13TH NATIONAL EMERGENCY MEDICINE CONGRESS

ATUDER Acil Tıp Uzmanları Derneği

EPAT Emergency Physicians Association of Turkey

4TH INTERCONTINENTAL EMERGENCY MEDICINE CONGRESS

INTERNATIONAL CRITICAL CARE AND EMERGENCY MEDICINE CONGRESS

MARDAN PALACE HOTEL - ANTALYA

18-21 MAY 2017

Non Invasive ventilation: only in ICU?

Eric REVUE, MD

Chief of the Emergency Department and prehospital EMS

(SAMU-SMUR- Chartres (France)

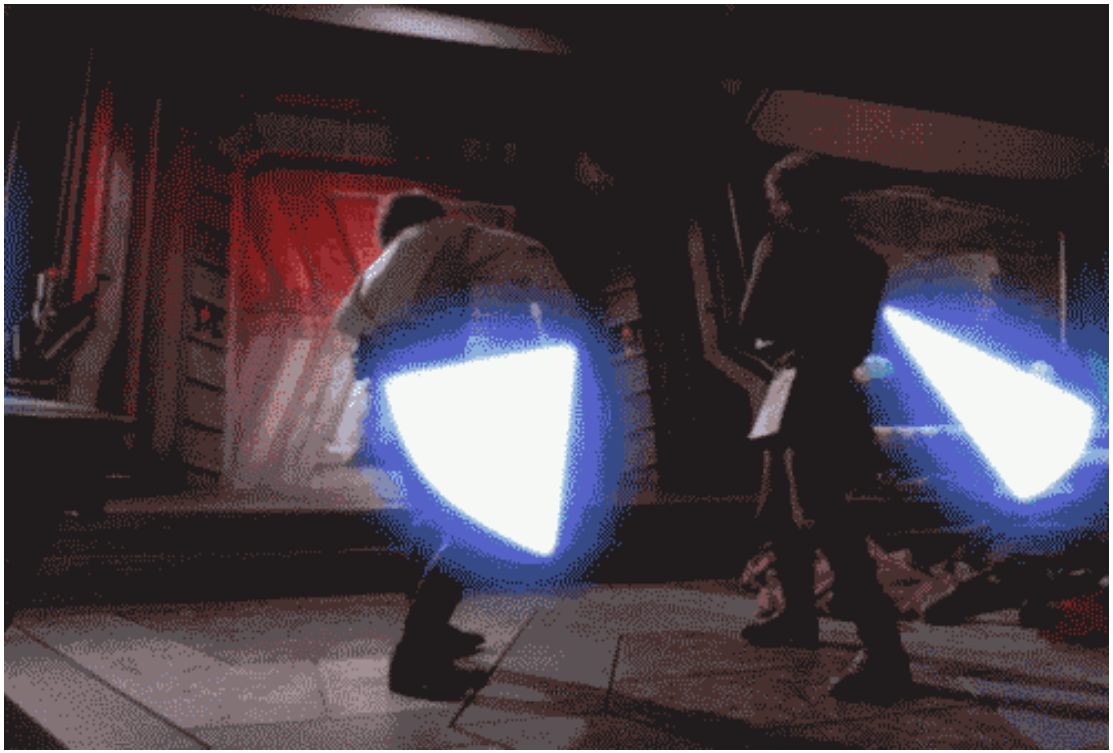
French Society of Emergency Medicine (SFMU)

European Society of Emergency Medicine (EuSEM)

Les Hôpitaux de Chartres

EUSEM EUROPEAN SOCIETY FOR EMERGENCY MEDICINE

No Conflict of Interest



Thanks to Dr Khoury

70 yo complaining of progressive dyspnea came to the ED by ambulance in sitting position

Past Medical History : Hypertension, COPD (heavy smoker)

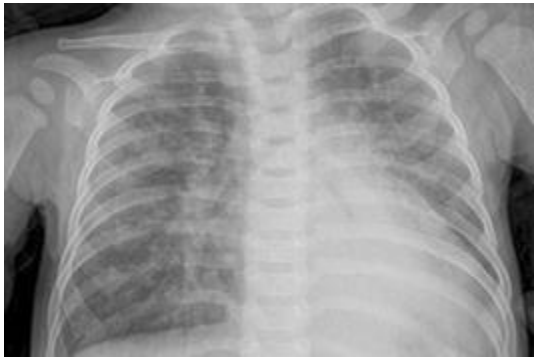
<u>Physical exam</u>

- **Sleepy, GCS = 10/15 Not answering simple orders**
- **cyanosis / extremities before O2**
- **HR = 130/min, ABP = 180/120, SpO2 88 % RR = 29/min**

- **O2 6L (Rebreathing Mask)**

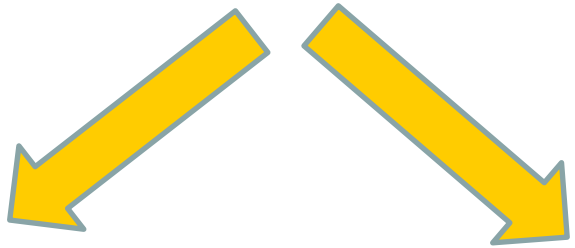
What you would do?

