La ventilazione meccanica (non invasiva) nell'anziano

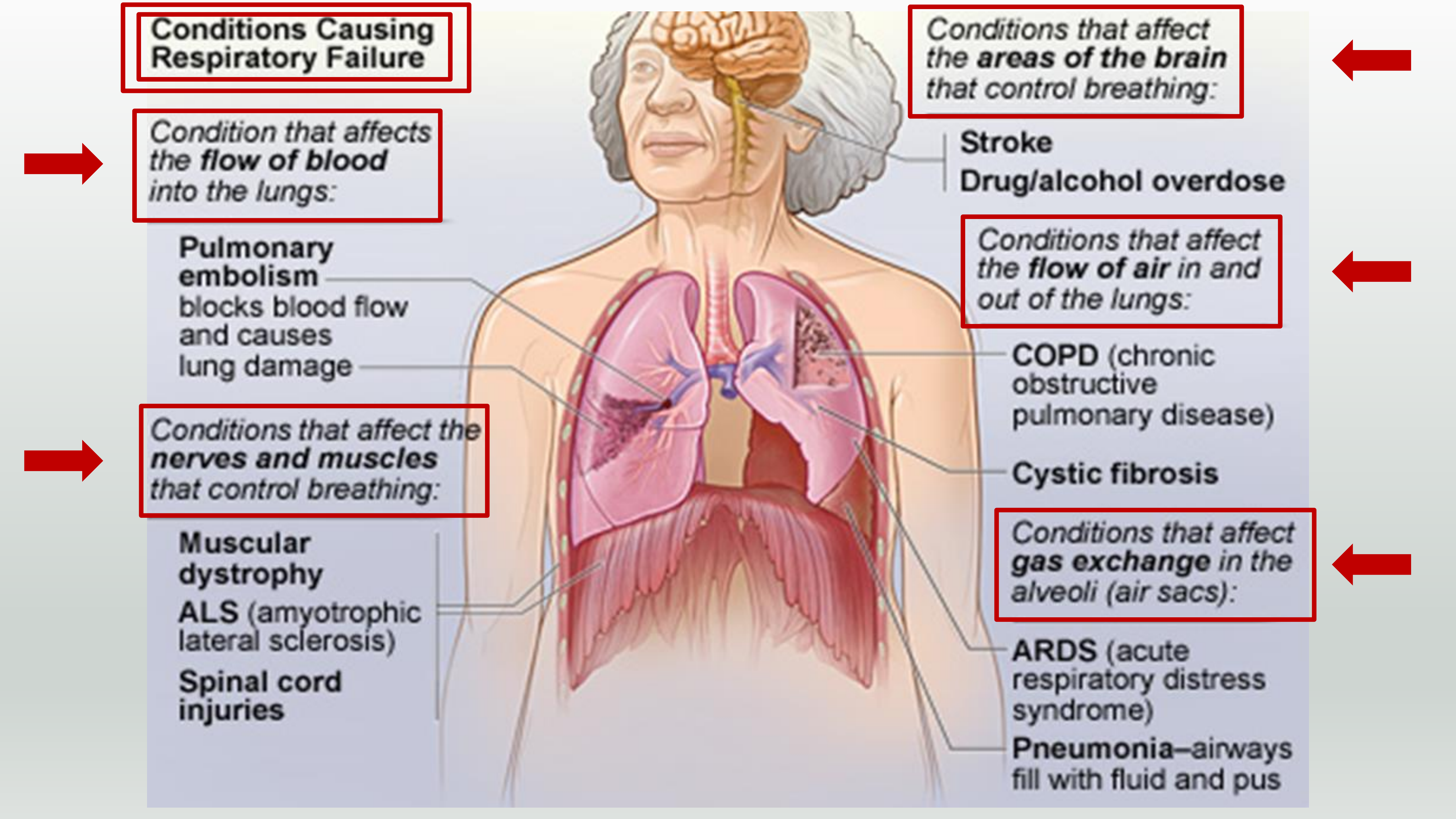
ANDREA CRUCITTI – 8 MARZO 2019

Insufficienza respiratoria

Fallimento del sistema respiratorio in una o entrambe le sue principali funzioni di scambio gassoso (ossigenazione, eliminazione dell'anidride carbonica)

PaO_2 <60 mm Hg
con o senza
$PaCO_2$ >45 mm Hg

Diverse malattie possono contribuire allo sviluppo di insufficienza respiratoria, che può essere diagnosticata durante un episodio acuto o può manifestarsi progressivamente come conseguenza di patologie croniche



Conditions Causing Respiratory Failure
Condition that affects the flow of blood into the lungs:
Pulmonary embolism blocks blood flow and causes lung damage
Conditions that affect the nerves and muscles that control breathing:
Muscular dystrophy
ALS (amyotrophic lateral sclerosis)
Spinal cord injuries
Conditions that affect the areas of the brain that control breathing:
Stroke
Drug/alcohol overdose
Conditions that affect the flow of air in and out of the lungs:
COPD (chronic obstructive pulmonary disease)
Cystic fibrosis
Conditions that affect gas exchange in the alveoli (air sacs):
ARDS (acute respiratory distress syndrome)
Pneumonia–airways fill with fluid and pus

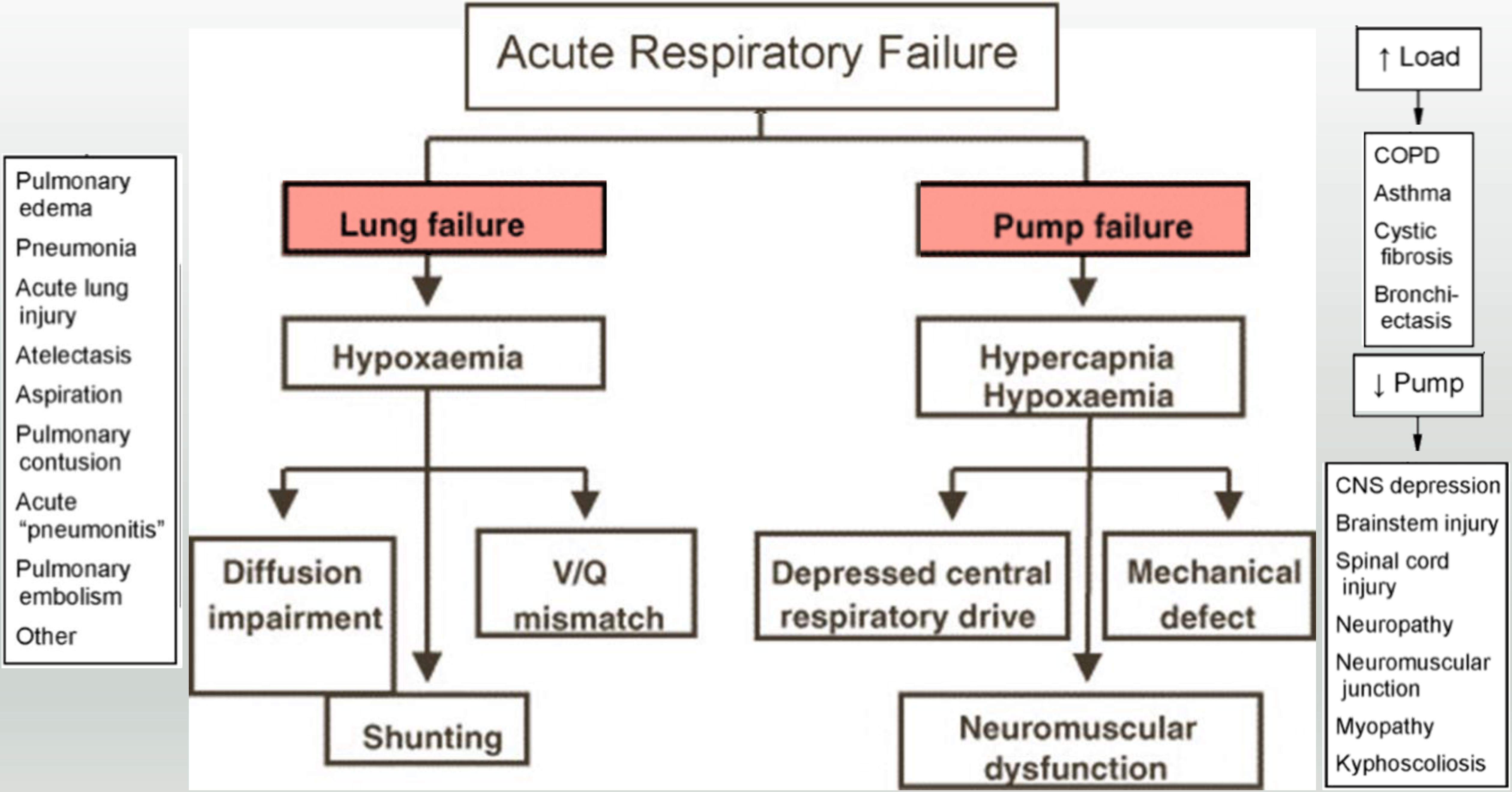
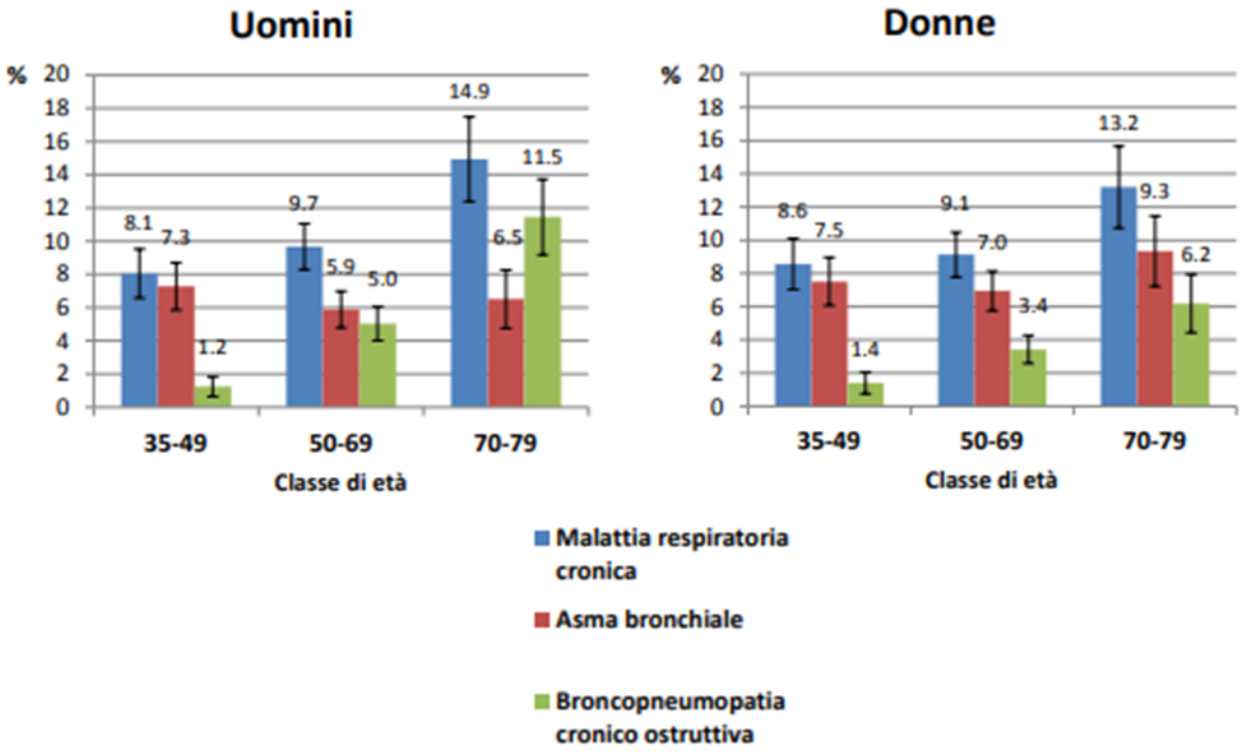
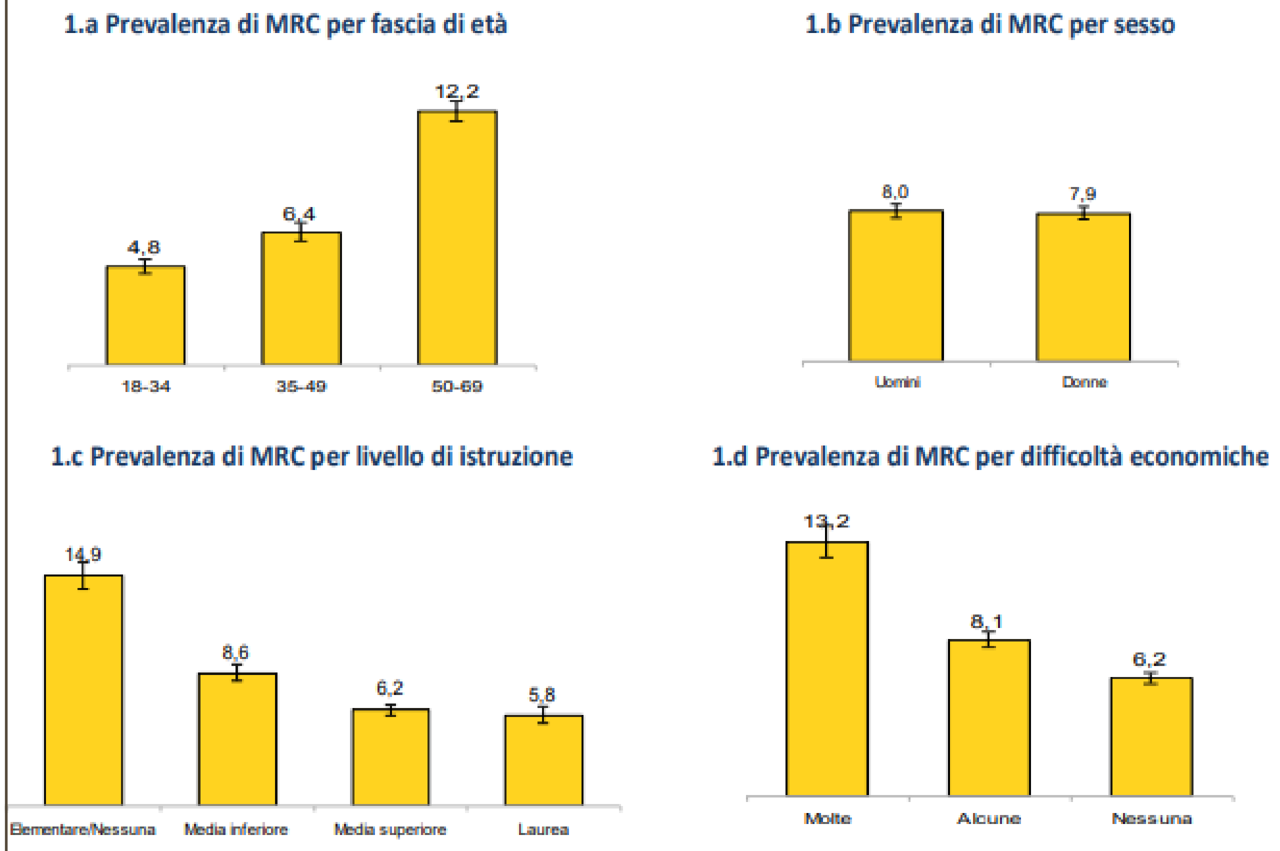

Acute Respiratory Failure
Lung failure
Hypoxaemia
Diffusion impairment
Shunting
V/Q mismatch
Pump failure
Hypercapnia Hypoxaemia
Depressed central respiratory drive
Mechanical defect
Neuromuscular dysfunction
Pulmonary edema
Pneumonia
Acute lung injury
Atelectasis
Aspiration
Pulmonary contusion
Acute "pneumonitis"
Pulmonary embolism
Other
↑ Load
COPD
Asthma
Cystic fibrosis
Bronchi-ectasis
↓ Pump
CNS depression
Brainstem injury
Spinal cord injury
Neuropathy
Neuromuscular junction
Myopathy
Kyphoscoliosis

Figura 1: Prevalenza (IC 95%) di malattia respiratoria cronica per classe di età e sesso. Indagine di popolazione Osservatorio Epidemiologico Cardiovascolare/Health Examination Survey 2008-2012.





