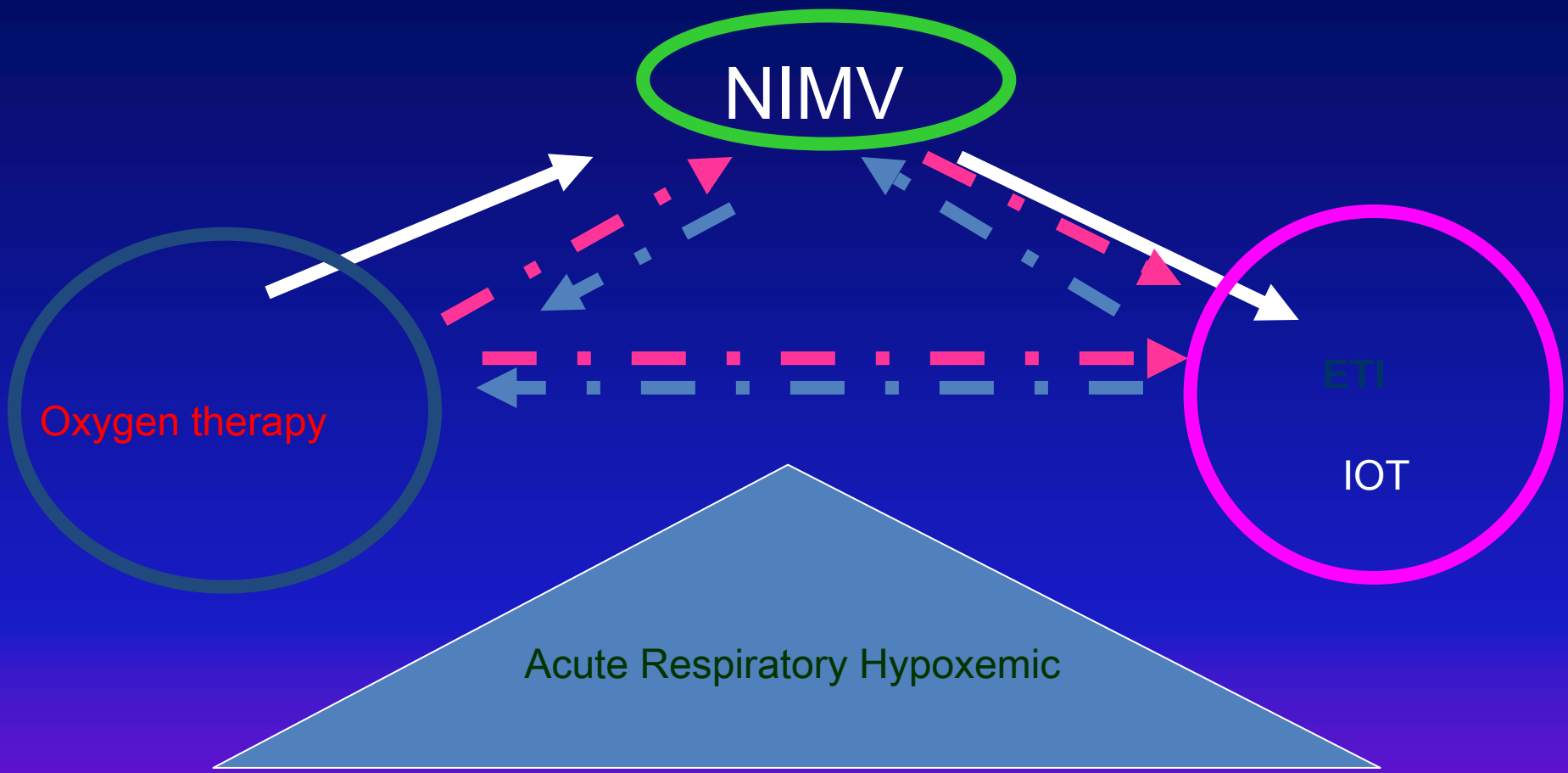
VENTILACIÓN MECÁNICA NO INVASIVA EN SALAS DE HOSPITALIZACIÓN.

BASES Y ORGANIZACION

Dr. Antonio M. Esquinas Rodríguez, FCCP,
International Fellow AARC
Unidad de Cuidados Intensivos
Hospital Morales Meseguer.
Murcia. España

CONCEPT. Alternatives in ARF-Hypoxemic.




HOSPITAL
HOSPITAL

JUSTIFICAN ANÁLISIS DEL PRONÓSTICO

Nueva tecnología

VMNI

- **CRITERIOS VENTILACIÓN MECÁNICA VMNI-VMI.**

- **FACTORES PRONÓSTICO Y RESPUESTA AL TRATAMIENTO**

INDICACIÓN DE VMNI

ASISTENCIAL ECONÓMICA PRONÓSTICO

COMORBILIDAD

TRATAMIENTO ASOCIADOS

MONITORIZACIÓN

INGRESO EN UNIDADES DE MAYOR COSTE -UCI

SUBGRUPO POSIBILIDAD INCREMENTO

FRECUENCIA REINGRESOS

ORGANIZACIÓN DE LA VMNI EN EL HOSPITAL

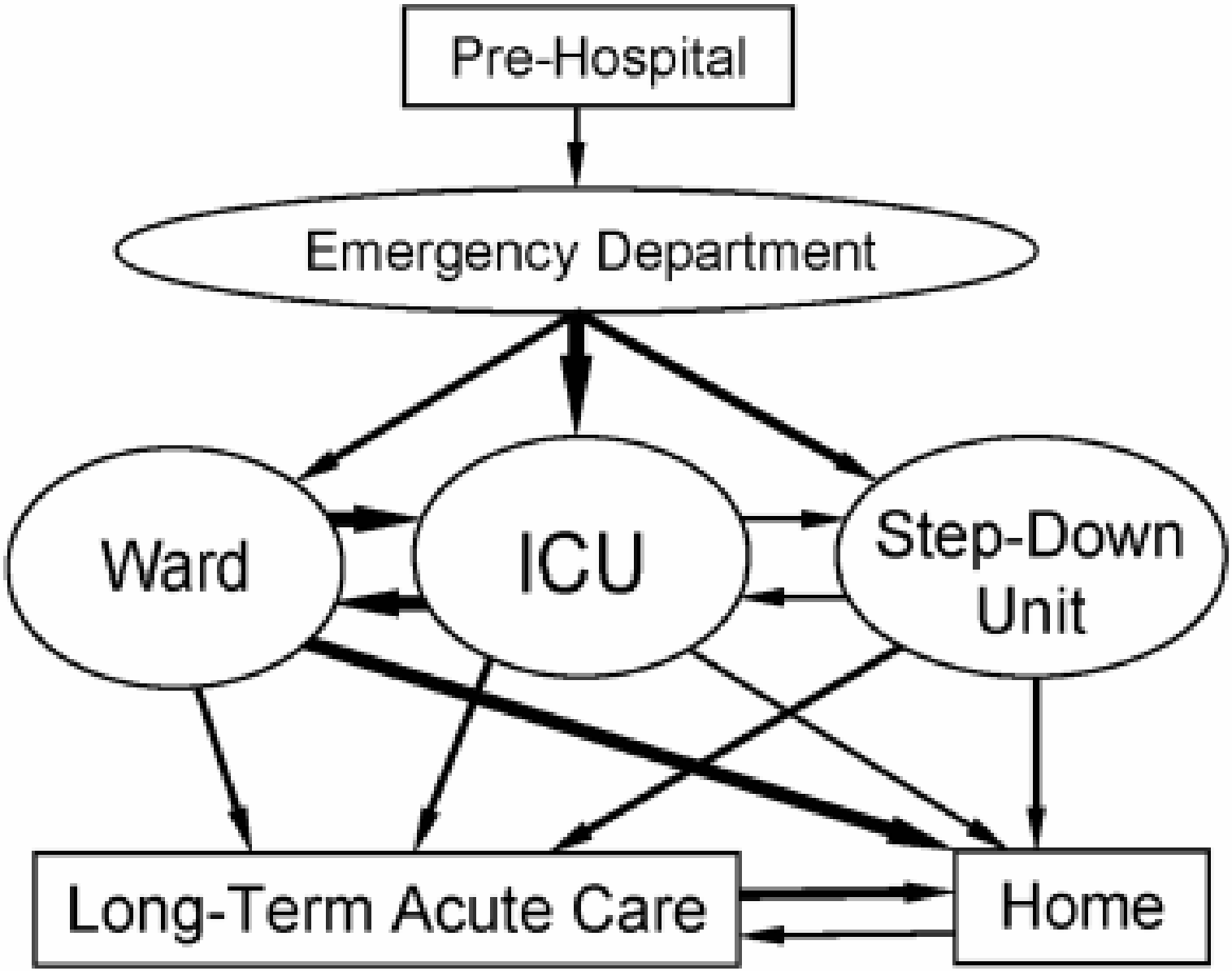
Where Should Noninvasive Ventilation Be Delivered?

