Ospedale San Giuseppe
MultiMedica S.p.A.

PNEUMOLOGIA 2016

Milano, 16 – 18 giugno 2016 · Centro Congressi Palazzo delle Stelline

MINICORSO

Ospedale San Giuseppe MultiMedica S.p.A.

LA VENTILAZIONE MECCANICA NON INVASIVA: INDICAZIONI E LIMITI OGGI

PNEUMOLOGIA 2016

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INDICAZIONI NON CONVENZIONALI

Raffaele Scala

Pneumologia-UTIP

Arezzo

USO NON CONVEZIONALE

USO "NON-EBM" NELL'IRA

USO "PROCEDURALE"

EBM

- COPD EXACERBATIONS
- CARDIOGENIC PULMONARY OEDEMA
- WEANING/EXTUBATION COPD
- IMMUNOSUPPRESSED PATIENTS

...ions for NIV to treat acute respiratory failure

...ava, Nicholas Hill

Lancet 2009; 374: 250–59

Systematic reviews (with homogeneity) of cohort studies—individual cohort studies (including low quality RCTs; eg, <80% follow-up)

Evidence of use (favourable)

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

Evidence of use (caution)

- Severe community acquired pneumonia
- Extubation failure (prevention)

POCHI O NESSUN RCT!

Level 3

Systematic reviews (with homogeneity) of case–control studies, individual case-control study

Evidence of use (favourable)

- Neuromuscular disease/kyphoscoliosis
- Upper airway obstruction (partial)
- Thoracic trauma
- Treatment of acute respiratory failure in asthma

Evidence of use (caution)

- Severe acute respiratory syndrome

Level 4

Case series (and poor quality cohort and case-control studies)

Evidence of use (favourable)

- Very old age, older than age 75 years
- Cystic fibrosis
- Obesity hypoventilation

Evidence of use (caution)

- Idiopathic pulmonary fibrosis

COSA CI DICE ANCORA L'EBM?

QUANDO NON DOBBIAMO USARE LA NIV

Contraindications

Absolute

- Respiratory arrest
- Unable to fit mask

Relative

- 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

PAZIENTI ESCLUSI DAI RCTs!!!!

Stefano Nava, Nicholas Hill

Lancet 2009; 374: 250–59

COSA SUCCEDE NELLA VITA REALE?

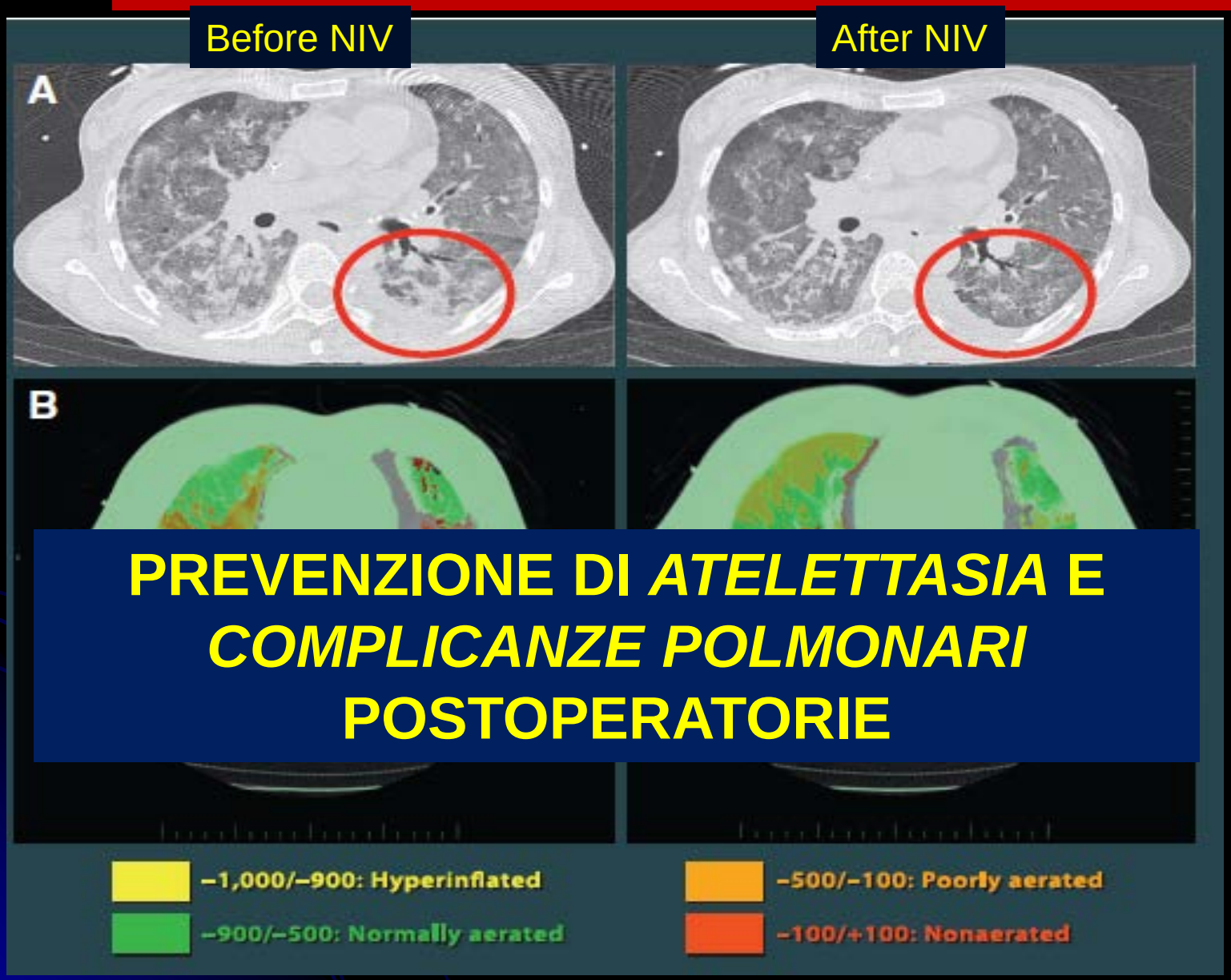
Use and Outcomes of Noninvasive Positive Pressure Ventilation in Acute Care Hospitals in Massachusetts

Ozsancak U. et al. *CHEST 2014; 145(5):964–971*

Diagnostic Category	Initial Use, No. (%)	Failure, No. (%)	30-d In-Hospital Mortality	
			Total, No. (%)	DNI Subset No. Died/Total DNI (%)
I. Acute-on-chronic lung disease	99 (76.7)[a]	24 (24.2)	15 (15.1)	9/23 (39)[b]
COPD[c]	74 (82.2)	19 (25.3)	9 (12.2)	7/21 (33)
Asthma	5 (45.5)	1 (20)	0	0
Restrictive lung disease	2 (50)	0 (0)	0	0
Lung cancer	5 (50)	3 (60)	4 (80)	2/2 (100)
Decompensated OSA	13 (92.9)	2 (15.4)	2 (15.4)	0/2 (0)
II. De novo acute respiratory failure	37 (37.8)[a]	20 (54.1)	10 (27.0)	2/8 (25)
Pneumonia	36 (41.4)	19 (52.8)	9 (25)	2/7 (29)
ARDS	0	NA	0	0
Other	1 (20)	1 (100)	1 (100)	0/1 (0)
III. Cardiogenic pulmonary edema[c]	63 (68.5)[a]	13 (20.6)	11 (17.5)	5/12 (42)[b]
IV. Neurologic diseases	2 (1.9)[a]	1 (50)	0	0
V. Cardiopulmonary arrest	0	NA	0	0
VI. Other[c,d]	10 (17.2)[a]	3 (30)	2 (20)	1/2 (50)
Total	211 (38.5)[a]	55(26.1)	35 (16.6)[a]	17/45 (38)[b]


IPOSSIEMIA
“NON-CONVENZIONALE”

NIV in ppoARF: FORTE RAZIONALE!



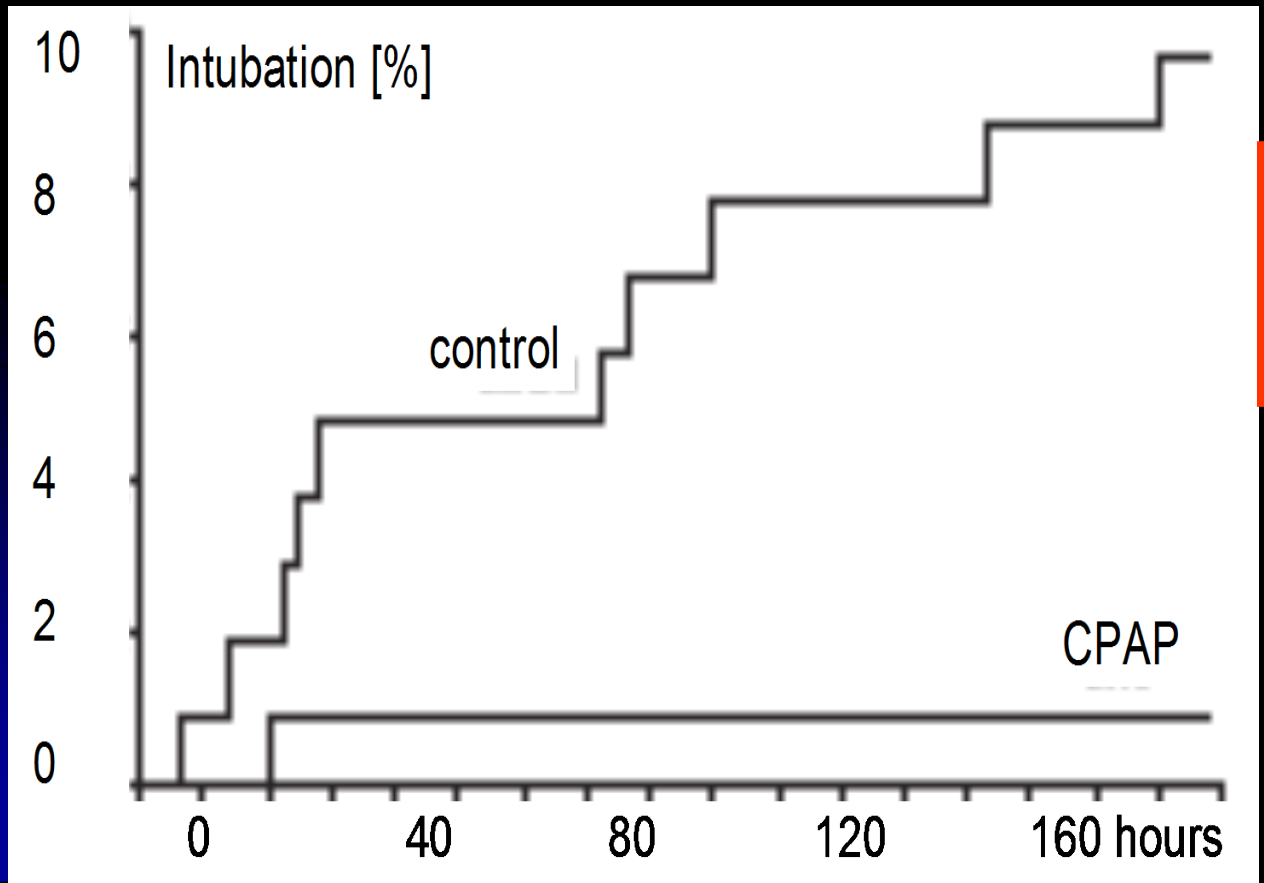
Jaber S et al, Anesthesiology 2010

Continuous Positive Airway Pressure for Treatment of Postoperative Hypoxemia

A Randomized Controlled Trial

Squadrone et al, JAMA, 2005; 293: 589-595

Prohylactic NIV in ppo ABDOMEN SURGERY



- ↓ ETI rate
- ↓ ICU stay
- ↓ Septic complications
- ↓ Time to achieve O2-goal

Noninvasive Ventilation Reduces Mortality in Acute Respiratory Failure following Lung Resection