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TERAPIA DELL'INSUFFICIENZA RESPIRATORIA

Terapia eziologica
O2 terapia
Supporto ventilatorio

La Ventilazione Meccanica non Invasiva (NIMV), *rappresenta una tecnica di supporto ventilatorio senza l'uso della via endotracheale*

La ventilazione meccanica non invasiva è il mezzo di cui il medico, anche non intensivista, dispone per il trattamento e il controllo dell'insufficienza respiratoria acuta (o acuta su cronica) nei suoi vari stadi, e con varie finalità.
E poi, con approccio più specialistico, è sempre maggiore il suo utilizzo nel trattamento e nella stabilizzazione dell'insufficienza respiratoria cronica, al domicilio o in strutture sanitarie.

LA VENTILAZIONE MECCANICA NON INVASIVA

DEFINIZIONE

Per **Ventilazione Meccanica Non Invasiva** *a pressione positiva* si intende un'assistenza ventilatoria che non utilizza una protesi endotracheale (tubo orotracheale o cannula tracheostomica) bensì un'interfaccia, rappresentata da una maschera o da uno scafandro. Vengono, quindi, preservate le vie aeree del paziente che respira in maniera spontanea.

Le interfacce possono essere classificate come:

- **Nasali**: maschere nasali e olive nasali, non indicate in corso di insufficienza respiratoria acuta visto che il paziente respira a bocca aperta;
- **Oro-Nasali**: maschere facciali che coprono naso e bocca;
- **Full face** (o total face) **mask:** maschere facciali totali che includono anche gli occhi;
- **Casco** (o scafandro)

Cos'è un ventilatore?

Un ventilatore meccanico è un apparecchio che attraverso l'applicazione alle vie aeree di una pressione sovra-atmosferica genera a livello polmonare un incremento di volume corrente.

Si sostituisce in parte o completamente all'azione dei muscoli respiratori la cui efficacia può essere alterata per patologia primitiva o secondaria polmonare, e determina la riduzione del lavoro e della fatica respiratoria.

Tale provvedimento terapeutico non sostituisce la terapia farmacologica e non costituisce un'alternativa equivalente all'intubazione endotracheale che non va ritardata se necessaria.

La tecnica della ventilazione meccanica non invasiva si caratterizza per le medesime modalità ventilatorie di quella invasiva ma preservando le vie aeree del paziente

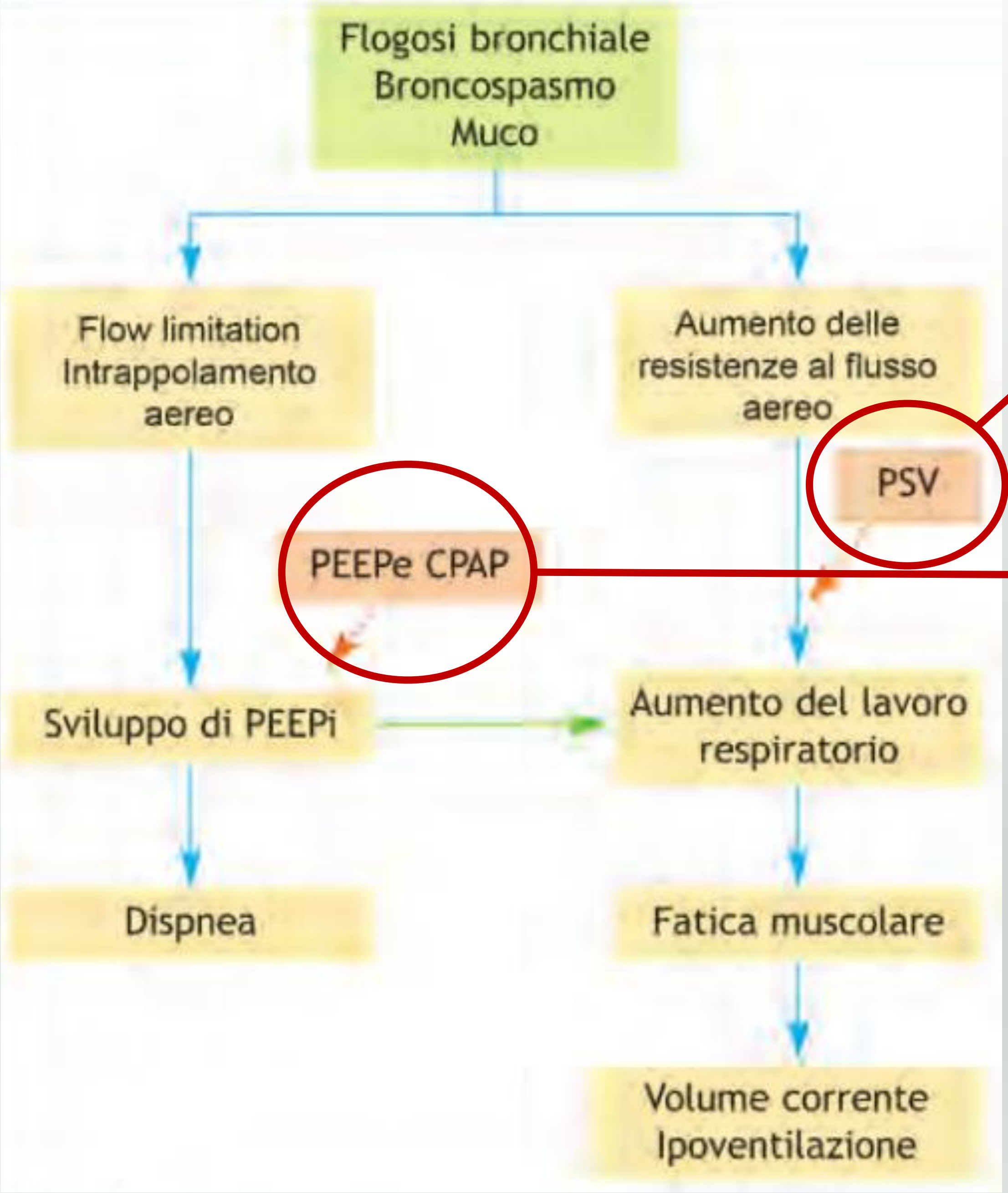
Bi-Level o PSV o NIMV a doppio livello di pressione

Ventilazione generata grazie ad ventilatore che garantisce un gradiente pressorio tra un livello inspiratorio più elevato (IPAP = Pressione Inspiratoria Positiva o PSV = Pressure Support Ventilation) ed un livello espiratorio inferiore (EPAP = Pressione Espiratoria Positiva o PEEP = End Expiratory Positive Pressure) in risposta al pattern respiratorio del paziente che è in respiro spontaneo. Quando il ventilatore «cicla» in inspirazione, un flusso rapido di aria (ambiente o miscelata con O2) entra nei polmoni fino a che viene raggiunto il livello di «*pressure support*». Quando il flusso rallenta ad un livello che segnala la fine dell’inspirazione, il ventilatore pone termine all’atto respiratorio e di conseguenza la pressione nel circuito scende al livello basale, consentendo al paziente di espirare.

CPAP (Pressione Positiva Continua nelle vie Aeree)

Al paziente in respiro spontaneo viene somministrata una pressione (PEEP) che è sempre la medesima indipendentemente dalla fase del ciclo respiratorio: tale pressione può essere erogata da un ventilatore, ma anche da sistemi più semplici, meno costosi e più gestibili.

NIMV a doppio livello di pressione

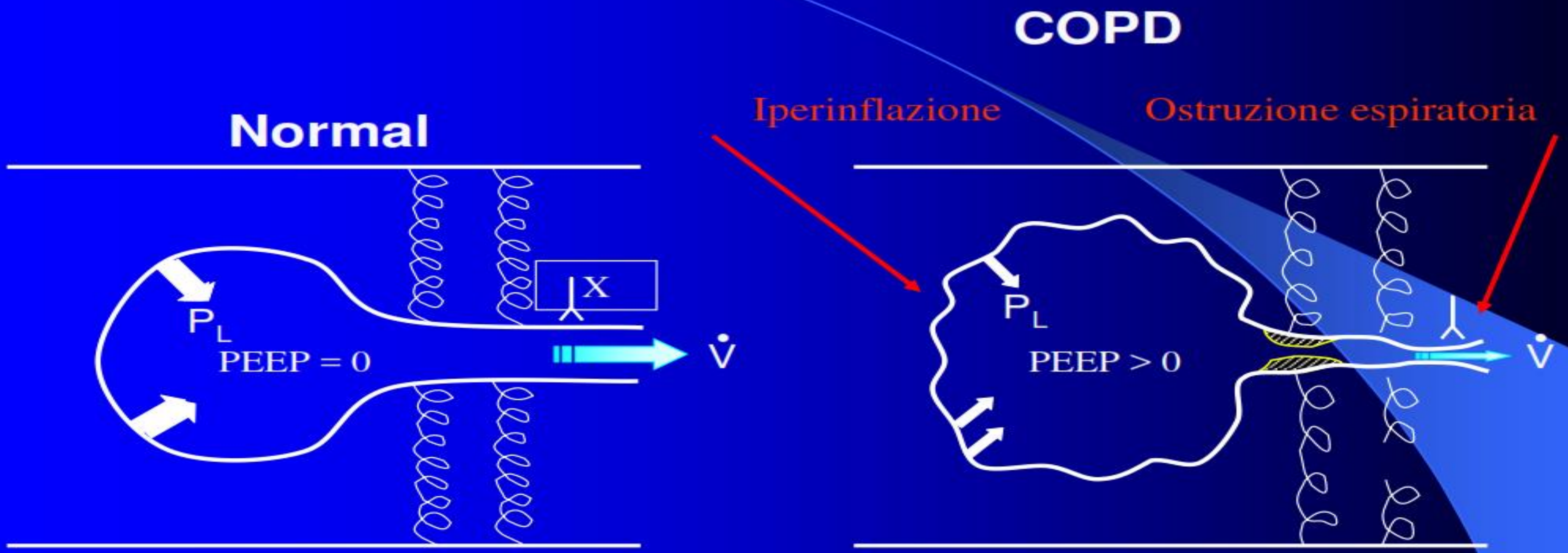


Aumenta la ventilazione alveolare e i volumi correnti

Corregge lo sviluppo intrinseco di pressione positiva di fine espirazione e previene il collasso alveolare

Riduzione del lavoro dei muscoli respiratori, miglioramento rapporto ventilazione/perfusione

