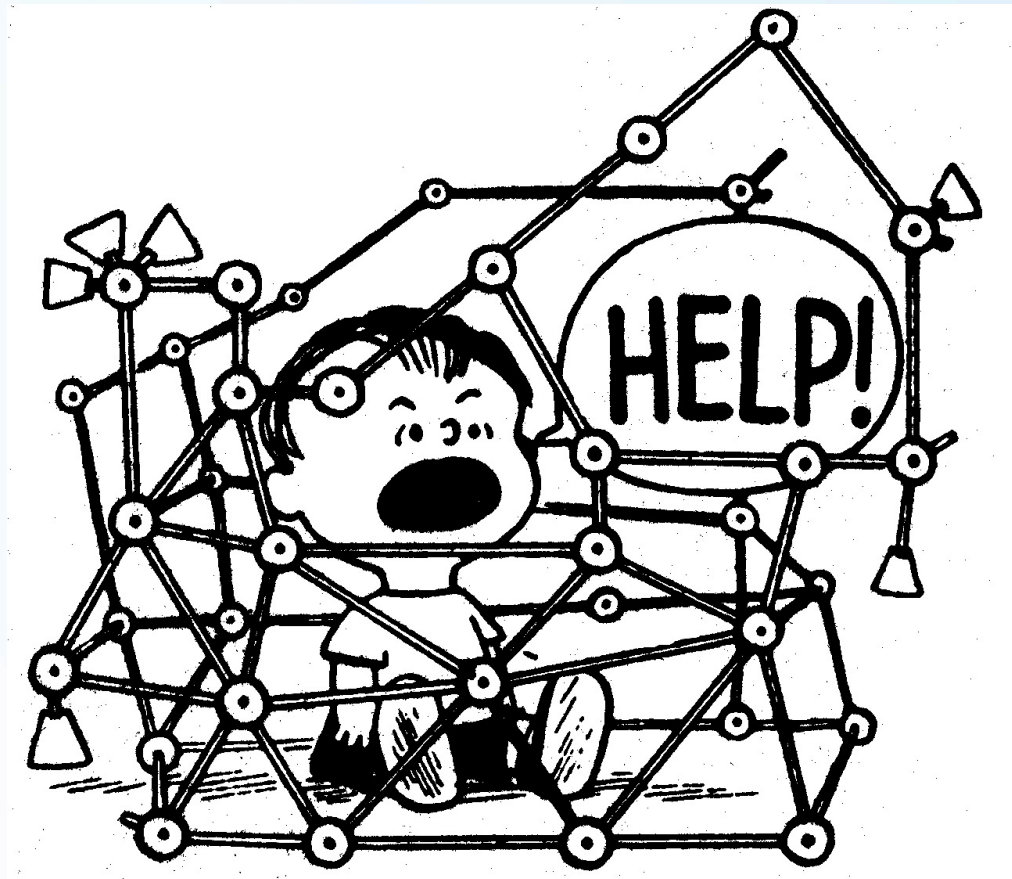
- *Dispnea ingravescente (da moderata a grave)*
- *Tachipnea ( $> 25-30$  atti/min)*
- *Segni di aumentato lavoro muscolare, uso della muscolatura accessoria, bilancia toraco-addominale, alterazione stato mentale*

**Scambi gassosi** (EGA):

- *Forma acuta o riacutizzazione di una forma cronica ( $PaCO_2 > 50$  mmHg,  $pH < 7.35$ )*
- *Ipossiemia ( $PaO_2/FiO_2 < 300$  mmHg)*



