



XI congresso nazionale

simeu

ROMA 24-26 MAGGIO 2018

PSV o CPAP nell'Edema polmonare acuto?

Dott Antonio Pagano

Linee guida

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

Recommendations	Class ^a	Level ^b	Ref ^c
Monitoring of transcutaneous arterial oxygen saturation (SpO ₂) 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.	Ila	C	
Oxygen therapy is recommended in patients with AHF and SpO ₂ <90% or PaO ₂ <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 ₂ <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.	Ila	B	541-545
Intubation is recommended, if respiratory failure, leading to hypoxaemia (PaO ₂ <60 mmHg (8.0 kPa)), hypercapnia (PaCO ₂ >50 mmHg (6.65 kPa)) and acidosis (pH <7.35), cannot be managed non-invasively.	I	C	

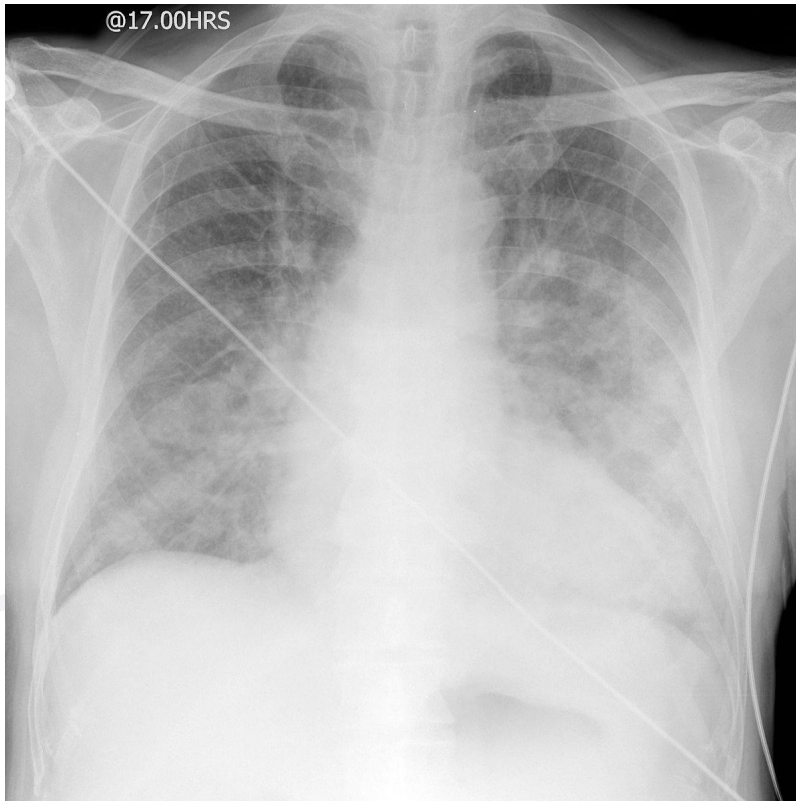
AHF = acute heart failure; BiPAP = bilevel positive airway pressure; COPD = chronic obstructive pulmonary disease; CPAP = continuous positive airway pressure; PaCO₂ = partial pressure of carbon dioxide in arterial blood; PaO₂ = partial pressure of oxygen in arterial blood; SpO₂ = transcutaneous oxygen saturation.

^aClass of recommendation.

^bLevel of evidence.

^cReference(s) supporting recommendations.

Fisiopatologia



- Aumenta la capacità funzionale residua
- Migliora la compliance polmonare
- Riduce il precarico
- Riduce la pressione trasmurale del ventricolo sinistro

TREATMENT OF SEVERE CARDIOGENIC PULMONARY EDEMA WITH CONTINUOUS POSITIVE AIRWAY PRESSURE DELIVERED BY FACE MASK

ANDREW D. BERSTEN, M.B., B.S., ANDREW W. HOLT, M.B., B.S., ALNIS E. VEDIG, M.B., B.S.,
GEORGE A. SKOWRONSKI, M.B., B.S., AND CHRISTOPHER J. BAGGOLEY, M.B., B.S.