- Monitor,Veinous access
- ABG's :
  - pH = 7.09
  - pCO2 = 12.6 kPA
  - pO2 = 22.8 kPA
  - Bicarbonates = 29.3 mmol/L
  - BE = - 0.3 mmol/L
- ECG
- Chest X-ray



Therapeutical option 1 :

INTUBATION



YES

- ✓ Respiratory Acidosis (pH <7,10 & RR 35/min)
- ✓ Impaired Consciousness
- ✓ Hypoxemia

NO

- ✓ Glasgow > 8
- ✓ Hemodynamically stable
- ✓ Other non invasive treatment

Therapeutical option 2 :

Non Invasive Ventilation (NIV)

YES

- ✓ Respiratory Acidosis (pH <7,10 & RR 35/min)
- ✓ Impaired Consciousness
- ✓ Hypoxemia

Modes

- ✓ CPAP
- ✓ BiPAP
- ✓ PPSV
- ✓ VAC

Indications for NIV : Respiratory distress or failure

Noninvasive positive pressure ventilation in acute respiratory failure: report of an International Consensus Conference in intensive care medicine, Paris, France, 13–14 April 2000*

Critical Care Assembly of the American Thoracic Society (ATS)
European Respiratory Society (ERS)
European Society of Intensive Care Medicine (ESICM)
Société de Réanimation de Langue Française (SRLF)
Société Française de Médecine d'Urgence
Royal College of Physicians
British Thoracic Society
The Intensive care Society

COPD
Cardiogenic Pulmonary Oedema

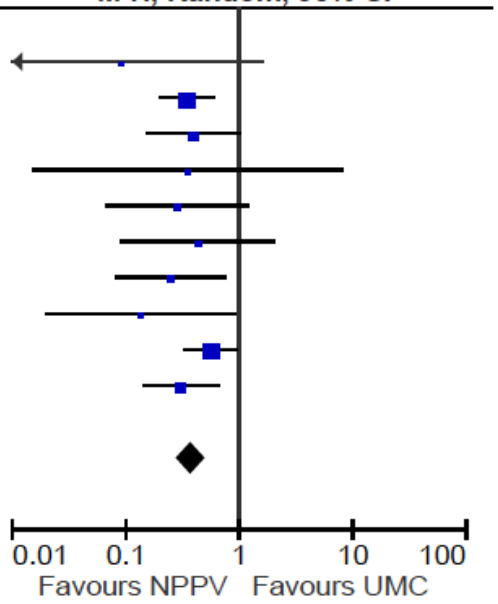
Others ?

Noninvasive Positive Pressure Ventilation for Acute Respiratory Failure Patients With Chronic Obstructive Pulmonary Disease (COPD): An Evidence-Based Analysis

Ontario
Health Quality Ontario
Qualité des services de santé Ontario

Study or Subgroup	NPPV Events	NPPV Total	UMC Events	UMC Total	Weight	Risk Ratio M-H, Random, 95% CI
Barbe 1996	0	10	0	14		Not estimable
Bott 1993	0	30	5	30	1.0%	0.09 [0.01, 1.57]
Brochard 1995	11	43	31	42	27.9%	0.35 [0.20, 0.60]
Carrera 2009	5	37	13	38	9.5%	0.40 [0.16, 1.00]
Dhamija 2005	0	14	1	15	0.8%	0.36 [0.02, 8.07]
Dikensoy 2002	2	17	7	17	4.0%	0.29 [0.07, 1.18]
Keenan 2005	2	25	5	27	3.4%	0.43 [0.09, 2.03]
Khilnani 2010	3	20	12	20	6.7%	0.25 [0.08, 0.75]
Kramer 1995	1	11	8	12	2.2%	0.14 [0.02, 0.92]
Plant 2000	18	118	32	118	30.4%	0.56 [0.34, 0.94]
Wang 2005	8	171	26	171	14.0%	0.31 [0.14, 0.66]
Total (95% CI)		**496**		**504**	**100.0%**	**0.38 [0.28, 0.50]**
Total events	50		140			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 5.49$, $df = 9$ ($P = 0.79$); $I^2 = 0\%$
Test for overall effect: $Z = 6.68$ ($P < 0.00001$)



Pooled Results for the **Need for Endotracheal Intubation** (NPPV (noninvasive positive-pressure ventilation) Plus UMC Versus UMC (Usual Medical Care) Alone)*

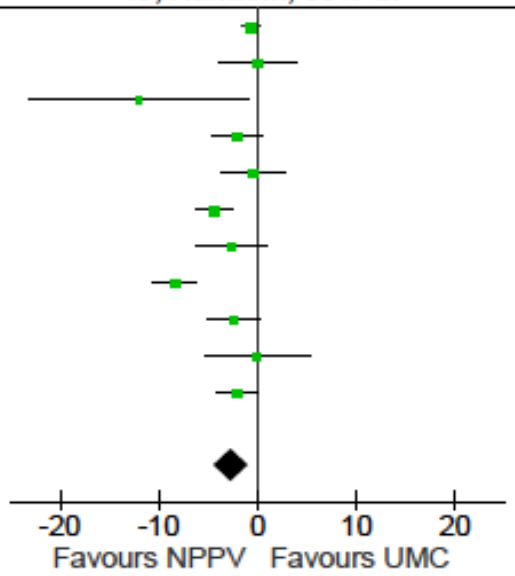
Ontario Health Technology Assessment Series; Vol. 12: No. 8, pp. 1–102, March 2012

Noninvasive Positive Pressure Ventilation for Acute Respiratory Failure Patients With Chronic Obstructive Pulmonary Disease (COPD): An Evidence-Based Analysis