IGOR AURIANT, ANNE JALLOT, PHILIPPE HERVÉ, JACQUES CERRINA, FRANCOIS LE ROY LADURIE, JEAN LAMET FOURNIER, BERNARD LESCOT, and FRANCOIS PARQUIN

Am J Respir Crit Care Med 2001; 164:1231-1235

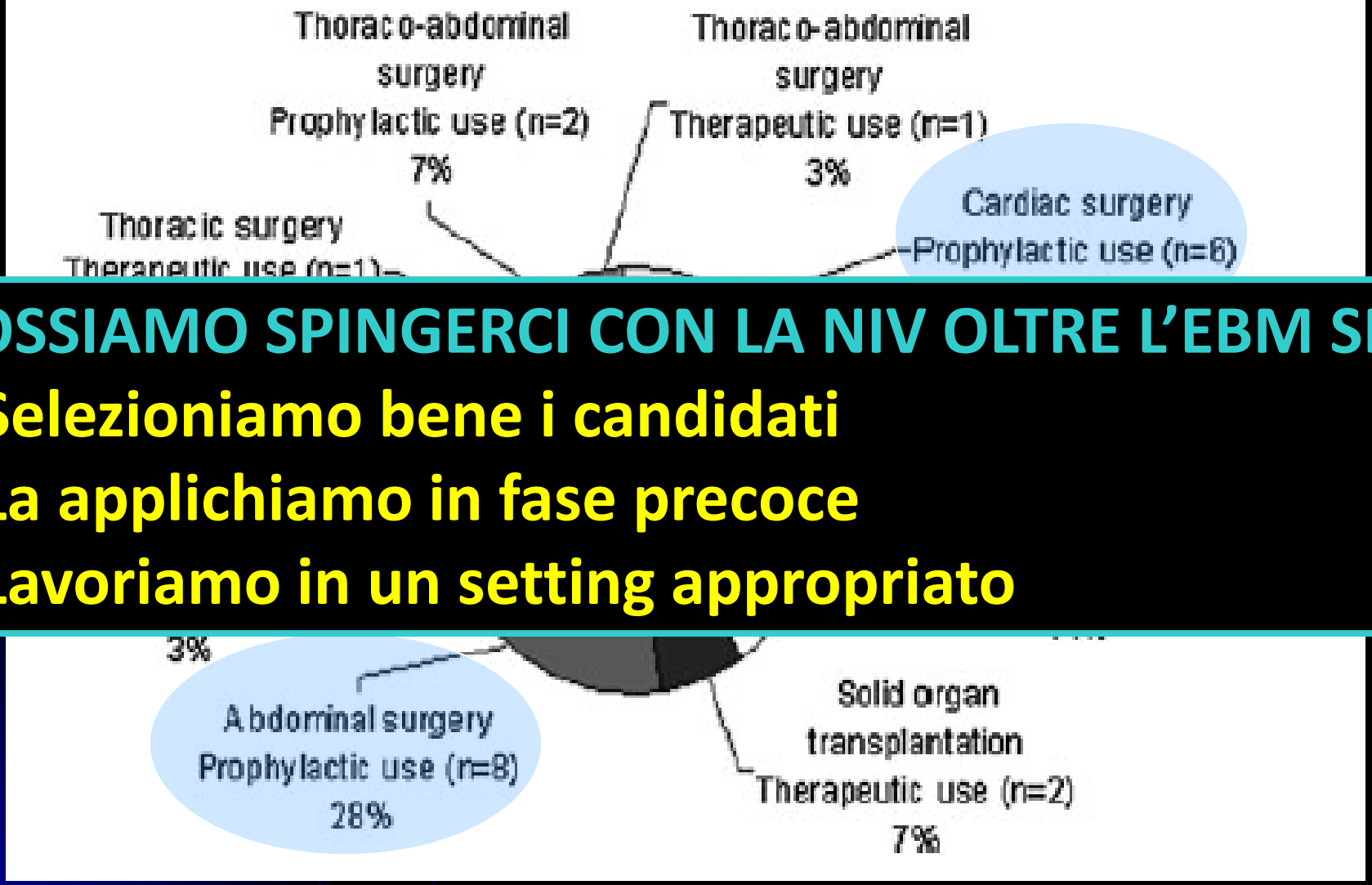
Curative NIV in ppo LUNG RESECTION

TABLE 3. ENDOTRACHEAL MECHANICAL VENTILATION, MORTALITY, AND LENGTH OF INTENSIVE CARE UNIT AND HOSPITAL STAYS

	No-NPPV ($n = 24$) Mean ± SD	NPPV ($n = 24$) Mean ± SD	p Value*
ETMV, n (%)	12 (50%)	5 (20.8%)	0.035
In-hospital deaths, n (%)	9 (37.5%)	3 (12.5%)	0.045
Length of ICU stay, d	14 ± 11.1	16.65 ± 23.6	0.52
Length of hospital stay, d	22.8 ± 10.7	27.1 ± 19.5	0.61
120 - d mortality, n (%)	9 (37.5%)	3 (12.5%)	0.045

NIV nell'IRA POSTOPERATORIA

USO FAVOREVOLE: LIVELLO 2 DI EVIDENZA



POSSIAMO SPINGERCI CON LA NIV OLTRE L'EBM SE:

- **Selezioniamo bene i candidati**
- **La applichiamo in fase precoce**
- **Lavoriamo in un setting appropriato**

Chiumello D et al, Intens Care Med 2011

Noninvasive Ventilation Reduces Intubation in Chest Trauma-Related Hypoxemia

A Randomized Clinical Trial

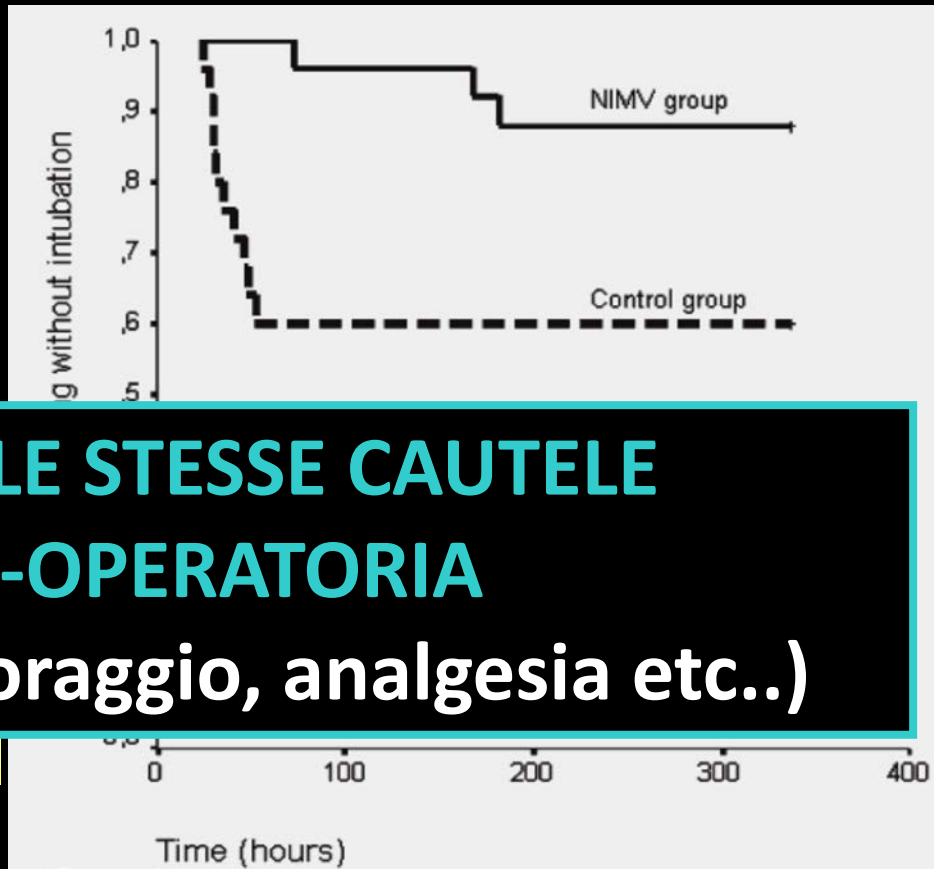
CHEST 2010; 137(1):74–80

Gonzalo Hernandez, MD, PhD; Rafael Fernandez, MD, PhD; Pilar Lopez-Reina, MD; Rafael Cu… …iradier, MD

IRA DA TRAUMA TORACICO

USO FAVOREVOLE: LIVELLO 3 DI EVIDENZA

	NIMV Group (n = 25)	Control Group (n = 25)
Gasometric variables at randomization		
Pao_2/Fio_2, mm Hg	108 ± 34.5	110 ± 34.5
$Paco_2$, mm Hg	36 ± 8.4	36 ± 6.7
Arterial pH	7.3 ± 0.3	7.4 ± 0.3