BPCO : FISIOPATOLOGIA



Reduced recoil

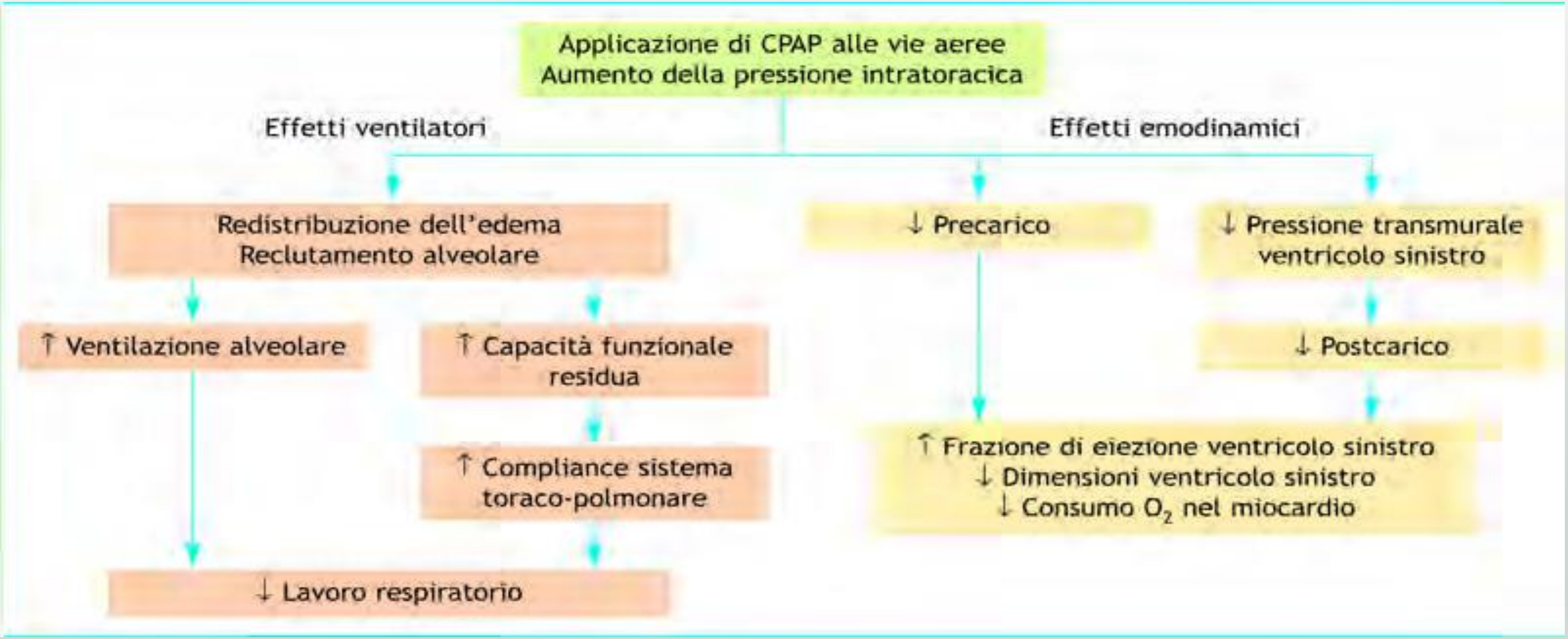
Reduced tethering

Increased airways resistance

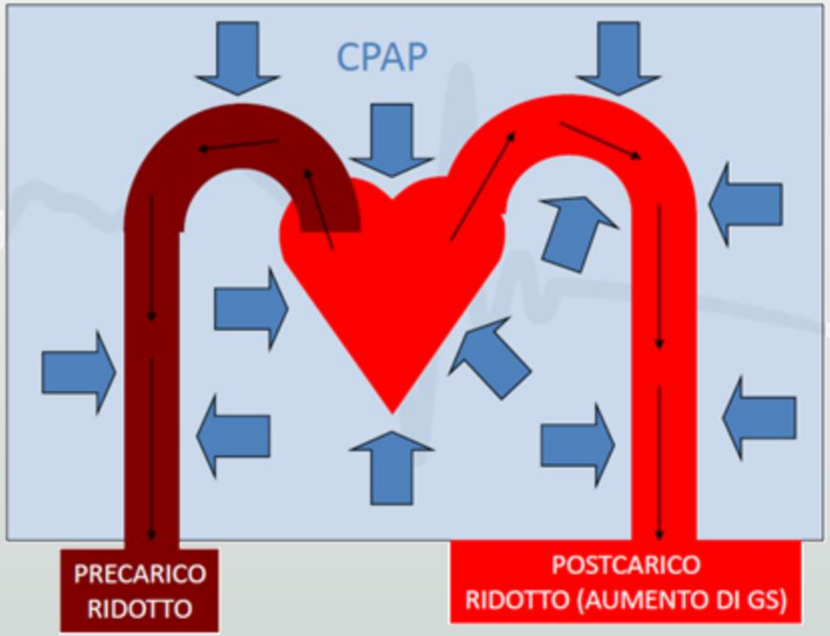
→ **Expiratory flow limitation**

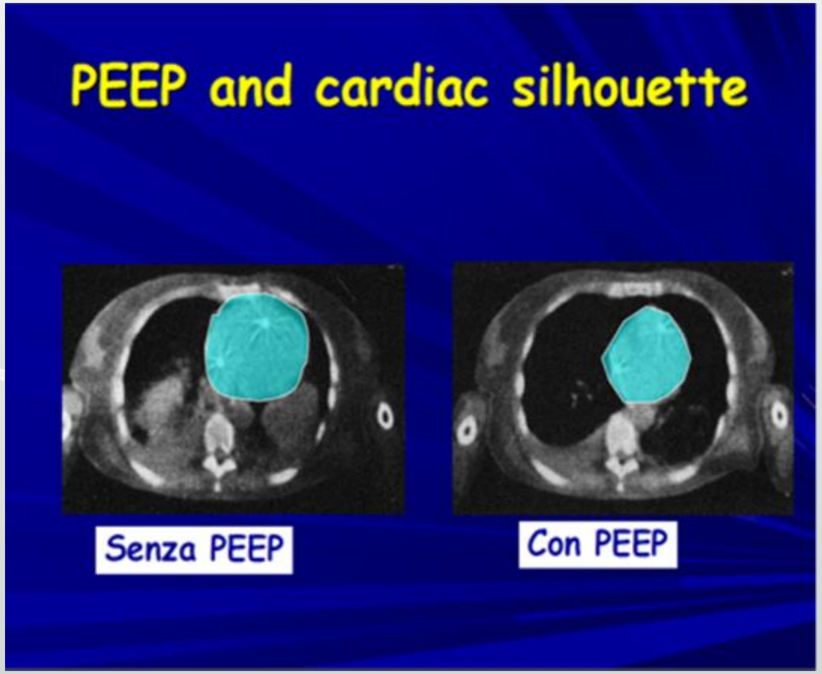
Courtesy of DE O'Donnell

CPAP (Pressione Positiva Continua nelle vie Aeree)



CPAP (Pressione Positiva Continua nelle vie Aeree)





Migliora la funzionalità cardiaca attraverso la riduzione del volume cardiaco che viene «compresso» dall’aumento di volume polmonare, la riduzione del ritorno venoso per aumento della pressione intratoracica e la riduzione del lavoro respiratorio e quindi del consumo di O2.

O2 TERAPIA

\+

TERAPIA MEDICA

\+ NIV

↓ tasso di intubazione
↓ durata della degenza ospedaliera
↓ mortalità intra-ospedaliera

VANTAGGI DELLA NIV

- Precoce supporto ventilatorio
- Facilità di applicazione e rimozione
- Applicazione intermittente
- Maggior difesa delle vie respiratorie
- Ridotta necessità di sedazione
- Possibilità di fonazione, alimentazione

Quando iniziare la VMNI ?

PARAMETRI EMOGASANALITICI

Esistono tre momenti fondamentali in cui applicare la VMNI, con differente significato:

1) Paziente nelle *fasi iniziali di insufficienza respiratoria acuta ipercapnica o ipossica* con **pH compreso tra 7.35 e 7.30 o con PaO2/FiO2 compreso tra 300 e 250** (**intervento per prevenire la progressione dell' IRA**);
2) Paziente in condizioni più critiche, con insufficienza respiratoria più conclamata, **pH compreso tra 7.30 e 7.25 o PaO2/FiO2 compreso tra 250 e 200** (**evitare il ricorso all'intubazione**);
3) Paziente con **pH < 7.25 o PaO2/FiO2 < a 200** (breve trial in ambiente protetto come **possibile alternativa all'intubazione**).

PARAMETRI CLINICI

Aumento della dispnea

Tachipnea (> 25 atti/min nella BPCO; >30 atti/min nelle patologie restrittive)

Segni di aumentato lavoro respiratorio (utilizzo dei muscoli accessori e respiro paradosso per dissincronismo toraco-addominale)

In quali patologie è indicata la VMNI?

- BPCO riacutizzata
- Edema polmonare acuto
- Svezzamento dalla ventilazione invasiva
- Attacco asmatico acuto non responsivo a terapia medica
- Polmoniti acquisite in comunità (nei casi di BPCO e immunodepressione)
- Acute lung injury (ALI) – ARDS
- Trauma toracico
- Postoperatorio
- Bronchiectasie – fibrosi cistica
- Malattie restrittive - Apnee ostruttive

DNI order (Do-not-intubate)

NIV come massimo trattamento ventilatorio ("ceiling ventilatory treatment")

Pazienti che rifiutano l'intubazione

Pazienti anziani con malattie cardio-respiratorie croniche in fase avanzata

Palliazione, nell'insufficienza respiratoria acuta in corso di patologia tumorale

Oxygen therapy & ventilatory support in stable COPD

OXYGEN THERAPY AND VENTILATORY SUPPORT IN STABLE COPD

OXYGEN THERAPY

- The long-term administration of oxygen increases survival in patients with severe chronic resting arterial hypoxemia **(Evidence A)**.
- In patients with stable COPD and moderate resting or exercise-induced arterial desaturation, prescription of long-term oxygen does not lengthen time to death or first hospitalization or provide sustained benefit in health status, lung function and 6-minute walk distance **(Evidence A)**.
- Resting oxygenation at sea level does not exclude the development of severe hypoxemia when traveling by air **(Evidence C)**.

VENTILATORY SUPPORT

- NPPV may improve hospitalization-free survival in selected patients after recent hospitalization, particularly in those with pronounced daytime persistent hypercapnia ($PaCO_2 \geq 52$ mmHg) **(Evidence B)**.

TABLE 3.10

- ***During exacerbations of COPD.*** Noninvasive ventilation (NIV) in the form of noninvasive positive pressure ventilation (NPPV) is the standard of care for decreasing morbidity and mortality in patients hospitalized with an exacerbation of COPD and acute respiratory failure.

Management of Exacerbations

- Non-invasive mechanical ventilation should be the first mode of ventilation used in COPD patients with acute respiratory failure who have no absolute contraindication because it improves gas exchange, reduces work of breathing and the need for intubation, decreases hospitalization duration and improves survival.

INDICATIONS FOR NONINVASIVE MECHANICAL VENTILATION (NIV)

At least one of the following:

- Respiratory acidosis ($PaCO_2 \geq 6.0$ kPa or 45 mmHg and arterial pH ≤ 7.35).
- Severe dyspnea with clinical signs suggestive of respiratory muscle fatigue, increased work of breathing, or both, such as use of respiratory accessory muscles, paradoxical motion of the abdomen, or retraction of the intercostal spaces.
- Persistent hypoxemia despite supplemental oxygen therapy.

La NIMV a doppio livello di pressione deve essere considerata la modalità ventilatoria di scelta in pazienti con BPCO riacutizzata e acidosi respiratoria associata alla terapia medica standard massimale.

Per quanto riguarda l'uso della **CPAP nella riacutizzazione di BPCO** non vi sono in letteratura studi randomizzati e controllati che ne supportino con evidenza l'utilizzo, però esistono alcuni lavori che riportano un beneficio in termini di riduzione della $PaCO_2$, del pH, della frequenza respiratoria e aumento della PaO_2.

È possibile ipotizzarne ***un utilizzo precoce nelle riacutizzazioni di BPCO in ambienti dove l'inizio di una NIMV a doppio livello di pressione non sia tecnicamente possibile***, con terapia broncodilatatrice, stretto monitoraggio e ravvicinato controllo emogasanalitico (a 30 minuti dall'inizio), adeguato addestramento tecnico del personale e opportunità, in caso di fallimento, di passare successivamente a metodiche di NIMV a doppio livello di pressione o ventilazione invasiva.

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

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.	IIa	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.	IIa	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	

***CPAP** is a feasible technique also in the pre-hospital setting*

***Bi-level** improves minute ventilation and is especially useful in patients with hypercapnia and acidosis, that most typically are those with a previous history of COPD.*

European Heart Journal, 2016; 37, 2129–2200

Review

Management of Acute Respiratory Failure Due to Community-Acquired Pneumonia: A Systematic Review

3.2.1. Non-Invasive Ventilation (NIV)

Nine papers assessed the role of NIV [11,31–38]: eight adopted an observational design (six prospective and two retrospective). They showed heterogeneous results, with a success rate ranging from 20% to 76%. NIV success predicted survival, whereas its failure was associated with increased mortality, longer ICU and hospital stay, and a higher rate of complications (e.g., sepsis). The majority of the studies chose NIV failure as the primary endpoint (i.e., need for endotracheal intubation and mechanical ventilation). Only Murad and collaborators performed a study on 209 patients using in-hospital mortality as the primary outcome and reported the highest NIV failure rate [35]. The study showing the lowest NIV failure rate (20%) was published by Nicolini in 2014 and proved a different NIV response in patients with ARF not associated with pre-existing lung or cardiac disease [36]. The same findings were described by Carrillo et al., where "de novo" ARF was associated with greater NIV failure [32]. Confalonieri et al. compared non-invasive positive pressure ventilation in CAP with standard care (oxygen therapy) [11]: NIV prevented intubation in patients with CAP associated with COPD or hypercapnic ARF.

The factors associated with an increased risk of NIV failure were: higher severity score on admission [32,35,37], deteriorating oxygenation (as indicated by a-ADO_2, P/F or oxygenation index) or physiological parameters (respiratory and heart rate, blood pH) 1 or 2 h after NIV exposure [32,33,35,37], and radiological worsening of lung infiltrates [32,36]. Two studies compared the efficacy of NIV in ARF due to CAP or due to causes other than CAP, such as COPD and cardiogenic pulmonary oedema: the highest intubation rate was observed in patients with pneumonia [31,34].

3.2.2. Continuous Positive Airway Pressure (C-PAP)

Two randomized clinical trials compared C-PAP with standard oxygen therapy. They showed superiority of C-PAP in preventing intubation following the improvement of oxygenation parameters, including respiratory rate [39,40].

Vanoni NM, et al. Medical Science 2019, 7, 10

Polmonite severa acquisita in comunità

Quali problemi presenta?

Si determina un effetto shunt, negli alveoli è presente essudato e il paziente è spesso ipovolemico a causa della febbre, sepsi complicanza frequente. I noti effetti emodinamici e ventilatori in corso di NIMV non sempre si rivelano utili in tali pazienti.

Ventilazione a doppio livello di pressione in pazienti BPCO selezionati (con acidosi respiratoria).
CPAP potrebbe trovare indicazione in pazienti senza BPCO che rimangono ipossiemici nonostante terapia standard massimale, ma senza dilazionare l'intubazione quando indicata.

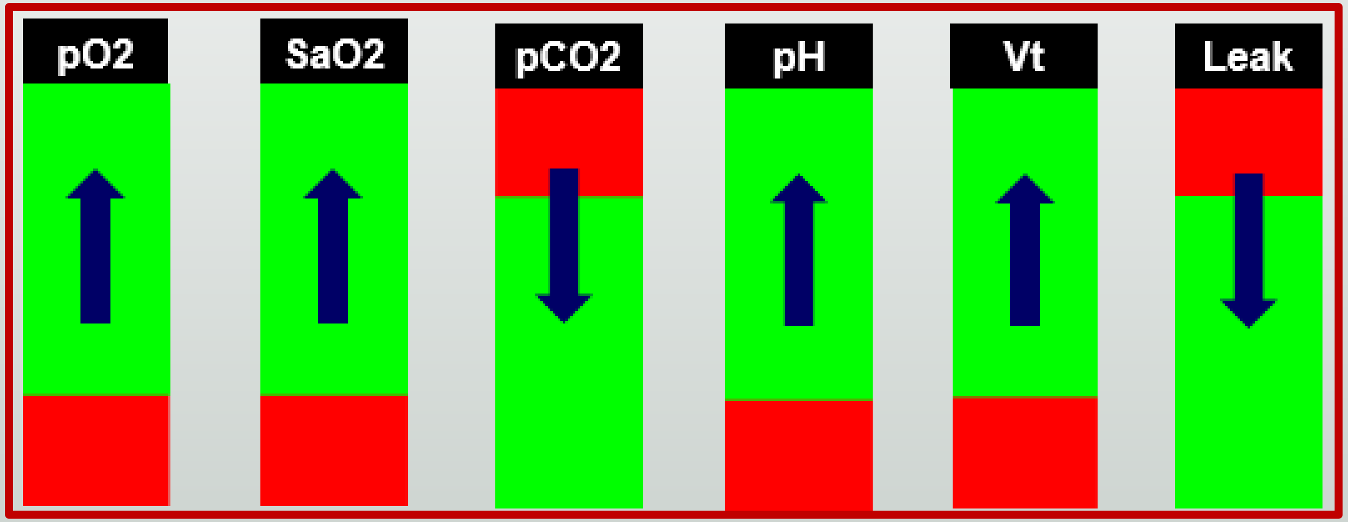
Broncoscopia disostruttiva ?