# Cosa è la NIV?



ASB

PSV

BIPA

pSIMV

BiPA PCPAP

MMV

IPPV

PRVC

APRV

CMV

PLV

A T C

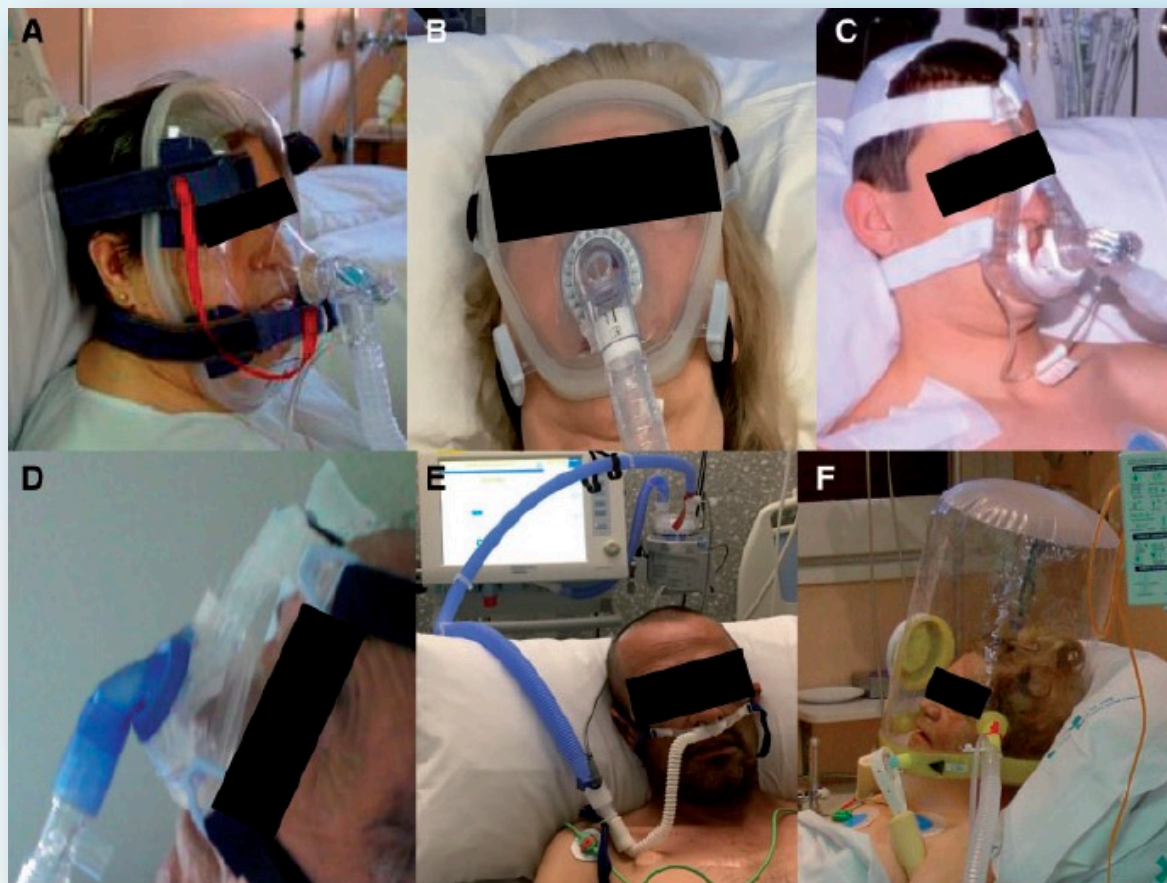
I R V

PS

P P S

SMART CARE

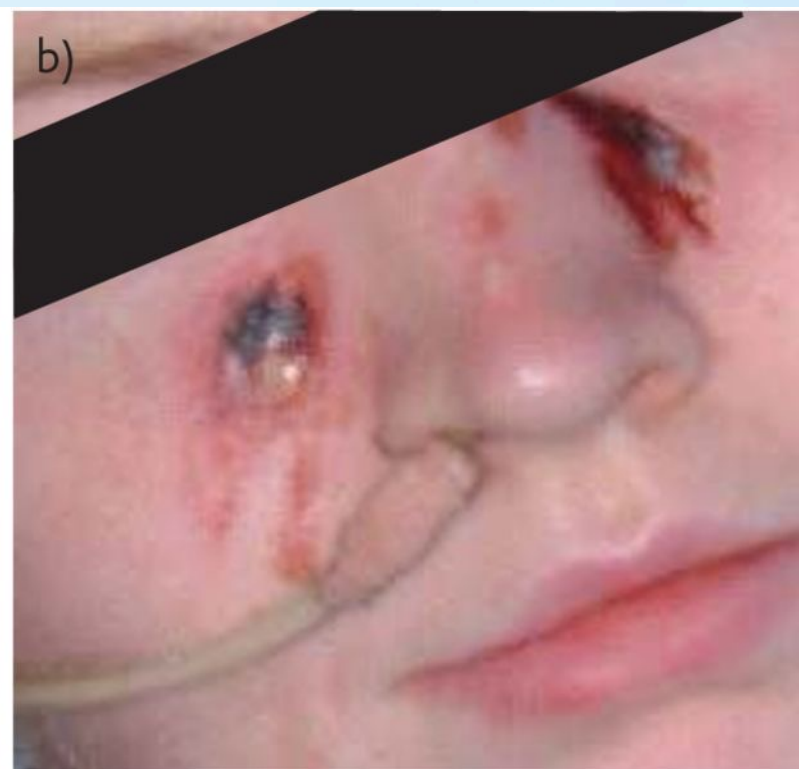
## NIV: Presidi utilizzabili



**a) ULCERA DI III GRADO SELLA NASALE**

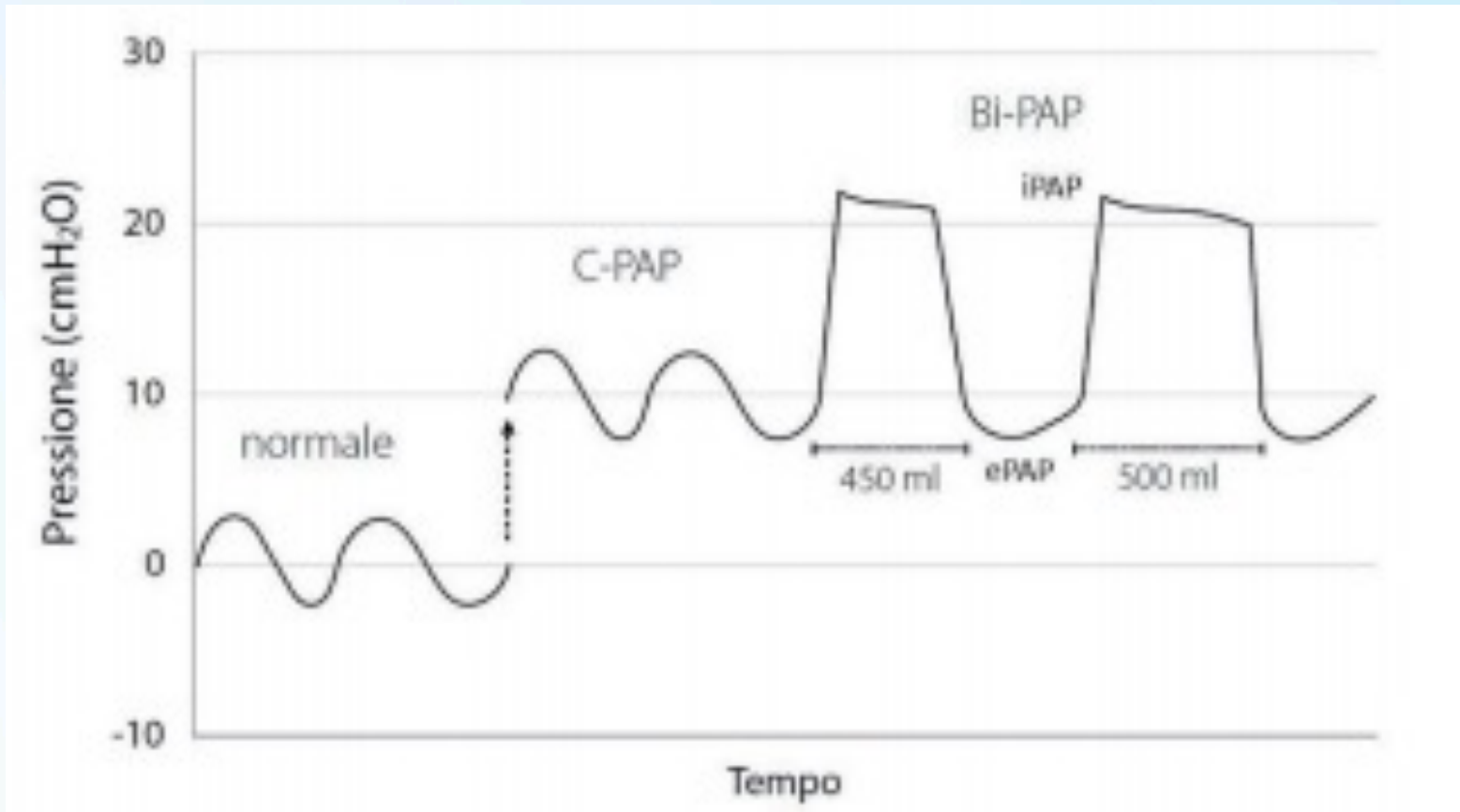


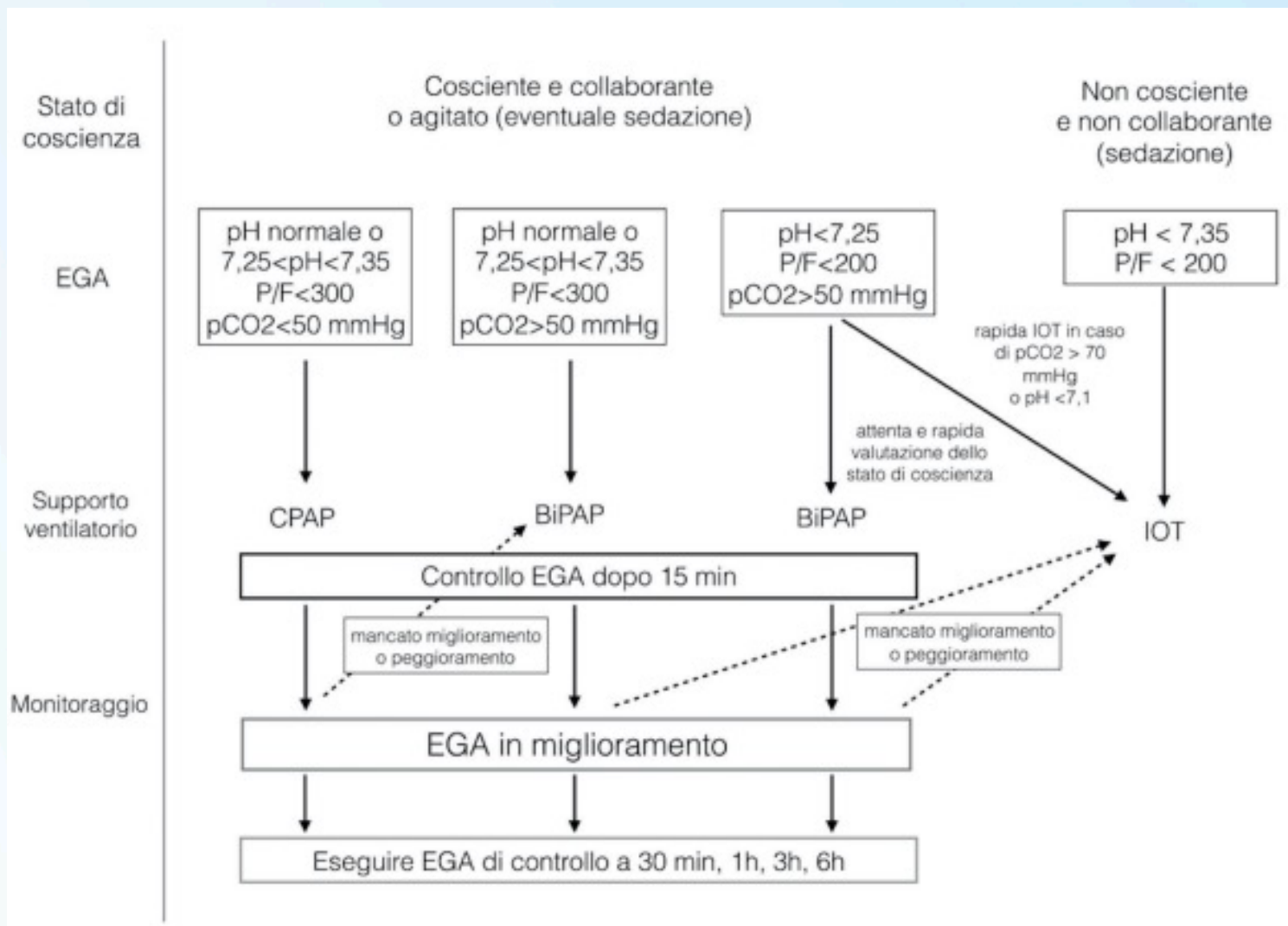
**b) ULCERE DI II GRADO SULLE GUANCE**





# on Invasive Ventilation







«...allora il Signore Dio plasmò l'uomo con polvere del suolo e soffiò nelle sue narici un alito di vita e l'uomo divenne un essere vivente...»

GENESI 2,7



«...It is, rather, as antiquated as it is inhumane and unsafe... a patient who is sick enough to need continuous positive airway pressure is sick enough to need endotracheal tube»

Philippe Kittredge, CHEST, '70



**EUROPEE**

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

**II A**

**CANADESI**

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

**I A**

**NICE**

Acute heart failure: diagnosis and management

No utilizzo routinario. Solo se dispnea severa ed acidosi

**AMERICANE**

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

**I B**

	Conventional oxygen therapy		CPAP	
	Died	Total	Died	Total
Räsänen et al, 1985 <sup>2</sup>	6	20	3	20
Bersten et al, 1991 <sup>5</sup>	4	20	2	19
Lin et al, 1995 <sup>4</sup>	6	50	4	50
Edinburgh study	7	31	2	27
Pooled data*	23	121	11	116

\*p<0.01,  $\chi^2$  test for conventional oxygen therapy versus CPAP.

**Effect of CPAP on pre-discharge hospital mortality: pooled data**

\*Stefano Nava, Annalisa Carlucci

Respiratory Unit, Fondazione S Maugeri,  
Istituto Scientifico di Pavia, via Ferrata 8,  
27100 Pavia, Italy

- 1 Masip J, Betbesé AJ, Páez J, et al. Non-invasive pressure support ventilation versus conventional oxygen therapy in acute cardiogenic pulmonary oedema: a randomised trial. *Lancet* 2000; **356**: 2126–32.