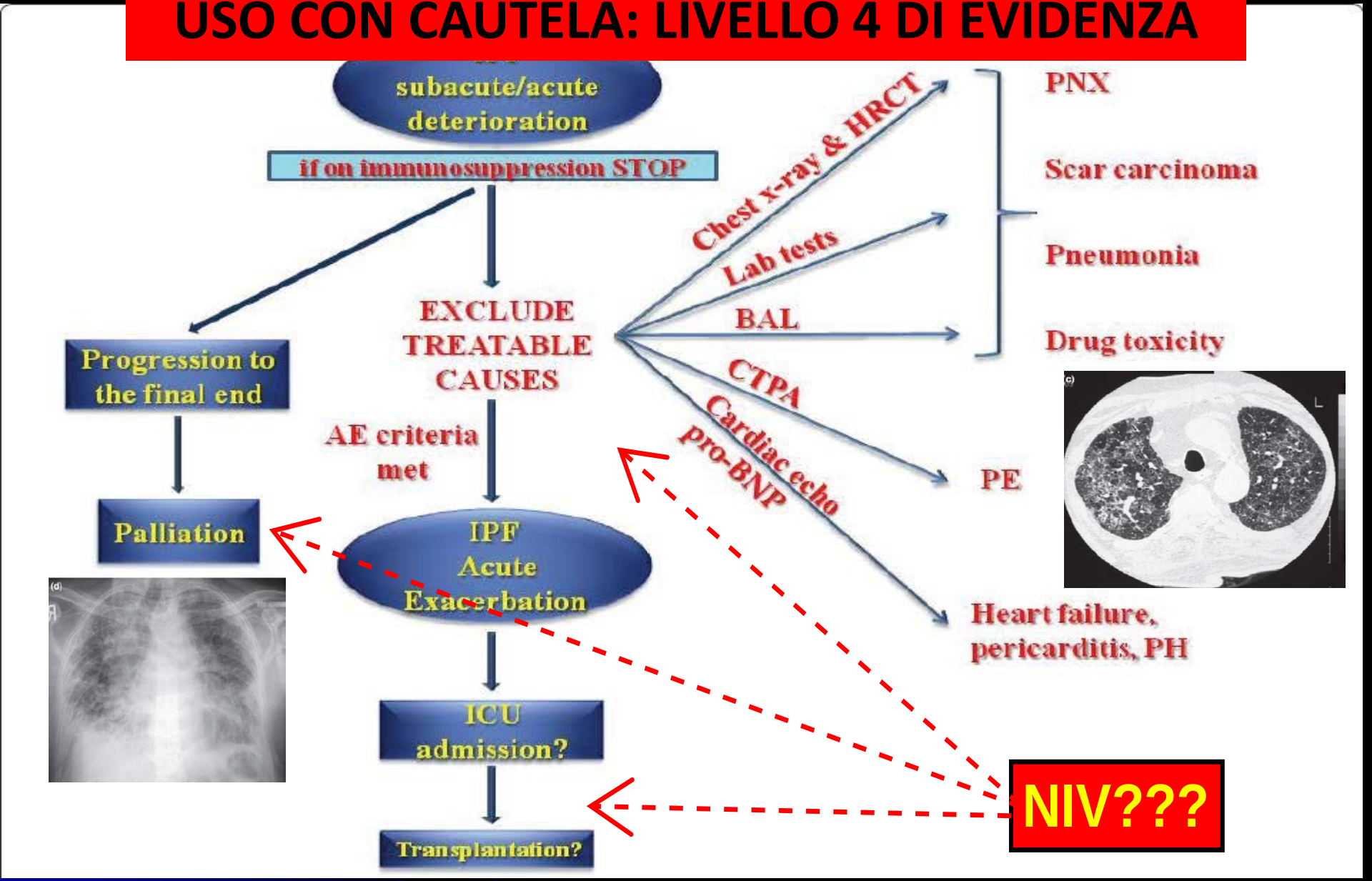


SPINGIAMOCI CON LE STESSE CAUTELE DELL' IRA POST-OPERATORIA

(bilancio trauma, monitoraggio, analgesia etc..)

IRA in IPF e ILDs

USO CON CAUTELA: LIVELLO 4 DI EVIDENZA

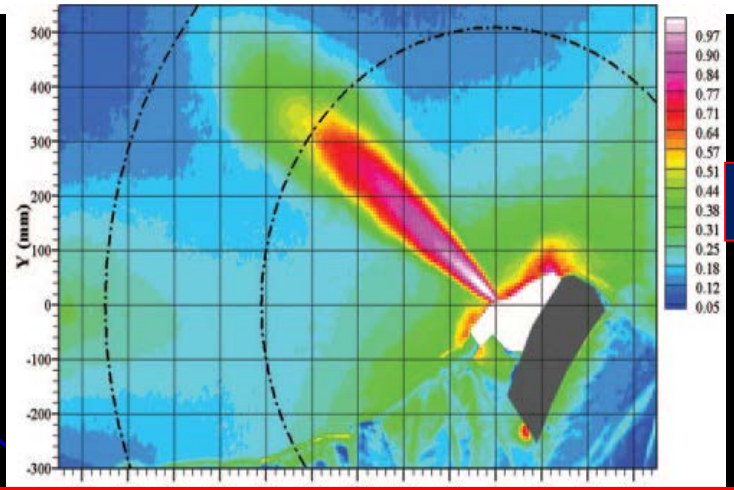


Papiris SA et al, Crit Care 2010

Noninvasive mechanical ventilation in high-risk pulmonary infections: a clinical review

Eur Respir Rev 2014; 23: 427–438

Antonio M. Esquinas[1], S. Egbert Pravinkumar[2], Raffaele Scala[3], Peter Gay[4], Arie Soroksky[5], Christophe Girault[6], Fang Han[7], David S. Hui[8], Peter J. Papadakos[9] and Nicolino Ambrosino[10] on behalf of the International NIV Network[11]



LOW RISK OF TRANSMISSION

NIV, when applied early in selected patients with SARS, H1N1 and acute pulmonary tuberculosis infections, can reverse respiratory failure. There are only a few reports of infectious disease transmission among healthcare workers.

D1
Close to pts

Evaluation of droplet dispersion during non-invasive ventilation, oxygen therapy, nebuliser treatment and chest physiotherapy in clinical practice: implications for management of pandemic influenza and other airborne infections *Health Technology Assessment* 2010; Vol. 14: No. 46, 131–172

AK Simonds,[1*] A Hanak,[1] M Chatwin,[1] MJ Morrell,[1] A Hall,[2] KH Parker,[3] JH Siggers[3] and RJ Dickinson[3]

"IN VIVO"

D2
1 m from

NIV is a DROPLET -not AEROSOL (<5 micron)- GENERATING DE

+++

Personal protective equipment (PPE)
Handwashing
Decontamination of surfaces
Modified Non-Vented Masks

??

Negative pressure rooms

Non-Vented masks plus antibacterial Filter

	p	0.894	0.912	0.639	0.143	0.552	**0.044**	0.908	0.909	0.238	**0.047**	**0.018**	**0.052**
Normal	D	−0.071	−0.073	−0.054	−0.078	−0.084	−0.086	−0.073	−0.081	−0.089	−0.114	−0.125	0.057
	p	0.971	0.963	0.703	0.703	0.690	0.588	0.975	0.970	0.963	0.836	0.734	0.431
Patient	D	−0.020	0.005	0.027	0.013	−0.039	0.087	−0.018	−0.017	−0.003	−0.014	−0.005	0.236
	p	0.829	0.437	0.393	0.463	0.558	0.402	0.776	0.687	0.521	0.545	0.513	0.244
Coryzal	D	−0.024	−0.026	−0.011	−0.147	−0.208	0.151	−0.016	−0.037	−0.092	−0.125	−0.153	0.011
	p	0.776	0.774	0.539	0.861	0.770	0.240	0.671	0.815	0.857	0.813	0.745	0.486


OBESITA’

Noninvasive Ventilation in Acute Hypercapnic Respiratory Failure Caused by Obesity Hypoventilation Syndrome and Chronic Obstructive Pulmonary Disease

Andres Carrillo[1], Miquel Ferrer[2,3], Gumersindo Gonza
Am J Respir Crit Care Med Vol 186, Iss. 12, pp 1279–1285, Dec 15, 2012

USO FAVOREVOLE: LIVELLO 4 DI EVIDENZA

Measurements and Main Results: Both groups had similar (mean ± SD) baseline respiratory acidosis (arterial pH, 7.22 ± 0.08; Pa_{CO_2}, 86 ± 21 mm Hg). Patients with OHS were older (74 ± 11 vs. 71 ± 10 yr; $P < 0.001$); were more frequently female (134, 77% vs. 66, 12%; $P < 0.001$); had less late NIV failure (12, 7% vs. 67, 13%; $P = 0.037$); had lower hospital mortality (10, 6% vs. 96, 18%; $P < 0.001$); and had higher 1-year survival (odds ratio, 1.83; 95% confidence interval, 1.24–2.69; $P = 0.002$). However, survival adjusted for confounders (adjusted odds ratio, 1.41; 95% confidence interval, 0.70–2.83; $P = 0.34$), NIV failure (11, 6% vs. 59, 11%; $P = 0.11$), length of stay, and hospital readmission were similar in both groups. Among patients with COPD, obesity was associated with less late NIV failure and hospital readmission.

L'OHS è UN CAMPO "NON-EBM" DOVE POSSIAMO SPINGERCI CON LA NIV!

ATTENZIONE ALLE DIFFICOLTA' NEL GRANDE OBESO!

- Alto carico di lavoro
- Posizione (supino ↓ 40-60% CV)
- OSAS (uso PEEP>10 cmH2O)
- OHS (piu' elevati livelli di PS)
- Duplice settaggio (Night & Day)
- Encefalopatia ipercapnica
- Comorbidità
- Difficile gestione vie aeree
- Gastrodistensione (aspirazione)
- Trasporti problematici

ATTACCO ASMATICO ACUTO

Non-invasive positive pressure ventilation for treatment of respiratory failure due to severe acute exacerbations of asthma (Review) 2012

Lim WJ, Mohammed Akram R, Carson KV, Mysore S, Labiszewski NA, Wedzicha JA, Rowe BH, Smith BJ

THE COCHRANE COLLABORATION®

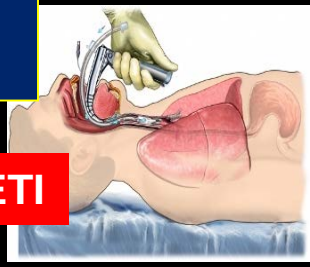
- Breve finestra temporale
- Severe alterazioni emodinamiche
- Agitazione e intensa dispnea

5 RCTs included

This review of studies … asthmaticus. As such this course of trea… tive randomised controlled trials of rig…

QUINDI NON C'E' SPAZIO PER LA NIV NELL'ATTACCO ASMATICO?

QUANDO E SE USARE LA NIV NELL'ATTACCO ASMATICO?



ALTERNATIVE OF ETI

PREVENTION OF ETI

OBJECTIVES OF NPPV

?

PREVENTION OF ARF

BRONCHODILATATION

?

ARF

SEVERITY OF ASTHMATIC ATTACK

Scala R, Respir Care 2010


Il PAZIENTE “DO NOT INTUBATE”

Review Article

Noninvasive positive pressure ventilation in critical and palliative care settings: Understanding the goals of therapy*