Ontario
Health Quality Ontario
Qualité des services de santé Ontario

Study or Subgroup	NPPV Mean	NPPV SD	NPPV Total	UMC Mean	UMC SD	UMC Total	Weight	Mean Difference IV, Random, 95% CI
Barbe 1996	10.6	0.9	14	11.3	1.3	10	12.7%	-0.70 [-1.63, 0.23]
Bott 1993	9	5.25	30	9	9.5	30	7.9%	0.00 [-3.88, 3.88]
Brochard 1995	23	17	43	35	33	42	2.0%	-12.00 [-23.20, -0.80]
Carrera 2009	10	5	37	12	6	38	10.4%	-2.00 [-4.50, 0.50]
Dhamija 2005	9.77	3.32	14	10.2	5.64	15	8.9%	-0.43 [-3.77, 2.91]
Dikensoy 2002	8	2.1	17	12.3	3.3	17	11.5%	-4.30 [-6.16, -2.44]
Keenan 2005	6.5	5.6	25	9.1	7.3	27	8.6%	-2.60 [-6.12, 0.92]
Khilnani 2010	9.4	4.3	20	17.8	2.6	20	10.9%	-8.40 [-10.60, -6.20]
Kramer 1995	14.9	3.3	11	17.3	3	12	10.2%	-2.40 [-4.99, 0.19]
Plant 2000	10	22.167	118	10	19.5	118	5.9%	0.00 [-5.33, 5.33]
Wang 2005	16	9	171	18	11	171	11.0%	-2.00 [-4.13, 0.13]
Total (95% CI)			500			500	100.0%	-2.68 [-4.41, -0.94]

Heterogeneity: $Tau^2 = 5.91$; $Chi^2 = 51.27$, df = 10 ($P < 0.00001$); $I^2 = 80\%$
Test for overall effect: $Z = 3.03$ ($P = 0.002$)



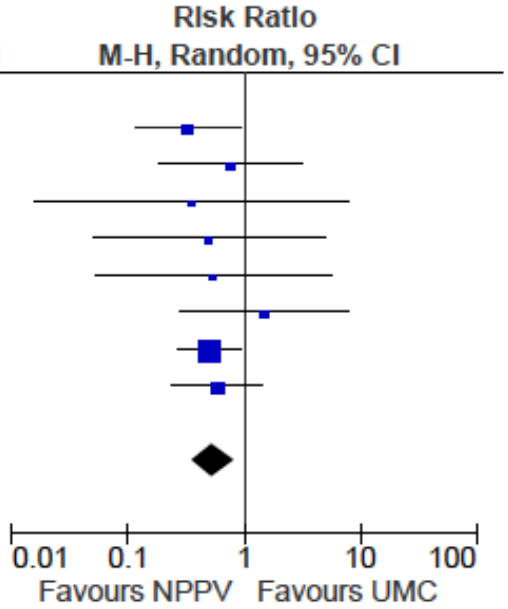
Pooled Results for **Mean Hospital Length of Stay** (NPPV Plus UMC Versus UMC Alone Comparison)3 *

Noninvasive Positive Pressure Ventilation for Acute Respiratory Failure Patients With Chronic Obstructive Pulmonary Disease (COPD): An Evidence-Based Analysis

Ontario
Health Quality Ontario
Qualité des services de santé Ontario

Study or Subgroup	NPPV Events	NPPV Total	UMC Events	UMC Total	Weight	Risk Ratio M-H, Random, 95% CI
Barbe 1996	0	14	0	10		Not estimable
Brochard 1995†	4	43	12	42	15.5%	0.33 [0.11, 0.93]
Carrera 2009	3	37	4	38	8.4%	0.77 [0.18, 3.21]
Dhamija 2005	0	14	1	15	1.8%	0.36 [0.02, 8.07]
Dikensoy 2002	1	17	2	17	3.2%	0.50 [0.05, 5.01]
Keenan 2005	1	25	2	27	3.1%	0.54 [0.05, 5.59]
Khilnani 2010	3	20	2	20	6.1%	1.50 [0.28, 8.04]
Plant 2000	12	118	24	118	41.2%	0.50 [0.26, 0.95]
Wang 2005	7	171	12	171	20.7%	0.58 [0.24, 1.45]
Total (95% CI)		459		458	100.0%	0.53 [0.35, 0.81]
Total events	31		59			

Heterogeneity: Tau² = 0.00; Chi² = 2.71, df = 7 (P = 0.91); I² = 0%
Test for overall effect: Z = 2.98 (P = 0.003)

