Vela: The Way to Go!

Leo Brouwer
International Clinical Manager
Marketing Critical Care

CardinalHealth
Essential to care™

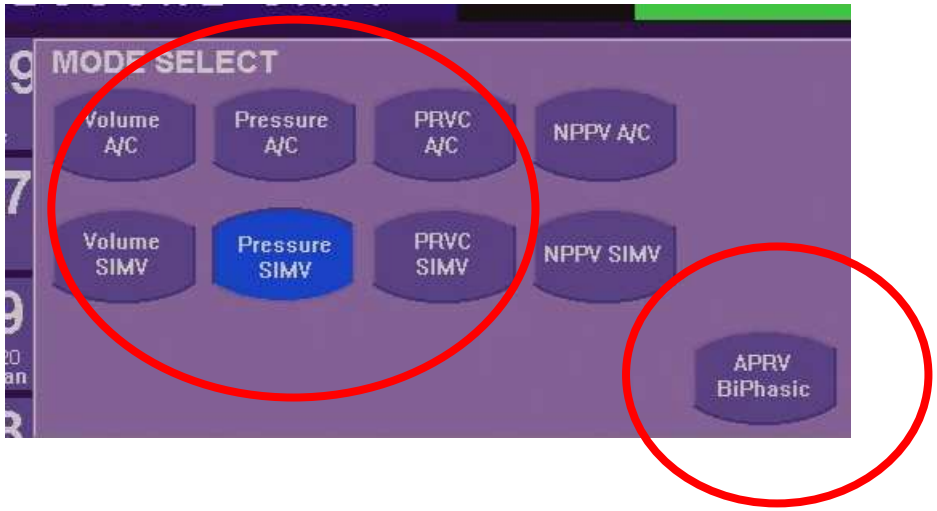
Vela maximum flexibility

- Invasive / non invasive ventilator
- Patient transport
- Pediatric and adult application
- Low cost of ownership
- Capnography (optional)
- PDMS connections
- Ease of use (reduce learning curve)

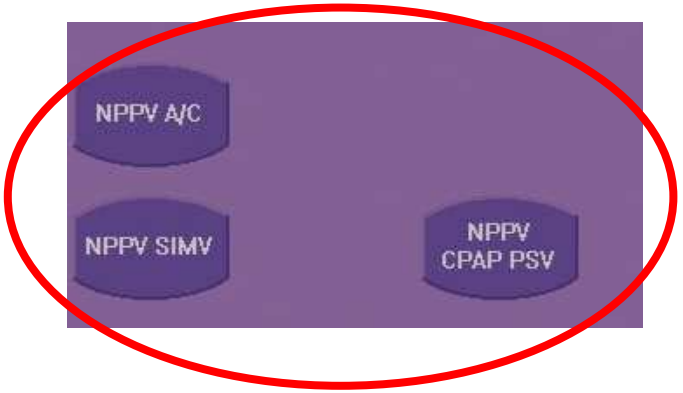
- A true 3 in 1 ventilator

Vela overview

Invasive



Non invasive



To come… s/w 02.02.14

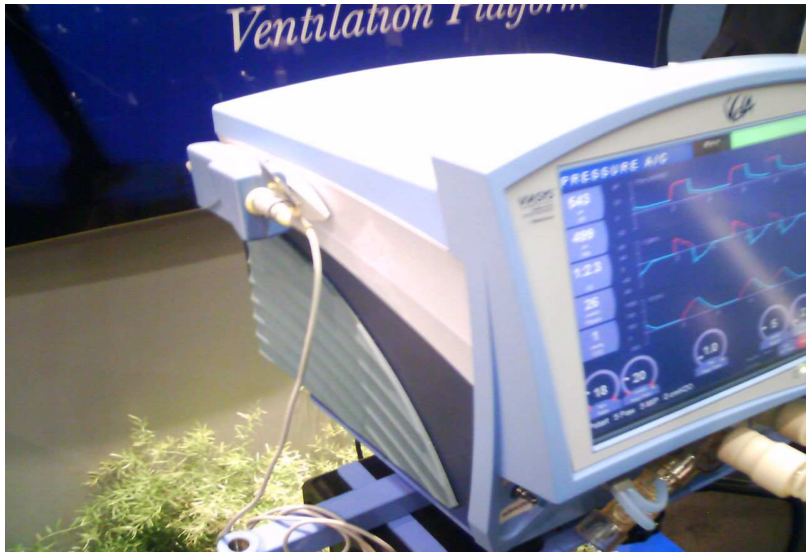
- $EtCO_2$
- Rapid Shallow Breathing Index (f/Vt) in PSV and NPPV/PSV
- Calculation Patient Resistance
- Flow cycle adjust to 70% in PC and PSV
- Improved transition in APRV to high and low level
- Improved leak compensation
- 5 kg approval
- Less autotriggering
- Battery power alarm adjusted

Vela overview

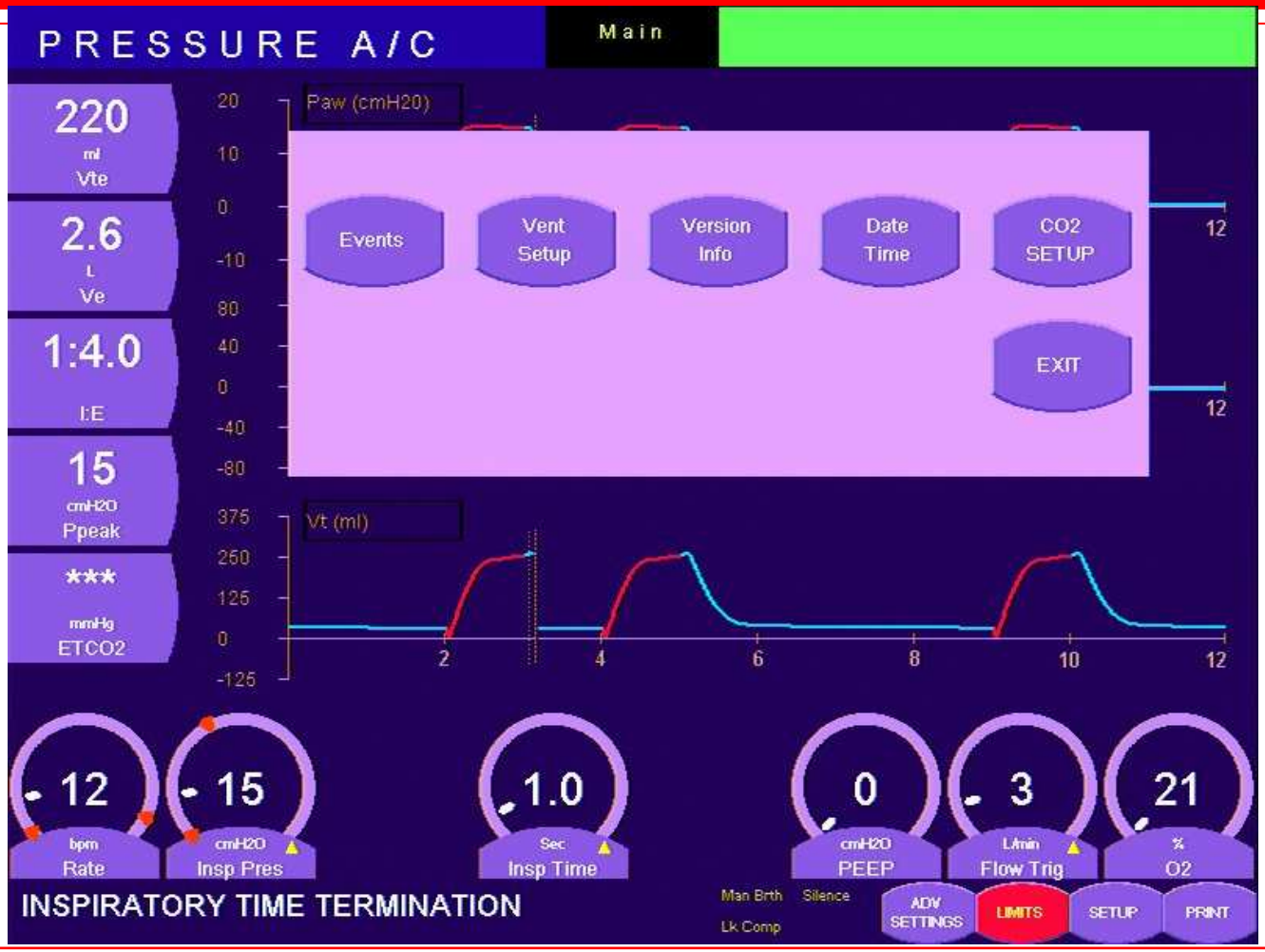
- Capnography:
- Benefits:
  - Identification of pulmonary disease
  - Allows comparisons of metabolism, cardiac function and respiration
  - Useful during intubation procedure, weaning and regular ventilation