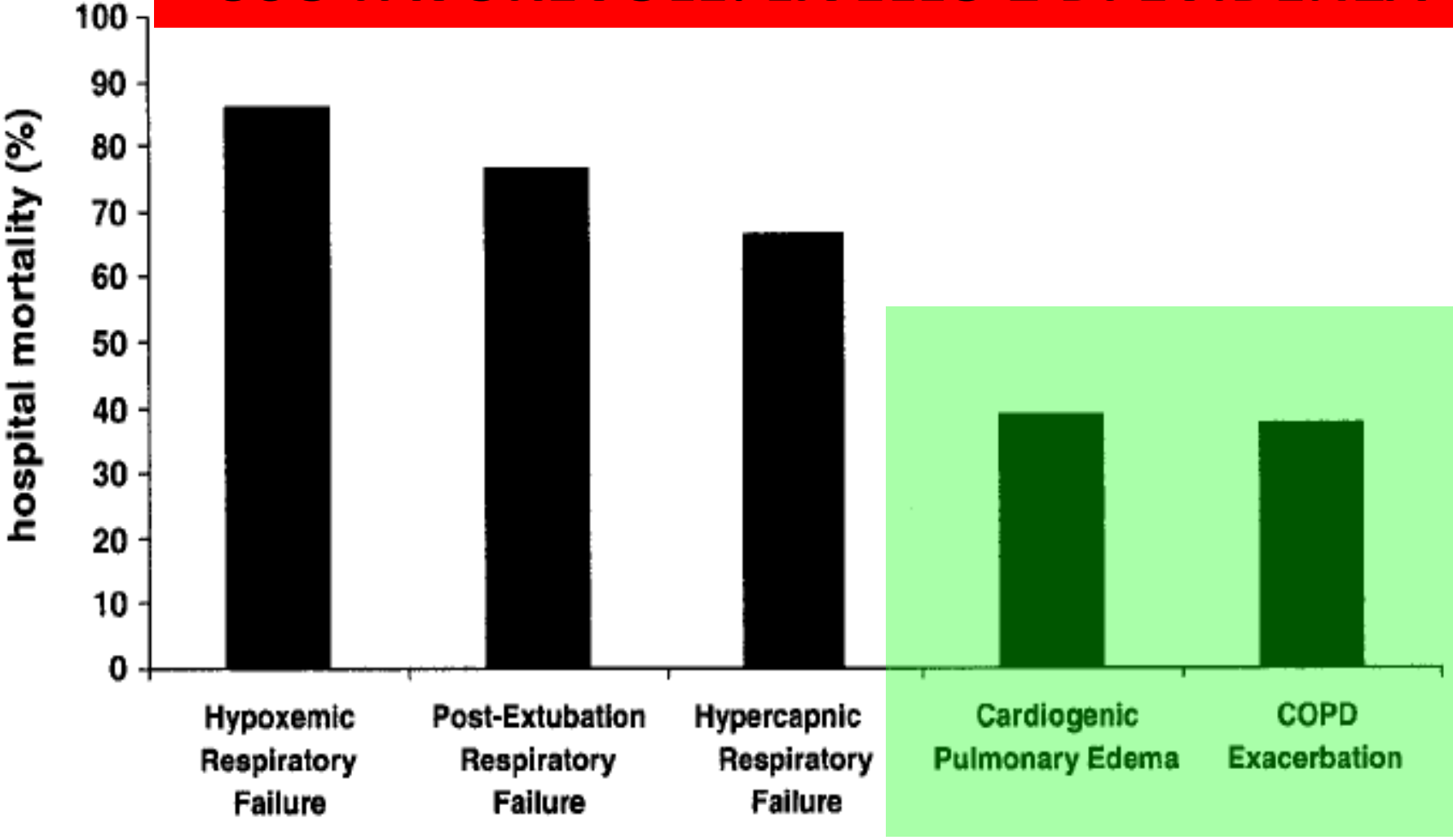
J. Randall Curtis, MD, MPH; Deborah J. Cook, MD; Tasnim Sinuff, MD, PhD; Douglas B. White, MD; Nicholas Hill, MD; Sean P. Keenan, MD, MSc(Epid); Joshua O. Benditt, MD; Robert Kacmarek, PhD, RRT; Karin T. Kirchhoff, RN, PhD, FAAN; Mitchell M. Levy, MD; the Society of Critical Care Medicine Palliative Noninvasive Positive Pressure Ventilation Task Force

QUANTO SPINGERCI NELLE CATEGORIE 2 e 3?

	CATEGORY 1	CATEGORY 2	CATEGORY 3
Approach	ETI IF NIV FAILURE	CEILING THERAPY	PALLIATIVE CARE
Definition	Life Support Without Preset Limits	Life Support With Preset Limit (Do Not Intubate)	Comfort Measures Only
Primary goals of care	Assist ventilation and/or oxygenation Alleviate dyspnea Achieve comfort Reduce risk of intubation Reduce risk of mortality Avoidance of intubation	Includes same as category 1 except intubation declined Also could include briefly prolonging life for a specific purpose (e.g., arrival of family member)	Palliation of symptoms (relief of dyspnea)
Main goals to communicate with patient and family	Goal is to restore health and use intubation if necessary and indicated	Goal is to restore health without using endotracheal intubation and without causing unacceptable	Goal is to maximize comfort while minimizing adverse effects of opiates

NIV AS A "CEILING THERAPY" (DNI/DNR STATUS)

USO FAVOREVOLE: LIVELLO 2 DI EVIDENZA



Schettino et al.

(Crit Care Med 2005; 33:1976–1982)

Non-invasive ventilation in elderly patients with acute hypercapnic respiratory failure: a randomised controlled trial

ELDERLY PATIENTS

Nava S et. al

Age and Ageing 2011; **0:** 1–7

USO FAVOREVOLE: LIVELLO 3 DI EVIDENZA

82 pt (>75 yrs)→ 41 NIV vs 41 SMT

DNI/DNR → 29 NIV and 33 SMT

Results: the rate of meeting the ETI criteria was lower in the NIV group compared with the SMT group (7.3 versus 63.4%, respectively; $P < 0.001$), as was the mortality rate [(odds ratios) OR = 0.40; 95% CI: 0.19–0.83; $P = 0.014$]. Twenty-two of 41 SMT patients with DNI orders received NIV as a rescue therapy. The mortality rate in this subgroup was comparable with the NIV group and significantly lower compared with patients receiving ETI (OR = 0.60, 95% CI: 0.18–1.92 versus 4.03, 95% CI: 2.35–6.94, respectively; $P = 0.009$). Arterial blood gases, respiratory rate and dyspnoea improved significantly faster with NIV than with SMT.

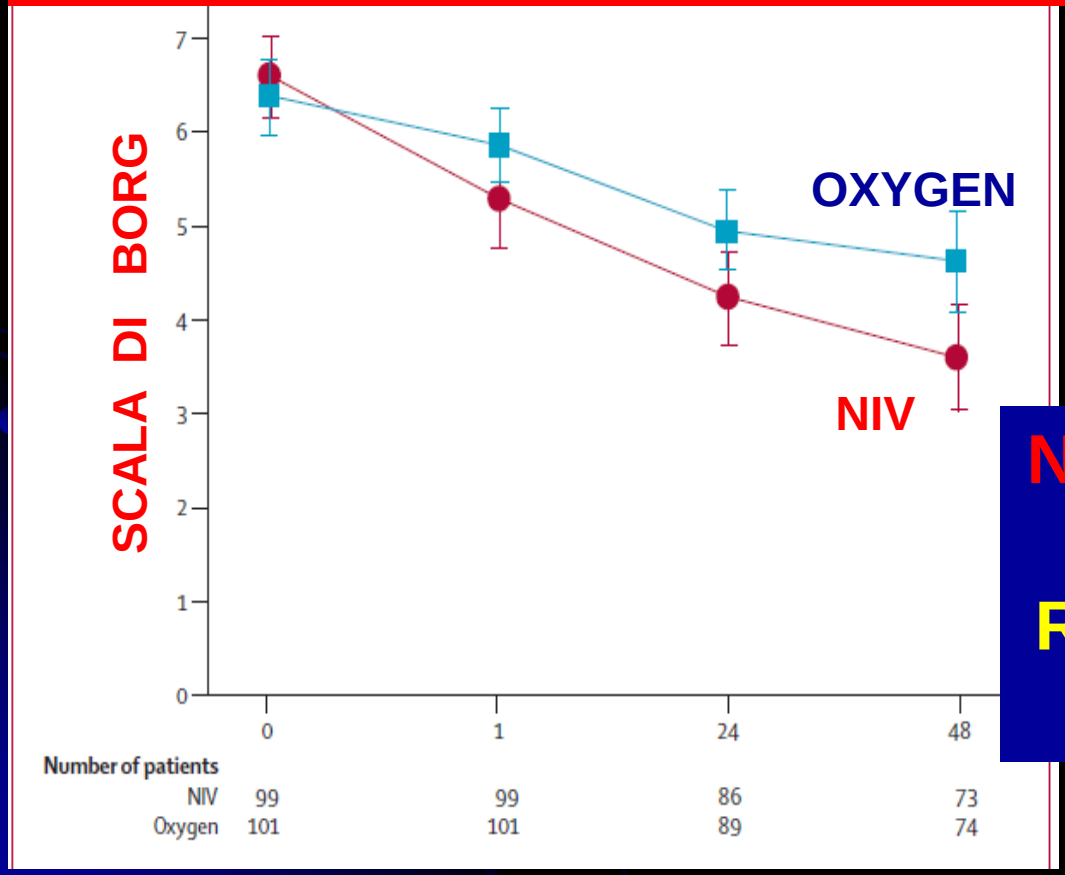
Conclusions: compared with SMT, NIV decreased the rate of meeting the ETI criteria and the mortality rate of very old patients with AHRF. NIV should be offered as an alternative to patients considered poor candidates for intubation and those with a DNI order.

Palliative use of non-invasive ventilation in end-of-life patients with solid tumours: a randomised feasibility trial

Stefano Nava, Miguel Ferrer, Antonio Esquinas, Raffaele Scala, Paolo Groff, Roberto Cosentini, Davide Guido, Ching-Hsiung Lin, Anna Maria Cuomo, Mario Grassi

Lancet Oncol 2013; 14: 219–27

USO FAVOREVOLE: LIVELLO 2 DI EVIDENZA



NIV NEI TUMORI SOLIDI

Ridotta dispnea e

Ridotto uso di morfinici

TUTTO FACILE ?

NIV near the end of life
"a bargain or a burden"?

Pro	Con
May prolong survival	May unduly delay the process of dying
May improve quality of life	May increase depression and anxiety
May improve quality of dying	May increase suffering
May improve communication	May increase hospital costs
May give time to say good bye and solve "open" personal problems	Withdrawing may be difficult
May improve dyspnoea and discomfort	Discharge at home may be impossible without a ventilator