Nicholas S Hill MD

Table 1. Advantages and Disadvantages of Locations for NIV in Acute and Subacute Conditions

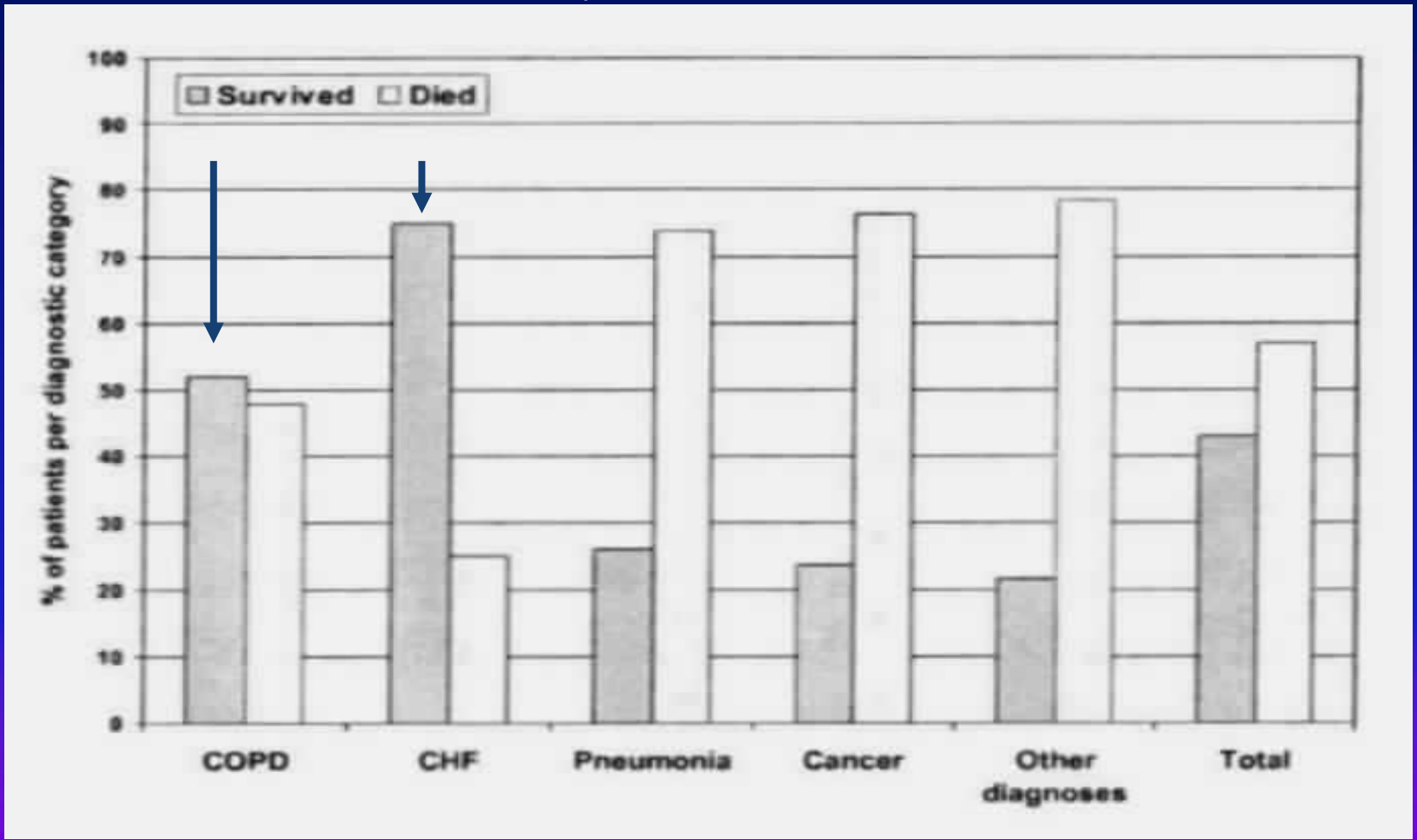
Location	Advantages	Disadvantages
Pre-hospital	Rapid application	Limited equipment and monitoring Lack of evidence
Emergency department	Rapid application Close monitoring in high-intensity room	Temporary location Staff may lack NIV skill and experience
Intensive care unit	1:1 nurse/patient ratio, usually with dedicated respiratory therapist Maximal monitoring capabilities	Resource-intensive and excessively costly for stable patients Beds in short supply
Step-down unit	1:2 to 1:4 nurse/patient ratio and central monitoring available Often have dedicated respiratory therapist Develop specialized NIV skills and suitable for most acute NIV applications	Many hospitals lack such units Excessive resource-use for stable patients NIV skills differ between units
General ward	Suitable for stable patients for more efficient use of resources Beds more often available than in ICU or step-down unit Some offer central monitoring, have NIV skills	Not suitable for patients who require close monitoring Many lack experience or skill with NIV
Long-term acute care	Good location for transitioning from tracheostomy to NIV More time to initiate stable long-term patients on NIV Rehabilitation and physical therapy services available	Not suitable for acutely ill patients Many lack experience and skill with NIV

FLUJOGRAMA DE ASISTENCIA


Pre-Hospital
Emergency Department
Ward
ICU
Step-Down Unit
Long-Term Acute Care
Home

NIV in DNI pts: outcome

Levy et al Crit Care Med 2004;32:2002-7



N=114 of 1211 screened

43% survived to discharge

ORGANIZACIÓN DE LA VMNI EN SALA DE HOSPITALIZACION

ESTRUCTURA EN VMNI

Servicios responsables.

Monitorización.

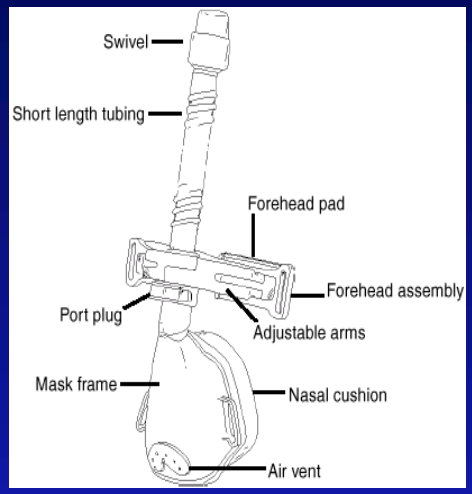
Ventiladores e interfaces adecuados en número y calidad.