Capnography

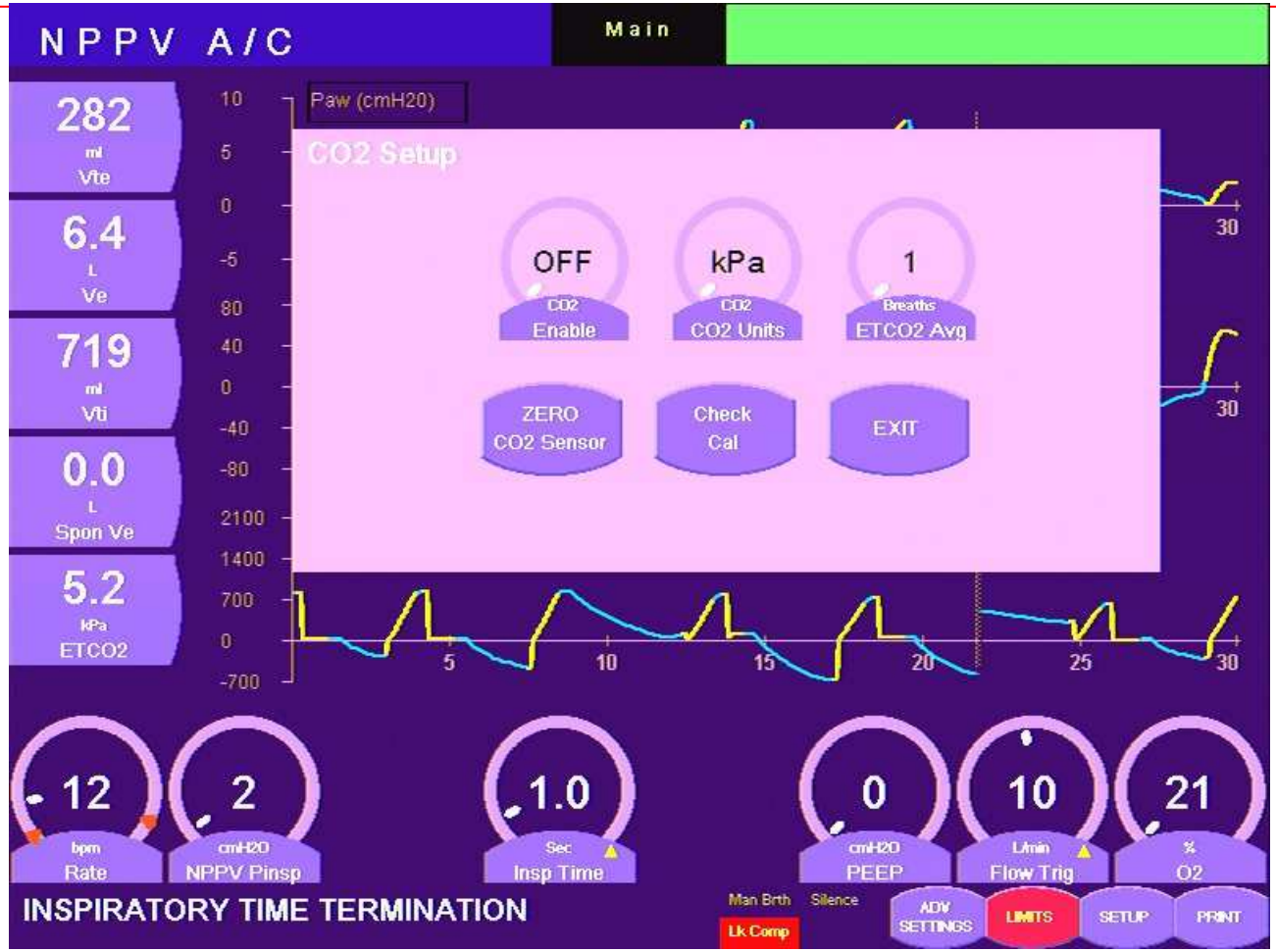
- Capnography inserted in Vela Diamond
- Provides waveform and $EtCO_2$
- How will it look like..