## Conclusions

Bilevel positive airway pressure improves ventilation and vital signs more rapidly than CPAP in patients with acute pulmonary edema. The higher rate of myocardial infarctions associated with the use of bilevel positive airway pressure highlights the need for further studies to clarify its effects on hemodynamics and infarction rates, and to determine optimal pressure settings. (Crit Care Med 1997; 25:620-628)

## Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema

Alasdair Gray, M.D., Steve Goodacre, Ph.D., David E. Newby, M.D., Moyra Masson, M.Sc., Fiona Sampson, M.Sc., and Jon Nicholl, M.Sc., for the 3CPO Trialists\*

The NEW ENGLAND JOURNAL of MEDICINE

2008; 359: 142-51

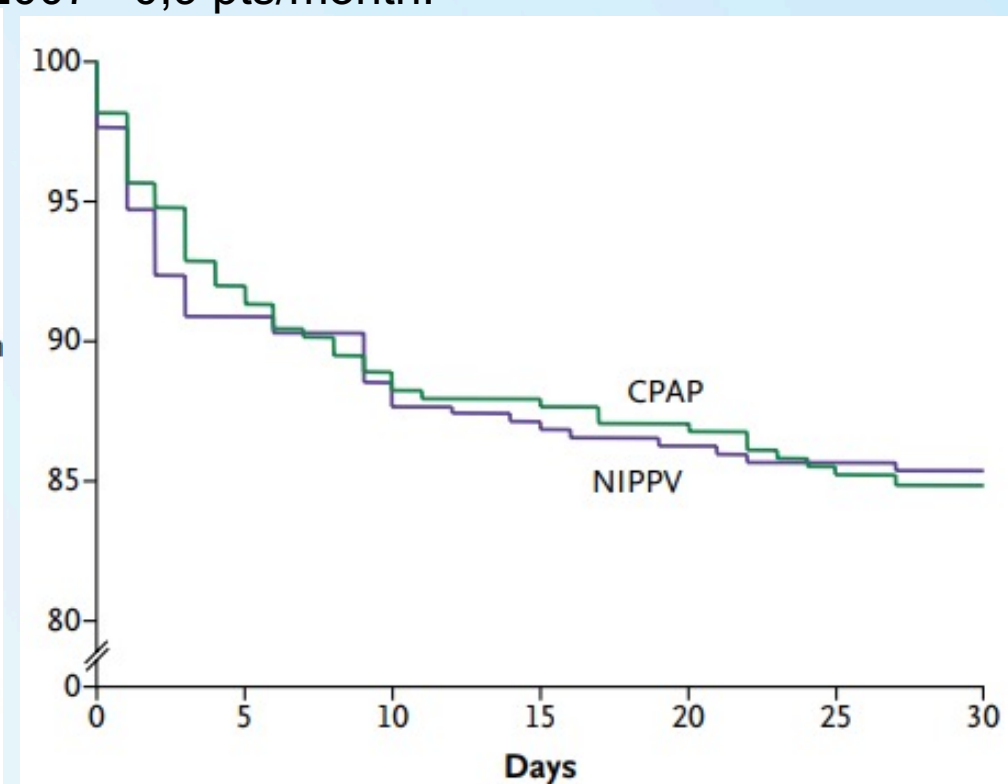
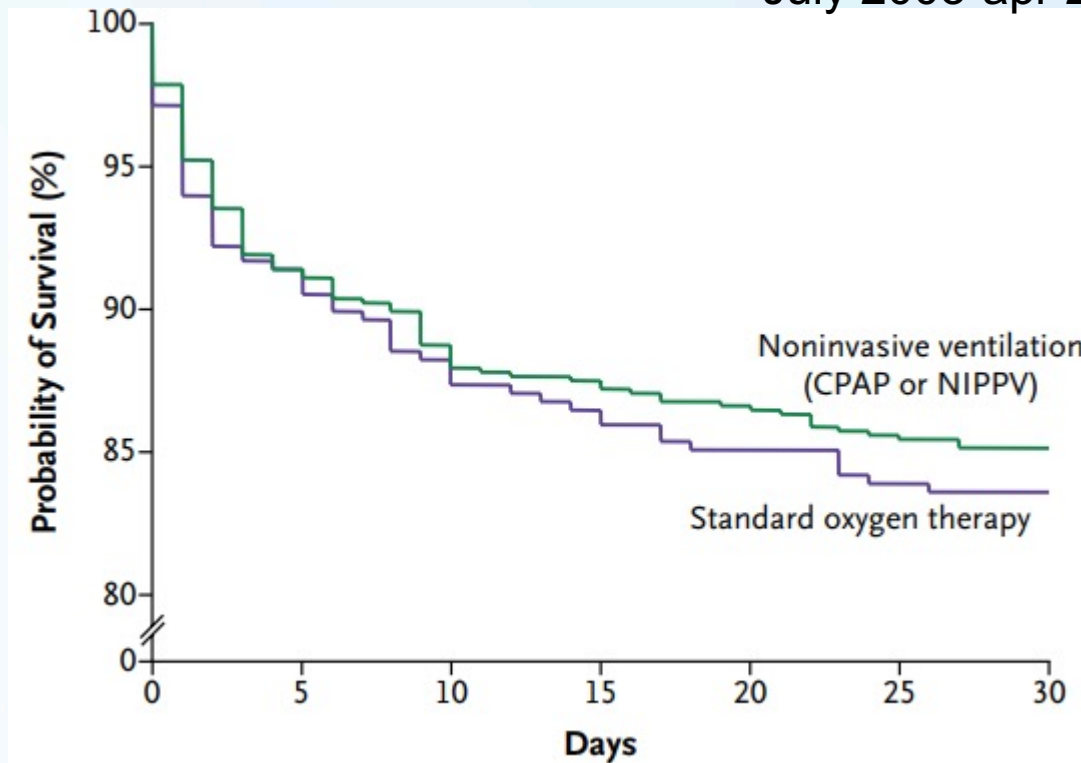
Variable	Standard Oxygen Treatment (N=367)	CPAP or NIPPV (N=702)	Odds Ratio (95% CI)	P Value
Mean change at 1 hr after start of treatment‡				
Dyspnea score§	3.9	4.6	0.7 (0.2 to 1.3)	0.008
Pulse rate (beats/min)	13	16	4 (1 to 6)	0.004
Arterial pH	0.08	0.11	0.03 (0.02 to 0.04)	<0.001
Arterial PaO <sub>2</sub> (kPa)	0.7	-0.6	-1.2 (-2.6 to 0.1)	0.07
Arterial PaCO <sub>2</sub> (kPa)	0.8	1.5	0.7 (0.4 to 0.9)	<0.001