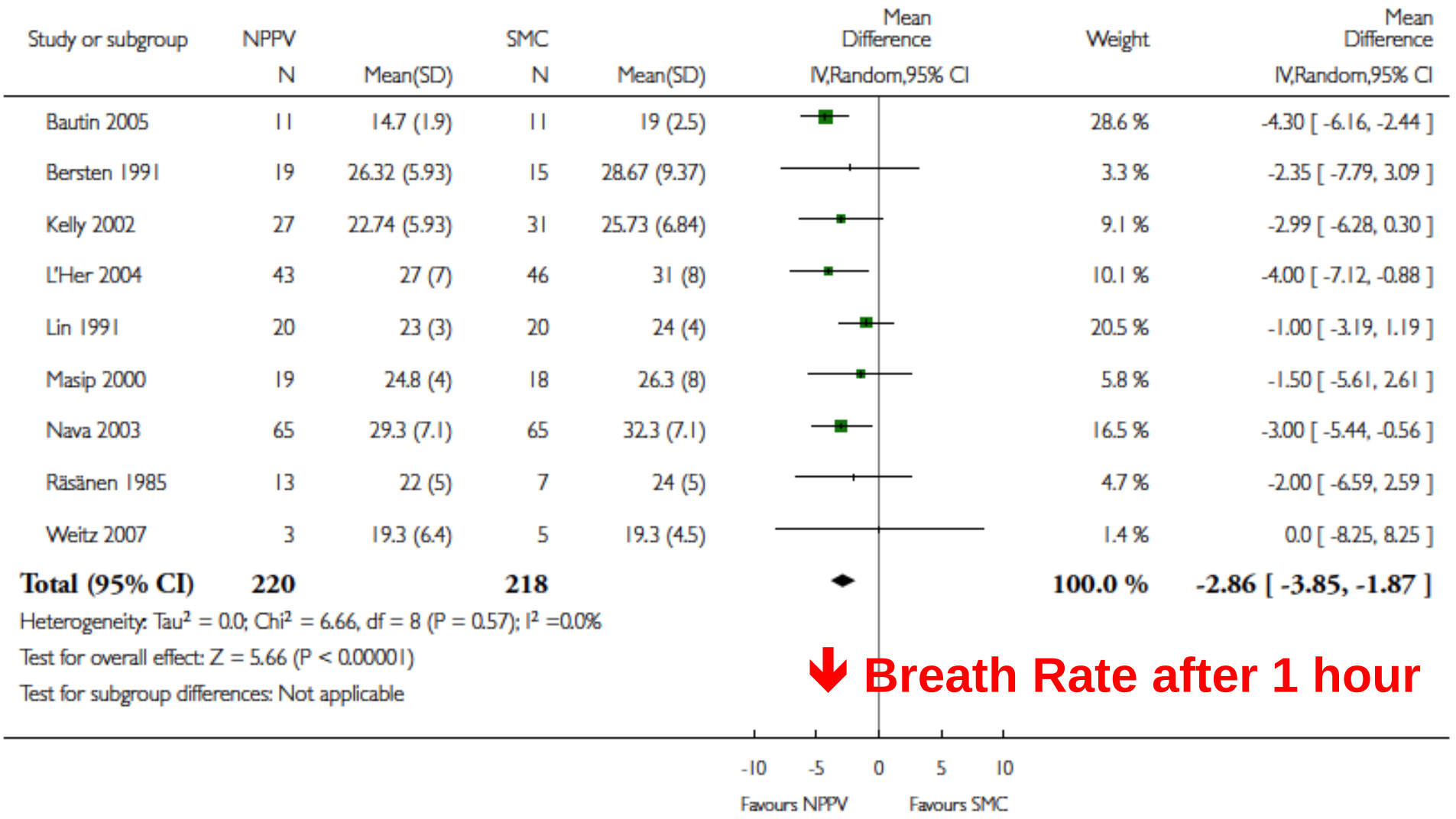


Pooled Results for **Inhospital Mortality** (NPPV Plus UMC Versus UMC Alone Comparison)*

Cochrane Library

Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary oedema (Review)