Controindicazioni alla ventilazione

- Instabilità cardio-vascolare, nonostante somministrazione di inotropi
- Aritmie minacciose
- Arresto cardio-respiratorio
- Coma soprattutto se non ipercapnico
- Clearance delle secrezioni bronchiali inefficace
- pH <7.1
- Grave ipossiemia
- Necessità di proteggere le vie aeree (vomito, sanguinamento apparato gastro-intestinale)
- Ostruzione delle vie aeree superiori
- PNX non drenato
- Recente chirurgia delle alte vie digestive
- Recente chirurgia facciale
- Grave delirium, agitazione psicomotoria non controllata farmacologicamente
- Intolleranza alla NIV

VALUTAZIONE E MONITORAGGIO
Cosa dovrebbe cambiare un'ora dopo l'avvio

- **FR < 30/minuto**
- **Distress respiratorio: riduzione della dispnea, riduzione del reclutamento della muscolatura accessoria**
- **Sensorio: miglioramento o stabilità**



- **Sp02 > 90%**
- **Pa02/FiO2: miglioramento di 100**
- **Miglioramento del pH rispetto al basale**
- **PaCO2 riduzione del 20% rispetto al basale**

Poi rivalutazione a 6-12 h

Italian Journal of Medicine (2009) 3, 201—211

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RASSEGNA

La ventilazione meccanica non invasiva nell'insufficienza respiratoria acuta: stato dell'arte *(I parte)*☆

Noninvasive ventilation for acute respiratory failure: state of the art (I part)

Federico Lari[a,*], Fabrizio Giostra[b], Gianpaolo Bragagni[a], Nicola Di Battista[c]

NIV for ARF due to COPD and ACPE is feasible, safe and effective also in a general medical ward

if selection of patients, staff training and monitoring are appropriate

Its early application improves clinical parameters, arterial blood gases, prevents endotracheal intubation, decreases mortality and hospitalization

Insufficienza respiratoria nell’anziano

Principali modificazioni dell'apparato respiratorio nell'anziano

- Irrigidimento gabbia toracica, ipotrofia muscolare del diaframma

- Diminuzione delle proprietà elastiche del polmone,
aumento del suo diametro sagittale

- Vie aeree distali soggette a collasso,
graduale riduzione superficie di scambio gassoso

- Capacità Vitale diminuita e Volume Residuo aumentato

- Accentuata disomogeneità dei rapporti ventilazione/perfusione

- Attenuata risposta ad ipossiemia e ridotta sensibilità a CO_2,
maggior tendenza ad ipoventilazione notturna

Principali modificazioni dell'apparato respiratorio nell'anziano

Declino globale della funzione respiratoria

↓

Maggiore rischio di sviluppare insufficienza respiratoria

Inadeguato recupero da un episodio di insufficienza respiratoria acuta,
con predisposizione al successivo sviluppo di insufficienza respiratoria cronica

Tabella 1. Media (IC 95%) dei principali indicatori di capacità respiratoria misurati attraverso la spirometria, per classi di età e sesso e presenza di malattia respiratoria cronica (MRC). Osservatorio Epidemiologico Cardiovascolare/Health Examination Survey 2008-2012.

UOMINI

	Capacità vitale osservata* (ml/cm)						VEMS osservata* (ml/cm)					
	Persone con MRC			Persone senza MRC			Persone con MRC			Persone senza MRC		
Anni	media	IC 95%		media	IC 95%		media	IC 95%		media	IC 95%	
35-49	26.2	25.3	27.1	26.9	26.7	27.2	22.5	21.8	23.3	24.0	23.8	24.2
50-69	21.7	20.9	22.5	22.6	22.4	22.8	17.9	17.2	18.6	19.9	19.7	20.1
70-79	16.0	15.1	16.9	18.6	18.2	18.9	12.7	11.9	13.6	15.9	15.6	16.2
35-79	**21.3**	**20.6**	**21.9**	**23.4**	**23.2**	**23.5**	**17.7**	**17.1**	**18.2**	**20.6**	**20.4**	**20.7**

	Capacità vitale %**						VEMS %**					
	Persone con MRC			Persone senza MRC			Persone con MRC			Persone senza MRC		
Anni	media	IC 95%		media	IC 95%		media	IC 95%		media	IC 95%	
35-49	100.0	96.8	103.2	102.4	101.3	103.4	104.4	101.1	107.8	110.8	109.8	111.8
50-69	96.3	93.4	99.3	98.5	97.6	99.5	100.2	96.8	103.7	109.1	108.1	110.1
70-79	80.0	75.7	84.3	91.4	89.8	93.1	83.3	77.9	88.7	102.3	100.4	104.3
35-79	**92.6**	**90.4**	**94.7**	**98.5**	**97.9**	**99.2**	**96.5**	**94.0**	**99.0**	**108.4**	**107.7**	**109.1**

DONNE

	Capacità vitale osservata* (ml/cm)						VEMS osservata* (ml/cm)					
	Persone con MRC			Persone senza MRC			Persone con MRC			Persone senza MRC		
Anni	media	IC 95%		media	IC 95%		media	IC 95%		media	IC 95%	
35-49	20.8	20.0	21.5	21.1	20.9	21.3	18.0	17.4	18.6	18.9	18.7	19.1
50-69	16.8	16.1	17.5	17.6	17.4	17.8	14.1	13.5	14.7	15.5	15.3	15.6
70-79	13.0	12.4	13.7	14.2	13.9	14.5	10.7	10.1	11.4	12.2	12.0	12.5
35-79	**17.0**	**16.5**	**17.5**	**18.2**	**18.0**	**18.3**	**14.4**	**13.9**	**14.8**	**16.1**	**15.9**	**16.2**

	Capacità vitale %**						VEMS %**					
	Persone con MRC			Persone senza MRC			Persone con MRC			Persone senza MRC		
Anni	media	IC 95%		media	IC 95%		media	IC 95%		media	IC 95%	
35-49	106.9	102.9	110.9	109.5	108.3	110.8	107.9	104.5	111.3	113.8	112.8	114.8
50-69	105.7	101.5	110.0	109.6	108.6	110.6	105.9	101.7	110.0	115.1	114.0	116.1
70-79	98.1	93.1	103.1	106.9	104.7	109.1	99.5	93.3	105.6	112.8	110.5	115.0
35-79	**104.1**	**101.5**	**106.6**	**109.1**	**108.3**	**109.8**	**104.8**	**102.2**	**107.4**	**114.2**	**113.5**	**115.0**

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The Oxygen Therapy

A. Corsonello*[,1], C. Pedone[2,3], S. Scarlata[2], A. Zito[2], I. Laino[1] and R. Antonelli-Incalzi[2,4]

Table 8. Limitations of Pulse Oximetry

Condition	Problem
SpO_2<80%	The oximeter can overestimate SpO_2, mainly in subjects with dark skin
Poor perfusion due to hypotension, heart failure, cold environment	The oximeter may be unable to provide a reading
Anaemia	Despite normal SpO_2, O_2 delivery to tissue is inadequate
CO poisoning	CO is registered as 90% oxygenated haemoglobin and 10% desaturated haemoglobin: falsely normal SpO_2.
Selected antiretroviral medications	They affect O_2 affinity for Hb
Movement, shivering patient, cardiac arrhythmias	The oximeter may be unable to identify a pulse signal (waveform) for reading
Dirty, varnished or artificial nails	No or low readings
Bright artificial light (e. g. operating room)	False low reading
Older patients	Normal SpO_2 may se slightly lower than in adults

Normal aging is associated with a decline in pulmonary function and with an important decline of PaO2 without noticeable changes in PaCO2. Such a decline is summarized by the equation:

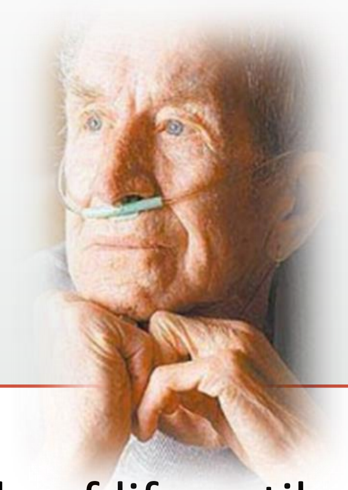
PaO2 = 109-(0.43 x age)

60 y = 83 mmHg; 80 y = 74 mmHg

Curr Med Chem. 2013; 20: 1103-26

Respiratory Failure in the Elderly Patient

Jean-François Muir, M.D., Ph.D.,[1,2] Bouchra Lamia, M.D., Ph.D.,[1,2]
Carlos Molano, M.D.,[1,2] and Antoine Cuvelier, M.D., Ph.D.[1,2]



Elderly population is growing

The incidence of Acute Respiratory Failure (ARF) increases significantly for each decade of life until age 85 years, with a particularly high incidence in patients over the age of 65, who account for nearly two thirds of all Intensive Care Unit (ICU) days.

Multifactorial etiology of ARF episodes - Pre-existing CRF?

Older patients (*especially with **dementia***) are at increased risk for ARF secondary to non-pulmonary conditions such as ***delirium, stroke, malnutrition, drugs*** (*excess of sedation, anticholinergics or antalgic drugs*) **which increase pulmonary aspiration risk.**

Muir JF, et al. Semin Respir Crit Care Med, 2010; 31: 634–46

ACUTE RESPIRATORY FAILURE IN THE ELDERLY

Increasing incidence rate of elderly patients admitted in the hospital for Acute Respiratory Failure

Especially if:

- Underlying chronic cardiopulmonary disorders;
- Immunosoppressed conditions;
- Solid and hematologic malignancies;
- Extra-pulmonary comorbidities.

Triggering causes of Acute Respiratory Failure in advanced age:

- Acute heart failure;
- Acute exacerbations of COPD;
- Severe community acquired pneumonia;
- Drug-induced lung injury

In a subset of elderly patients the deterioration of lung function may occur without any evidence of a superimposed condition and could be considered as an *inevitably progression of the natural history of the underlying cardiopulmonary disease*.

Scala R. BMC Pulmonary Medicine, 2016; 16: 150

Where and how to treat ARF in the elderly?

High variation in proportions of elderly patients admitted to ICU

↓

High variation in data on mortality

Mortality rates for elderly after ETV

ICU mortality: from 28 to 78%

One year later: from 52 to 96%

Two years later: from 69 to 96%

Muir JF, et al. Semin Respir Crit Care Med, 2010; 31: 634–46

Elderly usually receive less intensive and expensive care. This is particularly evident in the elderly with chronic cardiopulmonary diseases hospitalized for an episode of ARF for whom the denial of ICU admission is often determined by an unjustified pessimistic prognostic perspective shown by physicians

Poorly defined border between “curative”, “palliative” and “end-of-life” treatment in patients with end-stage diseases.

The “age-based” restriction access to higher level of care is not justified by the existing data but in octogenarians with chronic advanced respiratory disease the label of “do-not-intubate” order (DNI) is often applied.

Scala R. BMC Pulmonary Medicine, 2016; 16: 150

BMJ

Ethical dilemma

…escalating therapy or not?

Implications of prognostic pessimism in patients with chronic obstructive pulmonary disease (COPD) or asthma admitted to intensive care in the UK within the COPD and asthma outcome study (CAOS): multicentre observational cohort study

Martin J Wildman, consultant chest physician,[1] Colin Sanderson, reader in health services research,[2] Jayne Groves, research nurse,[3] Barnaby C Reeves, reader in epidemiology,[2] Jon Ayres, professor,[4] David Harrison, senior statistician,[5] Duncan Young, consultant intensivist,[6] Kathy Rowan, director[5]

ABSTRACT

Objective To determine whether clinicians' prognoses in patients with severe acute exacerbations of obstructive lung disease admitted to intensive care match observed outcomes in terms of survival.

Design Prospective cohort study.

Setting 92 intensive care units and three respiratory high dependency units in the United Kingdom.

Participants 832 patients aged 45 years and older with breathlessness, respiratory failure, or change in mental status because of an exacerbation of COPD, asthma, or a combination of the two.

Main outcome measures Outcome predicted by clinicians. Observed survival at 180 days.

Results 517 patients (62%) survived to 180 days. Clinicians' prognoses were pessimistic, with a mean predicted survival of 49% at 180 days. For the fifth of patients with the poorest prognosis according to the clinician, the predicted survival rate was 10% and the actual rate was 40%. Information from a database covering 74% of intensive care units in the UK suggested no material difference between units that participated and those that did not. Patients recruited were similar to those not recruited in the same units.

Conclusions Because decisions on whether to admit patients with COPD or asthma to intensive care for intubation depend on clinicians' prognoses, some patients who might otherwise survive are probably being denied admission because of unwarranted prognostic pessimism.

Wildman MJ, et al. BMJ, 2007; 335: 1132

NIV in the elderly

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

Stefano Nava[1], Mario Grassi[3], Francesco Fanfulla[2], Guido Domenighetti[4], Annalisa Carlucci[2], Andreas Perren[5], Daniela Dell'Orso[6], Michele Vitacca[7], Piero Ceriana[2], Zuhal Karakurt[8], Enrico Clini[6]

Abstract

Objective: older patients usually receive less invasive and costly hospital care, even if they meet the criteria for Intensive Care Unit admission or have a 'do not intubate'(DNI) order. The aim of this randomised, controlled trial was to assess the effectiveness of non-invasive mechanical ventilation (NIV) versus the standard medical therapy (SMT) in reducing the need of intubation, improving survival and reducing respiratory distress in very old patients with acute hypercapnic respiratory failure (AHRF).