ORIGINAL ARTICLE

# Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema

3CPO Trialists

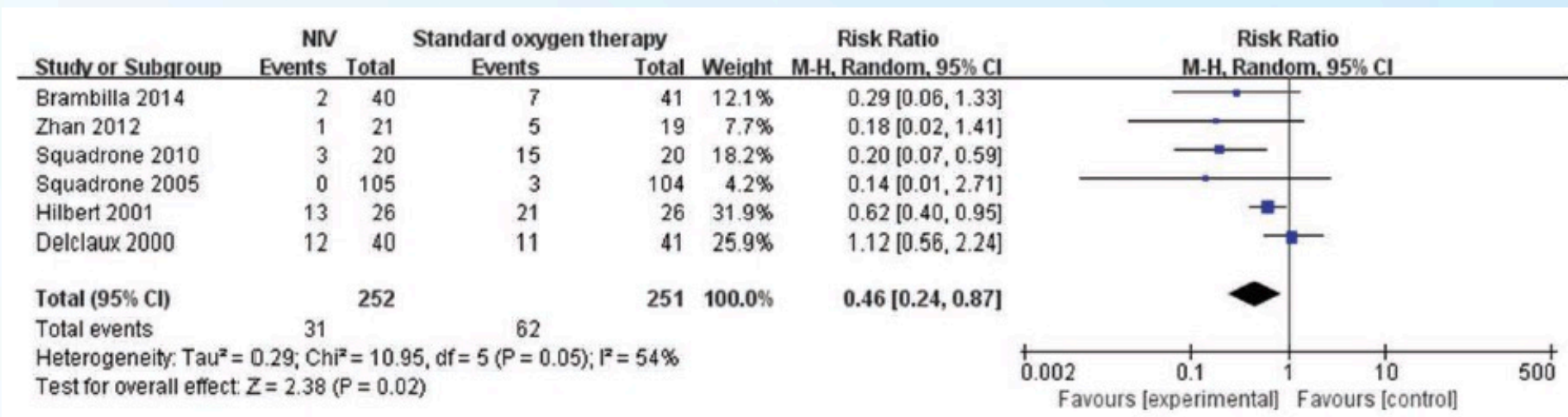
26 centers randomized 1069 pts, 77.7±9.7 years; female 56.9%  
July 2003-apr 2007= 0,9 pts/month:





## Noninvasive Ventilation in Acute Hypoxemic Nonhypercapnic Respiratory Failure: A Systematic Review and Meta-Analysis

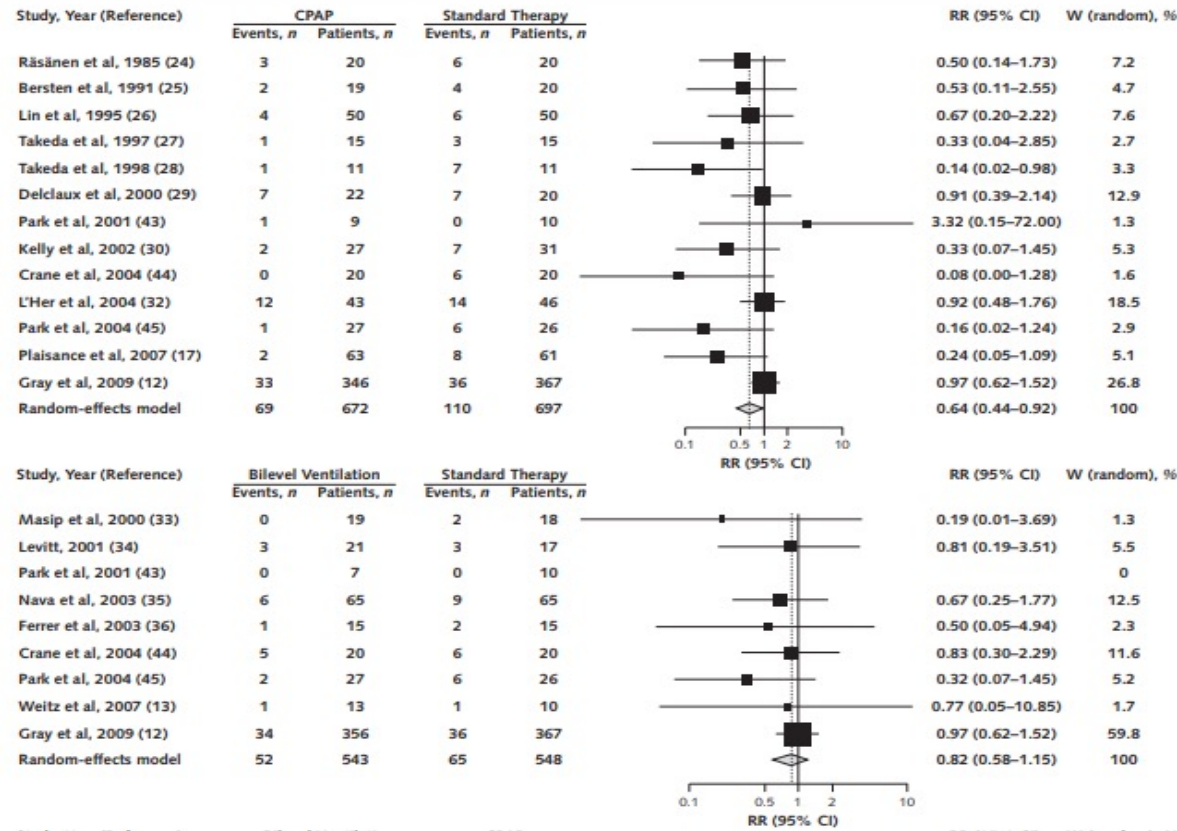
Xiu-Ping Xu, MD<sup>1</sup>; Xin-Chang Zhang, MD<sup>2</sup>; Shu-Ling Hu, MD<sup>1</sup>; Jing-Yuan Xu, MD<sup>1</sup>; Jian-Feng Xie, MD<sup>1</sup>; Song-Qiao Liu, MD, PhD<sup>1</sup>; Ling Liu, MD, PhD<sup>1</sup>; Ying-Zi Huang, MD, PhD<sup>1</sup>; Feng-Mei Guo, MD, PhD<sup>1</sup>; Yi Yang, MD, PhD<sup>1</sup>; Hai-Bo Qiu, MD, PhD<sup>1</sup>