Vital FMR, Ladeira MT, Atallah ÁN, 2013 issue 5

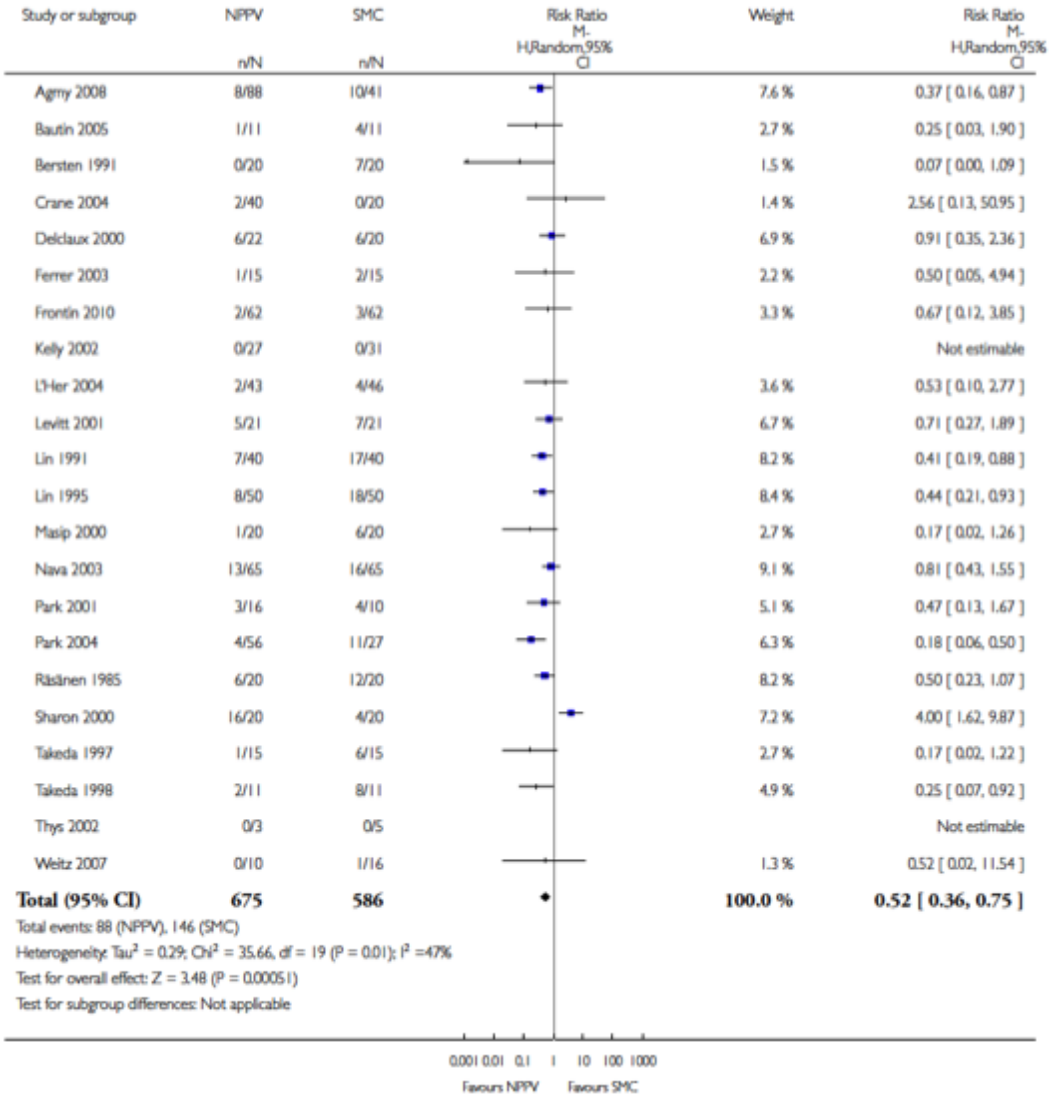


↓ Breath Rate after 1 hour

Cochrane Library

Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary oedema (Review)

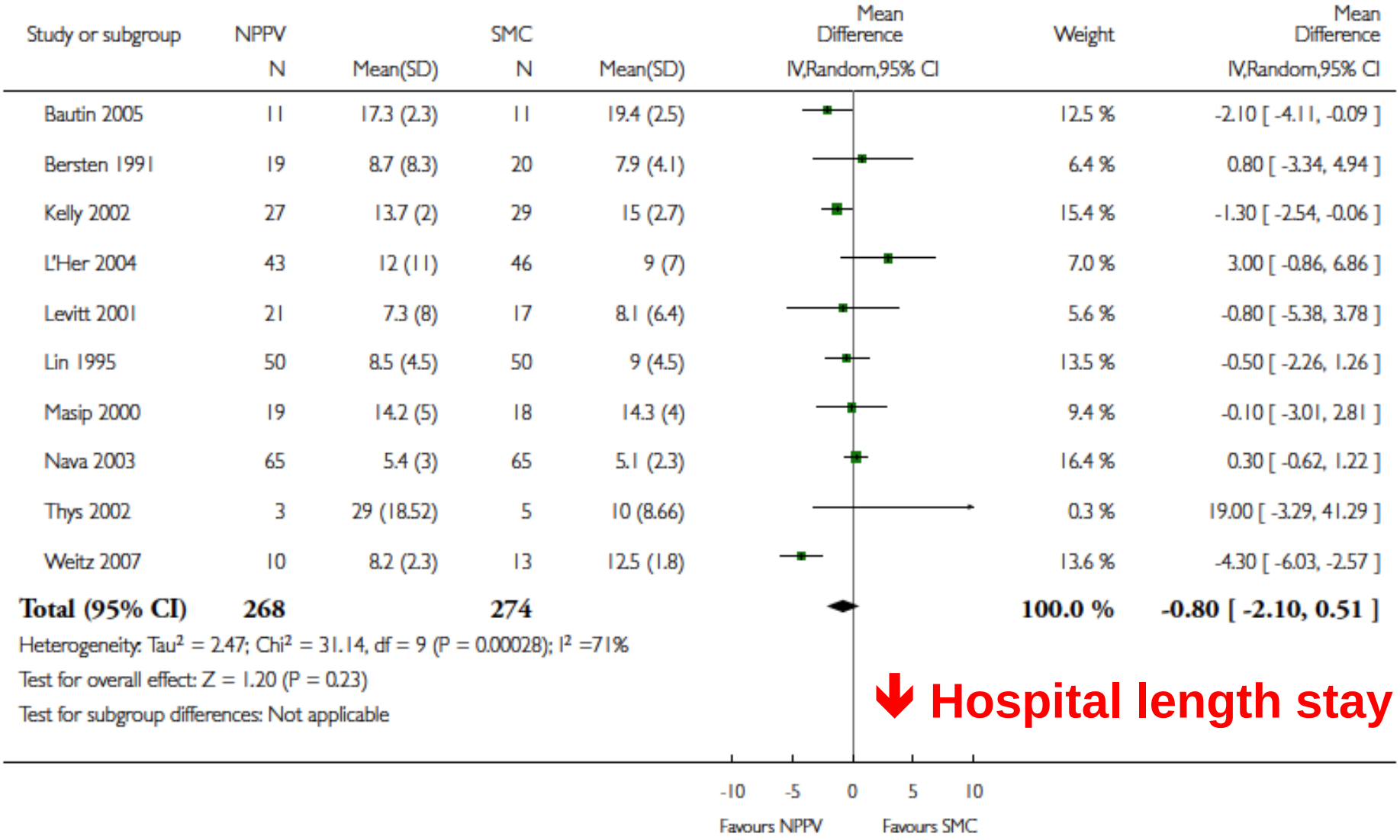
Vital FMR, Ladeira MT, Atallah ÁN, 2013 issue 5



↓ **Decreasing ETT**

Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary oedema (Review)