Participants and design: eighty-two patients aged >75 years (mean age 81.3 ± 3.5 years) were randomised to receive NIV or SMT.

Settings: three respiratory units.

Measurements: the primary outcome was the rate of meeting the endotracheal intubation (ETI) criteria. Secondary outcomes were the mortality rate, the respiratory rate, dyspnoea score, arterial blood gases.

Nava S. et al. Age and Ageing 2011; 40: 444–450

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.

Table 2. Differences for ETI (primary end-point), and the secondary end-points pH, $PaCO_2$, respiratory rate and Borg dyspnoea score changes at 1 h after the enrolment, in the two-arm groups

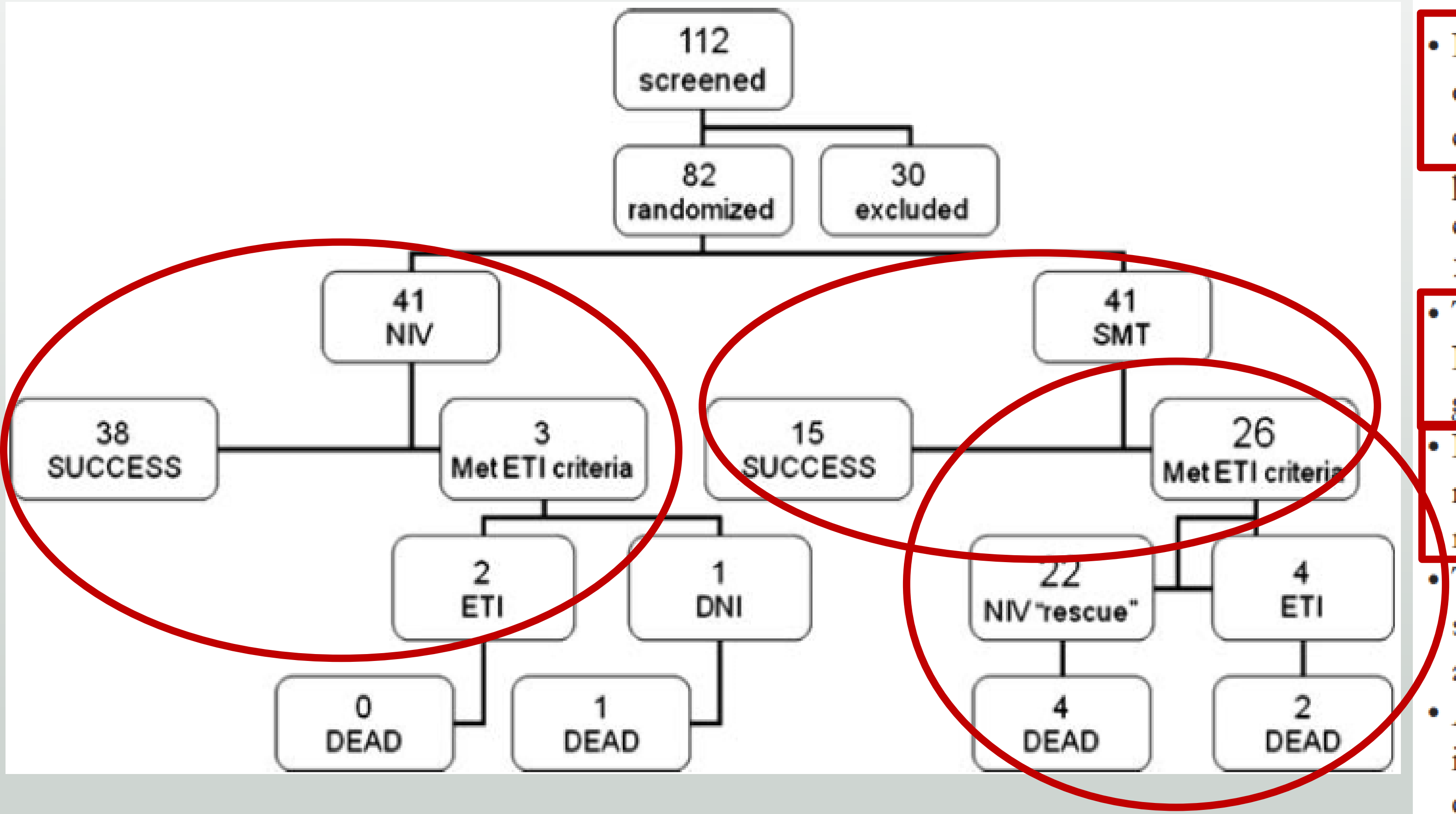
	NIV	SMT	*P*-value
ETI	3/41 (7.3%)	26/41 (63.4%)	<0.001
pH	0.04 ± 0.05	−0.006 ± 0.03	<0.001
$PaCO_2$ (KPa)	−0.91 ± 1.11	0.29 ± 1.13	<0.001
Respiratory rate (b.p.m.)	−4.1 ± 6.4	−0.9 ± 4.1	0.01
Dyspnoea score	−1 ± 1.5	−0.4 ± 1.2	0.05

Data are shown as frequency (%) or mean ± standard deviation.

Table 3. Frequency distributions (number of death/number of alive) of death history (in hospital 6 m and 12 m) and maximum likelihood estimates (MLE) of odds ratios (95% confidence intervals) from discrete-time survival analysis modelling

	No. of death/no. of alive				
	Inhospital	6 m	12 m	OR (95% CI)[b]	*P*-value
Randomised treatment					
SMT	6/35	11/22[a]	8/14	1 (reference)	0.014[c]
NIV	1/40	4/34[a]	11/23	0.40 (0.19–0.83)	
Rescue treatment					
SMT	1/15	2/11	5/6	1 (reference)	
NIV	3/57	13/42[a]	12/30	0.60 (0.18–1.92)	0.009[c]
ETI	3/3	0/3	2/1	4.03 (2.35–6.94)	

Nava S. et al. Age and Ageing 2011; 40: 444–450



Key points

- NIV has been shown to improve the clinical outcomes, compared with the standard medical treatment, during an episode of hypercapnic acute respiratory failure. The present randomised study is the first one to confirm the efficacy of this method of ventilation also in patients aged >75 years.
- The rate of meeting the criteria for ETI was lower in the NIV group versus standard medical treatment (control group).
- NIV was used as a 'rescue' therapy for those patients meeting the intubation criteria in the control group and refusing intubation.
- The mortality rate was lower in the NIV group versus the standard medical treatment, using the intention-to-treat analysis.
- Arterial blood gases, respiratory rate and dyspnoea improved significantly faster with NIV than with the standard medical treatment.

Nava S. et al. Age and Ageing 2011; 40: 444–450

Older patients with hypercapnia were shown to have a poor survival rate after an episode of ARF and this could be the reason why this kind of patients is rarely admitted to an ICU, despite needing intensive medical or ventilatory treatment.

This study demonstrates that most of these patients could be successfully treated with NIV and, therefore, they could also be treated in a medical ward, if the pH level is not dangerously low (i.e. >7.28).

The rescue therapy with NIV was very successful (75%). This highlights the importance of using NIV not only as a palliative measure but, also, as a preferential treatment when intubation is either not wanted by the patient or questionable for the physician.

Nava S. et al. Age and Ageing 2011; 40: 444–450

Results of noninvasive ventilation in very old patients

Background: Noninvasive ventilation (NIV) is frequently used for the management of acute respiratory failure (ARF) in very old patients (≥ 80 years), often in the context of a do-not-intubate order (DNI). We aimed to determine its efficacy and long-term outcome.

Methods: Prospective cohort of all patients admitted to the medical ICU of a tertiary hospital during a 2-year period and managed using NIV. Characteristics of patients, context of NIV, and treatment intensity were compared for very old and younger patients. Six-month survival and functional status were assessed in very old patients.

Results: During the study period, 1,019 patients needed ventilatory support and 376 (37%) received NIV. Among them, 163 (16%) very old patients received ventilatory support with 60% of them managed using NIV compared with 32% of younger patients ($p < 0.0001$). Very old patients received NIV more frequently with DNI than in younger patients (40% vs. 8%). Such cases were associated with high mortality for both very old and younger patients. Hospital mortality was higher in very old than in younger patients but did not differ when NIV was used for cardiogenic pulmonary edema or acute-on-chronic respiratory failure (20% vs. 15%) and in postextubation (15% vs. 17%) out of a context of DNI. Six-month mortality was 51% in very old patients, 67% for DNI patients, and 77% in case of NIV failure and endotracheal intubation. Of the 30 hospital survivors, 22 lived at home and 13 remained independent for activities of daily living.

Conclusions: Very old patients managed using NIV have an overall satisfactory 6-month survival and functional status, except for endotracheal intubation after NIV failure.

Schortgen, et al. Annals of Intensive Care, 2012; 2:5

Table 1 Characteristics of all patients managed with NIV according to age

	Patients ≥ 80 y (n = 98)	Patients < 80 y (n = 278)	*p* value
Characteristics at ICU admission			
Age, yr	84 (80-86)	67 (54-74)	< 0.001
[min-max]	[80-94]	[17-79]	
Gender, M/F, n	45/53	185/93	< 0.001
Home respiratory support, n (%)	14 (14)	28 (10)	0.4
Nasal O_2	10	17	
NIV	4	11	
History of ICU admission for ARF, n (%)	18 (18)	49 (18)	0.87
Immunocompromised, n (%)[a]	9 (9)	54 (19)	0.02
Location before ICU admission, n (%)			0.15
Emergency room	59 (60)	140 (50)	
Medical ward	28 (29)	110 (40)	
Surgical ward	11 (11)	28 (10)	
NIV start before ICU admission, n (%)	15 (15)	28 (10)	0.16
SAPS II at admission, points	43 (36-52)	39 (31-49)	< 0.01
Non-age-related SAPS II, points[b]	25 (18-34)	27 (20-38)	0.21
NIV management			
NIV duration within the first 24 hours, h	6 (4-10)	4 (3-8)	< 0.001
Period of NIV delivery during ICU stay, d	3 (1-5)	2 (1-3)	< 0.001
Discharged from ICU with NIV, n (%)[d]	9/94 (10)	11/267 (4)	0.05

Table 2 Living conditions of the 30 survivors at phone interview (> 6 months)

	Before ICU (n = 30)	After ICU (n = 30)	*p* value
Living			0.2
At home, n (%)	27 (90)	22 (73)	
Home care, n (%)	3 (10)	8 (17)	
Global functional status, n (%)			0.2
Full function (ADL 6)	18 (60)	13 (43)	
Moderate impairment (ADL 4-5)	8 (27)	9 (30)	
Severe impairment (ADL < 2)	2 (7)	5 (17)	
Chronic respiratory support, n (%)			< 0.01
No	28 (93)	18 (60)	
NIV dependency	0	8 (27)	
O_2 dependency	2 (7)	4 (13)	

	Before ICU	After ICU	*p* value
Bathing, n (%)			0.052
Independent	21 (70)	14 (47)	
Partly dependent	8 (27)	9 (30)	
Dependent	1 (3)	7 (23)	
Dressing, n (%)			0.064
Independent	23 (77)	17 (57)	
Partly dependent	6 (20)	6 (20)	
Dependent	1 (3)	7 (23)	
Toileting, n (%)			0.516
Independent	26 (87)	22 (73)	
Partly dependent	2 (7)	3 (10)	
Dependent	2 (7)	5 (17)	
Transfer, n (%)			0.148
Independent	25 (83)	18 (60)	
Partly dependent	3 (10)	7 (23)	
Dependent	2 (7)	5 (17)	
Continence, n (%)			0.657
Independent	22 (73)	20 (67)	
Partly dependent	2 (7)	1 (3)	
Dependent	6 (20)	9 (30)	
Feeding, n (%)			0.299
Independent	27 (90)	22 (73)	
Partly dependent	2 (7)	4 (13)	
Dependent	1 (3)	4 (13)	

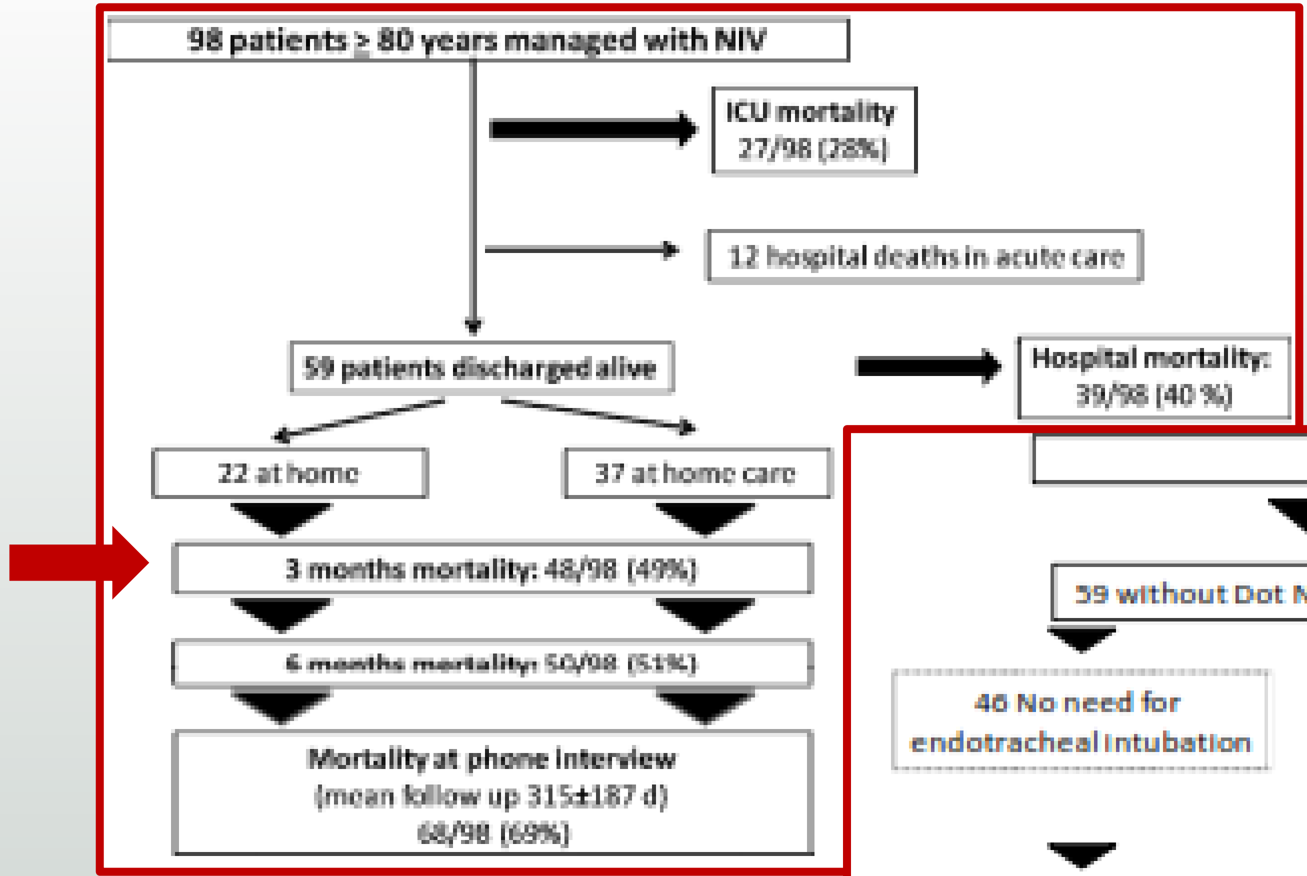
Schortgen, et al. Annals of Intensive Care, 2012; 2:5