Capnography



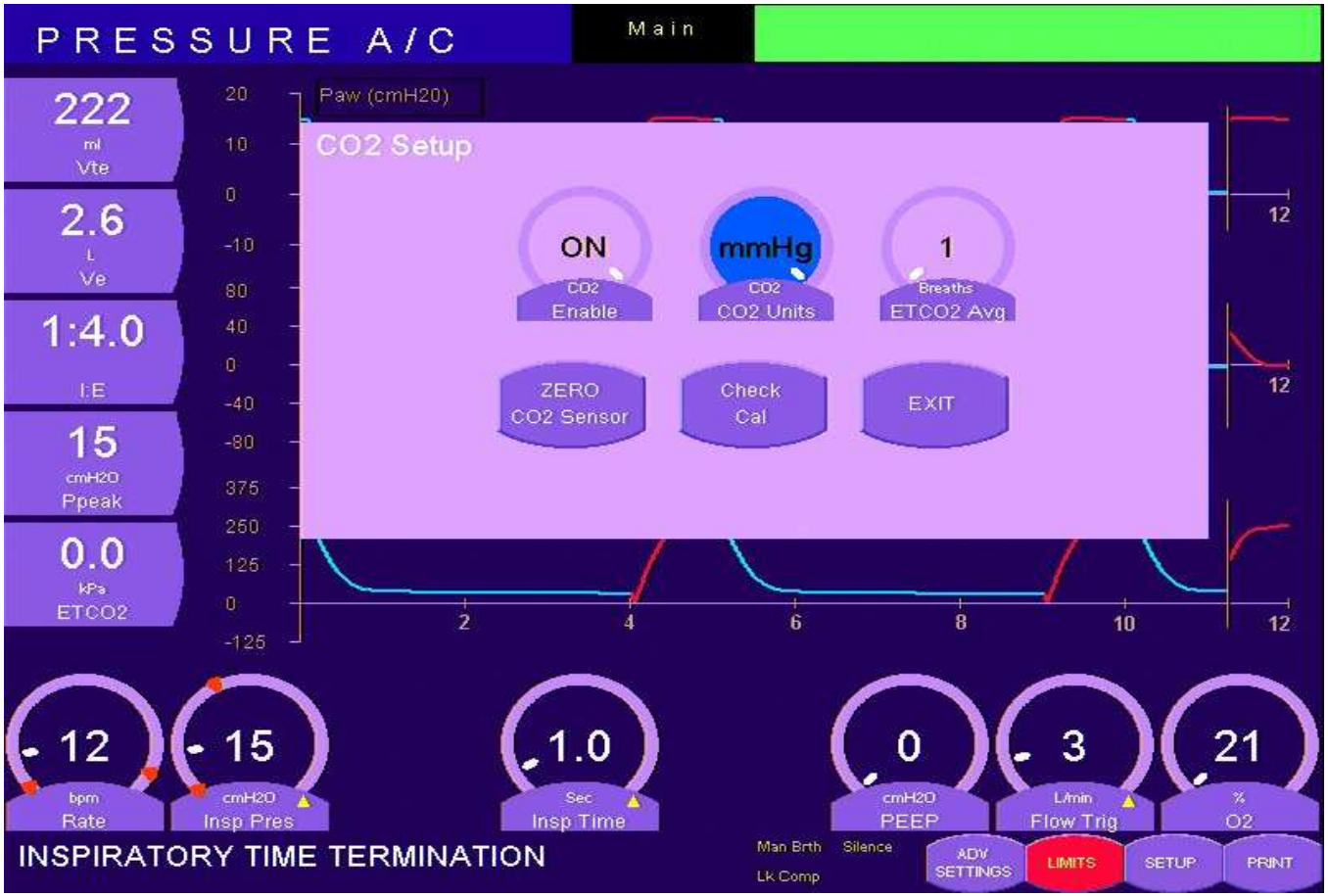
Capnography



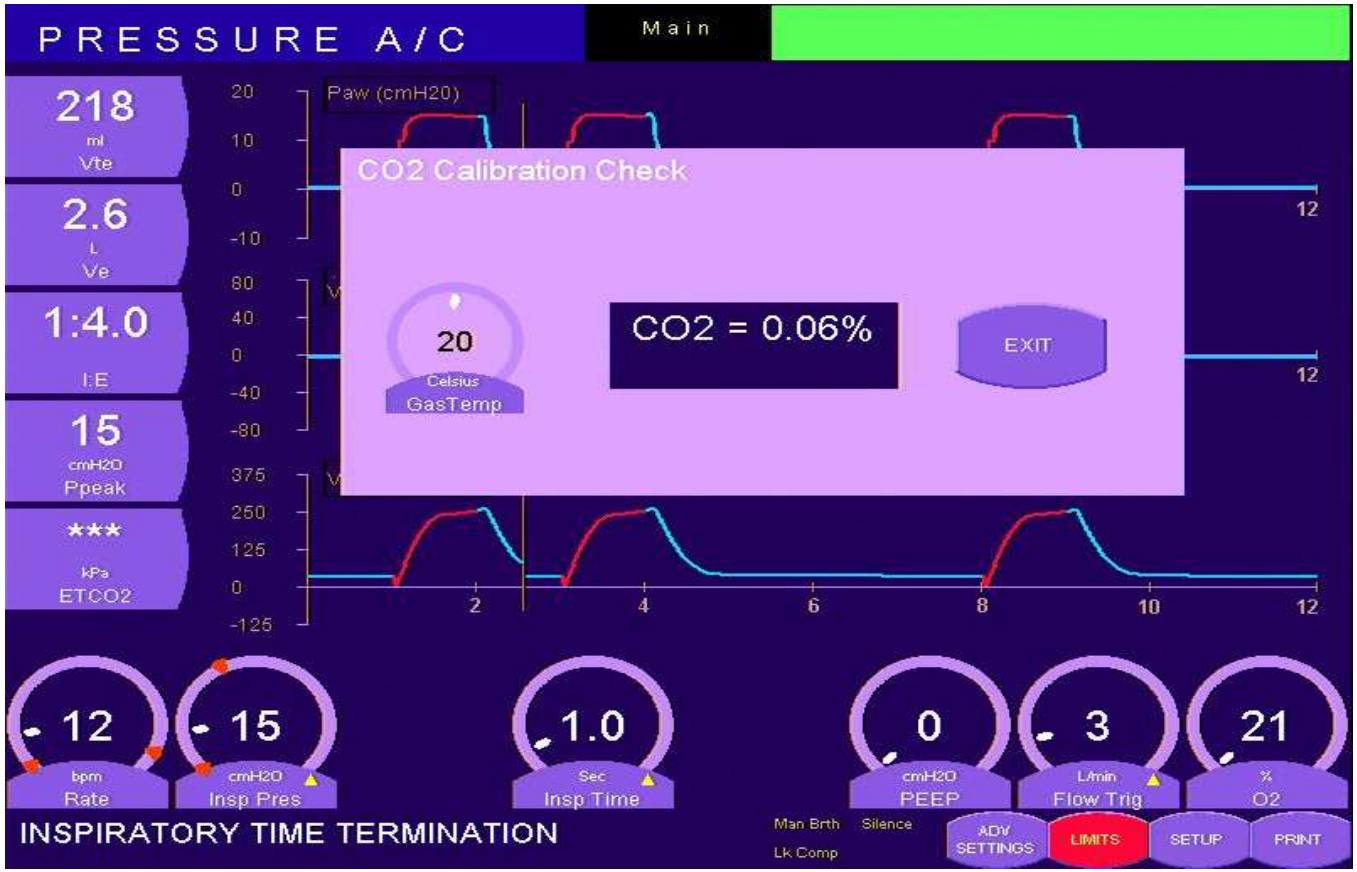
Capnography

CO2 Sensor Zero Pass

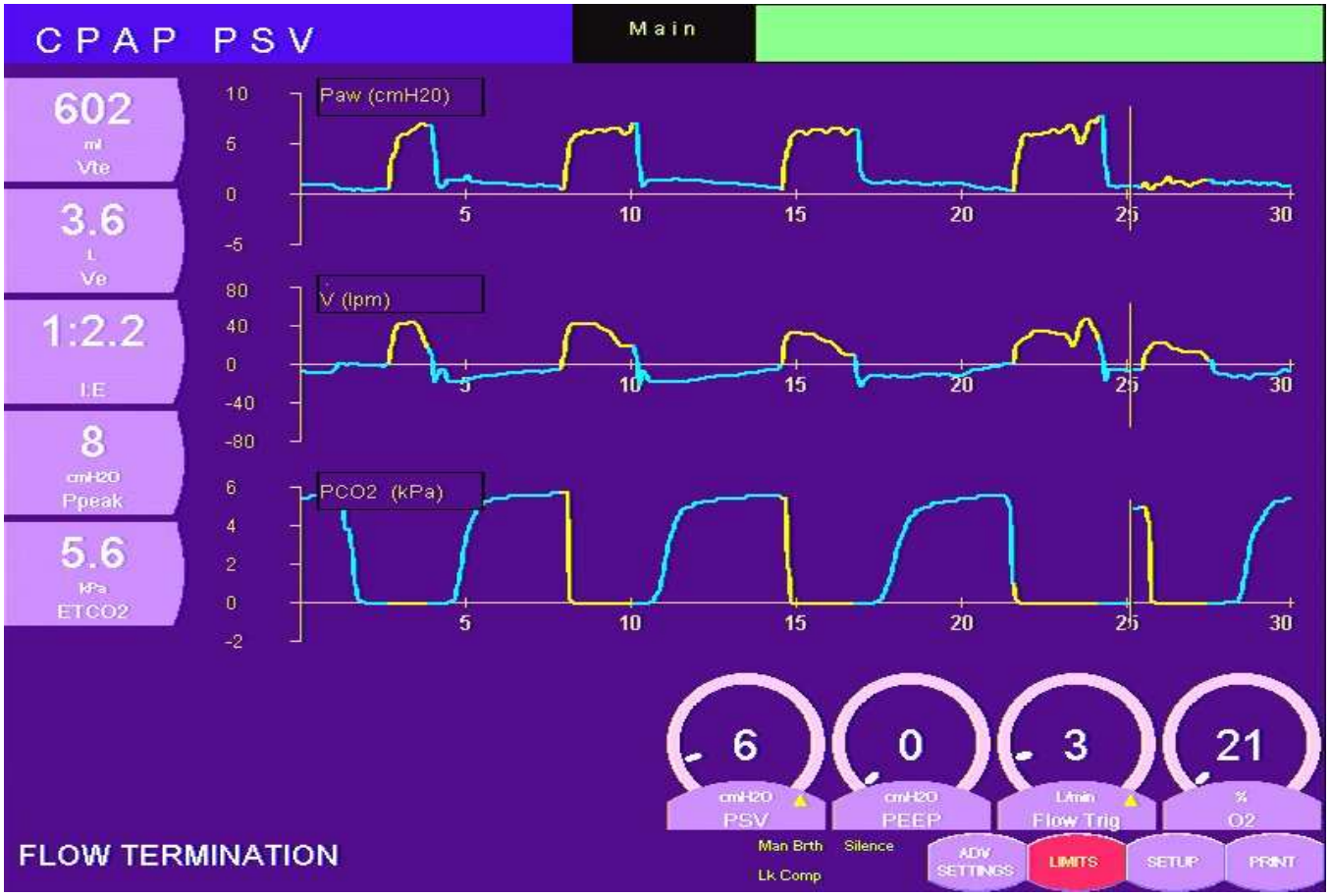
Capnography



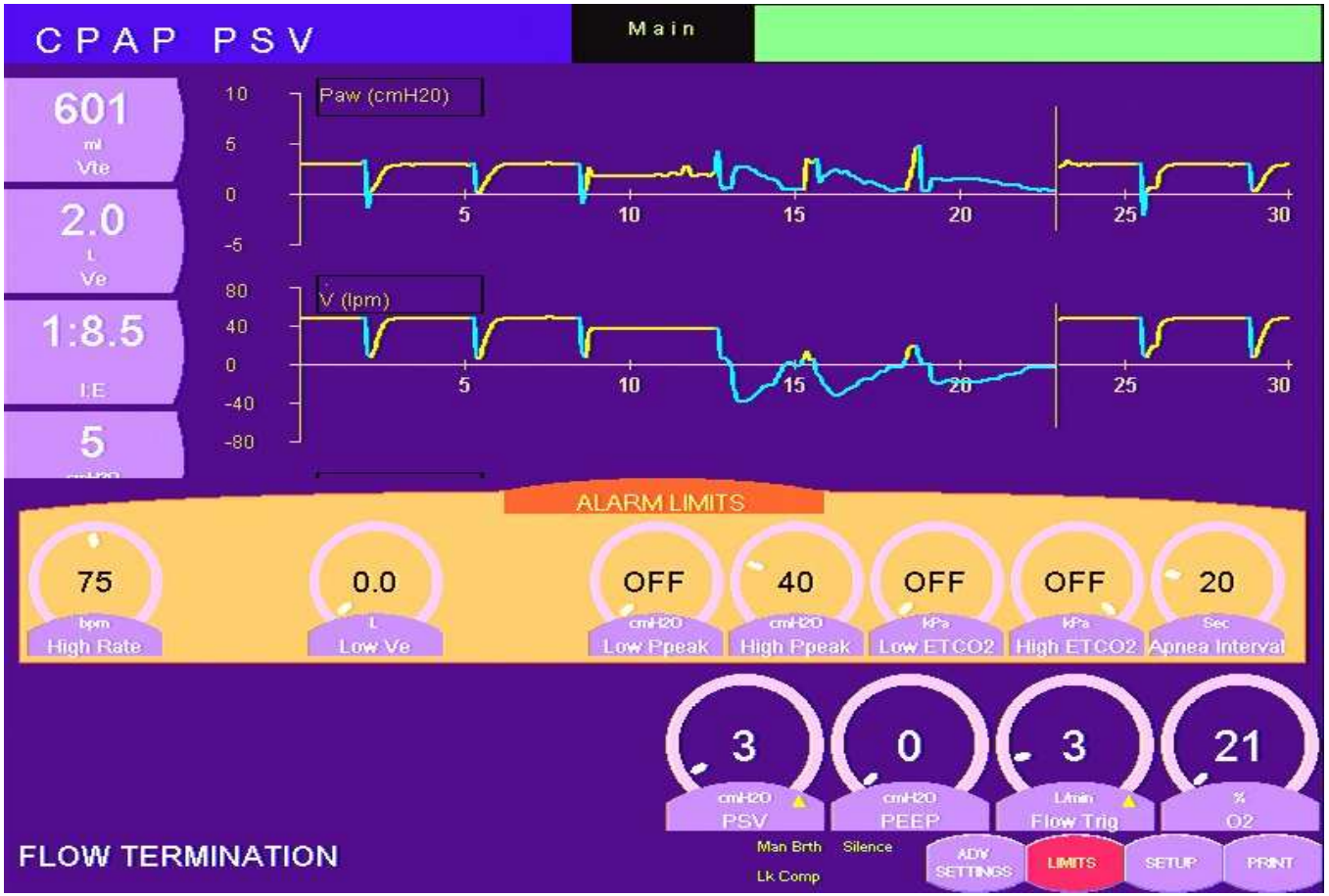
Capnography



Capnography



Alarm limits



NPPV

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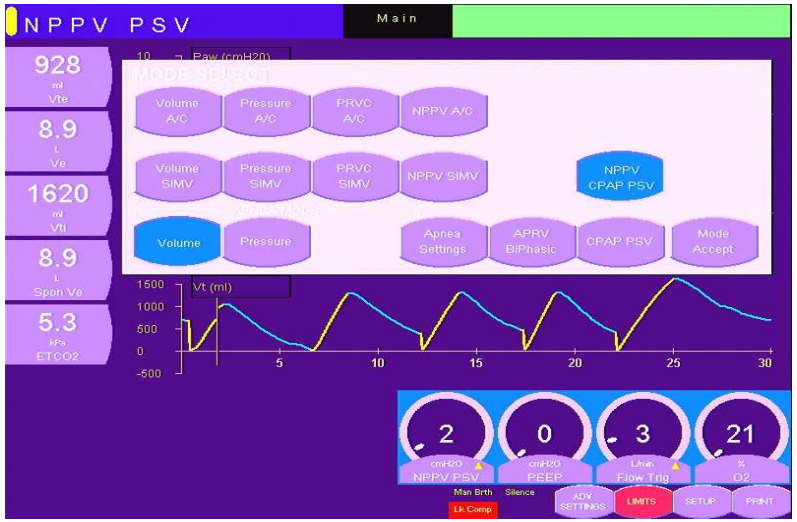
Essential to care™

Vela's excellent NPPV

- Increased use of NPPV
- NPPV can shorten LOS and mortality rates

- Vela closes the gap



NPPV success

- Depending:
  - 1: Motivated nursing staff and physicians!!!!!
  - 2: High performance ventilator
  - 3: Effective seal from mask
  - 4: Adequate humidification?

  - Nurses and physicians are most important success factor

Evidence for NPPV

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NPPV literature

- Patients:
  - COPD patients
  - Immuno compromised patients (AIDH)
  - Cardiac edema
  - Post extubation
  - Prevent intubation
  - Prevent VAP
  - ARF (acute respiratory failure)

Early use of non-invasive positive pressure ventilation for acute exacerbations of chronic obstructive pulmonary disease: a multicentre randomized controlled trial

Collaborative Research Group of Noninvasive Mechanical Ventilation for Chronic Obstructive Pulmonary Disease

Conclusions The early use of NPPV on general ward improves arterial blood gas and respiratory pattern, decreases the rate of need for intubation in AECOPD patients. NPPV is indicative for alleviating respiratory muscle fatigue and preventing respiratory failure from exacerbation.

Chin Med J 2005; 118(24):2034-2040

Noninvasive Ventilation in Acute Cardiogenic Pulmonary Edema