Vital FMR, Ladeira MT, Atallah ÁN, 2013 issue 5

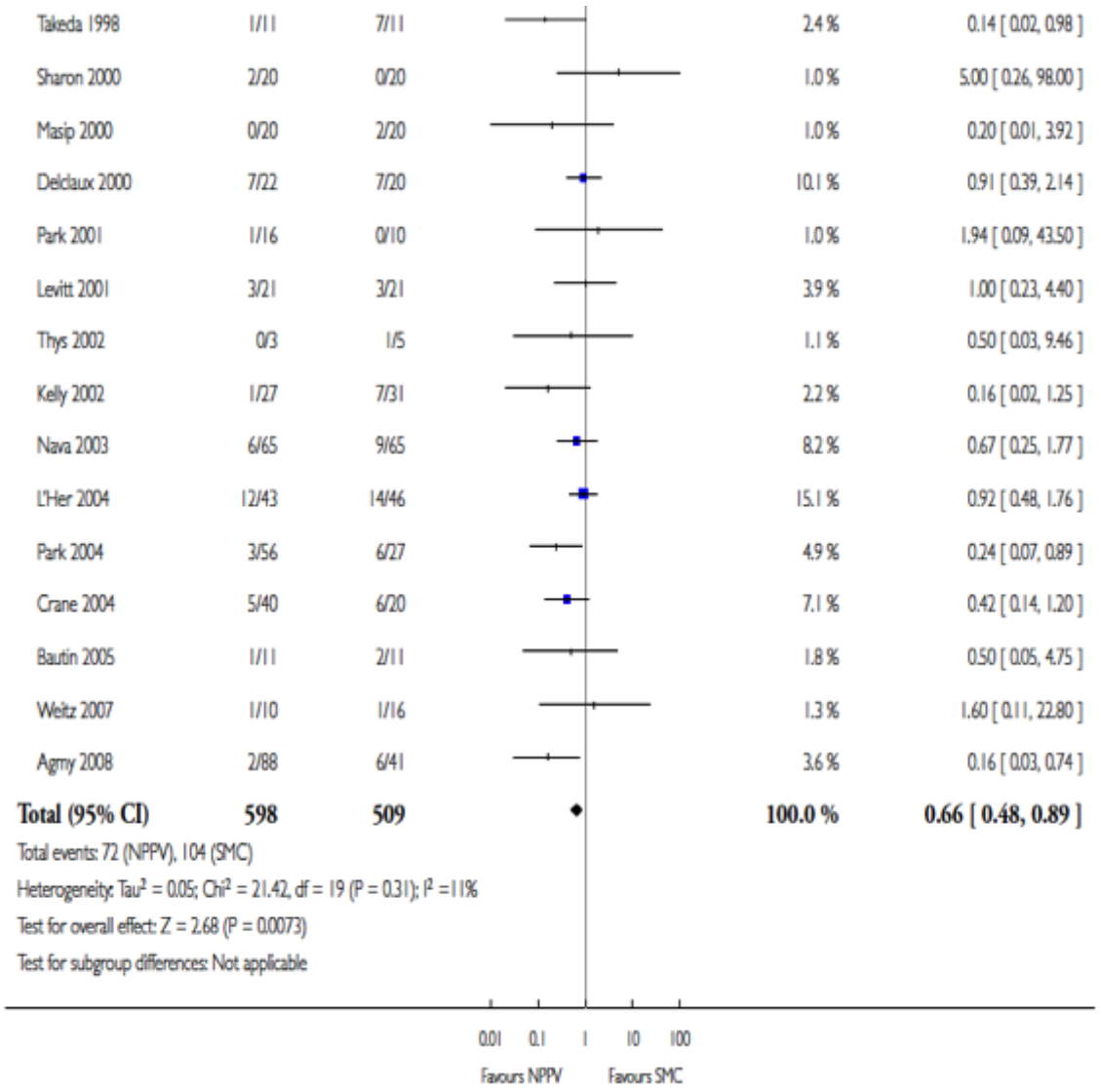


↓ Hospital length stay

Cochrane Library

Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary oedema (Review)

Vital FMR, Ladeira MT, Atallah ÁN, 2013 issue 5



↓ Mortality

Non-invasive positive pressure ventilation (CPAP or bilevel NPPV) for cardiogenic pulmonary oedema (Review)

Vital FMR, Ladeira MT, Atallah ÁN, 2013 issue 5

Study or subgroup	NPPV n/N	SMC n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Agmy 2008	2/88	6/41		7.2 %	0.16 [0.03, 0.74]
Crane 2004	5/40	6/20		13.8 %	0.42 [0.14, 1.20]
Kelly 2002	1/27	7/31		4.4 %	0.16 [0.02, 1.25]
L'Her 2004	12/43	14/46		27.4 %	0.92 [0.48, 1.76]
Levitt 2001	3/21	3/21		7.8 %	1.00 [0.23, 4.40]
Lin 1995	4/50	6/50		11.2 %	0.67 [0.20, 2.22]
Nava 2003	6/65	9/65		15.7 %	0.67 [0.25, 1.77]
Park 2004	3/56	6/27		9.7 %	0.24 [0.07, 0.89]
Weitz 2007	1/10	1/16		2.7 %	1.60 [0.11, 22.80]
Total (95% CI)	**400**	**317**		**100.0 %**	**0.55 [0.36, 0.86]**

Total events: 37 (NPPV), 58 (SMC)

Heterogeneity: $Tau^2 = 0.08$; $Chi^2 = 9.61$, df = 8 (P = 0.29); $I^2 = 17\%$

Test for overall effect: Z = 2.64 (P = 0.0084)

Test for subgroup differences: Not applicable

0.001 0.01 0.1 1 10 100 1000

Favours NPPV Favours SMC

↓ **Mortality/ ED**

The patient: Which Indications?