NIV and palliative care

R. Scala, S. Nava#*

Eur Respir Mon, 2008, 41, 287–306

ALTERAZIONI DEL SENSORIO

Patient's Cooperation and Sensorium

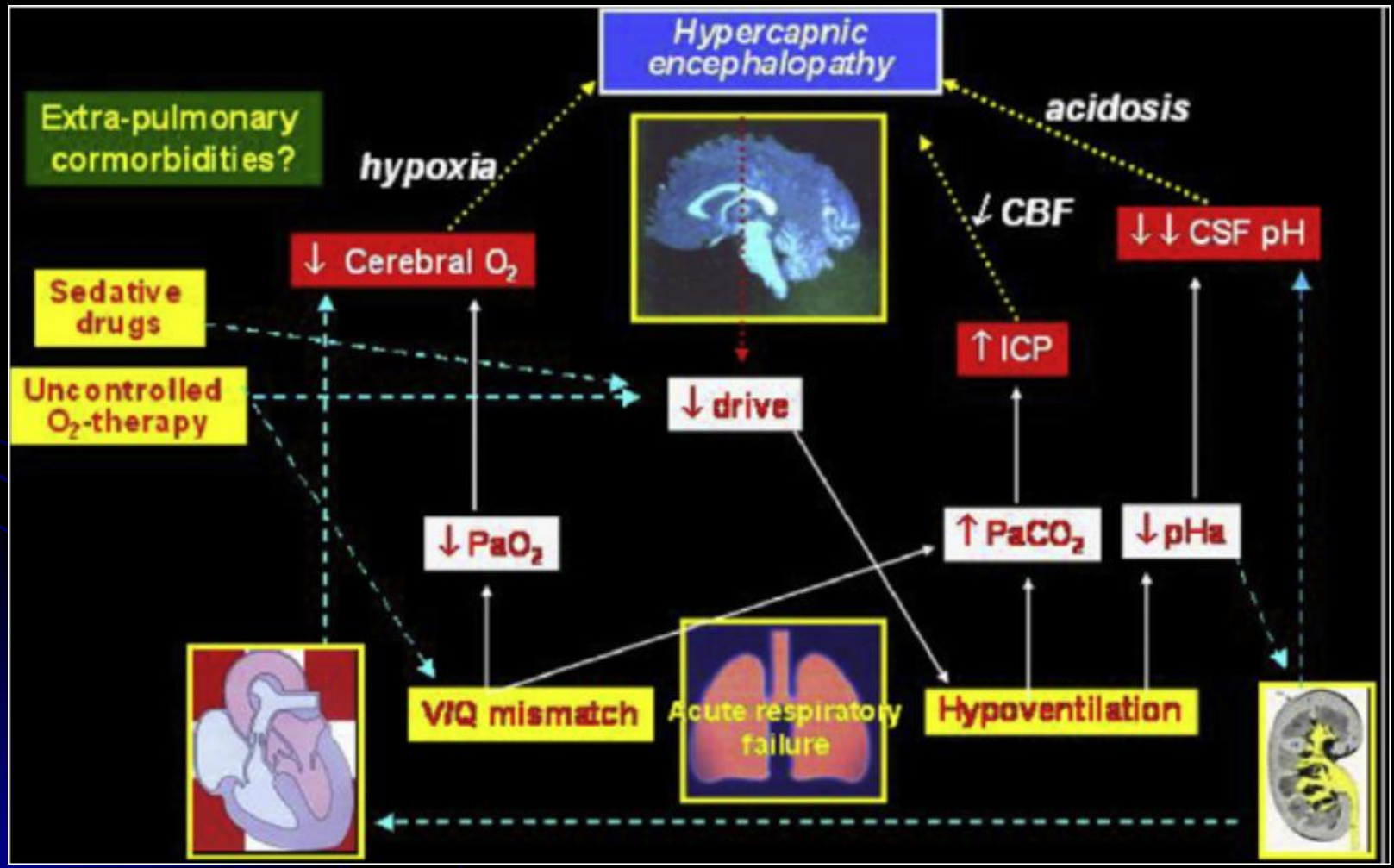
NIV OUTCOME	Success ($n = 65$)	Failure* ($n = 43$)	p Value
Age, yr	62 ± 16	66 ± 15	n.s.
SAPS II	30 ± 11	45 ± 27	< 0.005
ABG before ventilation			
Pa_{CO_2}, mm Hg	54 ± 23	63 ± 30	n.s.
pH	7.36 ± 0.09	7.30 ± 0.10	< 0.01
Pa_{O_2}/FI_{O_2}, mm Hg	227 ± 79	206 ± 119	n.s.
ABG at Day 1			
Pa_{CO_2}, mm Hg	57 ± 19	60 ± 31	n.s.
pH	7.37 ± 0.08	7.34 ± 0.09	n.s.
Pa_{O_2}/FI_{O_2}, mm Hg	232 ± 92	200 ± 115	n.s.
Copious secretions, yes/no†	9/55	14/27	< 0.05
Encephalopathy (no or moderate/pronounced)‡	43/17	18/19	< 0.01
Tolerance, good/poor	59/6	27/16	< 0.001
Leaks, minor/large	59/6	31/12	< 0.004
Mask, facial/nasal	56/9	40/3	n.s.

Carlucci A. et al *Am J Respir Crit Care Med* 2001;163:874-80

Hypercapnic encephalopathy syndrome: A new frontier for non-invasive ventilation?

Raffaele Scala*

Respiratory Medicine (2011) 105, 1109–1117



Intensive Care Med 2007
DOI 10.1007/s00134-007-0837-2

ORIGINAL

NIV IN HYPERCAPNIC ENCEPHALOPATHY

Raffaele Scala
Stefano Nava
Giorgio Conti
Massimo Antonelli
Mario Naldi
Ivano Archinucci
Giovanni Coniglio
Nicholas S. Hill

Noninvasive versus conventional ventilation to treat hypercapnic encephalopathy in chronic obstructive pulmonary disease

KMS: 3-5

	NPPV ($n = 20$)	CMV ($n = 20$)	p
In-hospital mortality	5 (25%)	5 (25%)	1.00
One-year mortality	9 (45%)	10 (50%)	0.75
Tracheostomy	2 (10%)	6 (30%)	0.23
Patients with complications	6 (30%)	13 (65%)	0.02
Patients with lethal complications	3 (15%)	5 (25%)	0.40
Complications	7	23	0.01
Sepsis and septic shock	2 (10%)	9 (45%)	0.02
Nosocomial pneumonia	0 (0%)	7 (35%)	0.01
Acute renal failure	2 (10%)	2 (10%)	1.00
Gastrointestinal bleeding	0 (0%)	1 (5%)	1.00
Urinary tract infections	0 (0%)	2 (10%)	0.49
Cardiovascular complications	3 (15%)	2 (10%)	1.00
Length of hospitalization (days: IQR)	5.0 (1.0–9.5)[a]	21.5 (6.0–21.5)[b]	0.02
Length of MV (days)	13.7 ± 6.1[a]	26.5 ± 22.3[b]	0.04
De novo LTOT	5 (25%)	6 (30%)	1.00
De novo HMV	3 (15%)[c]	2 (10%)[d]	1.00

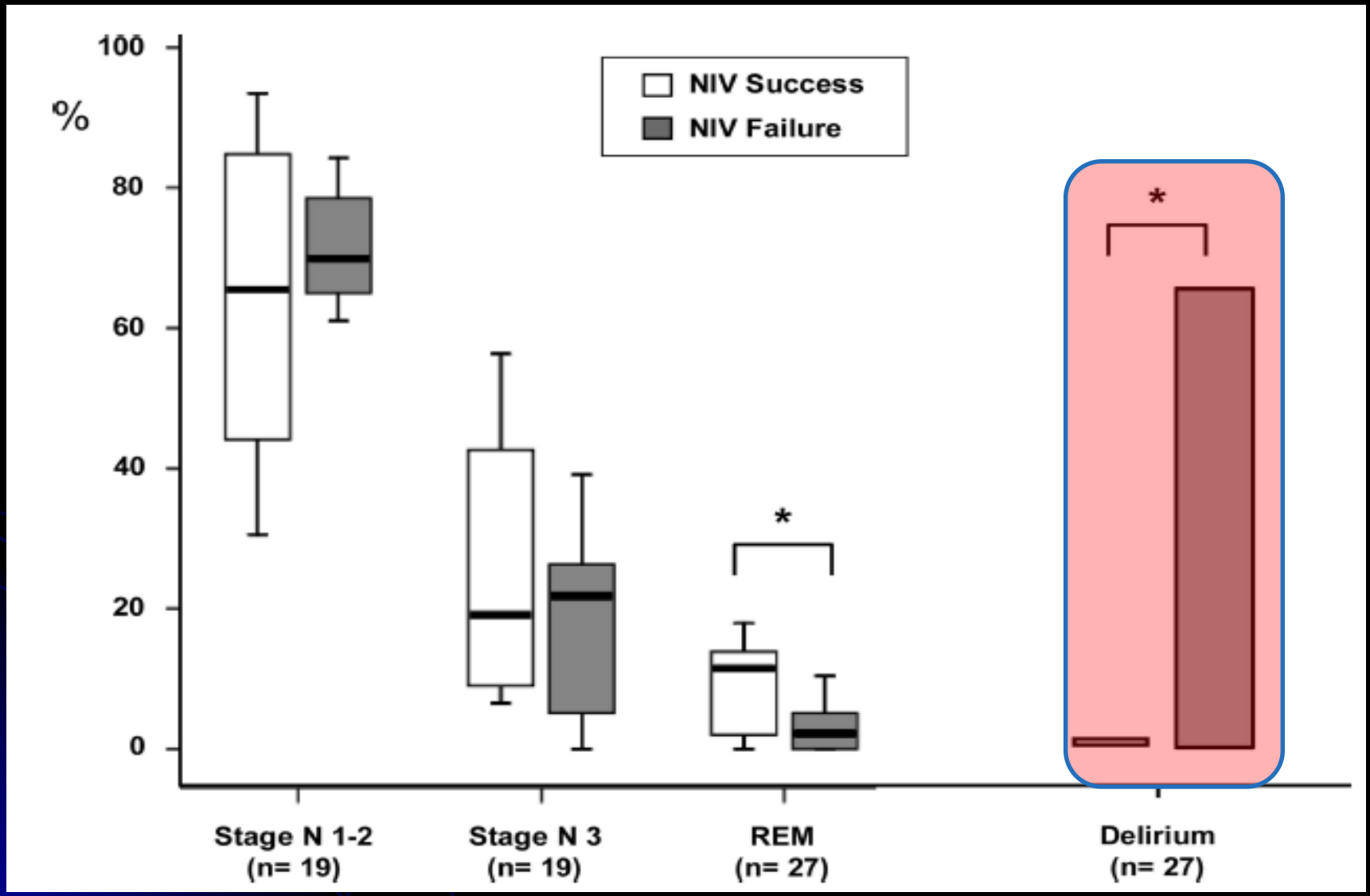
Ma attenzione al paziente comatoso

Variables	KELLY=1 (n = 20)	KELLY=2 (n =)	KELLY>3 (n = 20)
Need of intubation	3 (15)	(30)	9 (45)†
Intubated/needed intubation	1/3	4/6	0/9
Hospital mortality rate		4 (20)	9 (45)†
90-day mortality rate		7 (35)	10 (50)†
Causes of NPPV failure			
Respiratory arrest	0	0	0
Cardiac arrest or hemody	1	1	5†
ABG worsening	2	3	4	2
Level of co	2	2	3	4
Se	0	0	2	0
M	1	1	1	1

ATTENZIONE ALL'ENCEFALOPATIA NON-IPERCAPNICA.....

Scala R. et al, Chest 2005

Delirium is correlated with NIV failure



Roche-Campo F et al., Crit Care Med 2010

Giorgio Conti
Nicholas S. Hill
Stefano Nava

Is sedation safe and beneficial in patients receiving NIV? No

Do not sedate your patients unless non-pharmacologic approaches to achieving patient tolerance have been tried first

Do not use analgesia and sedation for NIV without appropriate monitoring by experienced staff

While we believe that benzodiazepines should certainly be avoided and dexmedetomidine could have the most suitable overall profile [15], further studies are definitely needed to determine the "ideal" sedative or analgesic drug to be used during NIV, as well as the "best" route and modalities of administration.