Table 4. Patients' Outcomes and Lengths of Stay in the Intensive Care Unit (ICU).*

VARIABLE	OXYGEN (N = 20)	OXYGEN PLUS CPAP (N = 19)	P VALUE†
Intubation and mechanical ventilation — no. (%)	7 (35)	0 (0)	0.005
Stay in ICU (days)			
All patients	2.7 ± 2.0	1.2 ± 0.4	0.006
Excluding 7 ventilated patients	1.7 ± 0.8	—	0.066
Hospital stay (days)			
All patients	7.9 ± 4.1	8.7 ± 8.3	0.68
Survivors only	8.9 ± 3.6	9.5 ± 8.5	0.79
In-hospital deaths — no. (%)	4 (20)	2 (10)	0.36
Predicted in-hospital mortality (%)‡	29 ± 10	28 ± 11	—

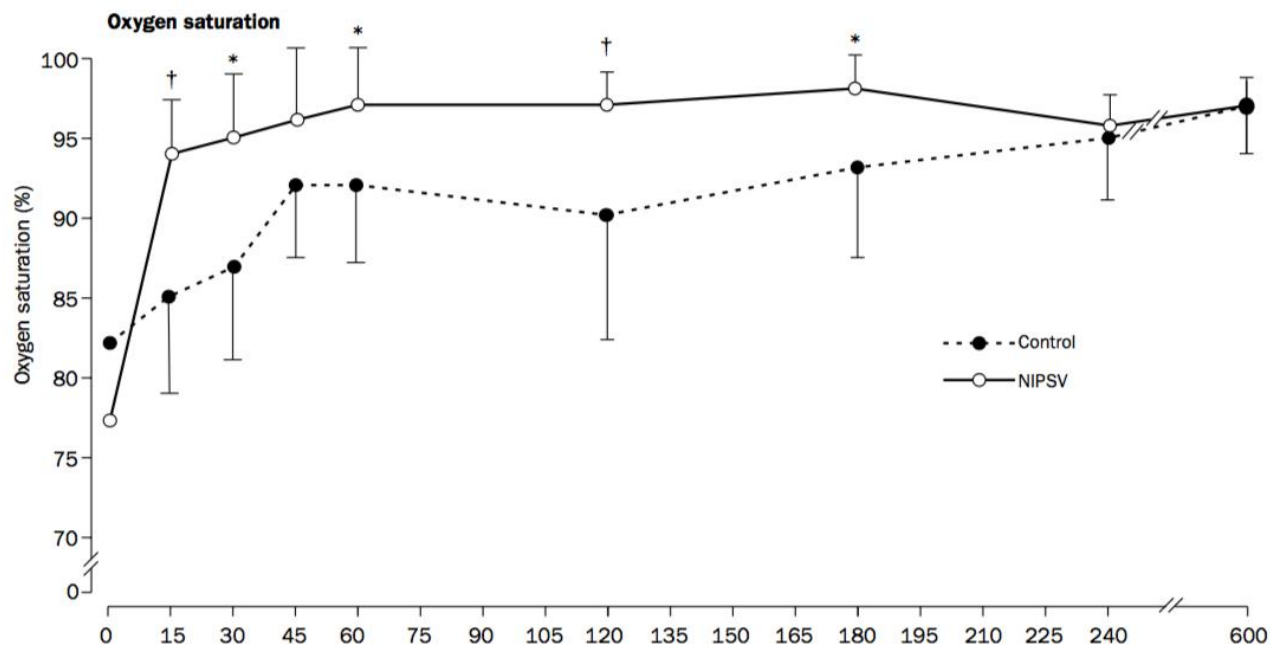
Se aggiungiamo una pressione di supporto?



- Ridurre il WOB
- Migliorare la ventilazione alveolare

Non-invasive pressure support ventilation versus conventional oxygen therapy in acute cardiogenic pulmonary oedema: a randomised trial

- Riduzione della mortalità
- Riduzione della necessità di IOT



Randomized, prospective trial of bilevel versus continuous positive airway pressure in acute pulmonary edema

- 27 pz arruolati
- gruppo CPAP vs gruppo Bilevel
- il gruppo Bilevel migliorava più rapidamente FR, FC, BP, PCO₂
- Maggiore incidenza di IMA nel gruppo Bilevel

Mehta, *Crit Care Med*, 25(4), 620–8. 1997

Bilevel ed IMA?

- Aumento dello stress di parete
- Riduzione della perfusione coronarica
- Aumento del post-carico