- Exacerbated COPD (Brochard NEJM 90, 95)
- Cardiogenic Pulmonary Oedema (Masip, Lancet 2001; Nava AJRCCM 2004)
- Severe Hypoxemia:
  - Hematology (Hilbert, NEJM 2001)
  - Early Extubation (Girault, AJRCCM 98)
  - Prophylaxy of post extubation Respiratory Distress (Nava CCM 2005; Ferrer AJRCCM 2006)

- Pneumonia (AM Brambilla, Intensive Care Med 2014; Nicolini A, Community Acquir Infect 2015;2:46-50

- Asthma (Lim, Cochrane dec 2012; Diehl, Minerva Anestesiol. 2013)

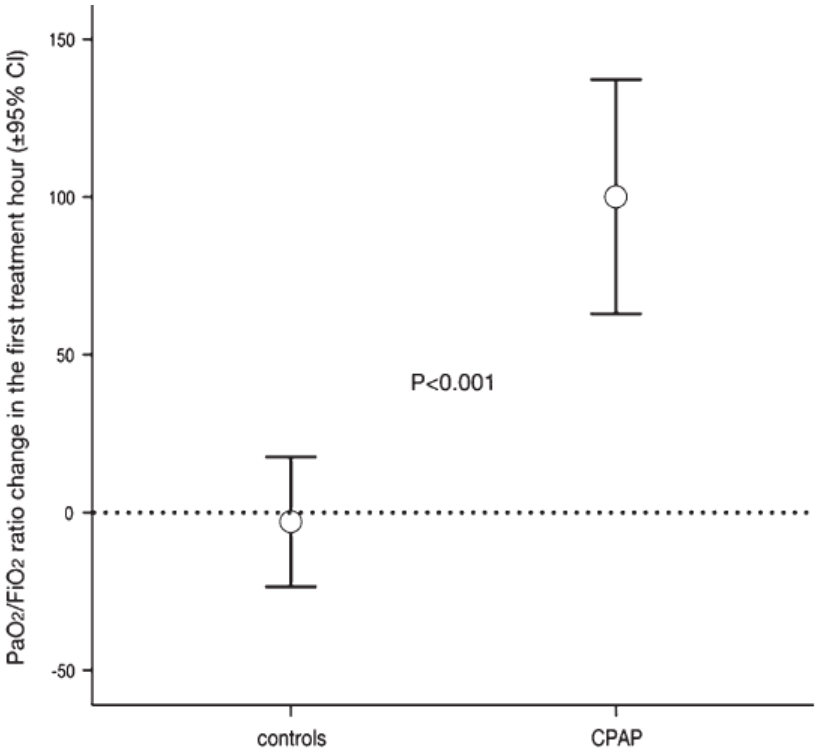
- **Post-operative (preventive, curative)**

Helmet Continuous Positive Airway Pressure vs Oxygen Therapy To Improve Oxygenation in Community-Acquired Pneumonia

CHEST 2010; 138(1):114–120

A Randomized, Controlled Trial

Roberto Cosentini, MD; Anna Maria Brambilla, MD; Stefano Aliberti, MD; Angelo Bignamini, PhD; Stefano Nava, MD; Antonino Maffei, MD; Renato Martinotti, MD; Paolo Tarsia, MD; Valter Monzani, MD; and Paolo Pelosi, MD



Improved outcomes

- While the use of NIV in asthma, PNA and ARDS has not been shown to improve outcomes it maybe reasonable to use
- in the EMS setting, NIV may allow providers to bridge the patient to the hospital where intubation may be safer.

Minerva Anestesiol. 2013 Aug;79(8):926-33. Epub 2013 Mar 19. **Non-invasive ventilation in severe asthma attacks.** Diehl JL[1], Guérot E.

When to use Non-Invasive Mechanical Ventilation : Indications

- COPD exacerbation: **Excellent**
- Cardiogenic pulmonary edema: **Excellent**

- Post-extubation failure: **OK**
- Transplant: **OK**
- Post-op respiratory failure: **OK**
- Neuromuscular disease: **OK**
- Obesity hypoventilation: **OK**

- Asthma: **No Proven Benefit**
- ARDS: **No Proven Benefit**
- Pneumonia: **No Proven Benefit**

Noninvasive positive pressure ventilation in acute respiratory failure: report of an International Consensus Conference in intensive care medicine, Paris, France, 13–14 April 2000*

Contraindications for NIV

"ACUTE"

- **Airways obstruction Aspiration risk vomiting**
- **Cardiac arrest**
- **Unconscious GCS < 10 Uncooperative Uncontrolled bleeding**
- **Trauma or facial abnormality**
- **Encephalopathy**

How (and Where) to use NIV ?

In the Emergency Departement…

Several patients

Not enough personnel

Quick Turnover

Noninvasive ventilation in the emergency department: are protocols the key?

Antonio M. Esquinas[a], Paolo Groff[b] and Roberto Cosentini[c], [a]Intensive Care Unit, Hospital Morales Meseguer, Murcia, Spain, [b]Emergency Department, Hospital Civile Madonna del Soccorso, San Benedetto Tronto and [c]Noninvasive Ventilation UO Emergency Medicine, Fondazione Ca' Granda IRRCS Policlinico Milano, Milan, Italy

there are no international regulations or policies on how NIV must be organized outside the ICU

European Journal of Emergency Medicine 2014, 21:240–241

Even scientific societies have still not carried out studies on this subject.

Hill NS. Respir Care 2009; 54:62–70

Failure of noninvasive mechanical ventilation: could we assess determining factors in emergency department?

Antonio M. Esquinas[a], Antonio Dominguez-Petit[b] and Andrea Purro[c], [a]Intensive Care Unit, Hospital Morales Meseguer, Murcia, [b]Emergency Department, Hospital Virgen del Rocio, Sevilla, Spain and [c]Emergency Department, Gradenigo Hospital, Turin, Italy

European Journal of Emergency Medicine 2015, 22:66–70

NIV in the ED…

Yes but…

- By Experienced physicians
- Work load in ED?
- Adapted environment & structure?
- Good quality Ventilators?