Systematic Review and Meta-analysis

Josep Masip, MD
Marta Roque, BSc
Bernat Sánchez, MD
Rafael Fernández, MD
Mireia Subirana, RN
José Angel Expósito, BSc

Context In patients with acute cardiogenic pulmonary edema noninvasive ventilation may reduce intubation rate, but the impact on mortality and the superiority of one technique over another have not been clearly established.

Objective To systematically review and quantitatively synthesize the short-term effect of noninvasive ventilation on major clinical outcomes.

Data Sources MEDLINE and EMBASE (from inception to October 2005) and Cochrane databases (library issue 4, 2005) were searched to identify relevant randomized controlled trials and systematic reviews published from January 1, 1988, to October 31, 2005.

N ONINVASIVE VENTILATION (NIV) is a modality of venti-

Given the results of our review, we think that NIV should be strongly considered as a first-line treatment.

Noninvasive Ventilation during Persistent Weaning Failure

A Randomized Controlled Trial

Miquel Ferrer, Antonio Esquinas, Francisco Arancibia, Torsten Thomas Bauer, Gumersindo Gonzalez, Andres Carrillo, Robert Rodriguez-Roisin, and Antoni Torres

Unitat de Vigilància Intensiva Respiratòria, Servei de Pneumologia, Institut Clínic de Pneumologia i Cirurgia Toràcica, Hospital Clínic, Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Universitat de Barcelona, Barcelona; and Unidad de Cuidados Intensivos, Hospital Morales Meseguer, Murcia, Spain

0.018). Earlier extubation with NIV results in shorter mechanical ventilation and length of stay, less need for tracheotomy, lower incidence of complications, and improved survival in these patients.