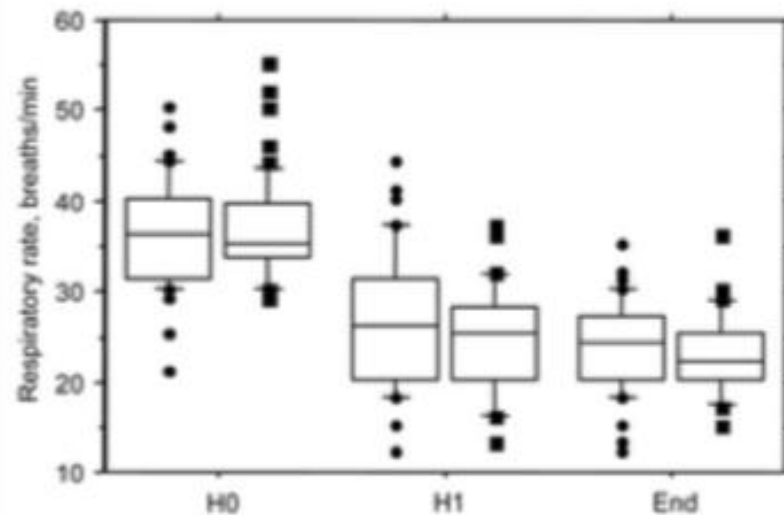
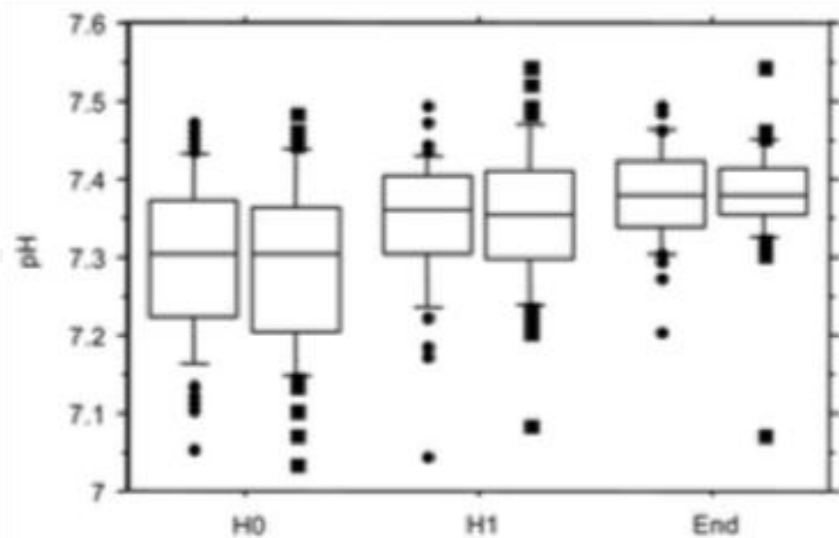
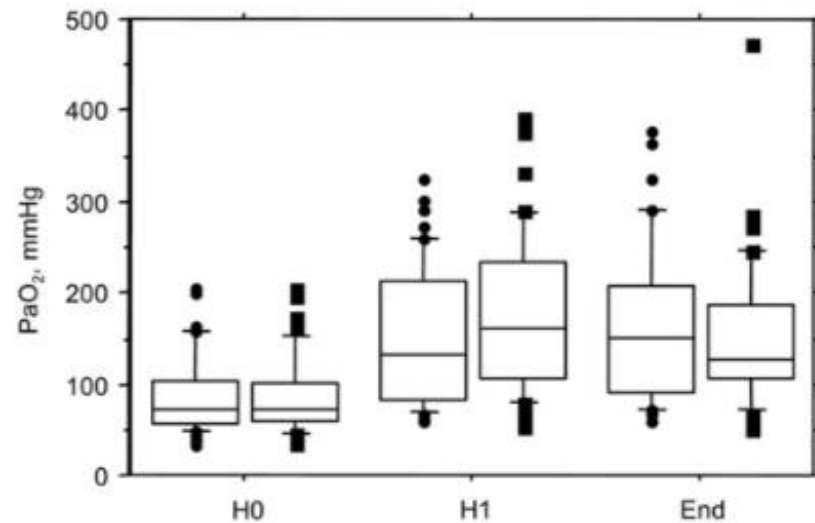
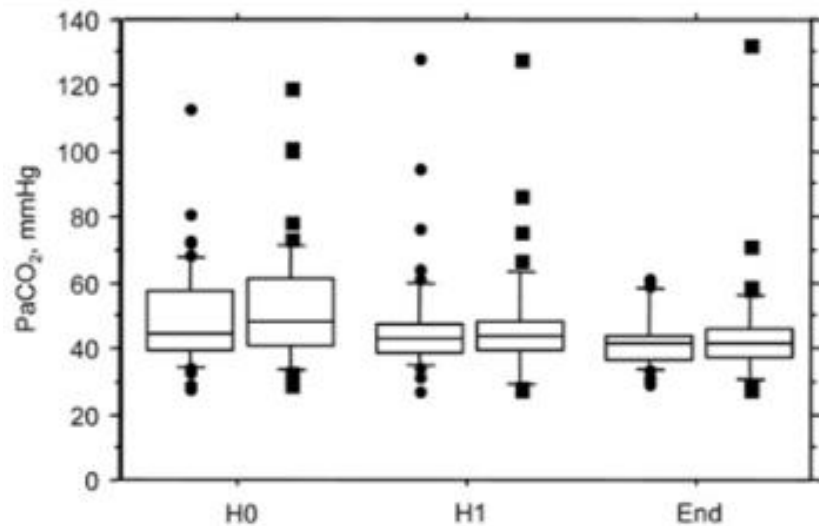
Continuous Positive Airway Pressure Versus Bilevel Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema: A Randomized Multicenter Trial