Resuscitation Room

High Acuity Zone

Dedicated Area in the ED

Dedicated personnel

Good performance Ventilators

Unfortunately…
In the Emergency Department…

Servo 900 D

Bird

Puritan Bennett 7200

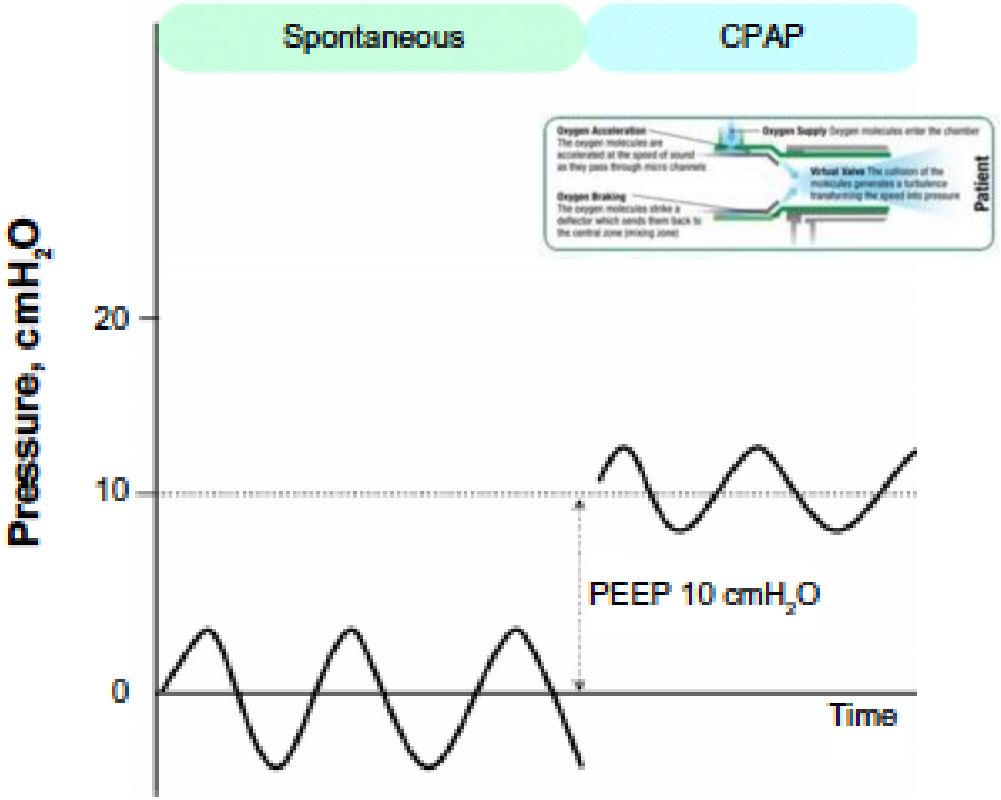
3rd Generation Transport Ventilators

Weinmann medumat

Monnal T 60

Elisée 250

Hamilton T1



Cardiogenic Pulmonary Oedema COPD

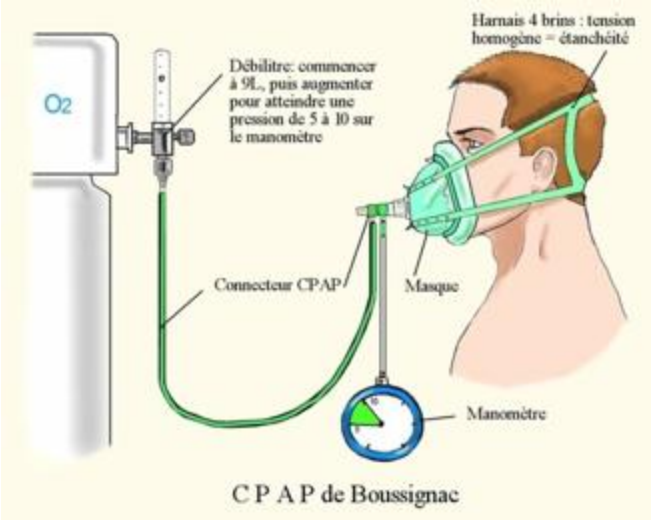
Mas & Masip, International Journal of COPD 2014:9

European Heart Journal (2007) 28, 2895–2901
doi:10.1093/eurheartj/ehm502

Clinical research
Heart failure/cardiomyopathy

A randomized study of out-of-hospital continuous positive airway pressure for acute cardiogenic pulmonary oedema: physiological and clinical effects

P. Plaisance[1†], R. Pirracchio[1†], Christine Berton[1], Eric Vicaut[2], and D. Payen[1*]



C P A P de Boussignac

Intensive Care Med. 2011 Sep;37(9):1501-9. doi: 10.1007/s00134-011-2311-4. Epub 2011 Jul 30.

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

Ducros L[1], Logeart D, Vicaut E, Henry P, Plaisance P, Collet JP, Broche C, Gueye P, Vergne M, Goetgheber D, Pennec PY, Belpomme V, Tartière JM, Lagarde S, Placente M, Fievet ML, Montalescot G, Payen D; CPAP collaborative study group.

Continuous positive airway pressure for cardiogenic pulmonary edema: a randomized study☆☆☆

Am J Emerg Med. 2011 Sep;29(7):775-81. doi: 10.1016/j.ajem.2010.03.007. Epub 2010 May 1.

Take Home Messages

- NIV should be considered if ARF unless contraindications
- For markedly Hypercapnic or severely Acidotic patients ++++
- COPD & ACPE are the best indications in ED
- **The earliest its used, the better outcomes**
- NIV is relatively simple and inexpensive
- Impacts long time survival

Thank you

11th EUROPEAN CONGRESS ON EMERGENCY MEDICINE