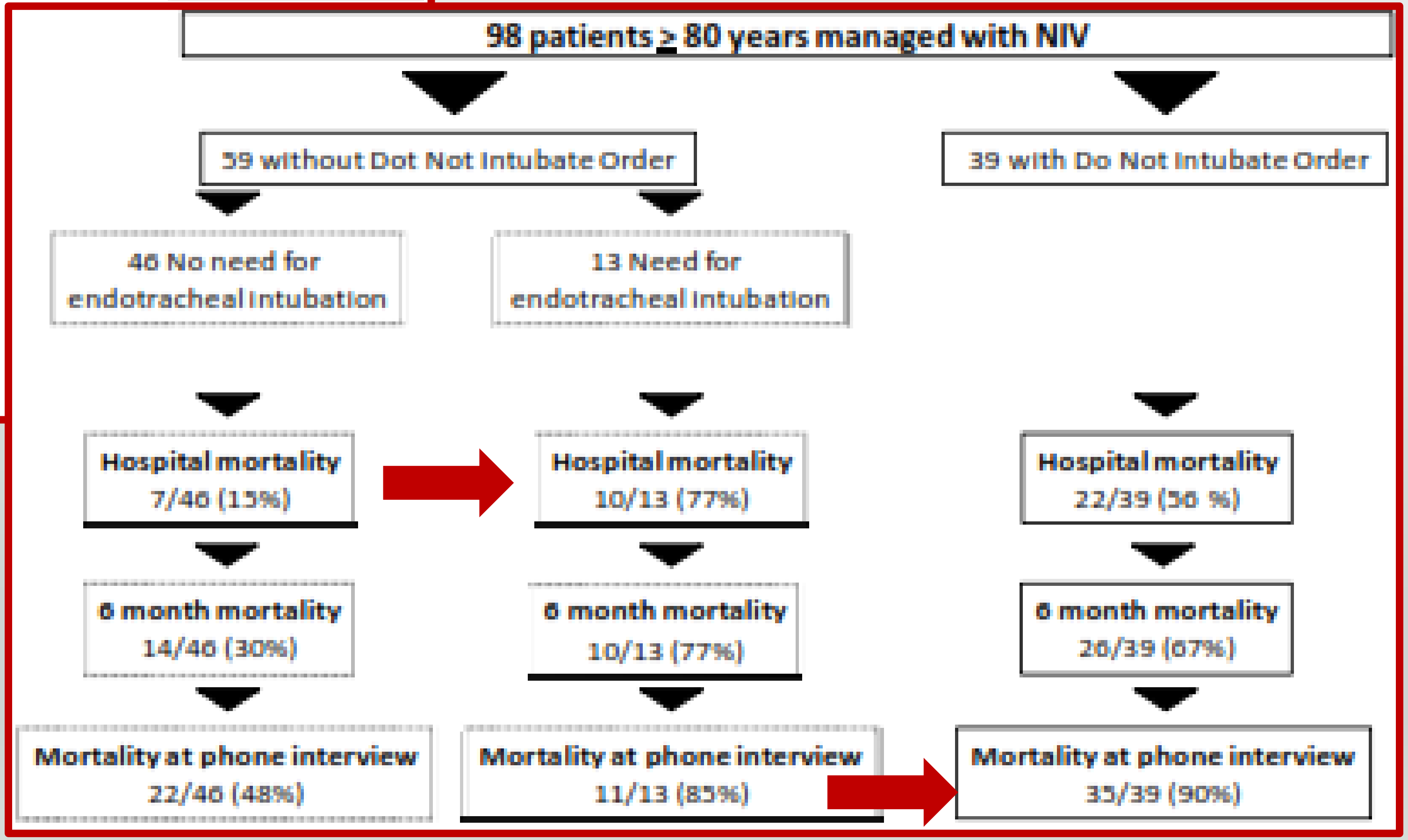
Table 4 Characteristics of very old patients according to do-not-intubate (DNI) status

	Very old patients without DNI order (n = 59)	Very old patients With DNI order (n = 39)	*p* value
Decision of limitation			NA
Do not intubate	0	33	
Do not reintubate after extubation failure	0	6	
Age (yr)	84 (81-85)	86 (83-89)	<0.01
Sex Male, n (%)	27 (46)	18 (46)	0.97
Patients living at home before hospital admission, n (%)	54 (92)	32 (82)	0.16
Charlson comorbidity index, n (%)			0.01
No or low comorbidities (0-1 point)	28 (47)	8 (21)	
High comorbidities (> 1 points)	31 (53)	31 (79)	
Type of comorbidities			
Dementia	1 (2)	6 (15)	0.02
Full dependency for ADL	0	11 (28)	<0.001
End-stage respiratory failure	4 (7)	16 (41)	<0.001
with home respiratory support	4	10	0.016
Active cancer	7 (12)	4 (10)	0.99
Chronic heart failure	24 (41)	17 (44)	0.77
Peripheral obstructive arterial disease	5 (8)	6 (15)	0.34
SAPS II, points	43 (36-52)	43 (36-50)	0.75
Patients with extra-respiratory OF[a], n (%)	38 (64)	27 (69)	0.67
ABG before NIV start			
pH	7.36 (7.27-7.43)	7.32 (7.22-7.4)	0.18
$PaCO_2$ (mmHg)	46 (38-64)	67 (53-80)	<0.01
PaO_2/FiO_2 ratio (mmHg)	180 (120-268)	195 (168-216)	0.59
NIV delivery			
Within first 24 hours (h)	6 (4-8)	9 (6-15)	<0.001
During ICU stay (d)	2 (1-3)	4 (3-6)	<0.001
Continuing need for NIV on day 6, n (%)	3 (5)	12 (33)	0.011
ICU length of stay (d)	8 (5-13)	8 (5-14)	0.87
Among survivors	8 (5-13)	7 (5-14)	0.48
Hospital length of stay (d)	25 (13-40)	20 (8-37)	0.21
Among survivors	27 (17-40)	29 (17-45)	0.25

ADL, activities of daily living; ABG, arterial blood gases. [a]Organ failure (OF) is defined by at least one point in the nonrespiratory SOFA score.

Schortgen, et al. Annals of Intensive Care, 2012; 2:5





Schortgen, et al. Annals of Intensive Care, 2012; 2:5

Figure 3 Hospital mortality according to age and the context of NIV. DNIO, Do-not-intubate order; CPE-AOC, cardiogenic pulmonary edema and acute-on-chronic respiratory failure. *$p < 0.05$ vs. younger patients.

NIV is a frequently used ventilatory support in very old patients admitted to the ICU.

Very old patients have similar hospital survival rates compared to younger patients when NIV is applied in validated indications.

Schortgen, et al. Annals of Intensive Care, 2012; 2:5

Scala *BMC Pulmonary Medicine* (2016) 16:150
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BMC Pulmonary Medicine

REVIEW

Open Access

Challenges on non-invasive ventilation to treat acute respiratory failure in the elderly

Raffaele Scala

Abstract

Acute respiratory failure is a frequent complication in elderly patients especially if suffering from chronic cardio-pulmonary diseases. Non-invasive mechanical ventilation constitutes a successful therapeutic tool in the elderly as, like in younger patients, it is able to prevent endotracheal intubation in a wide range of acute conditions; moreover, this ventilator technique is largely applied in the elderly in whom invasive mechanical ventilation is considered not appropriated.
Furthermore, the integration of new technological devices, ethical issues and environment of treatment are still largely debated in the treatment of acute respiratory failure in the elderly.
This review aims at reporting and critically analyzing the peculiarities in the management of acute respiratory failure in elderly people, the role of noninvasive mechanical ventilation, the potential advantages of applying alternative or integrated therapeutic tools (i.e. high-flow nasal cannula oxygen therapy, non-invasive and invasive cough assist devices and low-flow carbon-dioxide extracorporeal systems), drawbacks in physician's communication and "end of life" decisions.
As several areas of this topic are not supported by evidence-based data, this report takes in account also "real-life" data as well as author's experience.
The choice of the setting and of the timing of non-invasive mechanical ventilation in elderly people with advanced cardiopulmonary disease should be carefully evaluated together with the chance of using integrated or alternative supportive devices. Last but not least, economic and ethical issues may often challenges the behavior of the physicians towards elderly people who are hospitalized for acute respiratory failure at the end stage of their cardiopulmonary and neoplastic diseases.

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Background

Thanks to the modern pharmacological and non-pharmacological approach (i.e., long-term oxygen therapy and home mechanical ventilation) pulmonologists are able to prolong the survival of patients with chronic respiratory diseases till the very advances stages of their natural history [1]. However, the increase in the survival rate is not always associated with a satisfactory quality of life since an impaired lung function is often associated with a limitation in his/her daily activities living and with discomfort (i.e., dyspnea, weakness, depressive symptoms) [2, 3]. As a matter of the fact, prolonging survival is not always a desirable goal to achieve for both the physician and the patient according to the modern vision of patient-centred management of diseases [4].

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Conversely, palliation of symptoms and shared "end-of-life" decisions are the main target of the care in order to keep a human dignity in the transition to the death in patients with advanced chronic respiratory diseases [5]. On the other hand, severely disabled patients with "end-stage" cardio-pulmonary disease may agree to undergo life-support devices (i.e. mechanical ventilation) in Hospital to overcome an episode of acute decompensation even if the impairment in their quality of life at home may still progress depending on the severity of their underlying condition. Moreover, undue "nihilism" about outcomes of invasive mechanical ventilation (IMV) in conditions such as chronic obstructive lung disease (COPD), is common and of concern, as patients may be swayed by inaccurate inferences about the likely outcome, should support be provided. Because decisions on whether to admit patients with COPD or asthma to

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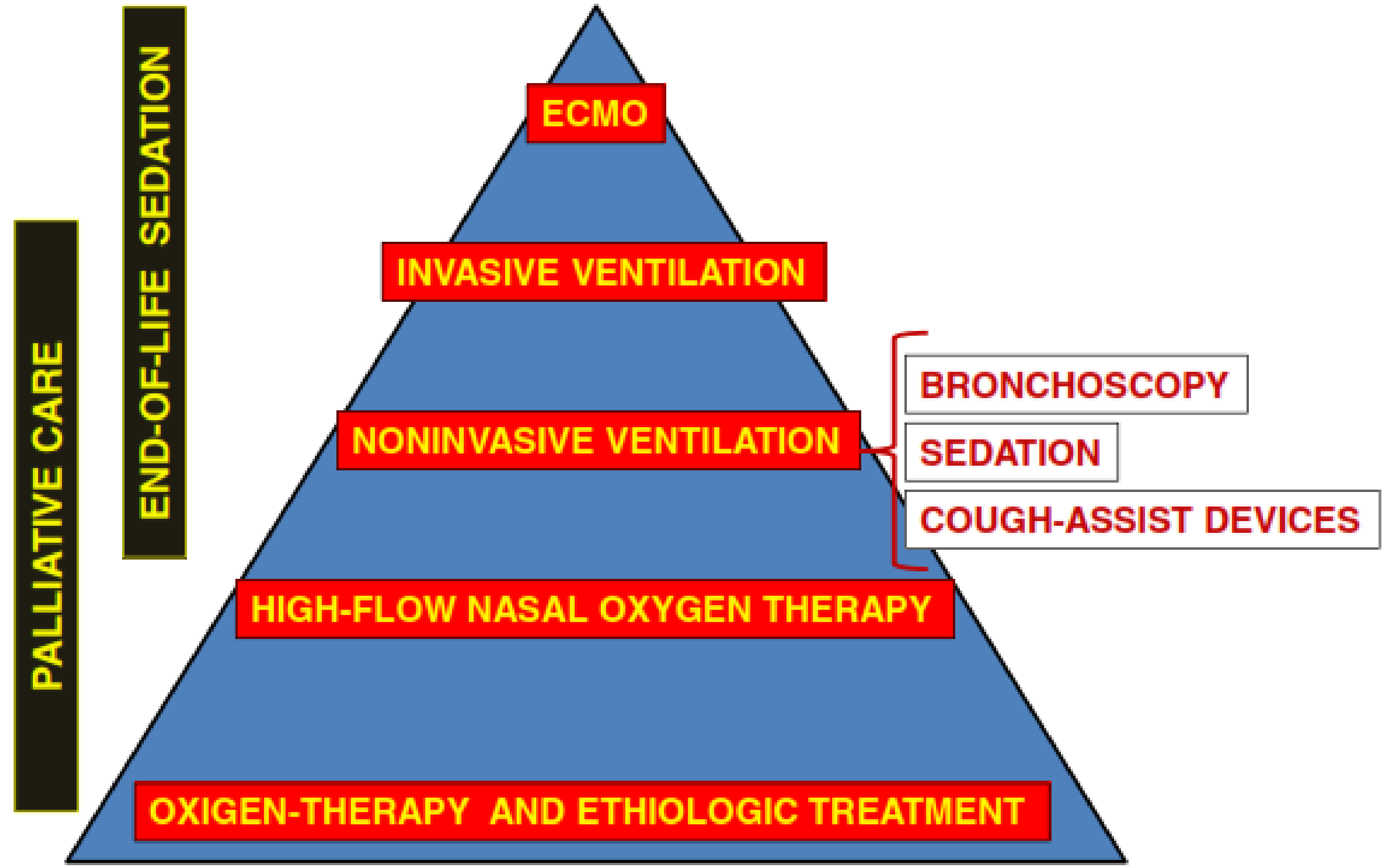