- 109 pazienti arruolati
- nessuna differenza in mortalità
- nessuna differenza in necessità di intubazione
- nessuna differenza in durata dell'ospedalizzazione

Moritz, Ann of Emerg Med vol 50 n 6, 2007

Continuous Positive Airway Pressure Versus Bilevel Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema: A Randomized Multicenter Trial

General outcomes	Bilevel PAP (n=50)	B-CPAP (n=59)	Treatment Difference*
Time on device, h			
Median (IQR)	2.0 (1.2–3.0)	2 (1.2–3.0)	0.0
Mean (95% CI)	2.8 (2.1–3.6)	2.3 (1.9–2.8)	–0.5 (–1.3 to 0.3)
Troponin Ic, 24 h after arrival			
All patients, $\mu\text{g/L}$, median (IQR)	0.6 (0.2–2.1)	0.3 (0.0–4.8)	–0.3
Mean (95% CI)	19.9 (0.0–52.8)	7.3 (1.4–13.2)	–12.7 (42.3–16.9)
Patients without MI, $\mu\text{g/L}$, median (IQR)	0.4 (0.1–1.0)	0.15 (0.0–0.6)	–0.3 (–0.5–1.2)
Mean (95% CI)	0.8 (0.4–1.2)	1.1 (0.4–1.8)	
Intubation, No. (%)	2 (4)	1 (2)	0.4 (0.0–8.4)
Acute myocardial infarction, No. (%)	3 (6)	2 (3)	0.5 (0.0–3.4)
Death in the first day, No. (%)	1 (2)	0	0 (0–33)
Combined criteria, No. (%)	6 (12)	3 (5)	0.4 (0.0–1.9)
Complications, No. (%)	3 (6)	5 (9)	1.5 (0.3–9.9)
Hospital stay (days) among nondeceased patients			
Median (IQR)	10.0 (7.0–16.0)	8.5 (6.0–14.0)	
Mean (95% CI)	13.6 (10.5–16.7)	11.1 (8.8–13.4)	–2.5 (–6.3 to 1.2)
Hospital mortality, No. (%)	4 (8)	8 (14)	1.8 (0.4–8.8)



RANDOMIZED TRIAL OF BILEVEL VERSUS CONTINUOUS POSITIVE AIRWAY PRESSURE FOR ACUTE PULMONARY EDEMA

Timothy Liesching, MD,* David L. Nelson, RRT,† Karen L. Cormier, RRT,† Andrew Sucov, MD,‡
Kathy Short, RN, RRT,§ Rod Warburton, BA,|| and Nicholas S. Hill, MD||

- 36 pz arruolati
- 29 pz trattati con CPAP e 17 con BiPAP
- Nessuna differenza in IOT, mortalità, incidenza di IMA