Intensive Care Med (2015) 41:1688–1691

Gilles Hilbert
Paolo Navalesi
Christophe Girault

Is sedation safe and beneficial in patients receiving NIV? Yes

Studi su ANALGO-SEDAZIONE in NIV

References	Type	Patients (*n*)	Reason for NPPV (*n*)	Reason for sedation/ analgesia		IV tolerance/ ion	NPPV success rate (%)
Rocker et al. [7]	Prospective observational	9/12	Hypoxemic ARF (ALI/ARDS)	Prevent		erance	50
Constantin et al. [8]	Prospective observational	13	Hypoxemic (10) or hypercapnic ARF (3)			erance	69
Akada et al. [9]	Prospective observational	10	Hypercapnic A			dequate tolerance	100
Rocco et al. [10]	Prospective observational	36	Persiste A			Adequate tolerance	61
Clouzeau et al. [11]	Prospective observational	10				Adequate tolerance	70
Senoglu et al. [12]	Prospective randomized double-blind	40			xmedetomidine (20) vs midazolam (20	Adequate tolerance/ sedation	100 vs 100 (during first 24 h)
Huang et al. [13]	Prospective rando			nce	Dexmedetomidine (33) vs midazolam (29)	Adequate tolerance/ sedation	79 vs 55 ($p = 0.043$)
Devlin et al. [14]	Pros			itive NIV intolerance	Dexmedetomidine (16) vs placebo (17) ±midazolam (agitation) and/or fentanyl (pain)	No adequate tolerance/sedation	69 vs 71

CAUTION
Use only if you are able to manage airways

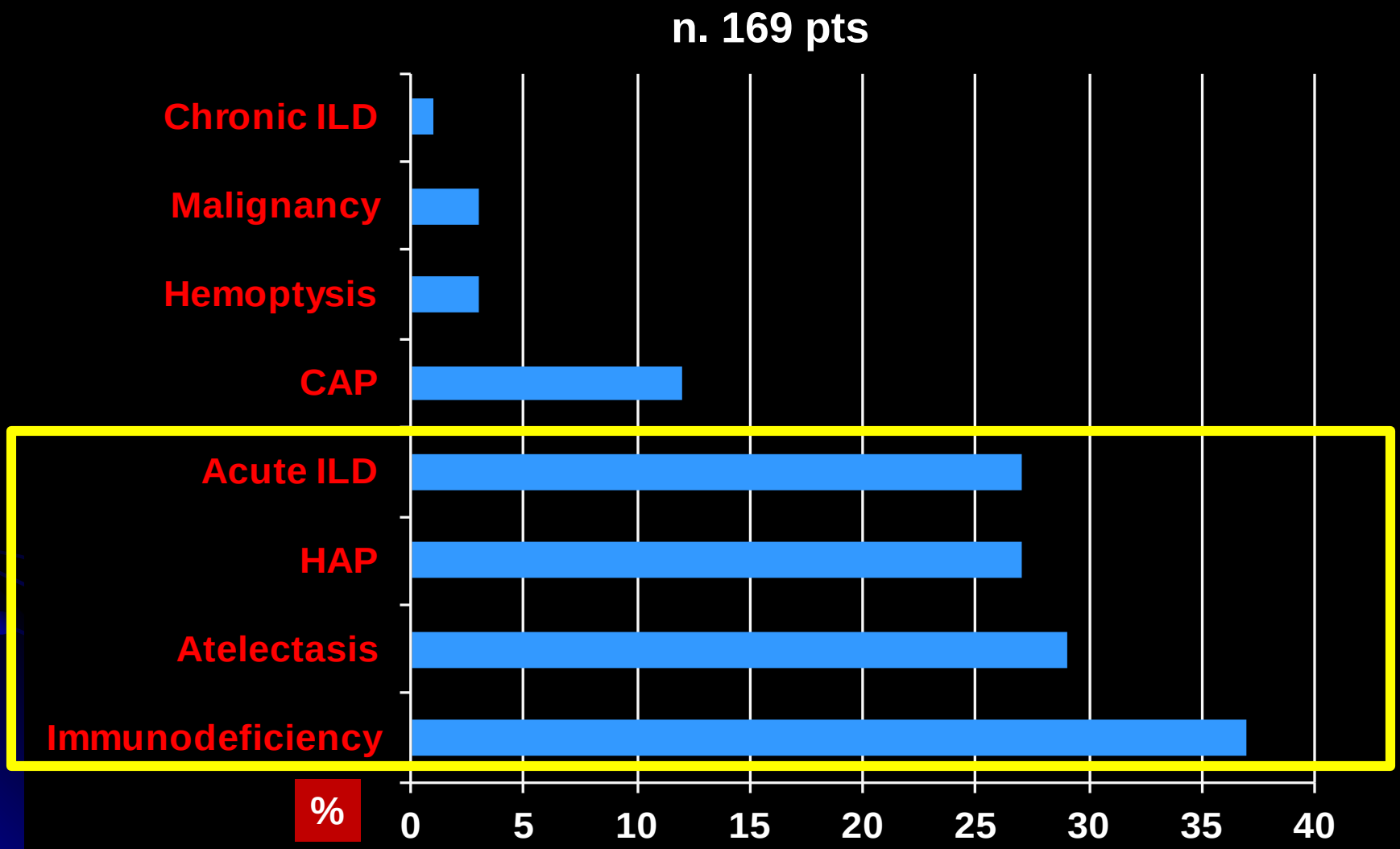
Hilbert J et al Intensive Care Med 2015

USO NON CONVEZIONALE

USO "NON-EBM" NELL'IRA

USO "PROCEDURALE"

Reasons for the use of FOB in ICU



Cracco C. et al. Intensive Care Med 2013;39(1):45-52

FBO & BAL in Spontaneous Breathing

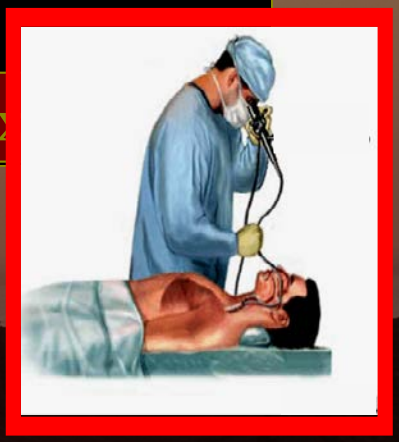
$$R = \frac{8\,\eta\,l}{\pi\,r^4}$$

$$\Delta P = R \times \dot{V}$$

$$WOB = (R \times$$

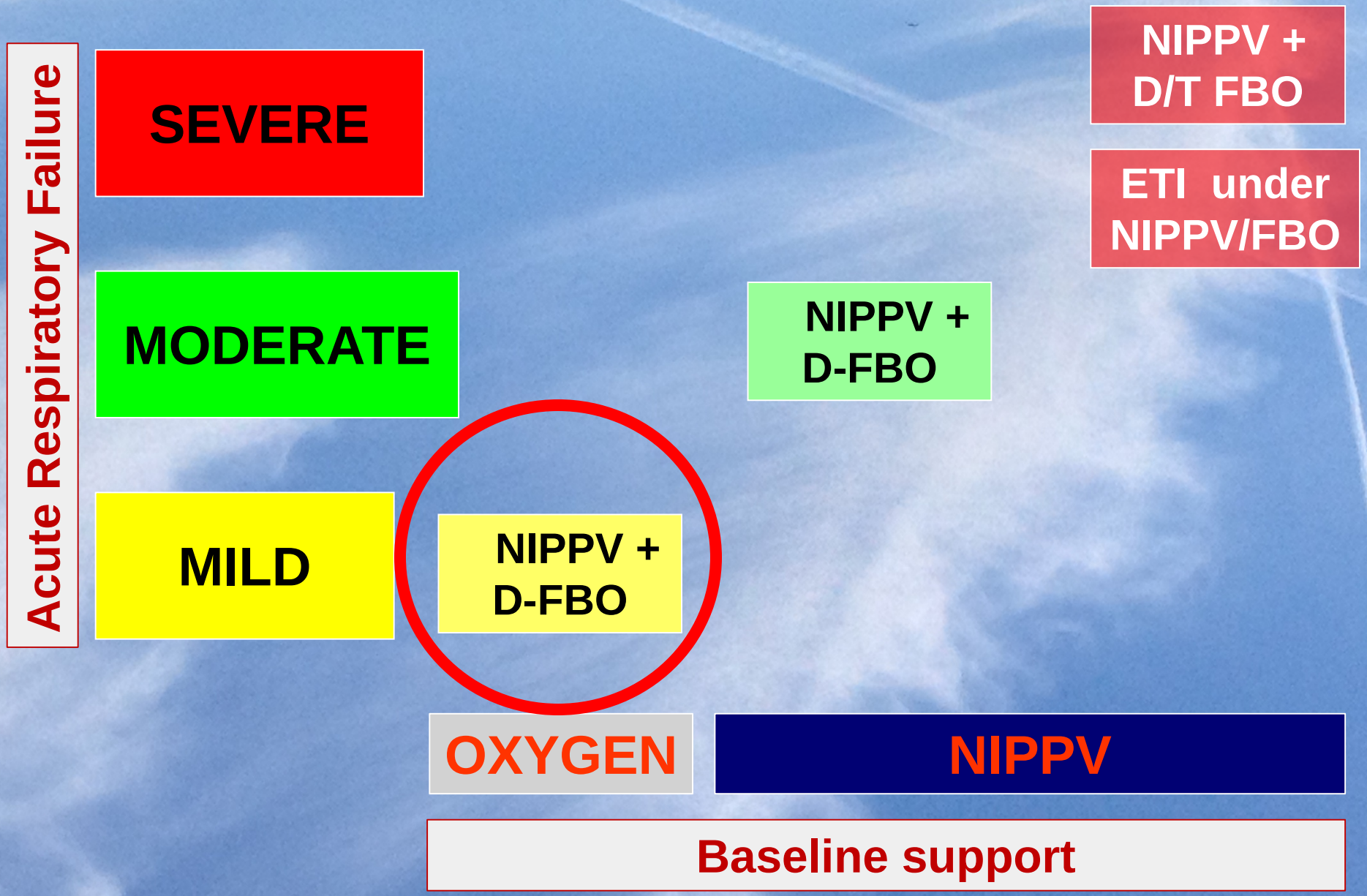
↑ $PaCO_2$ & ↓ PaO_2 over 90 min

Rationale of NPPV + FOB



- Correct hypoxia
- Correct rapid shallow breathing
- Compensate extra-work due to the bronchoscope within airway
- Compensate the Gas Exchange deterioration occurring during the 90 min after FOB

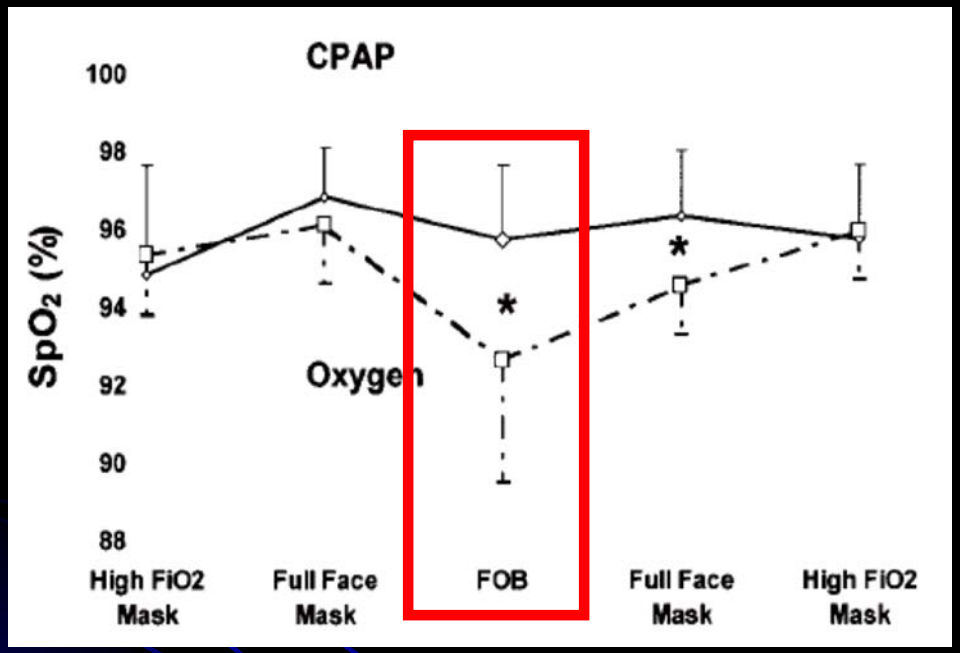
Type of FOB-NIPPV interventions



CPAP during Fiberoptic Bronchoscopy in hypoxemic Patients: A randomized, double blind study using a new device