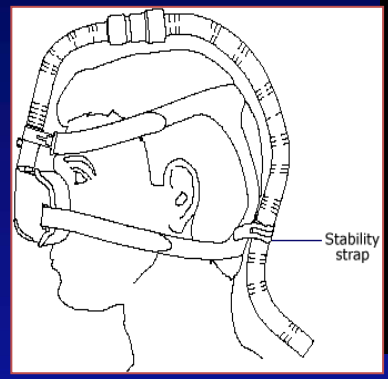
Sistema de mantenimiento y control del material.

Cursos de formación.

Acute Hypercapnic Respiratory Failure

Interface- clinical-technical factors



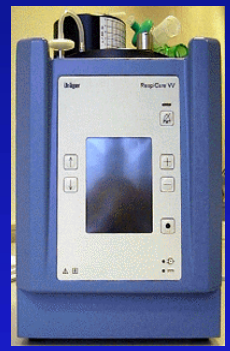




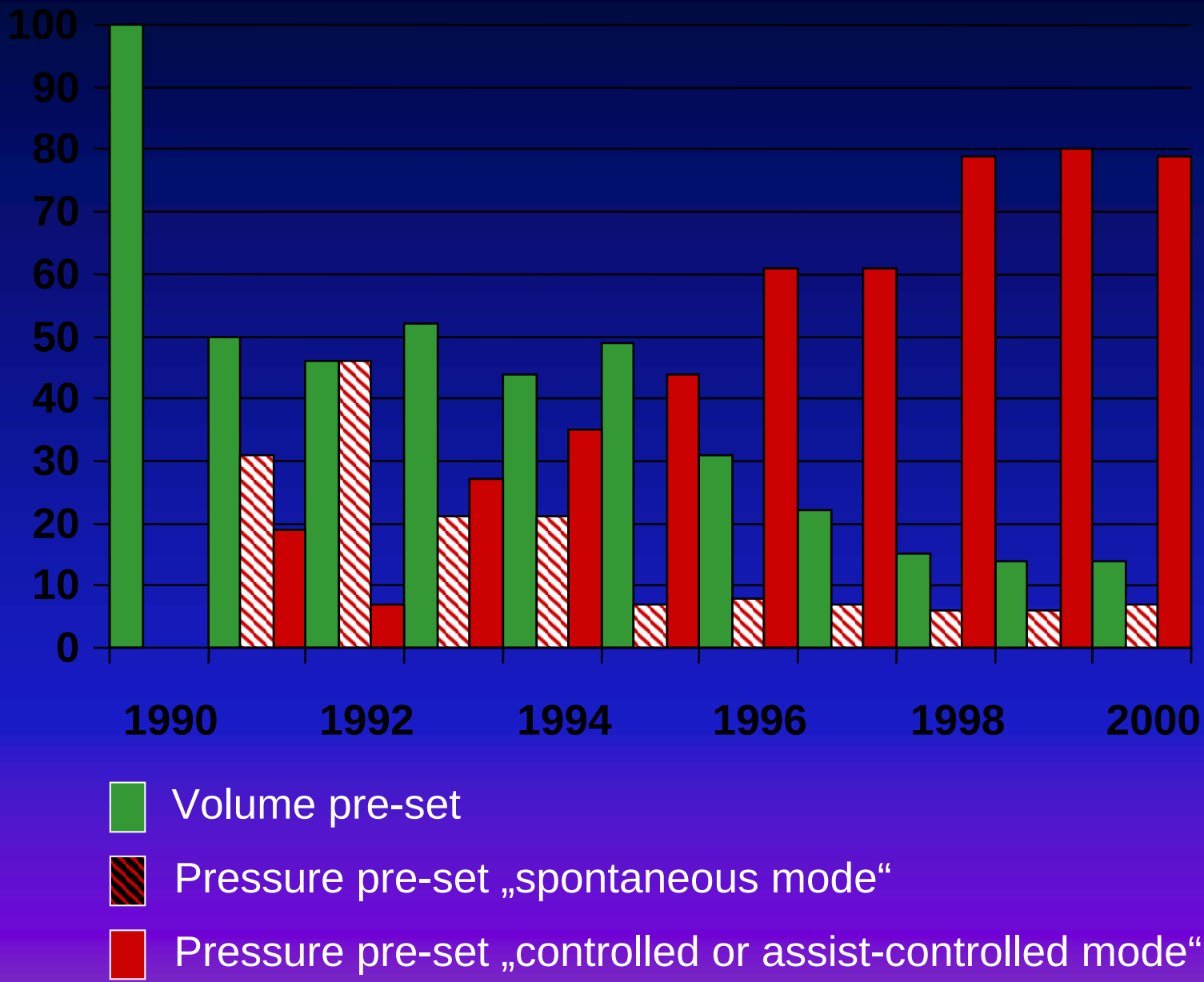








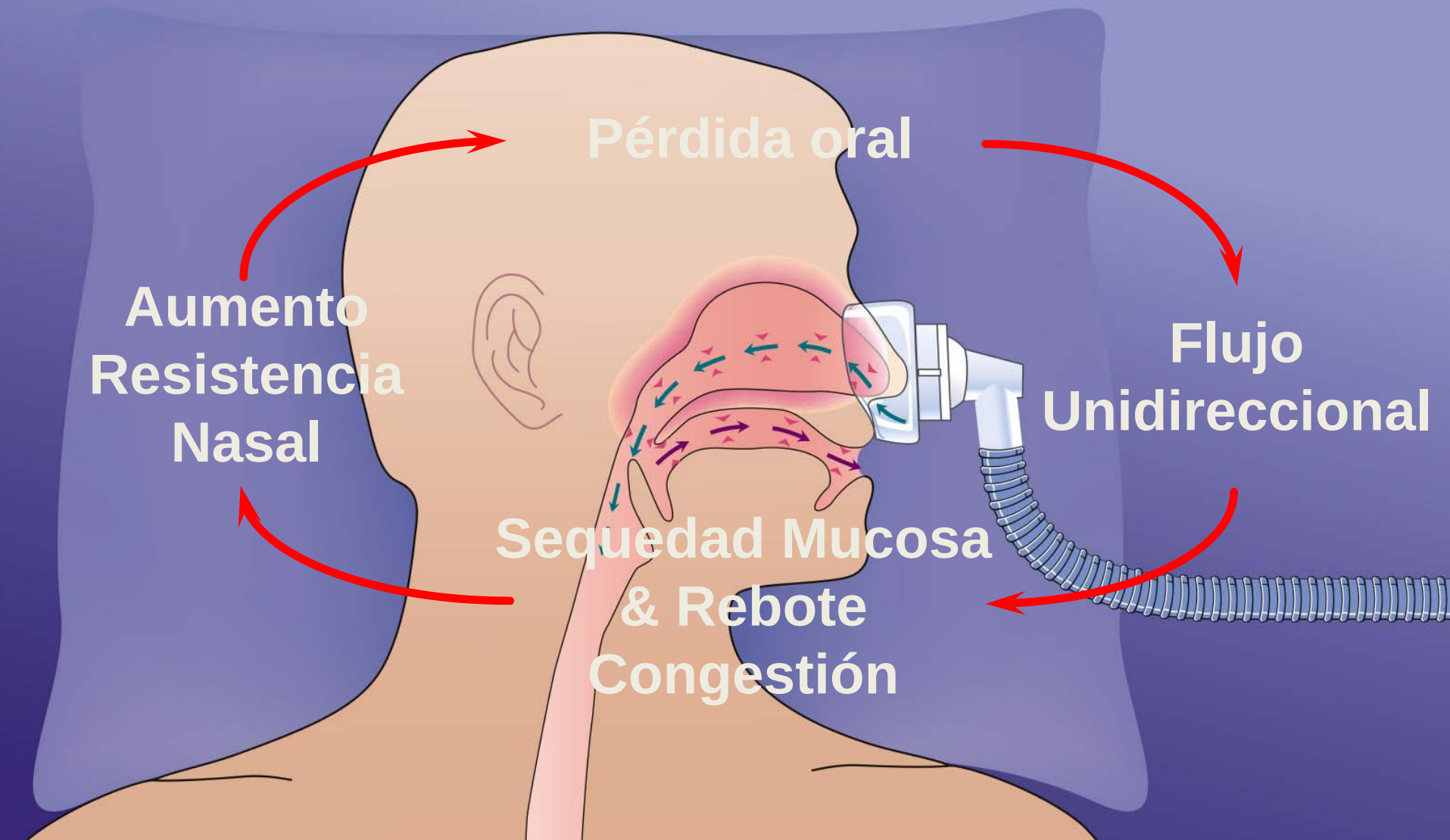


Schönhofer *ERS Monograph* 2001; 16: 259-2

ELEMENTOS DE VMNI

NIV pathophysiology. Leaks
Resistencia Nasal -& Pérdida/Respiración Oral



FACTORES DE RESPUESTA

HIPERCAPNICOS

Poor neurologic score (Glasgow Coma Score < 11)