Ospedalizzazione

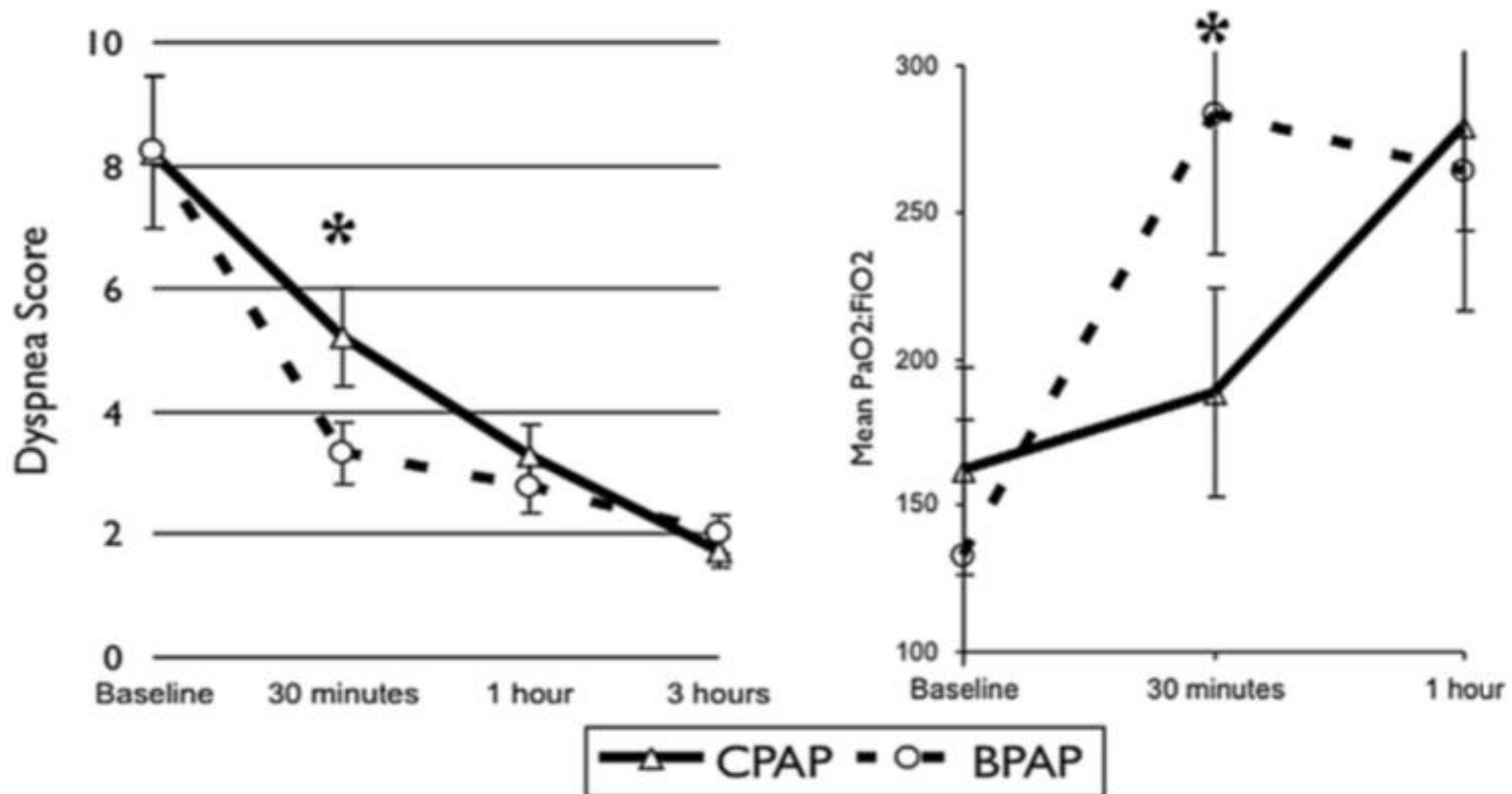
Table 5. ICU Admission Rate, Length of Stay, and Mortality for Patients with Acute Pulmonary Edema Treated with CPAP vs. BPAP

	CPAP	BPAP	<i>p</i> Value or z Value
ICU admission	91.67%	38.46%	0.008*
ICU length of stay	4.63	3.43	0.143
Hospital length of stay	6.64	6.50	0.623
Hospital mortality	14.28%	7.69%	0.084

ICU = intensive care unit; CPAP = continuous positive airway pressure; BPAP = bilevel positive airway pressure ventilation.

* $p < 0.05$.

Meglio prima che dopo...



Andrea Bellone
Marco Vettorello
Alessandra Monari
Francesca Cortellaro
Daniele Coen

Noninvasive pressure support ventilation vs. continuous positive airway pressure in acute hypercapnic pulmonary edema

- 36 pazienti in EPA
- $p\text{CO}_2 > 45$ mmHg
- gruppo CPAP vs gruppo NIPSV

Intensive Care Med (2005) 31:807–811
DOI 10.1007/s00134-005-2649-6

Table 3 Patient outcomes

	CPAP (<i>n</i> =18)	NIPSV (<i>n</i> =18)	<i>p</i>
Endotracheal intubation	1 (5.5%)	2 (11.1%)	0.5
In-hospital death	1 (5.5%)	0 (0%)	0.5
Resolution time	29±18	30±16	0.87

	Baseline	After 1 h	<i>p</i>	Baseline	After 1 h	<i>p</i>
PaO ₂ /FIO ₂ ratio	183±64	—	—	159±53	—	—
Bicarbonate (mEq)	24±4	—	—	25±6	—	—
Heart rate (beats/min)	110±20	—	—	113±23	—	—
Systolic BP (mmHg)	186±42	—	—	182±34	—	—
Diastolic BP (mmHg)	100±19	—	—	98±21	—	—
Respiratory rate (bpm)	37.9±4.5	21.3±5.1	<0.001	39.8±4.4	21.2±4.6	<0.001
Arterial pH	7.22±0.11	7.37±0.04	<0.001	7.19±0.11	7.38±0.04	<0.001
PaCO ₂ (mmHg)	60.5±13.6	42.8±4.9	<0.001	65.7±13.6	44.0±5.5	<0.001
SpO ₂ (%)	86.9±3.7	95.1±2.6	<0.01	83.7±6.6	96.0±2.9	<0.01