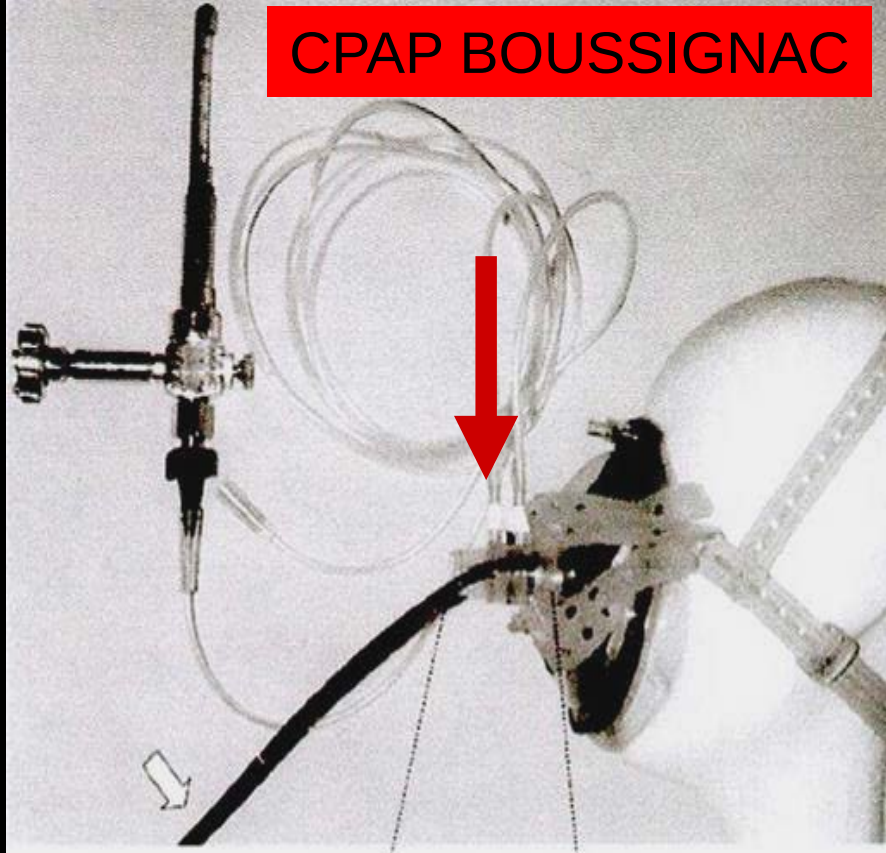
Maitre, AJRCCM, 2000;162:1063-1057

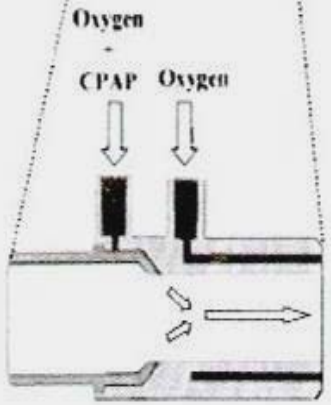
30 PTS with PaO2/FiO2 < 300



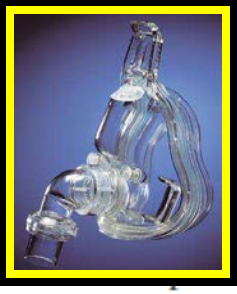
Need for Ventilatory Support in the 6 h after FOB	Oxygen (*n* = 15)	CPAP (*n* = 15)	p Values
Total	7	1	0.03
Attributed to FOB	5	0	0.04
NIV or CPAP	1	0	
Mechanical ventilation	4	0	

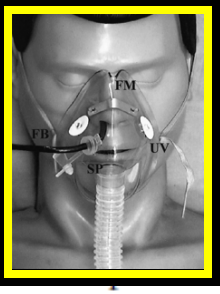
CPAP BOUSSIGNAC





Noninvasive Positive-Pressure Ventilation vs Conventional Oxygen Supplementation in Hypoxemic Patients Undergoing Diagnostic Bronchoscopy*





Antonelli M. et al. Chest 2002; 121: 1149-1154

26 hypoxemic pts with suspected HAP

Variable	(n = 13)	(n = 13)	p Value
Baseline			
Respiratory rate, breaths/min	35 ± 4	36 ± 4	0.18
Pao_2/Fio_2 ratio	143 ± 32	155 ± 24	0.30
$Paco_2$, mm Hg	50 ± 22	40 ± 8	0.15
pH	7.4 ± 0.07	7.4 ± 0.07	0.18
Heart rate, beats/min	94 ± 27	103 ± 20	0.35
MAP, mm Hg	88 ± 10	96 ± 13	0.08
During bronchoscopy			
Respiratory rate, breaths/min	31 ± 4	33 ± 4	0.12
Pao_2/Fio_2 ratio	261 ± 100	139 ± 38	< 0.001
$Paco_2$, mm Hg	48 ± 17	39 ± 8	0.13
pH	7.41 ± 0.06	7.44 ± 0.08	0.26
Heart rate, beats/min	98 ± 22	104 ± 10	0.37
MAP, mm Hg	87 ± 7	81 ± 13	0.12
within 10 h of FOB			
Mortality	4 (30)	7 (54)	0.16

Conclusion: In patients with severe hypoxemia, NPPV is superior to conventional oxygen supplementation in preventing gas-exchange deterioration during FOB with better hemodynamic tolerance.

Type of FOB-NIPPV interventions

Acute Respiratory Failure

SEVERE

MODERATE

MILD

NIPPV + D-FBO

NIPPV + D-FBO

NIPPV + D/T FBO

ETI under NIPPV/FBO

OXYGEN

NIPPV

Baseline support

RESEARCH ARTICLE Open Access

Can fiberoptic bronchoscopy be applied to critically ill patients treated with noninvasive ventilation for acute respiratory distress syndrome? Prospective observational study

BMC Pulmonary Medicine (2016) 16:89

Pervin Korkmaz Ekren[1*], Burcu Basarik Aydogan[1], Alev Gurgun[1], Mehmet Sezai Tasbakan[1], Feza Bacakoglu[1] and Stefano Nava[2]

Results: Twenty eight subjects (mean age 63.3 ± 15.9 years, 15 men, 13 women, PaO_2/FiO_2 rate 145 ± 50.1 at admission) were included the study. Overall the procedure was well tolerated with only 5 (17.9 %) patients showing minor complications. There was no impairment in arterial blood gas and cardiopulmonary parameters after FOB. PaO_2/FiO_2 rate increased from 132.2 ± 49.8 to 172.9 ± 63.2 ($p = 0.001$). No patient was intubated within 2 h after the bronchoscopy. 10.7, 32.1 and 39.3 % of the patients required invasive mechanical ventilation after 8 h, 24 h and 48 h, respectively. Bronchoscopy provided diagnosis in 27 (96.4 %) patients. Appropriate treatment was decided according to the results of the bronchoscopic sampling in 20 (71.4 %) patients.

STUDIO NON CONTROLLATO: INTUBAZIONE 40% a 48 H
ICU: IMMEDIATA DISPONIBILITA' A ETI!

Type of FOB-NIPPV interventions

Acute Respiratory Failure

SEVERE

NIPPV + D/T FBO

ETI under NIPPV/FBO

MODERATE

NIPPV + D-FBO

MILD

NIPPV + D-FBO

OXYGEN

NIPPV

Baseline support

Early fiberoptic bronchoscopy during non-invasive ventilation in patients with decompensated chronic obstructive pulmonary disease due to community-acquired-pneumonia

Scala *et al. Critical Care* 2010, **14**:R80

	NPPV (n = 15)	CMV (n = 15)	*P*
pH, mean (SD)	7.27 (0.02)	7.27 (0.03)	0.858
PaO_2/FiO_2, mean (SD)	163 (60)	165 (13)	0.910
$PaCO_2$ mmHg, mean (SD)	76 (7)	78 (13)	0.596
			0.396
			0.633
			0.486
			0.806

Key messages

- NPPV with early FBO performed by an experienced team is a potential alternative to ETI in acute COPD decompensations with HE and inability to clear copious secretions.

Tracheostomy, n (%)	0 (0)	6 (40.0)	0.008
Hospital mortality, n (%)	3 (20.0)	7 (46.7)	0.121
Complications, n (%)	3 (20.0)	12 (80.0)	0.001
Septic complications, n (%)	3 (20.0)	9 (60.0)	0.025

NASAL ACCESS/FULL-FACEMASK

ORAL ACCESS/TOTAL-FACEMASK

NASAL ACCESS/HELMET

ATTENZIONE AGLI ASPETTI PRATICI!