Tachypnea (> 35 breaths/min)

pH < 7.25

APACHE score > 29

Asynchronous breathing

Edentulous

Excessive air leak

Agitation

Excessive secretions

Poor tolerance

Poor adherence to therapy

No initial improvement within first 2 h of NIV:

- No improvement in pH
- Persistent tachypnea
- Persistent hypercapnia

HIPOXEMICOS

Diagnosis of ARDS or pneumonia

Age > 40 y

Hypotension (systolic blood pressure < 90 mm Hg)

Metabolic acidosis (pH < 7.25)

Low oxygenation index (P_{aO_2}/F_{IO_2})

Simplified Acute Physiology Score II > 34

Failure to improve oxygenation within first hour of NIV (P_{aO_2}/F_{IO_2} > 175 mm Hg)

ARDS = acute respiratory distress syndrome

F_{IO_2} = fraction of inspired oxygen

(Based on data in References 23-25.)

MONITORIZACION DE LA VMNI

Continuous observation from central monitoring area

Frequent checks of:

- Comfort
- Tolerance
- Mask fit
- Air leak
- Patient-ventilator synchrony

Vital signs, especially respiratory rate

Accessory muscle use

Ventilator tidal volume (aim for 6–7 mL/kg)

Continuous telemetry

- Electrocardiogram trace
- Oximetry

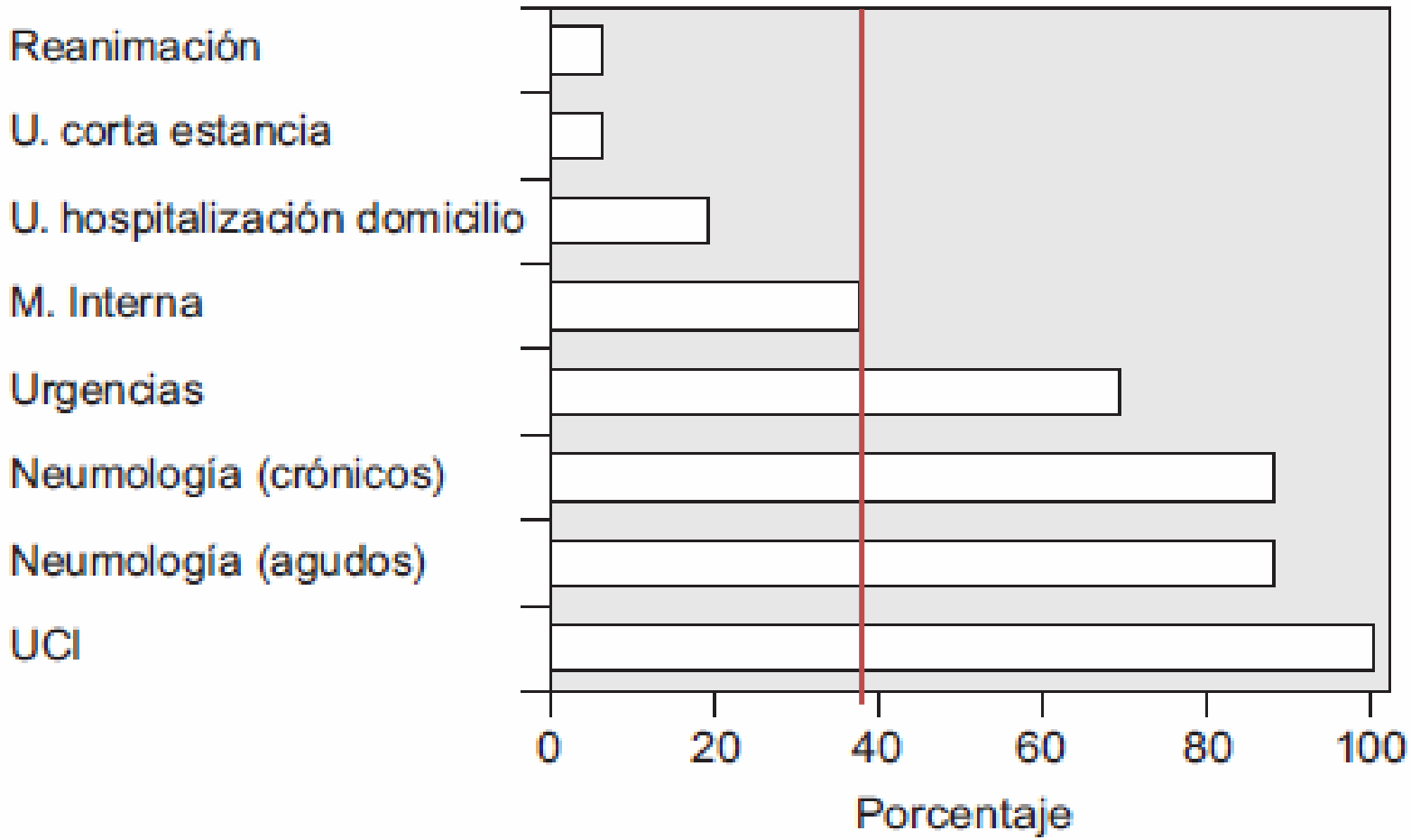
Blood gas values at baseline, after 1–2 h, and as indicated