Osservazioni



- PEEP in CPAP 7,5/10 mm H₂O
- PEEP in BiPAP 5 mm H₂O

La nostra esperienza

- studio osservazionale
- 153 pazienti affetti da edema polmonare (clinica+eco torace)
- 88 trattati con CPAP - 65 con PSV
- EGA t0-t30

In press Resp. Phys. & Neurob

Table 2. **Patients outcomes**

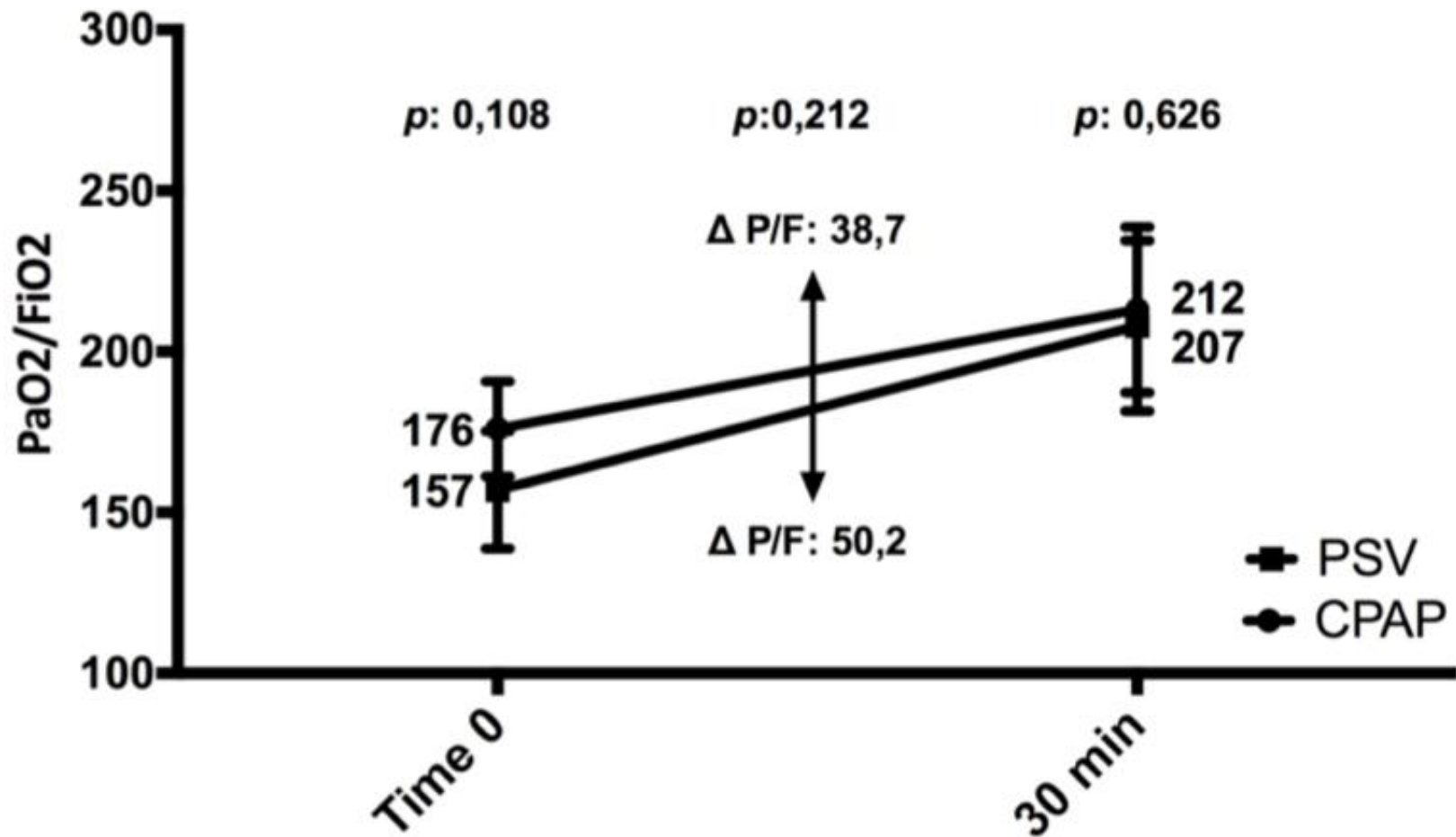
	CPAP (<i>n</i> = 88)	PSV (<i>n</i> =65)	<i>p</i> -value
Endotracheal intubation	5 (5,6%)	0 (0%)	0.054
In-hospital death	1 (1,1%)	1 (1,5%)	0.814
Change in ventilation mode	5 (5,6%)	1 (1,5%)	0.202
Failure of ventilation mode*	10 (11.2%)	1 (1,5%)	0.022