# Meta-analysis: Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema

Cui-Lian Weng, MD; Yun-Tao Zhao, PhD; Qing-Hua Liu, MM; Chang-Jun Fu, PhD; Feng Sun, PhD; Yan-Liang Ma, MD; Yan-Wen Chen, MD; and Quan-Ying He, MD

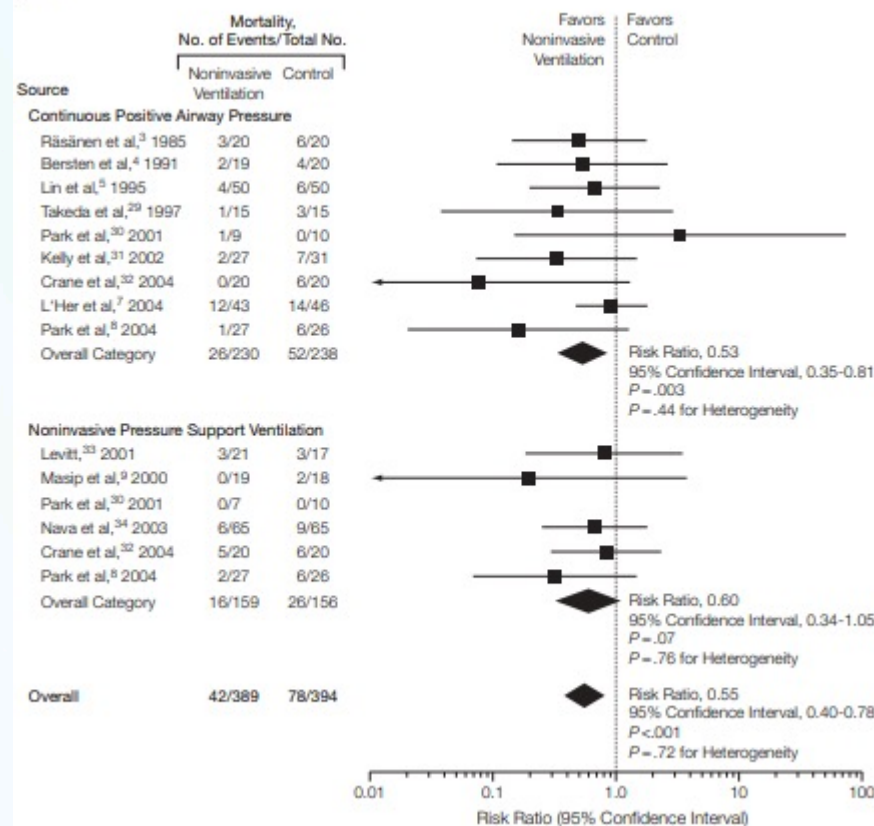
Figure 1. Forest plot for in-hospital mortality.



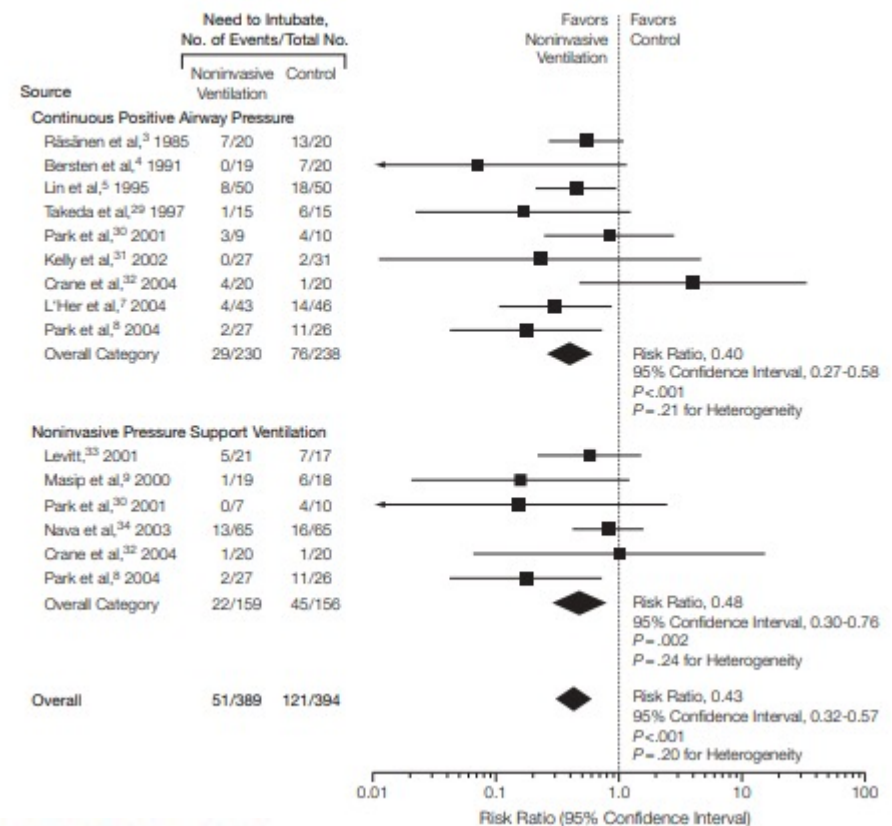
# Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema

## Systematic Review and Meta-analysis

**Figure 2.** Effects of Noninvasive Ventilation on Death



**Figure 3.** Effects of Noninvasive Ventilation on Need to Intubate







## 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

### Recommendations for the management of patients with acute heart failure: oxygen therapy and ventilatory support

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Ref <sup>c</sup>
Monitoring of transcutaneous arterial oxygen saturation (SpO <sub>2</sub> ) is recommended.	I	C	
Measurement of blood pH and carbon dioxide tension (possibly including lactate) should be considered, especially in patients with acute pulmonary oedema or previous history of COPD using venous blood. In patients with cardiogenic shock arterial blood is preferable.	IIa	C	
Oxygen therapy is recommended in patients with AHF and SpO <sub>2</sub> <90% or PaO <sub>2</sub> <60 mmHg (8.0 kPa) to correct hypoxaemia.	I	C	
Non-invasive positive pressure ventilation (CPAP, BiPAP) should be considered in patients with respiratory distress (respiratory rate >25 breaths/min, SpO <sub>2</sub> <90%) and started as soon as possible in order to decrease respiratory distress and reduce the rate of mechanical endotracheal intubation. Non-invasive positive pressure ventilation can reduce blood pressure and should be used with caution in hypotensive patients. Blood pressure should be monitored regularly when this treatment is used.	IIa	B	541–545
Intubation is recommended, if respiratory failure, leading to hypoxaemia (PaO <sub>2</sub> <60 mmHg (8.0 kPa)), hypercapnia (PaCO <sub>2</sub> >50 mmHg (6.65 kPa)) and acidosis (pH <7.35), cannot be managed non-invasively.	I	C	