Noninvasive Positive-Pressure Ventilation and Ventilator-Associated Pneumonia

Dean R Hess PhD RRT FAARC

Table 1. Studies Reporting Nosocomial Pneumonia Rates Associated With NPPV

Study	Patient Population	Design	Patients (*n*)		Pneumonia Rate (%)	
			NPPV	Control	NPPV	Control
Brochard et al[10]	COPD exacerbation	Randomized controlled trial	43	42	5	17
Guerin et al[11]	Medical intensive care unit	Prospective cohort	30	199	0	8
Antonelli et al[12]	Acute hypoxemic respiratory failure	Randomized controlled trial	32	32	3	25
Nava et al[13]	Intubated COPD patients randomized to extubation and NPPV or remained intubated	Randomized controlled trial	25	25	0	28
Nourdine et al[14]	All mechanically ventilated patients during study period	Prospective cohort	129	607	0	13
Antonelli et al[15]	Acute respiratory failure in patients with solid-organ transplantation	Randomized controlled trial	20	20	10	20
Hilbert et al[16]	Acute respiratory failure in immunocompromised patients	Randomized controlled trial	26	26	8	23
Girou et al[17]	Medical intensive care unit	Matched case control	50	50	8	22
Carlucci et al[1]	All mechanically ventilated patients during study period	Prospective cohort	65	380	2	19
Keenan et al[18]	Post-extubation respiratory failure	Randomized controlled trial	39	42	41	40
Ferrer[19]	Persistent weaning failure	Randomized controlled trial	21	22	24	59
Ferrer[20]	Acute hypoxemic respiratory failure	Randomized controlled trial	51	54	10	24

NPPV = noninvasive positive-pressure ventilation
COPD = chronic obstructive pulmonary disease

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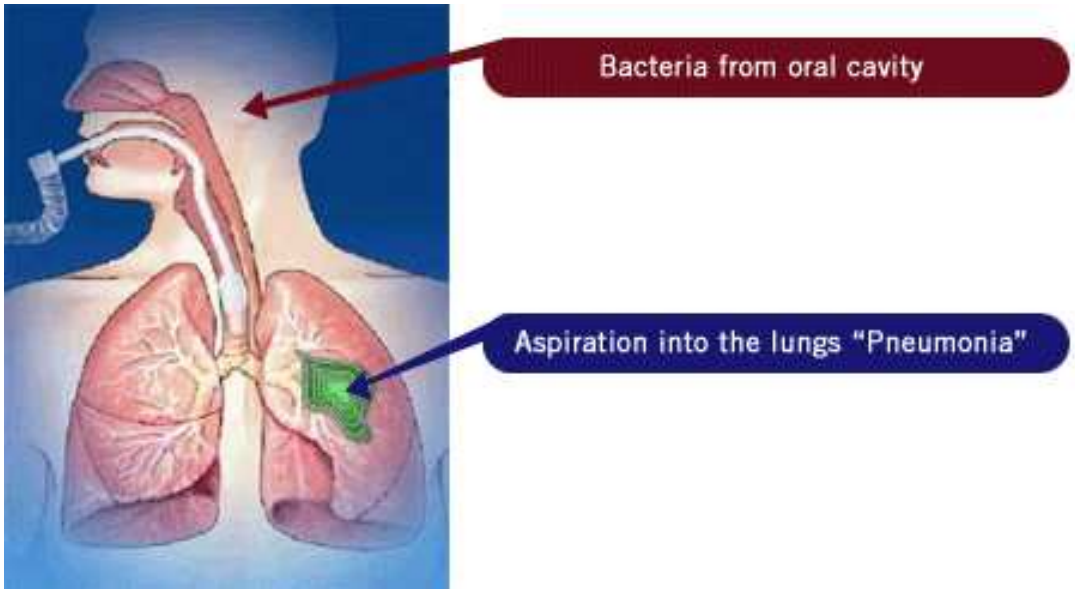
Invasive vs non invasive



Ventilator-associated Pneumonia

Jean Chastre and Jean-Yves Fagon

Service de Réanimation Médicale, Groupe Hospitalier Pitié-Salpêtrière; and Service de Réanimation Médicale, Hôpital Européen Georges-Pompidou, Paris, France

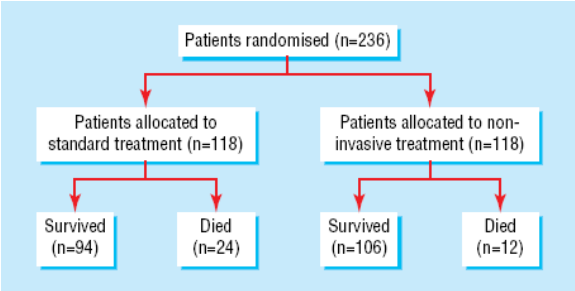
TABLE 1. INCIDENCE AND CRUDE MORTALITY RATES OF VENTILATOR-ASSOCIATED PNEUMONIA

First Author	Ref.	Year of Publication	No. of Patients	Incidence (%)	Diagnostic Criteria	Mortality Rate (%)
Patients in ICU						
Salata	41	1987	51	41	Clinical–autopsy	76
Craven	15	1986	233	21	Clinical	55
Langer	9	1989	724	23	Clinical	44
Fagon	12	1989	567	9	PSB	71
Kerver	43	1987	39	67	Clinical	30
Driks	40	1987	130	18	Clinical	56
Torres	14	1990	322	24	Clinical–PSB	33
Baker	44	1996	514	5	PSB/BAL	24
Kollef	45	1993	277	16	Clinical	37
Fagon	51	1996	1,118	28	PSB/BAL	53
Timsit	46	1996	387	15	PSB/BAL	57
Cook	35	1998	1,014	18	Clinical–PSB/BAL	24
Tejada Artigas	47	2001	103	22	PSB	44
Patients with ARDS						
Sutherland	49	1995	105	15	PSB/BAL	38
Delclaux	17	1997	30	60	PTC/BAL	63
Chastre	16	1998	56	55	PSB/BAL	78
Meduri	50	1998	94	43	PSB/BAL	52
Markowicz	18	2000	134	37	PSB/BAL	57

Definition of abbreviations: ARDS = acute respiratory distress syndrome; BAL = bronchoalveolar lavage; ICU = intensive care unit; PSB = protected specimen brush; PTC = plugged telescoping catheter.

Cost effectiveness of ward based non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease: economic analysis of randomised controlled trial

P K Plant, J L Owen, S Parrott, M W Elliott



Conclusions Non-invasive ventilation is a highly cos effective treatment that both reduced total costs and improved mortality in hospital.

BMJ VOLUME 326 3 MAY 2003 bmj.com

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

Influence of NPPV on Workload

An early, uncontrolled report indicated that NPPV created an excessive workload for ICU nurses (41). Subsequent controlled investigations including evaluations of respiratory therapist time have shown this not to be the case (24, 36). When invasive ventilation and NPPV were compared, no differences were found in the time doctors, nurses, or therapists spent at the bedside during the initial 6 h of ventilatory support. In the subsequent 42 h, less nursing time was required to monitor patients receiving NPPV (42). Studies of NPPV administered in the respiratory ward noted that nursing time was not significantly different when comparing patients managed using NPPV with control subjects (40).