*evaluated as a clinical deterioration entailed any change in ventilation mode (including endotracheal intubation)

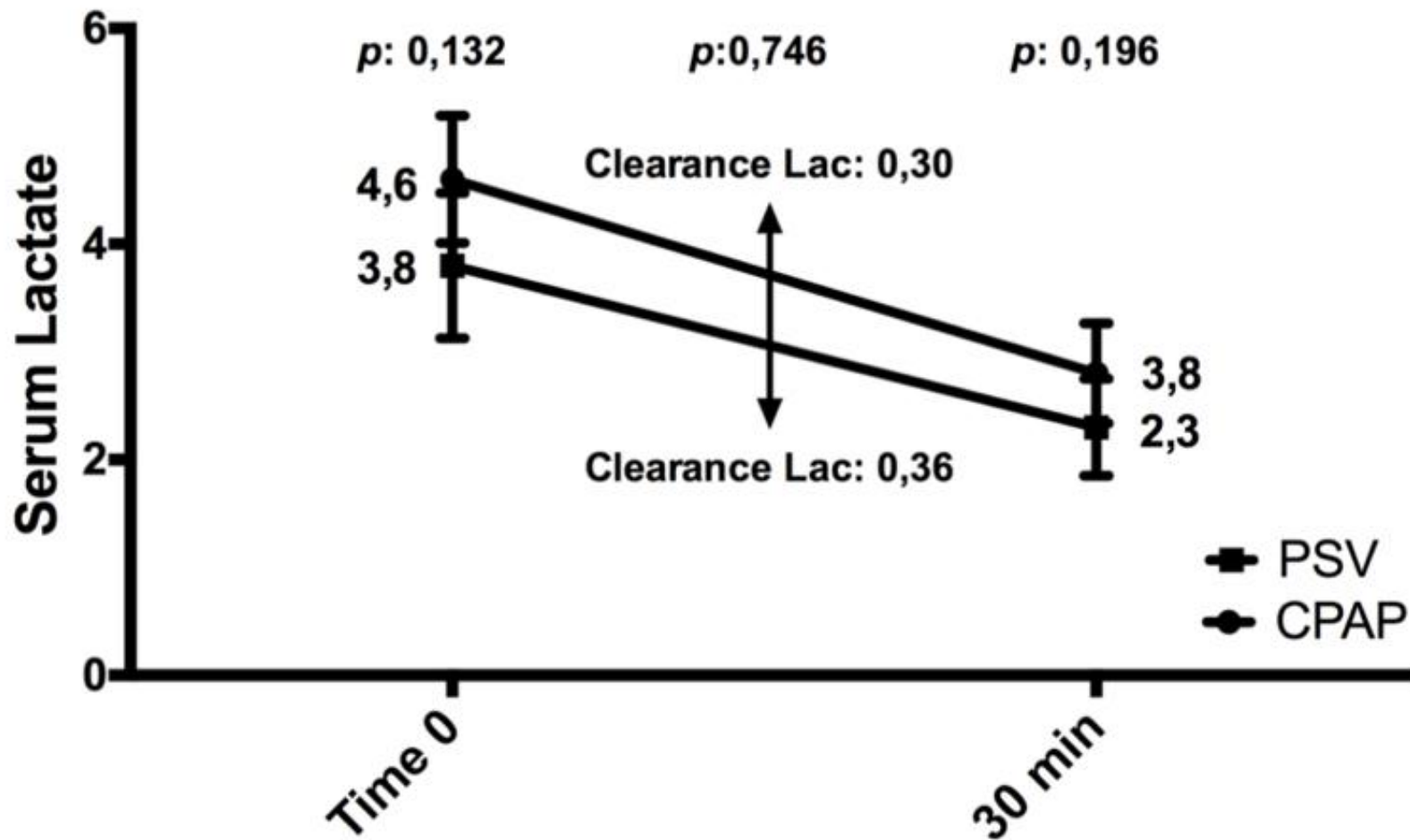
Cause fallimento

- Intolleranza all'interfaccia (1 CPAP/1 PSV)
- Comparsa di ipercapnia (5 CPAP)
- Peggioramento dell'ipossia (4 CPAP)