SITUACION ACTUAL EN NUESTRO PAIS

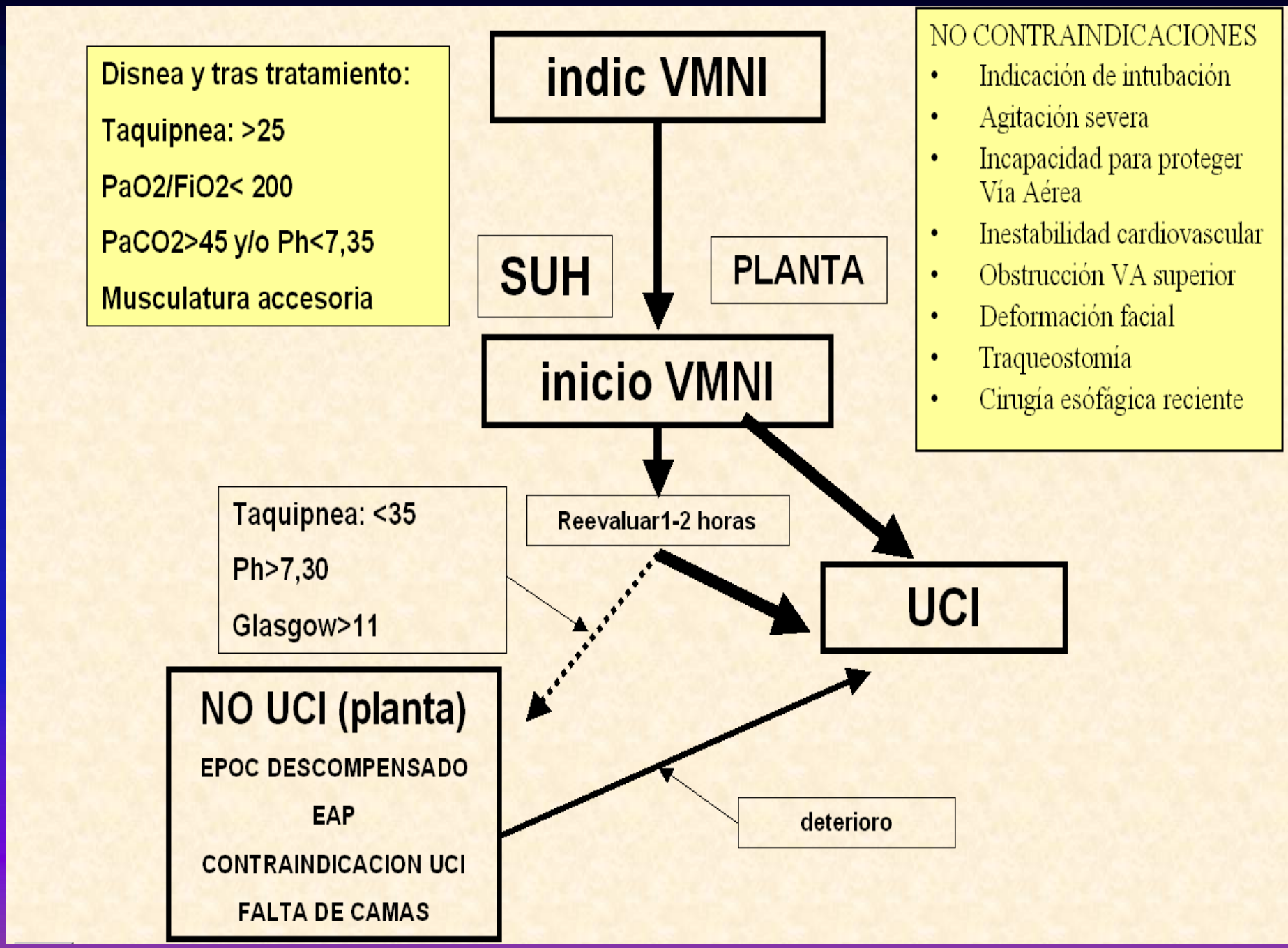
Ventilación mecánica no invasiva en la Comunidad Valenciana: de la teoría a la práctica

Eusebi Chiner [a,*], Mónica Llombart [a], Miguel Ángel Martínez-García [b], Estrella Fernández-Fabrellas [c], Rafael Navarro [d] y Ángela Cervera [c], en representación del Grupo de Trabajo de SAHS y VMNI de la Sociedad Valenciana de Neumología

Arch Bronconeumol. 2009;**45(3)**:118–122



¿ COMO REALIZAR LA VMNI EN SALAS DE HOSPITALIZACION?


Disnea y tras tratamiento:
Taquipnea: >25
PaO2/FiO2< 200
PaCO2>45 y/o Ph<7,35
Musculatura accesoria
indic VMNI
SUH
PLANTA
NO CONTRAINDICACIONES
Indicación de intubación
Agitación severa
Incapacidad para proteger Vía Aérea
Inestabilidad cardiovascular
Obstrucción VA superior
Deformación facial
Traqueostomía
Cirugía esófágica reciente
inicio VMNI
Taquipnea: <35
Ph>7,30
Glasgow>11
Reevaluar1-2 horas
UCI
NO UCI (planta)
EPOC DESCOMPENSADO
EAP
CONTRAINDICACION UCI
FALTA DE CAMAS
deterioro

THE WARD STUDIES

- Early (pH < 7.35, RR > 23) intervention beneficial
- 80% patients with pH > 7.30 will get better anyway
- Outcome in patients with pH < 7.30 is poor without NIV

Intensive Care Med (2003) 29:419–425
DOI 10.1007/s00134-002-1574-1

ORIGINAL

Annalisa Carlucci
Monica Delmastro
Fiorenzo Rubini
Claudio Fracchia
Stefano Nava

Changes in the practice of non-invasive ventilation in treating COPD patients over 8 years

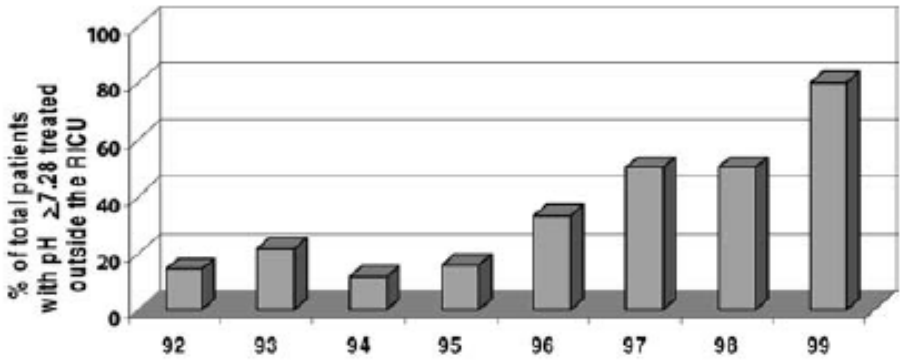


Fig. 4 Percentage of patients with pH >7.28 treated outside the RICU, in the medical ward, in the 8 years of the study. $P<0.001$ in the x^2 Hf for linear trend analysis

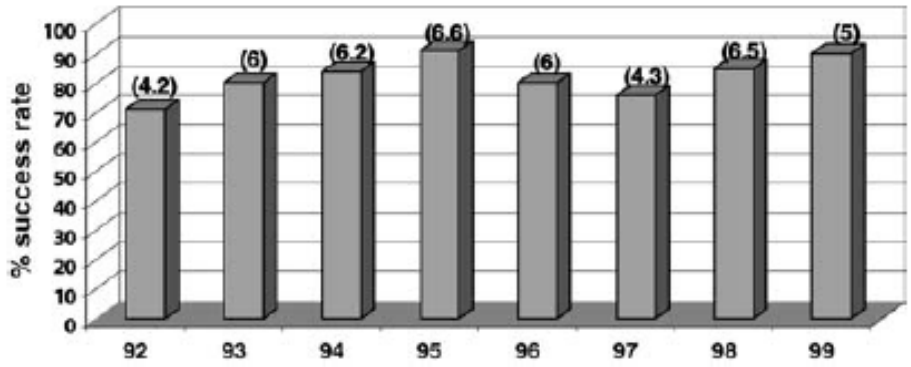


Fig. 2 Success rate of the patients treated with NIV in the 8 years of the study. Numbers in brackets are the numbers of patients ventilated with NIV for a single RICU bed per year. P = ns