Fig. 1 Therapeutic options in elderly with acute respiratory failure

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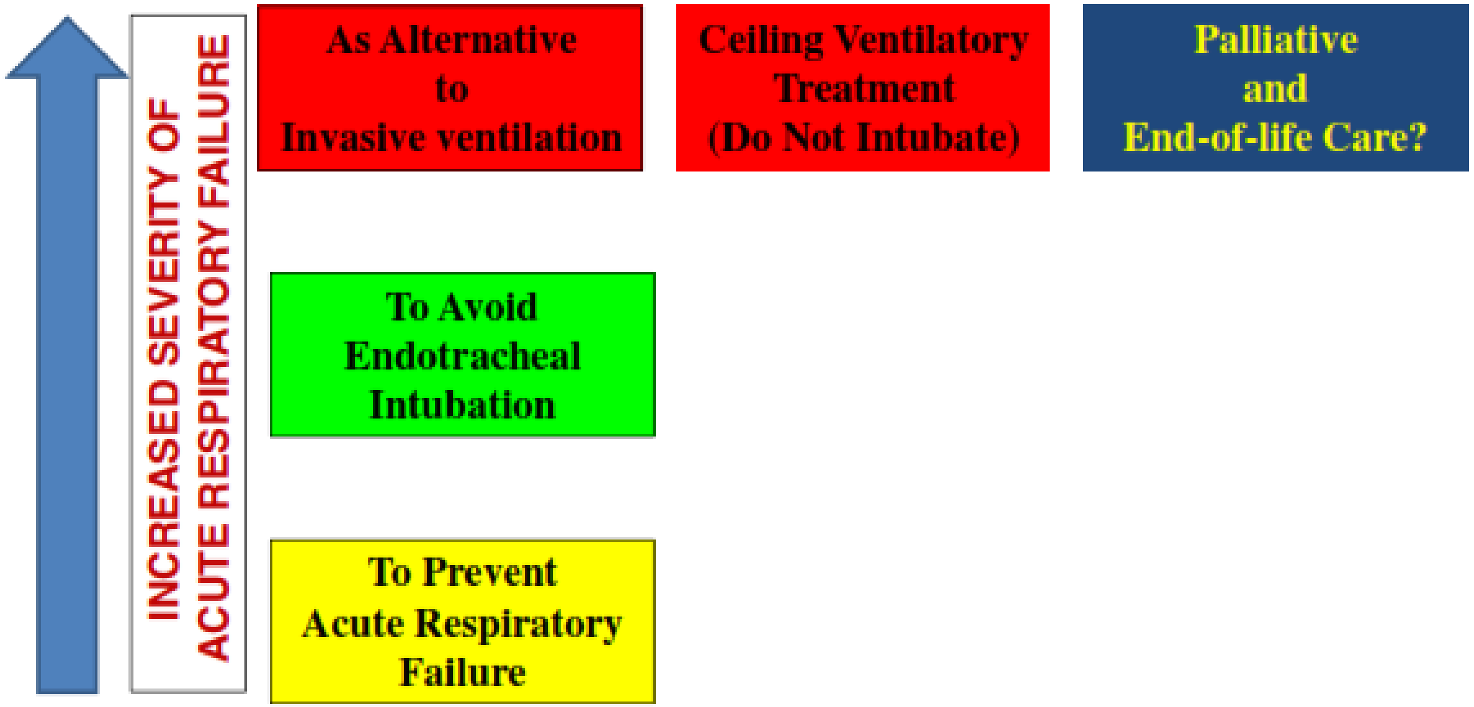

Fig. 3 Reasons for applying non-invasive ventilation in elderly at different stages of acute respiratory failure

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Table 1 Likelihood of success of NIV in elderly patients according to the different types of ARF

Clinical condition with Acute Respiratory Failure	Avoidance of intubation Reduction of Mortality
COPD exacerbations	+++
Cardiogenic pulmonary edema	+++
Immuno-compromised status	+++
Obesity-hypoventilation	+++
Chest wall deformities	+++
Weaning/Extubation in COPD	++−
Mild-moderate Encephalopathy	++−
Neuromuscular diseases[a]	++−
Community Acquired Pneumonia	+−−
Mild ARDS	+−−
Agitation/Delirium[b]	+−−
Interstitial fibrotic lung diseases	—
Multi-organ failure/Comorbidities	—

[a] with cough augmentation techniques
[b] with low doses of sedatives

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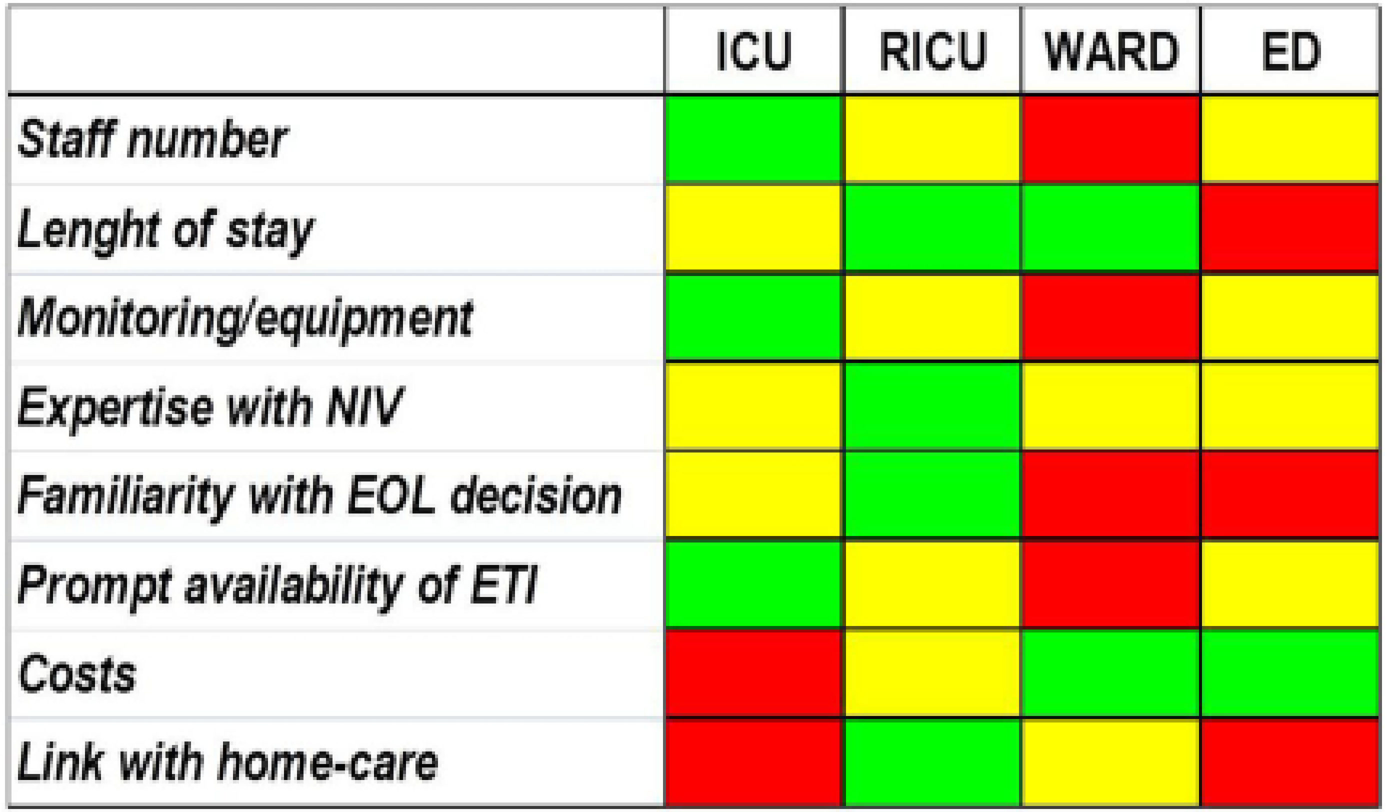

Fig. 2 Characteristics of the different settings where non-invasive ventilation (NIV) may be applied. Green, yellow, red indicates respectively a highly favorable, favorable, unfavorable issue for the different enviroment. ICU: Intensive Care Unit, RICU: Respiratory Intensive Care Unit, ED: Emergency Department, ETI: endotracheal intubation, EOL: end-of-life

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Anche nei reparti medici, si è assistito recentemente a una graduale diffusione di metodiche di ventilazione non invasiva a causa di vari fattori, tra i quali:

- **il progressivo aumento di pazienti molto anziani;**

- **il progressivo aumento di pazienti con multimorbilità complesse;**

- **il progressivo aumento di malati neoplastici e/o immunocompromessi nei quali l'intubazione e la ventilazione meccanica tradizionale condurrebbero a un peggioramento della prognosi;**

- **la carenza di posti letto nei reparti di Terapia Intensiva.**

The impact of frailty on noninvasive mechanical ventilation in elderly medical intensive care unit patients

Iskender Kara[1] · F. Yildirim[1] · A. Zerman[1] · Z. Gullu[1] · N. Boyaci[1] · B. B. Aydogan[1] · U. Gaygisiz[1] · K. Gonderen[1] · G. Arik[2] · M. Turkoglu[3] · M. Aydogdu[4] · G. Aygencel[3] · Z. Ulger[2] · G. Gursel[4]

Thirty (29%) patients were grouped as NIV failure group and the remaining 73 (71%) as NIV success group.
The Glascow Coma Scores (GCS) were lower and SOFA scores were higher in the NIV failure group.
Mortality was also higher in NIV failure group than in success group (57 vs. 1%, p=0.000.

In the multivariate analysis only low GCS and EFS ≥8 were identified as independent risk factors for NIV failure.

In hospital mortality occurred in 18 (17%) patients. Age, APACHE II score, SOFA score, Charlson comorbidity score, NIV failure, CFS ≥5 and EFS ≥8 were identified as significant factors affecting the mortality. Among them, NIV failure and CFS ≥5 were found as independent risk factors of mortality in logistic regression analysis.

Sixty-five (63%) patients had NIV application problems and the mortality was higher in these patients (23 vs. 8%, p = 0.042). These problems were more common in patients with previous diagnosis of delirium and dementia (respectively, 21 vs. 3%; p = 0.024 and 23 vs. 7%, p = 0.044) and in frail patients with CFS ≥5 and EFS ≥8 (respectively, 48 vs. 29%, p = 0.047 and 43 vs. 24%, p = 0.037).

Kara I, et al. Aging Clin Exp Res, 2018; 30: 359-66

The NIV failure and application problems were higher among frail patients and, therefore, *frailty is interpreted to be an important factor for the prediction of NIV success and outcomes among the medical ICU patients*.

In our study, NIV success rate was 71% and in frail patients NIV failure was higher.
The higher EFS score was found as an independent risk factor for NIV failure.

The main point in NIV success is carefully choosing patients with respiratory failure and implementing a very well established NIV protocol

During appropriate patient selection, the frailty assessment among elderly population may contribute to success.

Kara I, et al. Aging Clin Exp Res, 2018; 30: 359-66

NONINVASIVE VENTILATION IN OLDER ADULTS ADMITTED TO A PNEUMOGERIATRIC UNIT

To the Editor: This study involved 30 individuals aged 80 and older (range 81–101) who underwent noninvasive ventilation (NIV) in the Pneumogeriatric Unit, Department of Geriatrics, Campus Bio-Medico University, Rome, Italy between April 1, 2012, and September 30, 2013. This unit had mixed medical management by geriatricians and pneumologists conforming to principles of comprehensive geriatric assessment and treatment (Table 1). NIV was performed using facial masks. Arterial blood gas measurements were made before starting NIV, after 1 hour of NIV, and at discharge.

The mean age of the subjects was 87 ± 5; 21 were women. The mean length of hospital stay was 12 ± 7 days. Four patients died during their hospital stay: two from cardiorespiratory failure, one from sepsis, and one from stroke (in hematological malignancy).

NIV was required for acute heart failure in 20 subjects, for acute exacerbation of chronic obstructive pulmonary disease (COPD) in nine, and for stroke in one because of ventilatory muscle weakness.

Concomitant dementia was found in 12 subjects and chronic renal disease in eight; 25 subjects had heart failure as a primary or concurrent disease, 11 had COPD, and four had stroke.

All subjects tolerated NIV well, and none required treatment withdrawal; agitation or delirium occurred in six patients and was successfully treated using low-dose quetiapine. The most common complication was the development of facial ulcers, which occurred in nine subjects; gastric distention was detected in two.

Table 1. Main Diagnostic and Therapeutic Procedures Scheduled in the Pneumogeriatric Therapeutic Plan for Very Old Patients Undergoing Noninvasive Ventilation

Definition of the therapeutic target, based on current and historical health status.
Nutritional assessment and support.
Monitoring of fluids, electrolytes, and acid–base balance.
Execution of echocardiography, chest X ray, and dosage of N-terminal pro-brain natriuretic peptide for screening and prognostic purposes.
Drug dose adjustment according to renal and hepatic function.
Reduction of polypharmacy by discontinuing unnecessary or inappropriate medications.
Prevention of pressure ulcers using a validated protocol.
Prevention and treatment of constipation.
Prevention and treatment of delirium and dementia using pharmacological and nonpharmacological therapies.
Early start of physical and respiratory rehabilitation.
Early removal of urinary catheter and voiding rehabilitation, as needed.
Negotiate with caregivers and social workers the destination and health and social care needs at discharge.
Design and implementation of a training program for caregivers.
Performing a comprehensive geriatric assessment at discharge and planning an integrated pneumogeriatric ambulatory follow-up.

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Concomitant oxygen therapy was required in 19 subjects after 1 hour of NIV; at discharge, oxygen was still required in 17 subjects, and NIV was required in 13.

The Spearman test indicated a significant positive correlation between pCO_2 levels at baseline and length of hospital stay (correlation coefficient (r_s) (30) = 0.62; $P < .001$). No significant correlation was found between duration of hospitalization and baseline pH or pO_2.

Twelve subjects were discharged to home, 11 to respiratory rehabilitation, two to hospice, and one to postacute care.

NIV allows the individuals to talk, eat, and partially clear secretions autonomously.[1] Thus, NIV not only treats the cardiorespiratory problem, but also decreases the risk of delirium and malnutrition.[2,3] Furthermore, NIV reduces the need for sedatives, compared with invasive ventilation,[1] which further contributes to prevent delirium and immobilization.

The presence of delirium or dementia was not a barrier for the indication or for the administration of NIV; the presence of a pneumogeriatric team allowed the symptoms to be controlled and the cooperation of the subjects to be obtained. In addition, NIV in a non-ICU setting allows relatives to visit more frequently and for longer time.[4] Moreover, the presence of a pneumogeriatric team could promote hospital discharge, education of caregivers, and selection of the best discharge setting.