Ventilator settings and behavior

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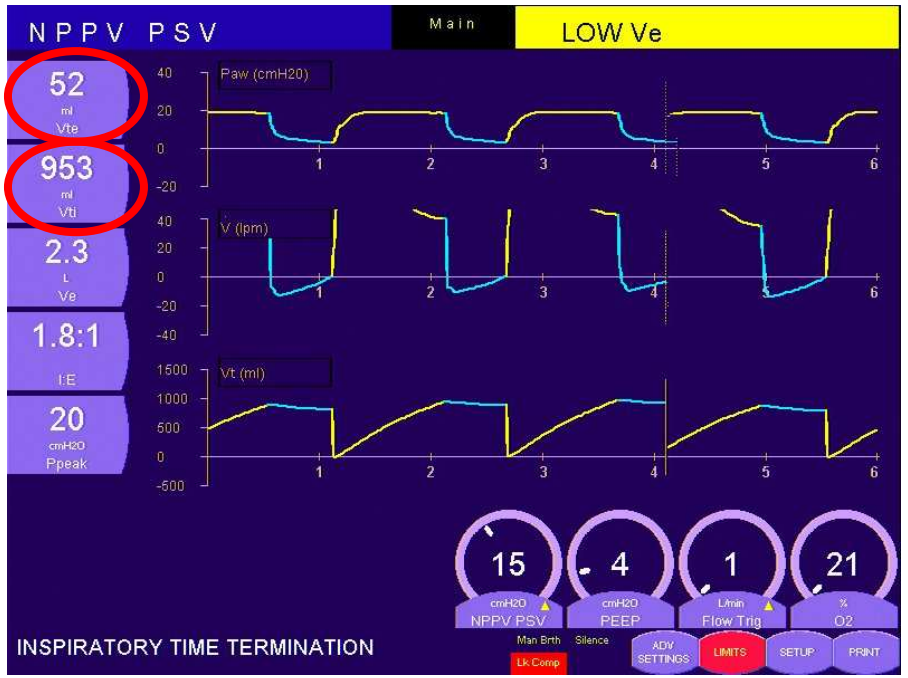
NPPV ventilator specifications

- Ability to compensate leakage
- End inspiratory flow cycling
- Fast flow delivery
- Transportable

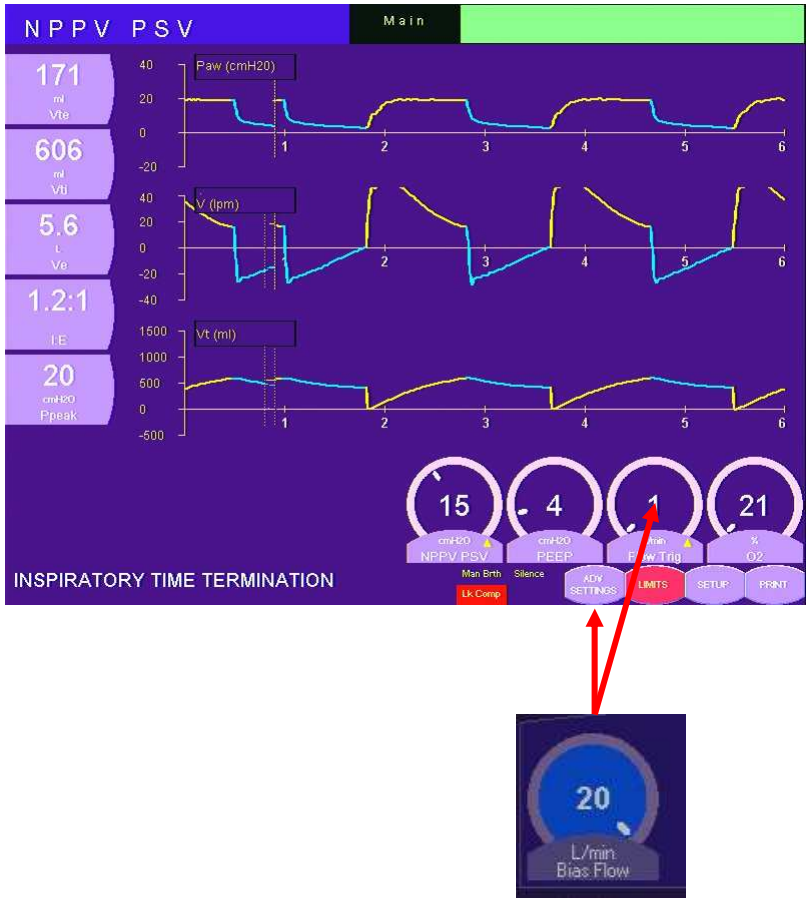
Leakage

- Patients comfort
  - Irritated eyes
  - Wasted effort



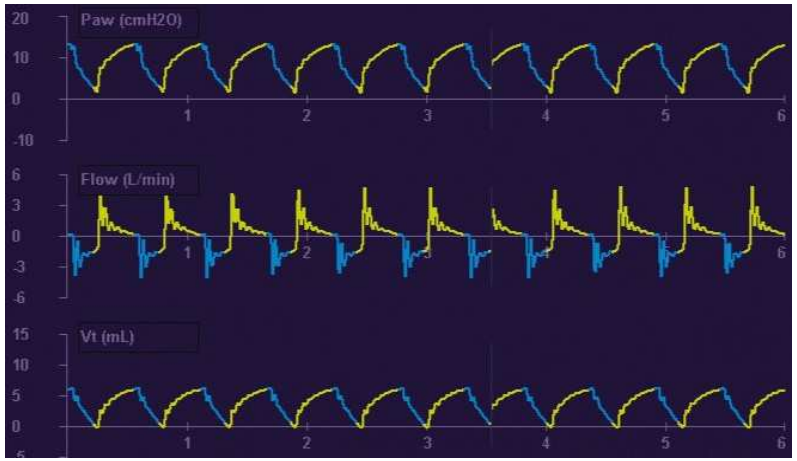
Bias flow

- Is needed to allow trigger
- Leak compensation is 40 lpm with 20 lpm biasflow total = 60 lpm



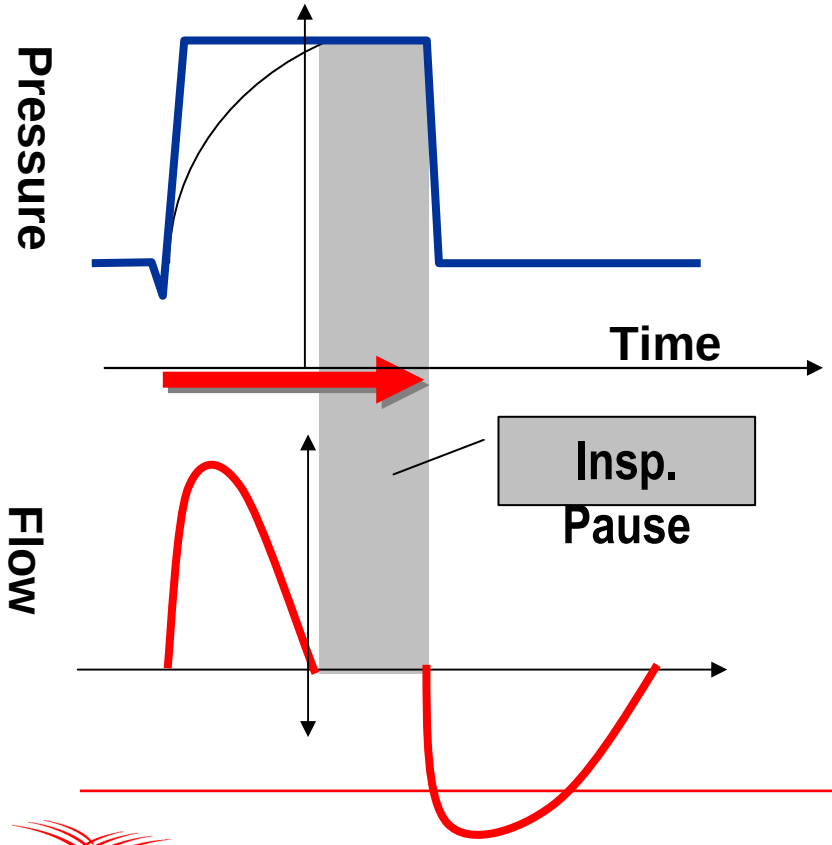
Inspiratory trigger

- Prevent auto trigger
- Variable leakage increases autotrigger
- Decrease trigger sensitivity during autotrigger (increase trigger flow)