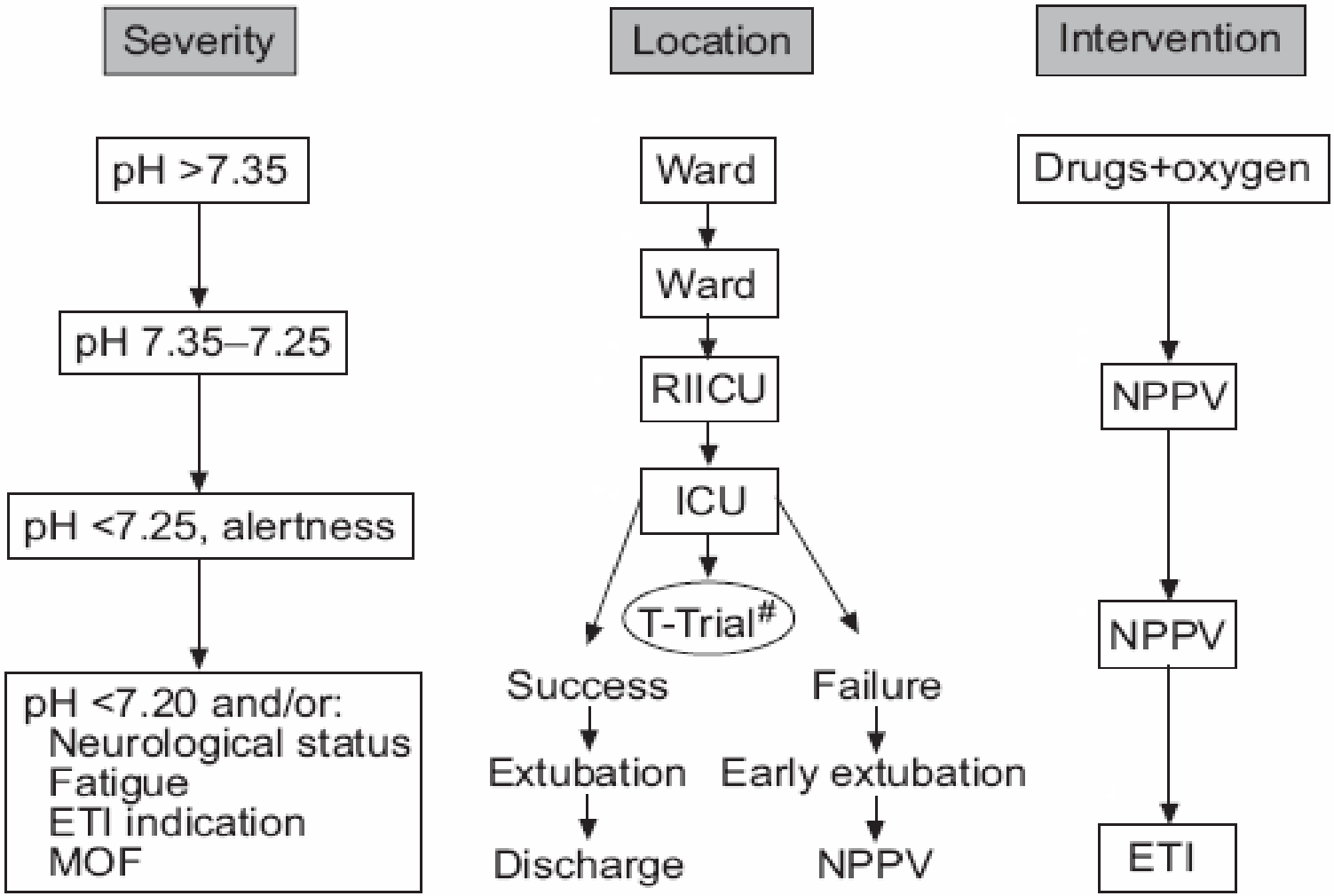
***Conclusions**:* … experience with NIV may progressively allow more severely ill patients to be treated without changing the rate of success.

REVIEW

Noninvasive positive pressure ventilation in the acute care setting: where are we?

N. Ambrosino*,# and G. Vagheggini#

Eur Respir J 2008; 31: 874–886



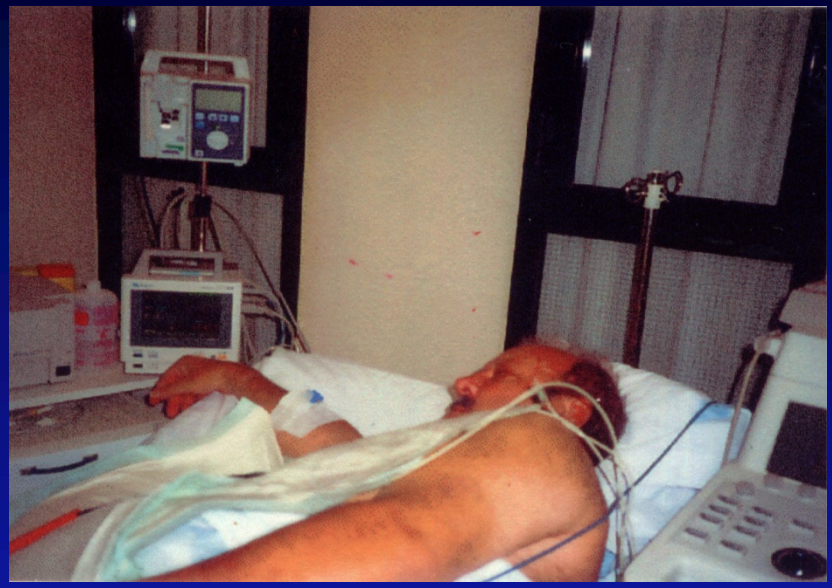
TECNICAS ENDOSCOPICAS APLICACIONES Y BENEFICIOS

Bronchoscopy

Bronchoscopy Acute HospitalApplications

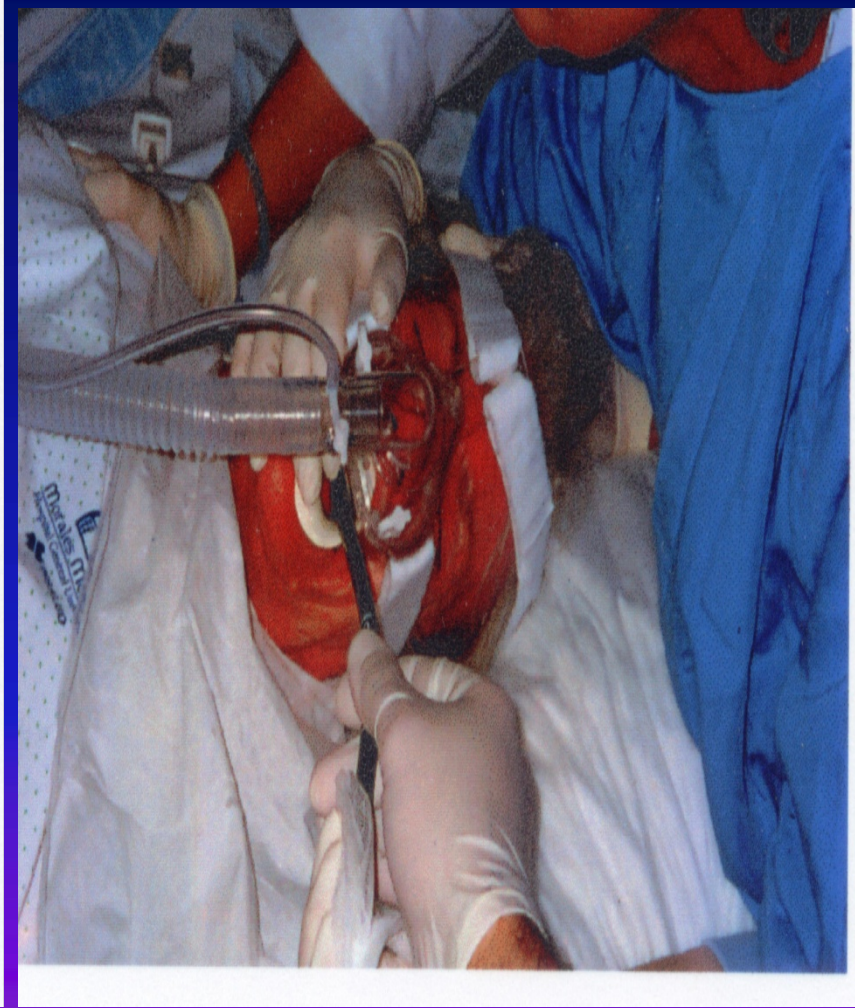
Acute HospitalApplications

TRANSESOPHAGEAL ECHOCARDIOGRAPHY



UPPER GASTROENDOSCOPY

Acute HospitalApplications



FACTORES PRONÓSTICOS

FACTORES PRONÓSTICOS

- Edad avanzada
- Fumador activo
- Pobre respuesta broncodilatadora
- Hipoxemia severa no controlada
- Cor pulmonale
- Pobre capacidad funcional residual