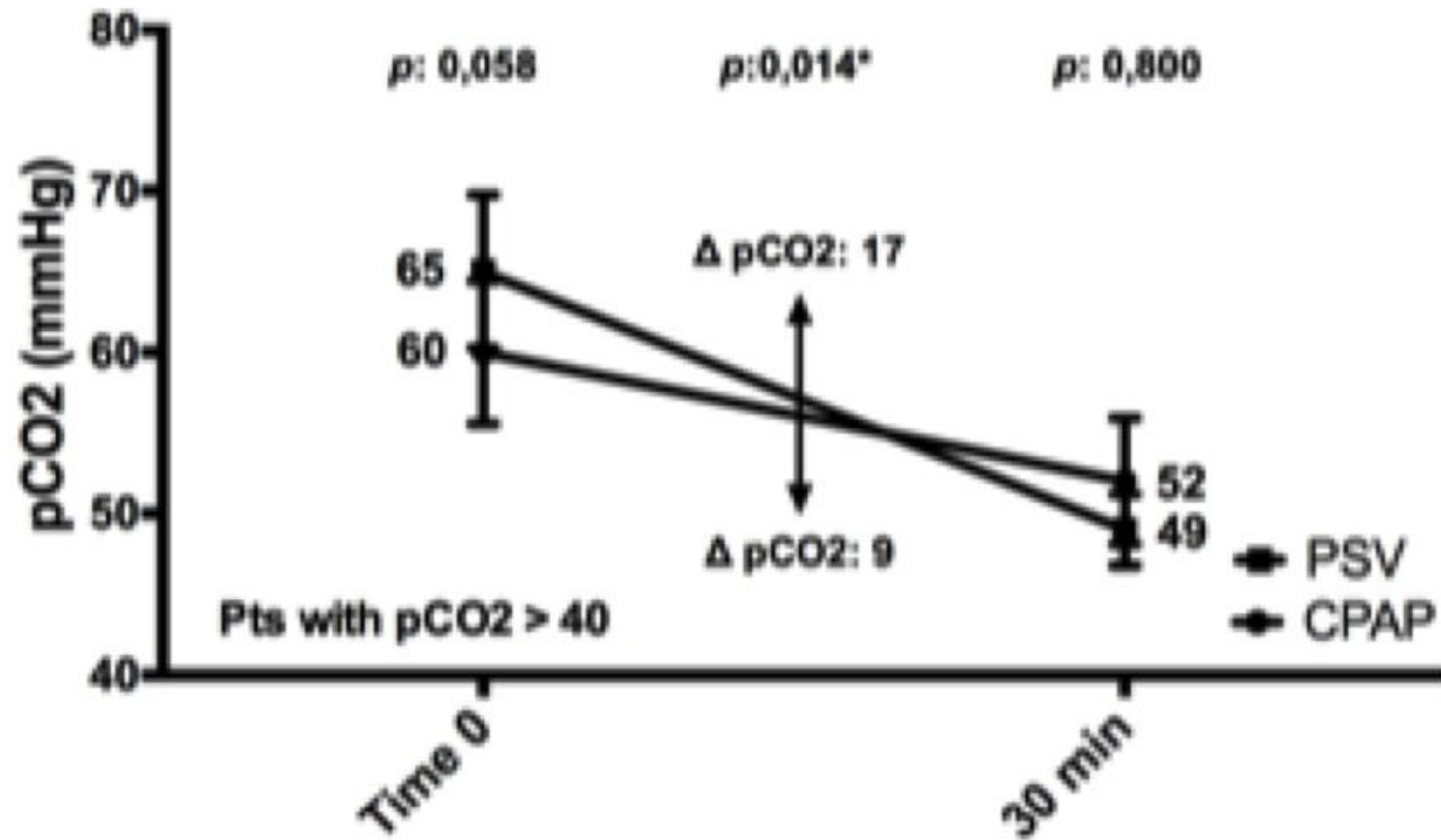
incremento pO₂/FiO₂



Clearance del lattato



Riduzione pCO₂



Take home message

- Ventiliamo tutti i pazienti con EPA
- Ventiliamo con quello che abbiamo
- Nel paziente ipercapnico la PSV può essere la metodica di scelta
- Necessità di uno studio randomizzato PSV/CPAP con parametri ventilatori standardizzati

Grazie

Antonio Pagano
per GCT group
antoniopag82@gmail.com