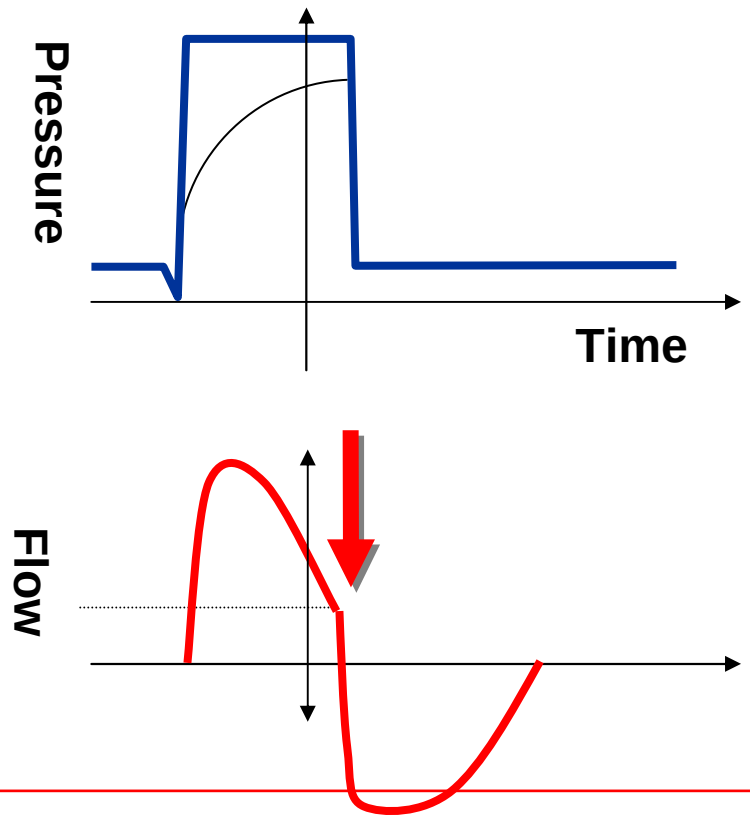


Flow cycling

Time Cycled Ventilation



Flow Cycled Ventilation



Cycling

- Cycling based on time or flow
- Flow cycling is percentage of peak flow
- Benefits of flow cycling:
  - More synchrony with patients demand to exhale
  - Increase of comfort
  - Reduction on WOB
  - Less non triggered breaths
  - Reduce sedation needs

Impact of Expiratory Trigger Setting on Delayed Cycling and Inspiratory Muscle Workload

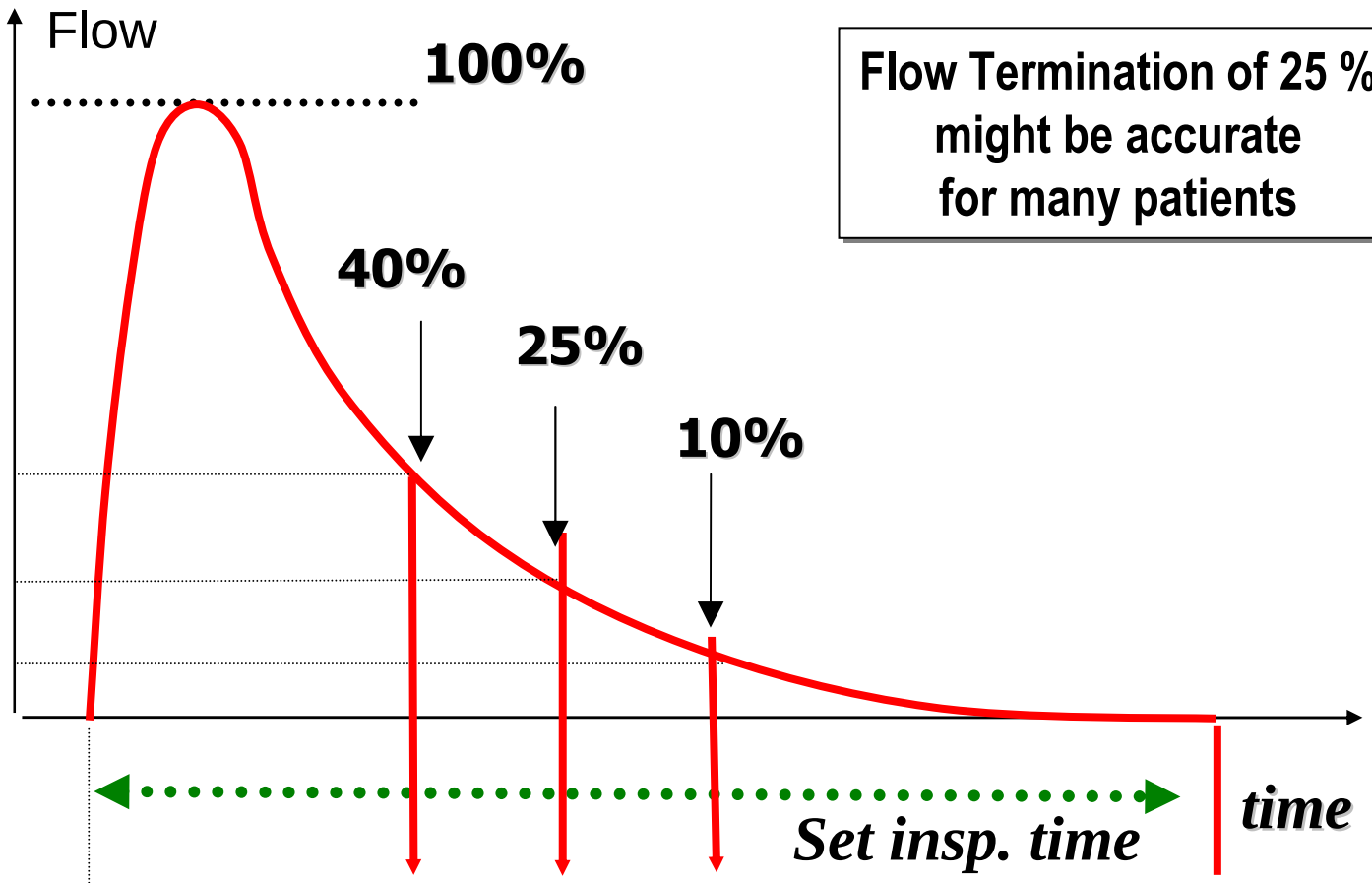
Didier Tassaux, Marc Gainnier, Anne Battisti, and Philippe Jolliet

Medical Intensive Care, University Hospital, Geneva, Switzerland; and Medical Intensive Care, Ste. Marguerite University Hospital, Marseille, France

product (0.9 ± 0.8 vs. 2.1 ± 0.7 cm $H_2O \cdot s$, $p < 0.05$).