1. EPOC DE LARGA DURACIÓN.
2. EPOC CON OBSTRUCCIÓN AL FLUJO AÉREO GRAVE (FEV1 < 30%)
3. EXISTENCIA DE CO-MORBILIDAD ELEVADA (CARDIOPATÍA, DESNUTRICIÓN, ARRITMIAS)
4. FRECUENCIA DE REINGRESOS PREVIOS
5. SEVERIDAD DE LA AGUDIZACIÓN
6. (NIVEL DE ACIDOSIS E HIPERCAPNIA Y OXIGENACIÓN)

FACTORES DE RESPUESTA

A chart of failure risk for noninvasive ventilation in patients with COPD exacerbation

M. Confalonieri*, G. Garuti#, M.S. Cattaruzza¶, J.F. Osborn¶, M. Antonelli+, G. Conti+, M. Kodric*, O. Resta§, S. Marchese/, C. Gregoretti** and A. Rossi, on behalf of the Italian noninvasive positive pressure ventilation (NPPV) study group##

Risk stratification of NPPV failure was assessed in 1,033 consecutive patients admitted to experienced hospital units, including two intensive care units, six respiratory intermediate care units, and five general wards. NPPV was successful in 797 patients.

		pH admission <7.25		pH admission 7.25–7.29		pH admission >7.30	
	RR	APACHE ≥29	APACHE <29	APACHE ≥29	APACHE <29	APACHE ≥29	APACHE <29
GCS 15	<30	29	11	18	6	17	6
	30–34	42	18	29	11	27	10
	≥35	52	24	37	15	35	14
GCS 12–14	<30	48	22	33	13	32	12
	30–34	63	34	48	22	46	21
	≥35	71	42	57	29	55	27
GCS ≤11	<30	64	35	49	23	47	21
	30–34	76	49	64	35	62	33
	≥35	82	59	72	44	70	42

FIGURE 2. Failure risk chart of noninvasive positive pressure ventilation at admission (the values in the table correspond to the percentage of patients who fail in each

. : 0–24%; : 25–49%; : 50–74%; : 75–100%.

Eur Respir J 2005; 25: 348–355

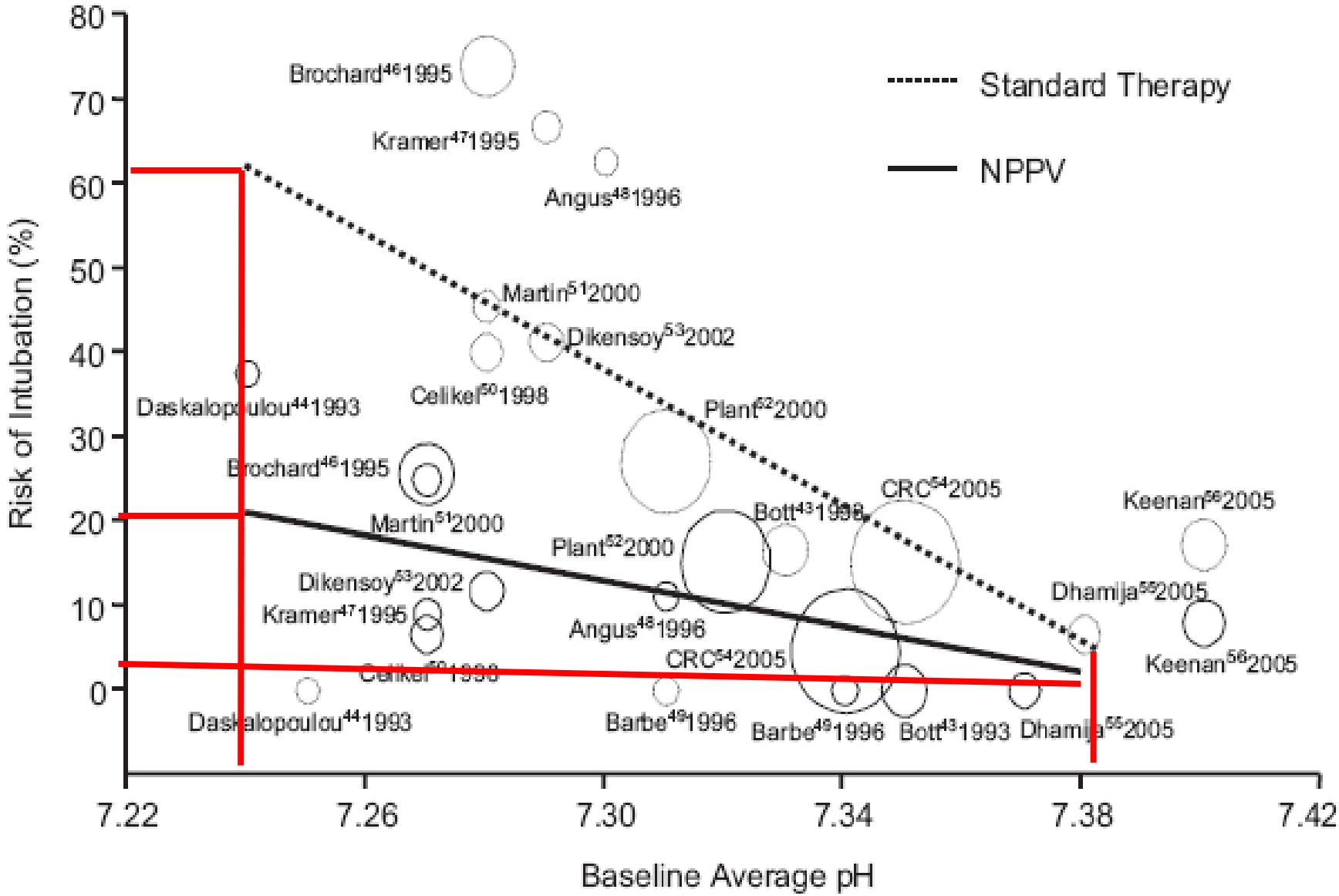
A chart of failure risk for noninvasive ventilation in patients with COPD exacerbation

M. Confalonieri*, G. Garuti#, M.S. Cattaruzza¶, J.F. Osborn¶, M. Antonelli+, G. Conti+, M. Kodric*, O. Resta§, S. Marchese^, C. Gregoretti** and A. Rossi, on behalf of the Italian noninvasive positive pressure ventilation (NPPV) study group##