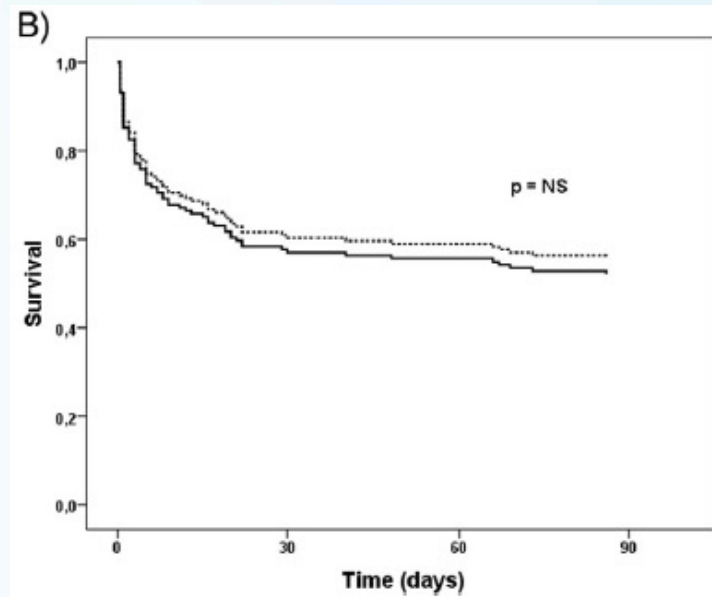
# NIV NELLO SHOCK CARDIOGENO

Use of noninvasive and invasive mechanical ventilation in cardiogenic shock: A prospective multicenter study



*Int J Cardiol* 2017; 230: 191-197

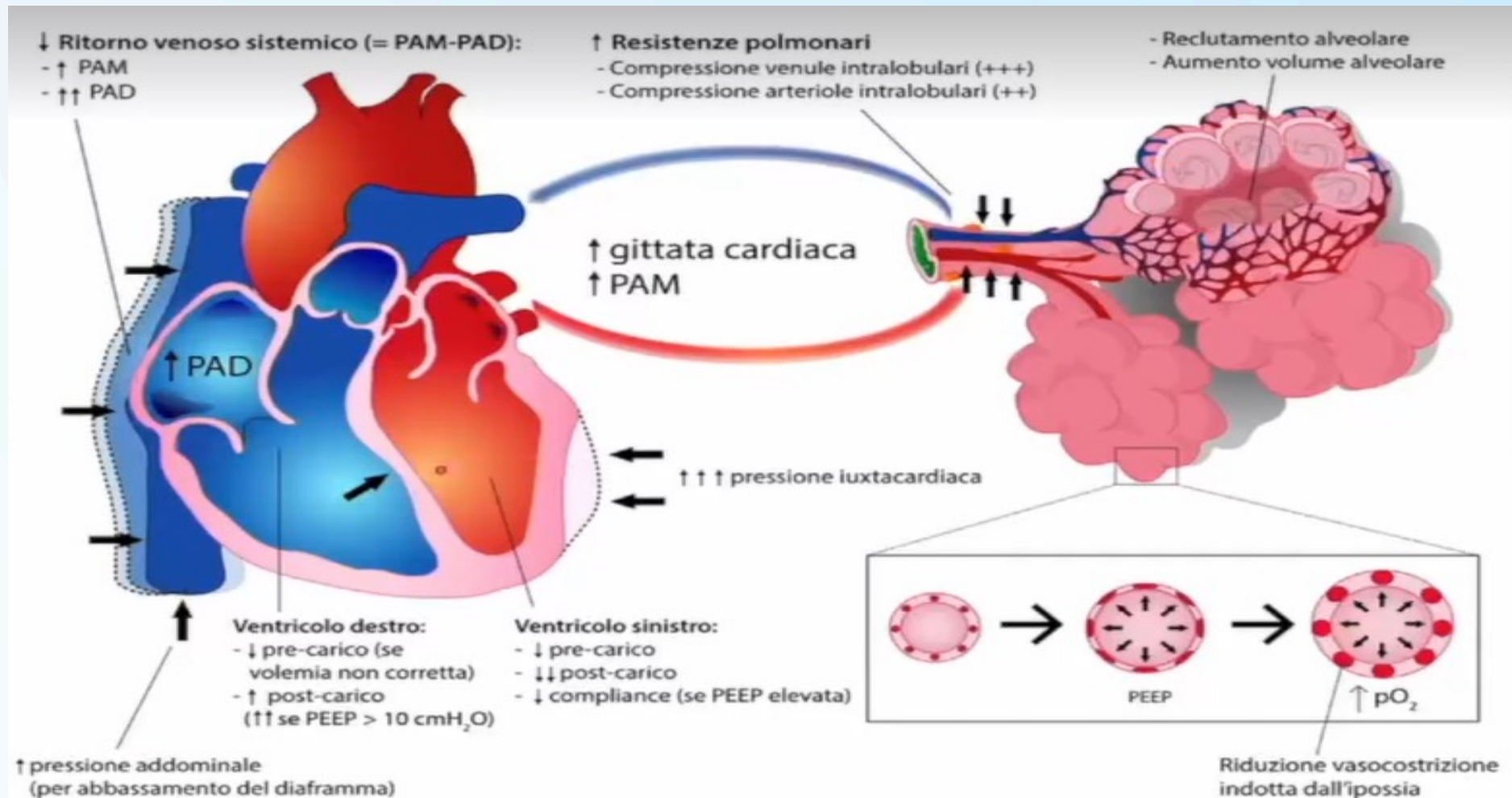
Mari Hongisto <sup>a,\*</sup>, Johan Lassus <sup>b</sup>, Tuukka Tarvasmaki <sup>a</sup>, Alessandro Sionis <sup>c</sup>, Heli Tolppanen <sup>b</sup>,  
Matias Greve Lindholm <sup>d</sup>, Marek Banaszewski <sup>e</sup>, John Parissis <sup>f</sup>, Jindrich Spinar <sup>g</sup>, Jose Silva-Cardoso <sup>h</sup>,  
Valentina Carubelli <sup>i</sup>, Salvatore Di Somma <sup>j</sup>, Josep Masip <sup>k</sup>, Veli-Pekka Harjola <sup>a</sup>