ORAL ACCEES /FULL-FACEMASK

ORAL ACCESS/NASAL MASK

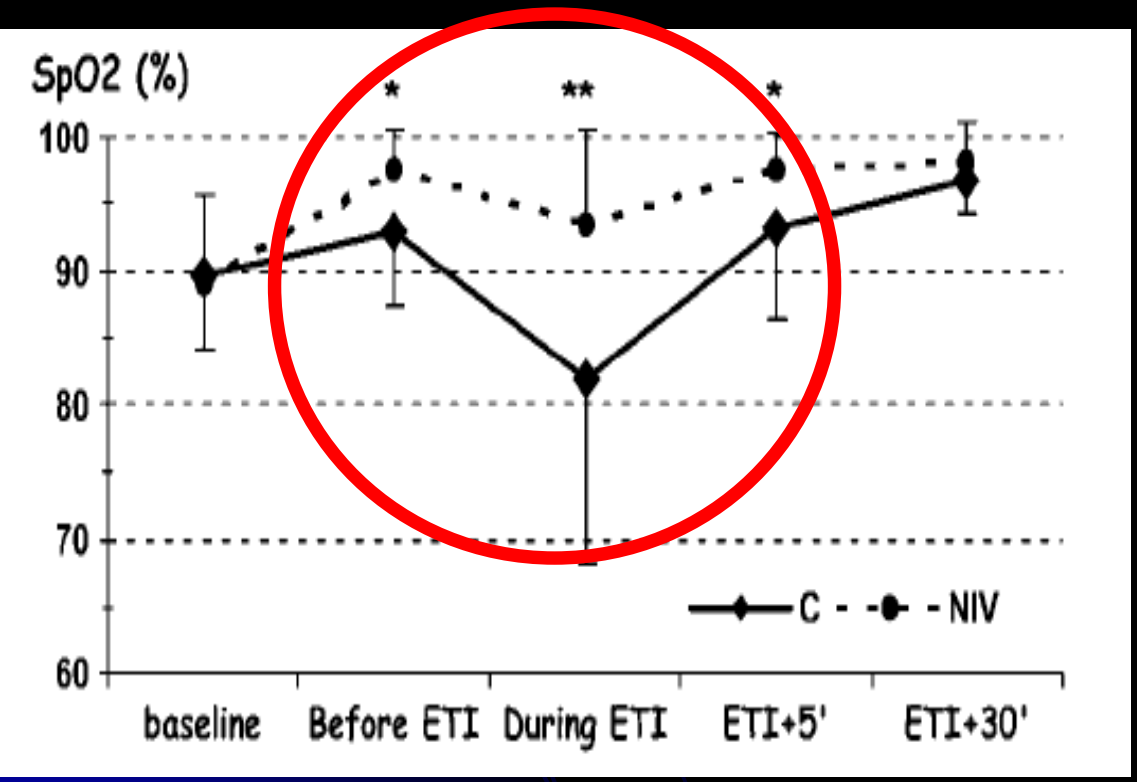
ORAL ACCESS/TOTAL-FACE MASK

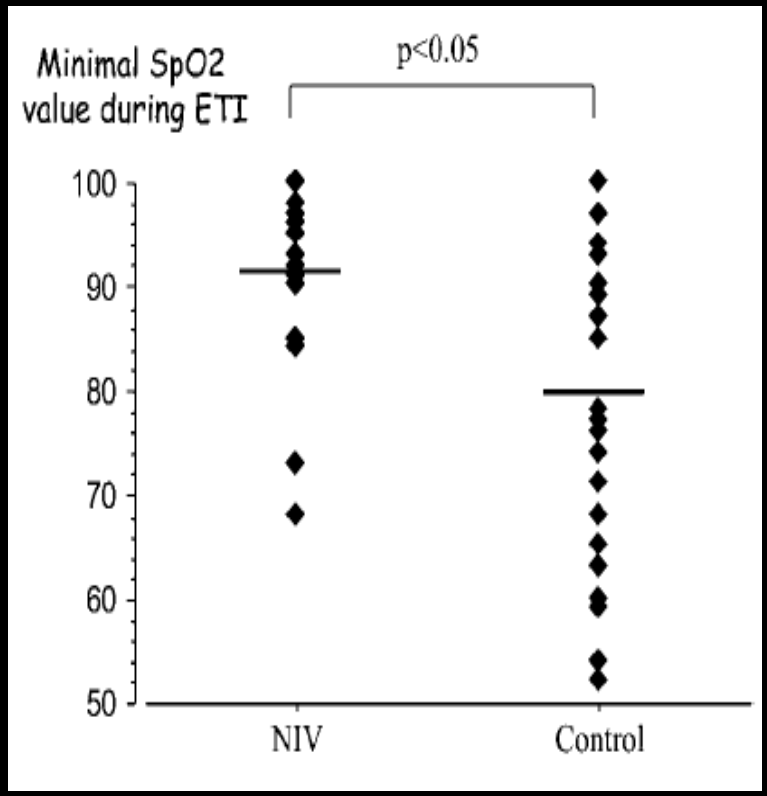
Noninvasive Ventilation Improves Preoxygenation before Intubation of Hypoxic Patients

Christophe Baillard, Jean-Philippe Fosse, Mustapha Sebbane, Gérald Chanques, François Vincent, Patricia Courouble, Yves Cohen, Jean-Jacques Eledjam, Frédéric Adnet, and Samir Jaber

Am J Respir Crit Care Med Vol 174. pp 171–177, 2006

NIV COME SUPPORTO PRE-INTUBAZIONE IN PAZ IPOSSIEMICI





Bronchoscopic Intubation During Continuous Nasal Positive Pressure Ventilation in the Treatment of Hypoxemic Respiratory Failure

Igor Barjaktarevic, MD, MSc[1], and David Berlin, MD[2]

J Intensive Care Med published online 15 November 2013

FB COME SUPPORTO ALL'ETI SE NIV FAILURE

Endotracheal intubation is difficult in patients with hypoxemic respiratory invasive positive pressure ventilation (NIPPV). Maintaining NIPPV during deterioration in gas exchange. We report a case series of 10 nonconsecutive patients with NIPPV failure who were intubated via a flexible bronchoscope during nasal mask positive pressure ventilation. All 10 patients were intubated in the first attempt. Hypotension was the most frequent complication (33%). Mean decrease in oxyhemoglobin saturation during the procedure was 4.7 ± 3.1. This method of intubation may extend the benefits of preoxygenation throughout the whole process of endotracheal intubation. It requires an experienced operator and partially cooperative patients. A prospective trial is necessary to determine the best intubation method for NIPPV failure.

ALTRI USI “PROCEDURALI”?

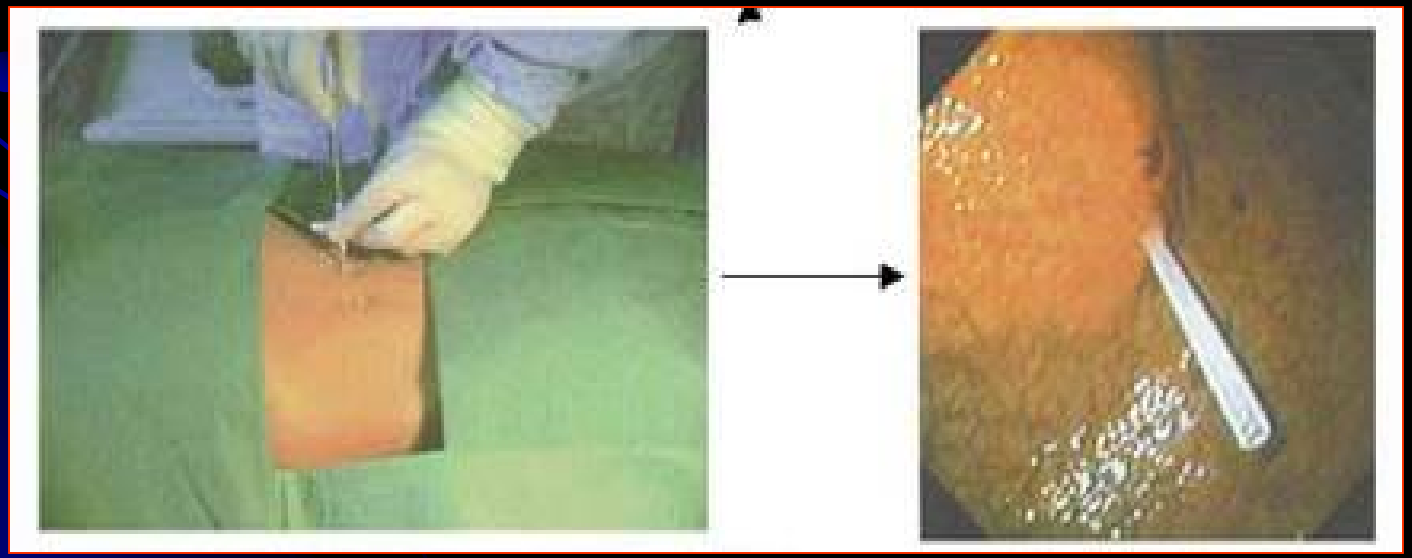
A survey of combined epidural-propofol anesthesia with noninvasive positive pressure ventilation as a minimally invasive anesthetic protocol

Hiroshi Iwama[ABCDEF], Shinju Obara[BD], Sachie Ozawa[BD], Setsuo Furuta[BD], Hiroshi Ohmizo[BD], Kazuhiro Watanabe[BD], Toshikazu Kaneko[BD]

Med Sci Monit, 2003; 9(7): CR316-323

NIV allows gastrostomy tube placement in patients with advanced ALS

Boitano *et al, Neurology. 2001; 56:413-4*



Non-invasive ventilation-aided transoesophageal echocardiography in high-risk patients: a pilot study

European Journal of Echocardiography 2010

Fabio Guarracino[1]*, Luca Cabrini[2], Rubia Baldassarri[1], Claudia Cariello[1], Remo Daniel Covello[2], Giovanni Landoni[2], Sonia Petronio[3], and Nicolino Ambrosino[4]

NIV with a modified full-face mask

Giuliano Rucci
Tommasina Casale
Stefano Nava

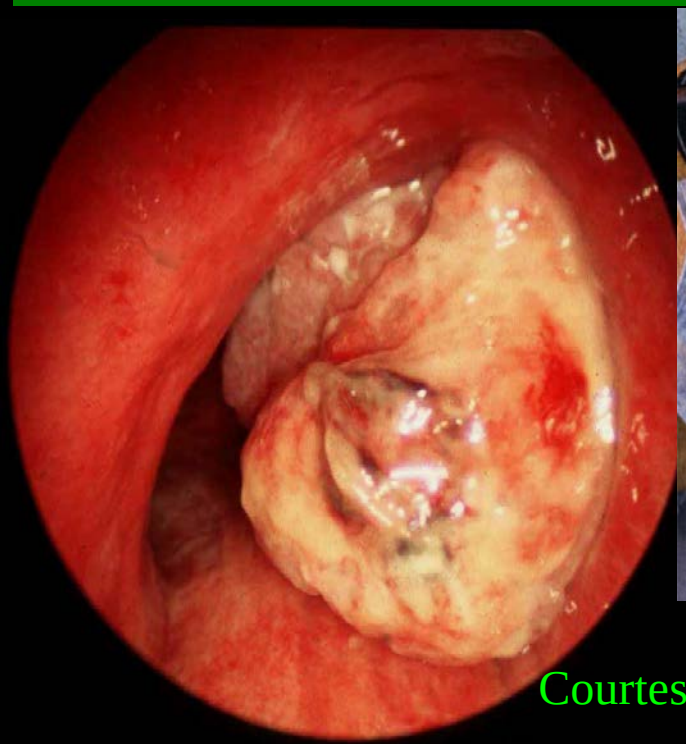
Intensive Care Med (2013) 39:1166–1167

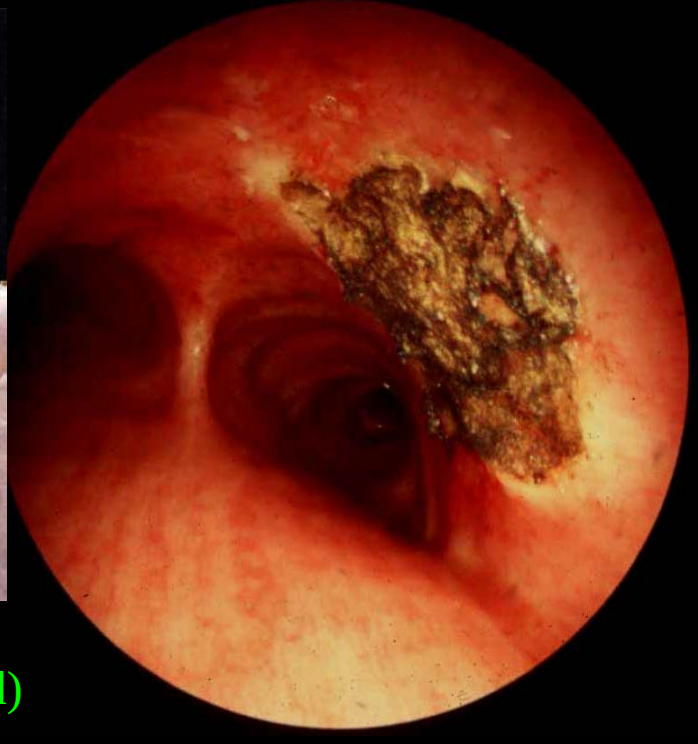
First use of noninvasive ventilation during urgent coronary stenting in acute myocardial infarction complicated by pulmonary edema

NEGATIVE-PRESSURE NIV in corso di DISOSTRUZIONE LASER-ASSISTITA

- Non necessita' di miorisoluzione
- Piu' Bassa FiO2
- Miglior Controllo VA
- Tempi di recupero piu' brevi

Natalini et al 1998





Courtesy, by Cavaliere S. (modified)

NIV COME SUPPORTO A EBUS IN ANALGO SEDAZIONE

Alternativa a Maschera Laringea?

Working in progress

Original Study

Journal of Veterinary Emergency and Critical Care **19**(5) 2009, pp 416–425
doi: 10.1111/j.1476-4431.2009.00458.x

Noninvasive ventilation in cats

Judy E. Brown, DVM, MSc; Alexa M.E. Bersenas, DVM, MSc, DACVECC; Karol A. Mathews, DVM, DVSc, DACVECC and Carolyn L. Kerr, DVM, PhD, DVSc, DACVA