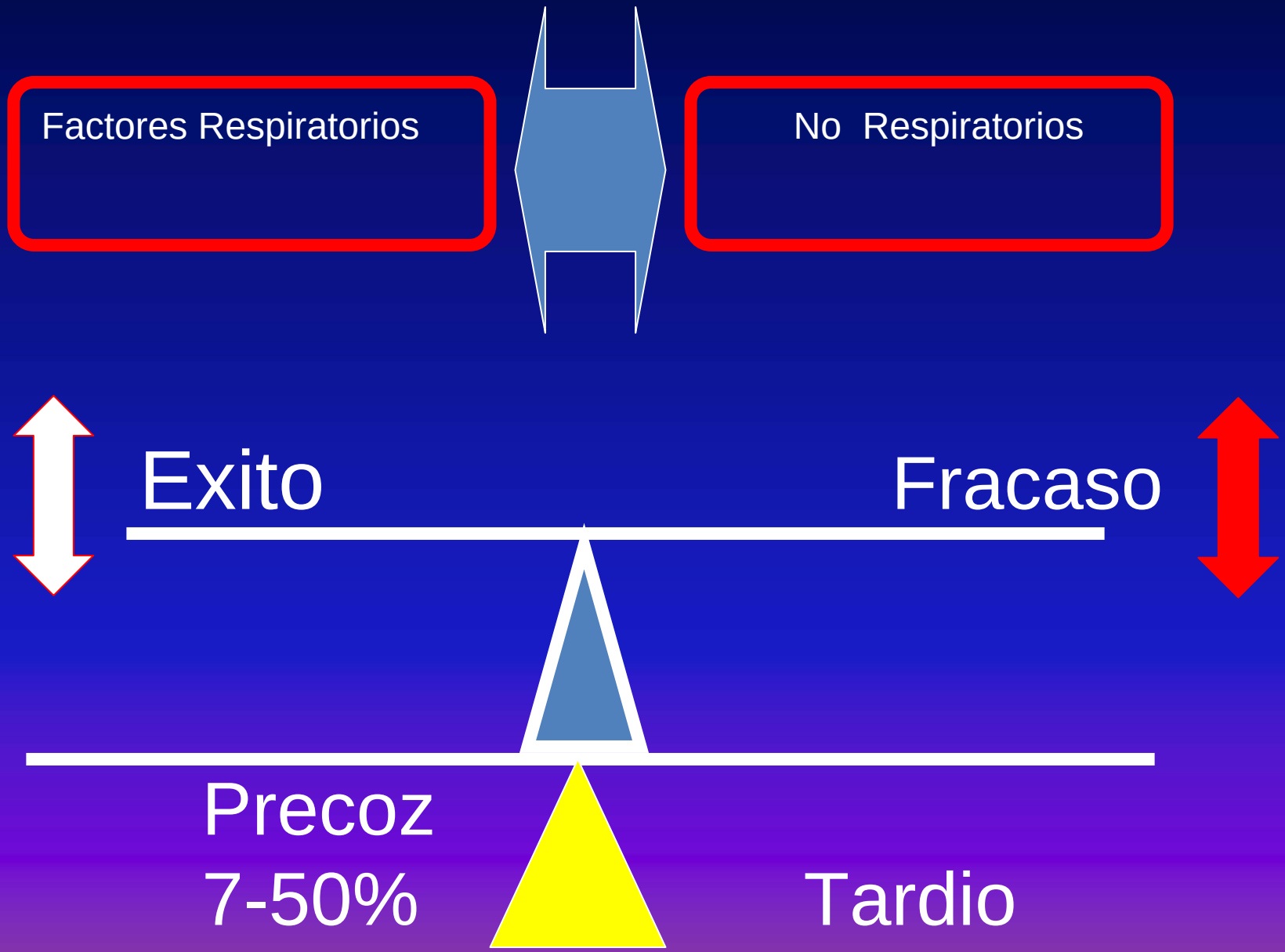
		pH after 2 h <7.25		pH after 2 h 7.25–7.29		pH after 2 h ≥7.30	
	RR	APACHE ≥29	APACHE <29	APACHE ≥29	APACHE <29	APACHE ≥29	APACHE <29
GCS 15	<30	72	35	27	7	11	3
	30–34	88	59	49	17	25	7
	≥35	93	73	64	27	38	11
GCS 12–14	<30	84	51	41	13	19	5
	30–34	93	74	65	28	39	12
	≥35	96	84	78	42	54	20
GCS ≤11	<30	93	74	65	28	39	12
	30–34	97	88	83	51	63	26
	≥35	99	93	90	66	76	40

. : 0–24%; : 25–49%; : 50–74%; : 75–100%.

(CHEST 2008; 133:756–766)



FACTORES DE RESPUESTA- VMNI-



PERFIL CLINICO VMNI.
FACTORES PRONOSTICOS EPOC REAGUDIZADO I

Acidosis: Basal pH (sensivilidad 97%, especifidad 71%).
(7,22 vs 7,28 Ambrosino, Brochard).

Hipercapnico: (PaCO2). (30 min, 1 hora, largos periodos)

Frecuencia Respiratoria (no siempre vista)

Indice de Severidad
APACHE II (21(4), (Ambrosino)
SAPS II Benhamou.

CVF (Capacidad Vital Forzada)
FEV. (Flujo Espiratorio Forzado)
Anton et al
Bajo peso.

PERFIL CLINICO VMNI.
FACTORES PRONOSTICOS EPOC REAGUDIZADO-II

Causa de Reagudización del EPOC (variable)

Consolidación Radiologica.

Edad

Status Neurologico(nivel de conciencia / 1 hora

(Bronchard)

Tolerancia VMNI (Benhamou, Ambrosino)

Compliance (Soo Hoo)

Nivel de fugas

Falta de Dentición (Soo Hoo et al)

- Patología de base.
- Afectación otros órganos.

STAFF

Who should administer NPPV and in what location ?

Recommendations

- **NPPV in ED : when staff is expert**
- **NPPV should be managed in ICU or in a high-level monitoring enviroment**
- **in selected hyperCO_2 COPD with ARF (pH $\geq$ 7.30) NPPV may be initiated and maintained in the GW when staff is expert**
- **if signs of NPPV unsuccess outside the ICU appear patients should be transferred to ICU**

Consensus Conferences Am J Respir Crit Care Med 2001

COST EFFECTIVE?

- Effectiveness - meta analysis
    - more effective than conventional treatment
- Decision tree constructed and probability determined at each node
- Costs - saving of $2,500 per patient per admission
- "……More effective and less expensive"

Keenan et al. Crit Care Med 2000; 28:2094-2102.

RECOMENDACIONES INTERNACIONALES DE LA VMNI

BTS GUIDELINE

Non-invasive ventilation in acute respiratory failure

British Thoracic Society Standards of Care Committee

Thorax 2002;**57**:192–211

SUMMARY OF RECOMMENDATIONS

Introduction

- NIV has been shown to be an effective treatment for acute hypercapnic respiratory failure (AHRF), particularly in chronic obstructive pulmonary disease (COPD). Facilities for NIV should be available 24 hours per day in all hospitals likely to admit such patients. [**A**]
- NIV should not be used as a substitute for tracheal intubation and invasive ventilation when the latter is clearly more appropriate. [**B**]
- The beneficial effects of NIV have mainly been demonstrated in patients with a respiratory acidosis (pH <7.35, H^+ >45 nmol/l). Knowledge of arterial blood gas tensions is therefore critical to its application. Arterial blood gas tensions should be measured in most patients with acute breathlessness. [**B**]
- Arterial blood gas tensions improve rapidly in many patients with AHRF when they receive maximum medical treatment and appropriate supplementary oxygen. A repeat sample should usually be taken after a short interval to see if NIV is still indicated. [**B**]
- There should be a low threshold for measuring arterial blood gas tensions in patients with neuromuscular diseases, chest wall deformity, obesity, or acute confusional states who may be in respiratory failure without significant breathlessness. [**B**]

American Thoracic Society

International Consensus Conferences in Intensive Care Medicine: Noninvasive Positive Pressure Ventilation in Acute Respiratory Failure

Organized Jointly by the American Thoracic Society, the European Respiratory Society, the European Society of Intensive Care Medicine, and the Société de Réanimation de Langue Française, and approved by the ATS Board of Directors, December 2000

Am J Respir Crit Care Med Vol 163. pp 283–291, 2001

QUESTION 3: WHO SHOULD ADMINISTER NPPV AND IN WHAT LOCATION?

- The best venue depends on local factors such as the training and experience of the staff, available resources (beds, staff, equipment), and monitoring capacity.
- NPPV can be initiated in the **ED** when staff have been adequately trained.
- … most patients receiving NPPV should be managed in an **ICU** or within a system of care capable of providing high-level monitoring, …
- When NPPV is initiated outside the ICU, failure to improve gas exchange, pH, respiratory rate, or dyspnea, or deterioration in hemodynamic or mental status, should prompt referral to the ICU service.