	All (n = 219)	MV (n = 137)	NIV (n = 26)	p-Value*	Supplementary oxygen (n = 56)
<b>Mortality, n (%)</b>					
In-hospital mortality	80 (37)	62 (45)	5 (19)	0.01	13 (23)
90-day mortality	89 (41)	67 (49)	7 (27)	0.03	15 (27)
ICU/CCU length of stay, days	5 (2–10)	6 (2–11)	4 (2–8)	0.2	3 (1–7)
In-hospital length of stay, days	12 (7–25)	17 (10–27)	12 (7–27)	0.2	8 (4–18)

Propensity score adjusted

# NIV: Effetti emodinamici



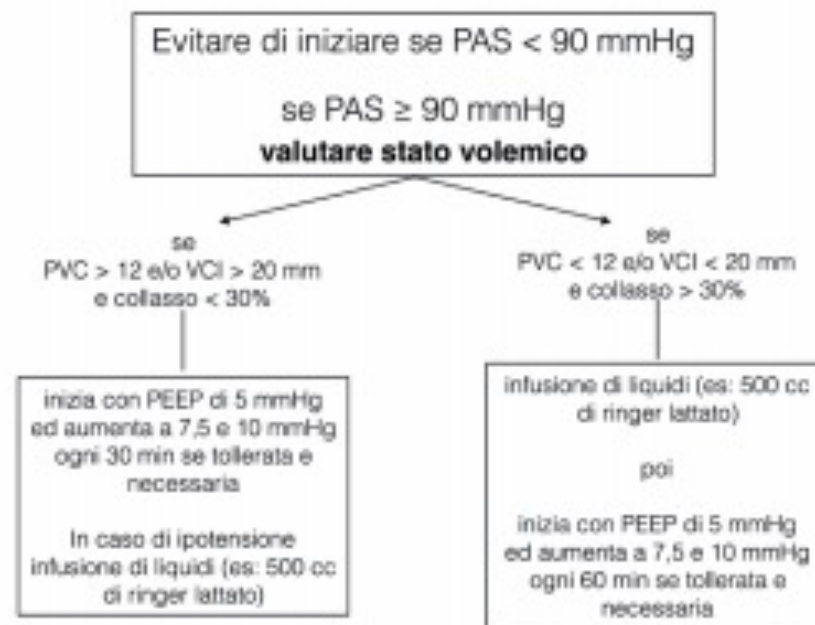
## Gli effetti emodinamici della pressione positiva di fine espirazione

Marco Marini<sup>1\*</sup>, Giorgio Caretta<sup>2\*</sup>, Fabio Vagnarelli<sup>3\*</sup>, Fabiana Lucà<sup>4\*</sup>, Emilia Biscottini<sup>5\*</sup>, Alberto Lavorgna<sup>6\*</sup>, Vincenza Procaccini<sup>7\*</sup>, Letizia Riva<sup>8\*</sup>, Gabriele Vianello<sup>9\*</sup>, Nadia Aspromonte<sup>10\*</sup>, Andrea Mortara<sup>11\*</sup>, Renata De Maria<sup>12\*</sup>, Piera Capasso<sup>13\*</sup>, Serafina Valente<sup>14\*</sup>, Michele Massimo Gulizia<sup>15\*</sup>

## Gestione della PEEP

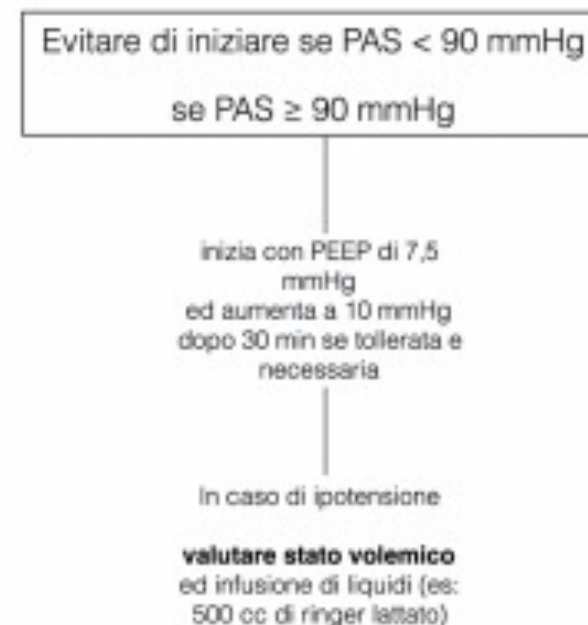
### Paziente con cuore precario dipendente

(cuore sano; ipovolemia; versamento pericardico moderato o severo; embolia polmonare; disfunzione ventricolare dx; cardiomiopatia ipertrofica ostruttiva)



### Paziente con cuore postcarico dipendente

(disfunzione ventricolare sx; stenosi aortica; insufficienza mitralica severa; cardiomiopatia ipertrofica; crisi ipertensiva)



# CONTROINDICAZIONI ALLA NIV

Stato neurologico compromesso



## *Take home messages*

- NIV e CPAP sono entrambe modalità efficaci in caso di EPA, perché determinano una riduzione del distress respiratorio e del tasso di intubazione endotracheale rispetto all'ossigenoterapia convenzionale, tuttavia l'impatto sulla mortalità non è ancora definito.
- NIV è indicata anche nei pazienti con AHF associata a malattia polmonare e può essere considerata anche nei pazienti con CS
- La corretta selezione dei pazienti e delle interfacce, l'applicazione precoce, il raggiungimento di una buona sincronia tra i pazienti e il ventilatore evitando perdite eccessive, un attento monitoraggio, una gestione proattiva e, in alcuni casi una lieve sedazione, possono determinare il successo della tecnica.

*Grazie per l'attenzione*