In conclusion, NIV is effective and safe also in very old adults; this setting and this model of care qualify as a valuable alternative to costly, busy intensive or subintensive units.

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Use of noninvasive ventilation on internal wards for elderly patients with limitations to respiratory care: a cohort study

ABSTRACT

Background The use of noninvasive positive pressure ventilation (NPPV) outside the intensive wards has been evaluated in patients with no limitation on life-sustaining support. Our aim was to evaluate its usefulness in general wards for patients with NPPV as the ceiling of ventilator care when admission to the intensive care unit (ICU) has been withheld.

Materials and methods Noninvasive positive pressure ventilation was used in 44 patients with acute respiratory failure (ARF) and limitations to respiratory care– 22 with chronic obstructive pulmonary disease (COPD) exacerbations and 22 with acute cardiogenic pulmonary oedema (CPE). Survival at hospital discharge, and survival and readmission rate at 12 months were assessed.

Results Sixty-three per cent of COPD and 55% of CPE patients survived hospital discharge; and 50% and 37% respectively, were alive after 1 year. The cause of the in-hospital mortality was related to the admission diagnosis in 88% of cases. Cancer in COPD patients [*P* = 0·040, odds ratio (OR) = 15, 95% CI = 1·14–198] and the completion of NPPV treatment in both diseases (*P* = 0·008, OR = 0·03, 95% CI = 0·00–0·39 for COPD and *P* = 0·010, OR = 0·04, 95% CI = 0·00–0·45 for CPE) were related to in-hospital mortality.

Fifty-six per cent of COPD and 33% of CPE patients that survived hospital admission were readmitted.

Conclusions Our study suggests that the use of NPPV in general wards could be a safe and effective option, as a last choice treatment, in patients with NPPV as the ceiling of ventilator care when admission to ICU has been withheld.

Keywords Aged, general ward, hospitalization, positive-pressure respiration, respiratory insufficiency, treatment outcome.

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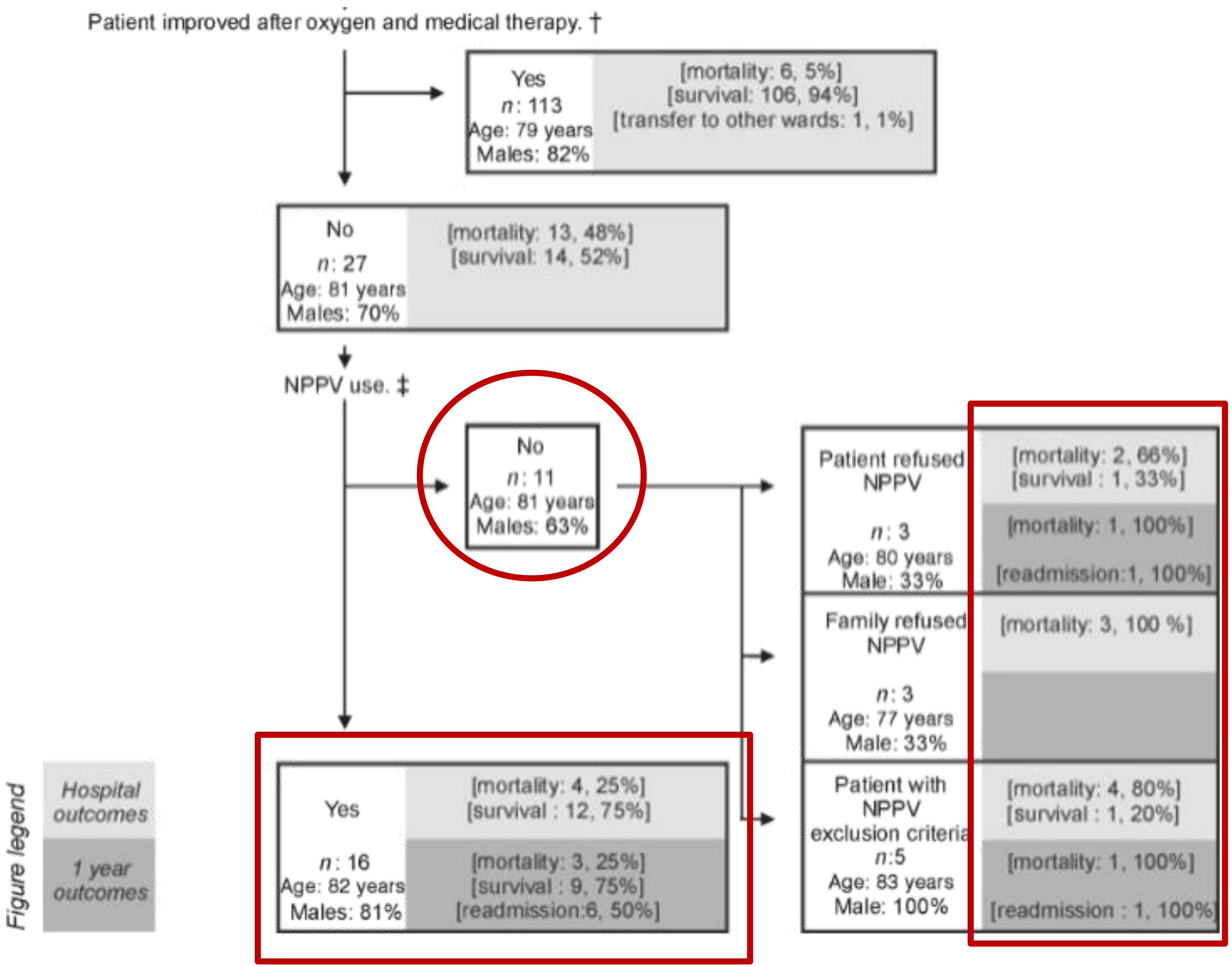

Corral-Gudino L, et al. Eur J Clin Invest 2011; 41: 59-69

Non-invasive ventilation for very old patients with limitations to respiratory care in half-open geriatric ward: experience on a consecutive cohort of patients

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Abstract

Introduction A leading role for non-invasive ventilation (NIV), as comfort treatment or palliative care, is actually recognized for very old patients suffering from ARF. NIV was frequently used in both ICU and respiratory ICU (RICUs) for very old patients and it is associated with a reduced rate of endotracheal intubations and mortality. This study aims to evaluate the effects of NIV, performed in a setting of half-open geriatric ward with family support, in a cohort of very old patients with ARF and DNI decision.

Methods A consecutive cohort of 20 very old patients with DNI decision was admitted in our 26-bed geriatric ward during a 6 months' period. DNI decision was obtained in emergency room with an intensive care physician supported by a psychologist. Pressure support ventilation was the first choice of NIV. NIV has been performed by three adequately trained geriatricians, with one of them experienced in ICU, and in close collaboration with intensive care physicians. Arterial blood gases, to assess the response to ventilation, were obtained after 1, 6 and 12 h. NIV settings were modified according to arterial blood gas analyses or respiratory fatigue, if needed.

Results Therefore, 75 % of patients were discharged home and 12 out of 20 patients had home respiratory support. PaO_2/FiO_2 ratio and pH increased while $PaCO_2$ decreased during the 12 h of NIV with statistical significance. At the admission, alive patients had $PaCO_2$ significantly lower than dead patients. After 12 h, alive patients had a better pH than dead patients. Dead patients experienced more complication than survivors.

Conclusion Very old DNI patients with ARF could be treated with NIV in half-open geriatric ward with trained physicians and nurses. The presence of family members may improve patients' comfort and reduce anxiety level even at the end of life. Further studies are needed to address the effective role of NIV in very old patients with DNI decisions.

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This study showed that in selected patients, with exacerbations of hypercapnic COPD and without need of mechanical ventilation, *NIV may be started and maintained in the ward in which staff training and experience are adequate*. Our study showed that trained and experienced are probably more important than the environment and there is for sure a ‘‘learning’’ effect when using NIV. Experience means not only increase the skill, but also avoiding treating patients not likely to respond to NIV.

Very old DNI patients with ARF could be treated with NIV in half-open geriatric ward with trained physicians and nurses. The presence of family members may improve patients’ comfort and reduce anxiety level even at the end of life.

The mortality was about 25 %

Dead patients had severe hypoxemic respiratory failure due to ARDS, sepsis and/or active cancer. When patients have a higher severity score or fail to improve after 1 h of treatment, the risk of failure is higher.

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Table 3 Demographic characteristics, NIV settings and outcome of dead and alive patients

	Dead	Alive	*p* value
Patient (*n*)	5/20	15/20	
Age	85 ± 2.9	80 ± 10.3	0.09
APACHE III	93.2 ± 10.2	79.9 ± 14.8	0.01
ADL	3 ± 1.6	3.64 ± 1.9	0.37
IADL	2 ± 1	3.2 ± 3	0.17
Respiratory rate (breaths/min)	12.6 ± 1.4	14 ± 1.5	0.02
Pressure support (cm H_2O)	15.4 ± 1.5	16.4 ± 1.6	0.11
PEEP	5	5	1
TI (s)	0.7 ± 2	0.7 ± 2	1
TE (%)	49 ± 8	50 ± 6	0.74
Complication (*n*)	4/5	1/15	0.00
Number of comorbidities (Charlson index)	7.8 ± 1.09	5.0 ± 2.28	0.01
Type of comorbidities			
Cerebrovascular diseases	0	4	0.36
Active end-stage cancer with ARF	4	0	0.00
End-stage respiratory failure (with home respiratory support)	0	12	0.00
Sepsis with hypoxemic ARF and renal failure in liver cirrhosis	1	0	0.00
Post extubation condition	0	1	0.00
Heart failure	0	3	0.02
Full dependency for ADL	1	4	0.38
Discharge at home (*n*)	0/5	15/15	0.00
Discharged with MV at home (*n*)	0/5	12/15	0.00

Data were reported as mean ± standard deviation. The term cerebrovascular disease is comprehensive of vascular dementia. End-stage failure is comprehensive of patients with cor pulmonale, home respiratory support and previous ICU admission for ARF within the past years or FEV1 <30 % of predicted value

n number of patients

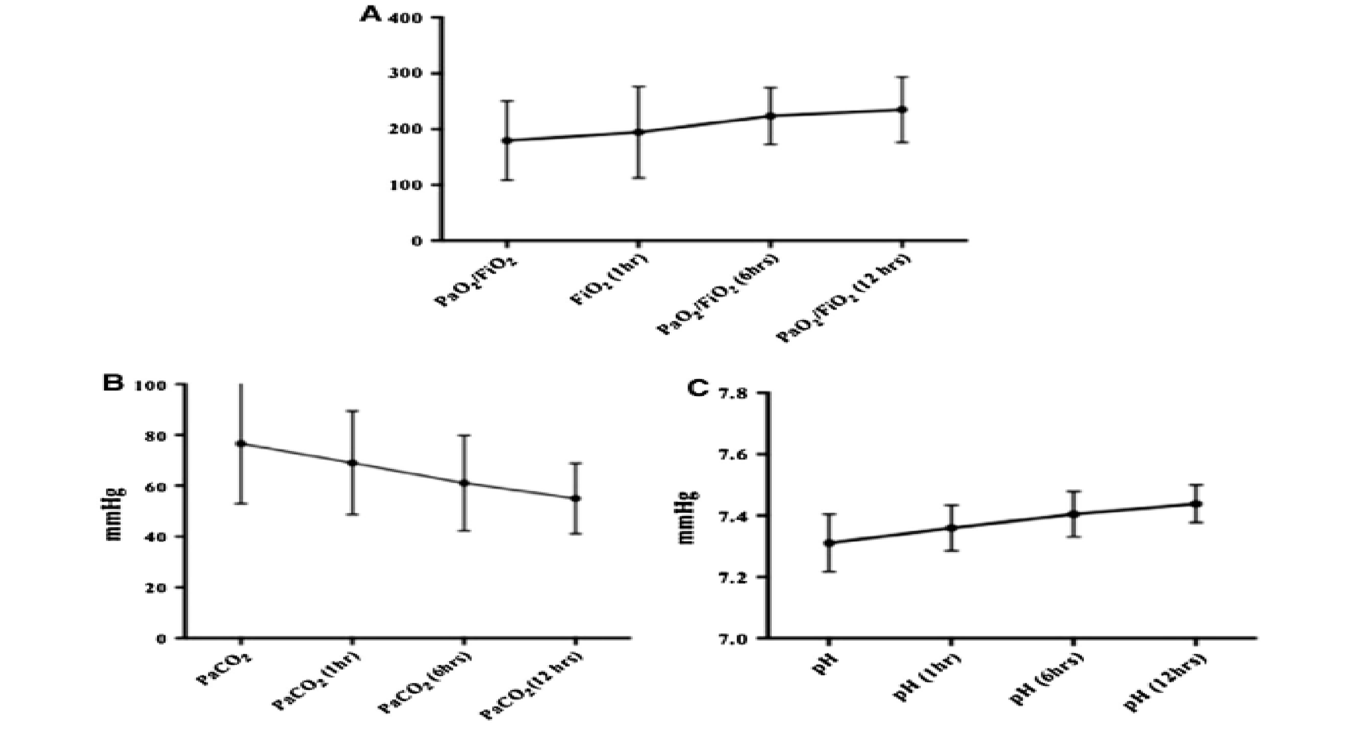

Fig. 1 **Panel A** PaO_2/FiO_2 levels at beginning and after 1, 6 12 h. **Panel B** $PaCO_2$ levels at beginning and after 1, 6 12 h. **Panel C** pH levels at beginning and after 1, 6 12 h

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LETTER TO THE EDITOR

Frailty, comorbidity and critical illness: a trilogy insights for non invasive mechanical ventilation in elderly

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Preceding experiences with younger patients but with similar value in prognostic scales, showed that the frail critical ill patients treated intensively the mortality rate was higher than that NIV [3].

We consider that, furthermore, a randomised study between frail patients with ARF treated with NIV and/or IMV could be very important but not ethically feasible. We believe that associations between frailty, selected comorbid conditions, and critical illness requires confirmation and evaluation in larger studies.

And after this, has time been reached for a guideline on the use of NIV in the geriatric patients, considering its wide use in daily clinical practice?

Considerazioni finali

Ad oggi non esistono linee guida a riguardo

Chi intubare? Non vi sono chiari criteri
…Guida il buonsenso e il giudizio clinico

Importanza delle DAT

Il ruolo del geriatra

Focus group

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