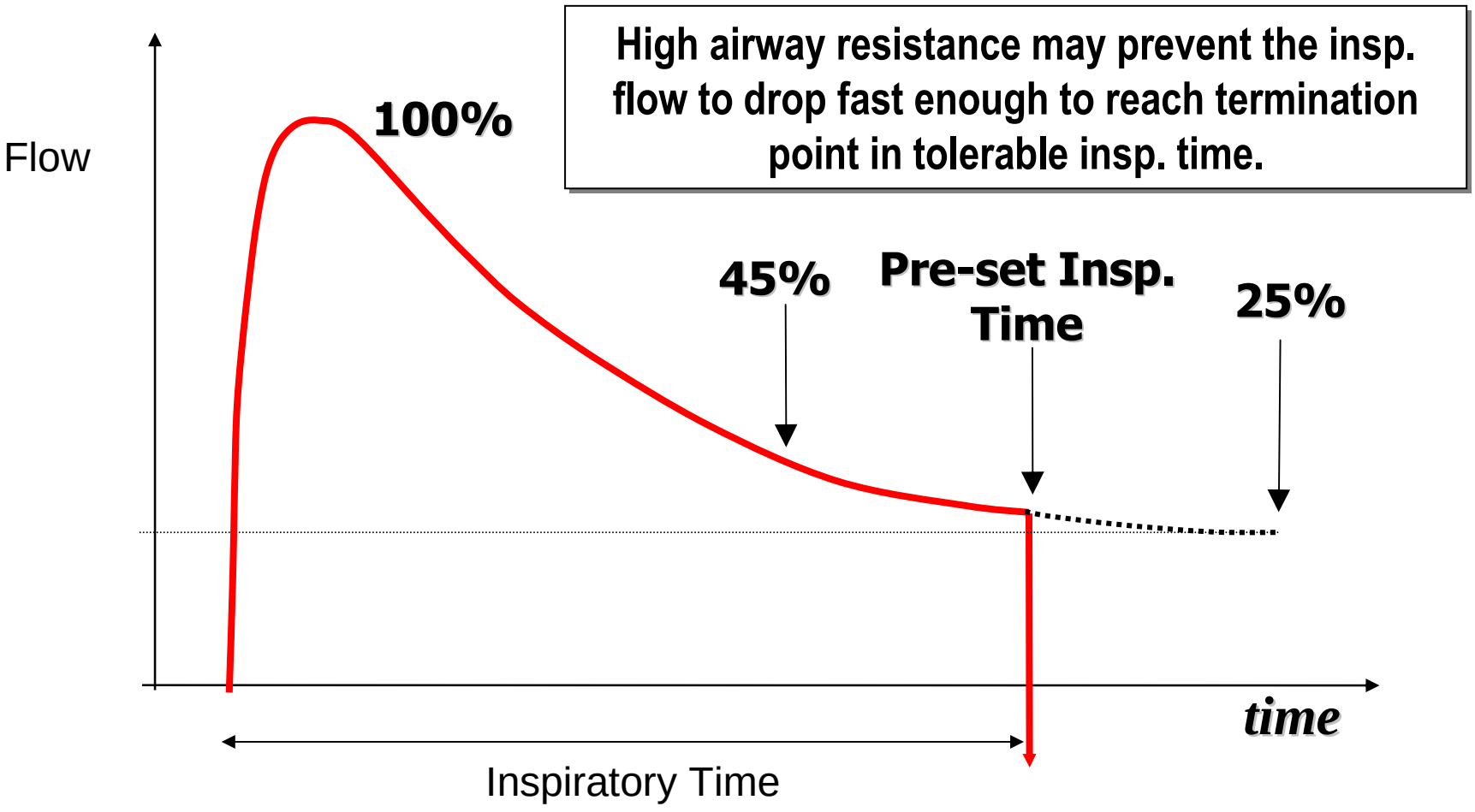
Conclusions: Setting expiratory trigger at a higher percentage of peak inspiratory flow in patients with obstructive disease during pressure support improves patient–ventilator synchrony and reduces inspiratory muscle effort. Further studies should explore whether these effects can influence patient outcome.

Flow cycling

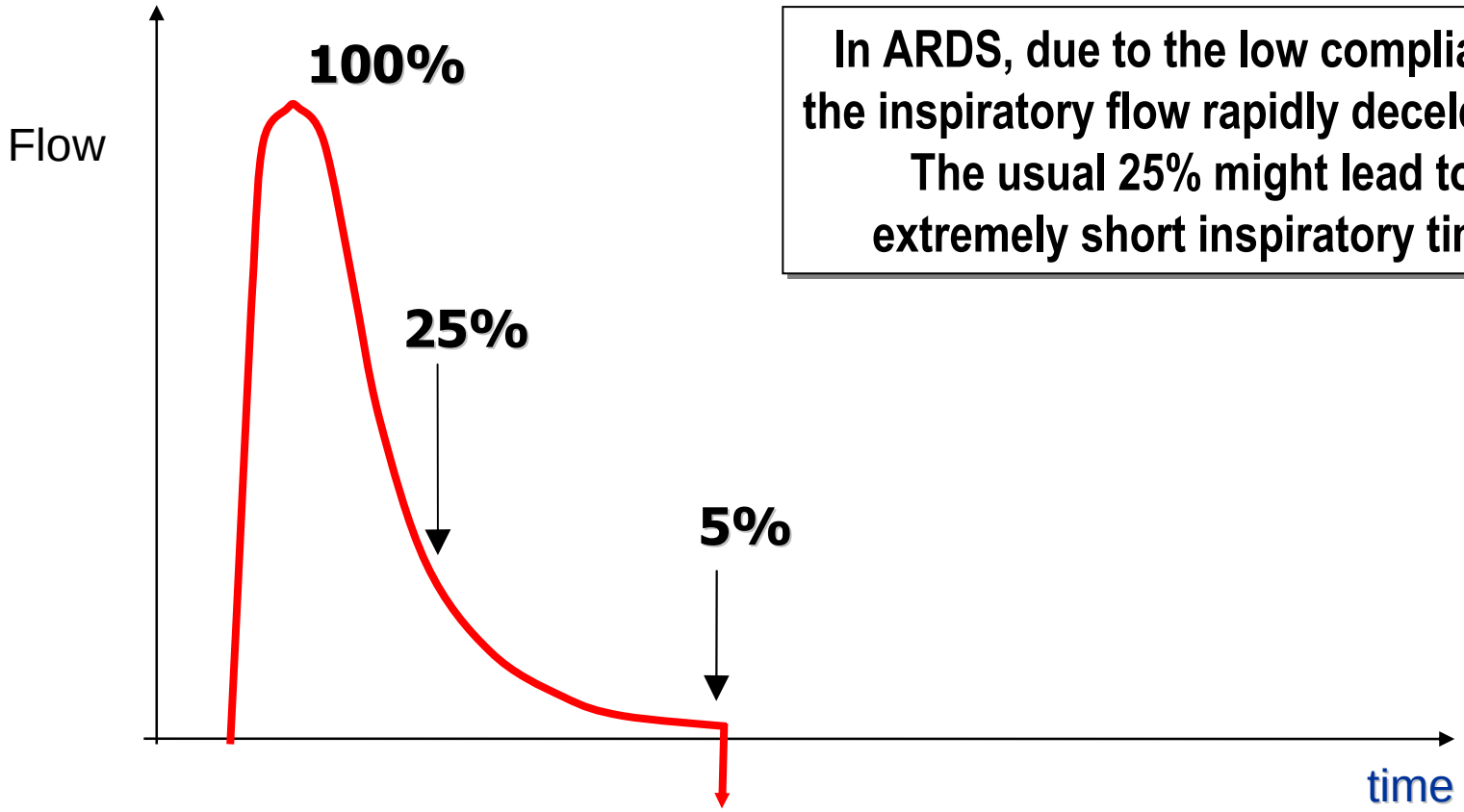


Flow Termination of 25 % might be accurate for many patients

Flow cycling



Flow cycling



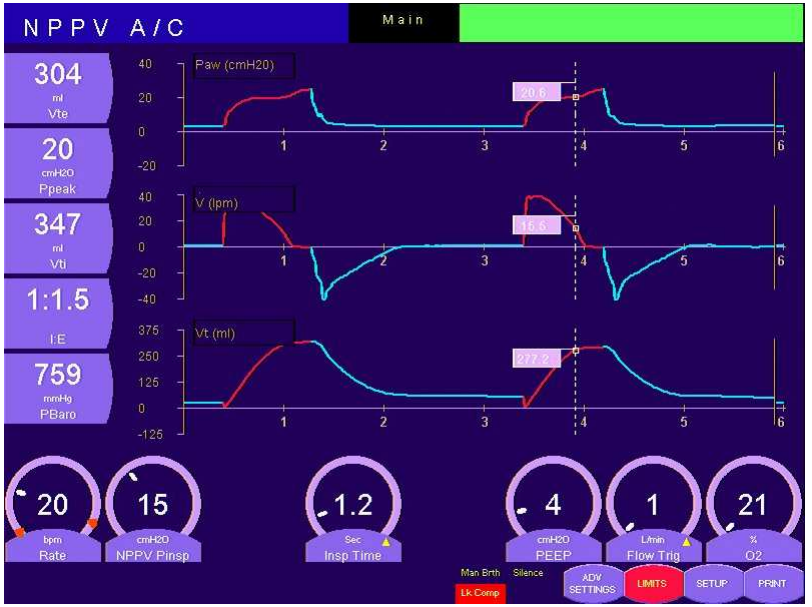
In ARDS, due to the low compliance, the inspiratory flow rapidly decelerates. The usual 25% might lead to extremely short inspiratory time.

How to set a flow cycle?

- Detect an expiratory trigger (pressure waveform)
- Freeze the screen and measure peak flow
- Measure flow at pressure increase (expiratory trigger)
- Formula:
- Set flow cylce (expiratory trigger)

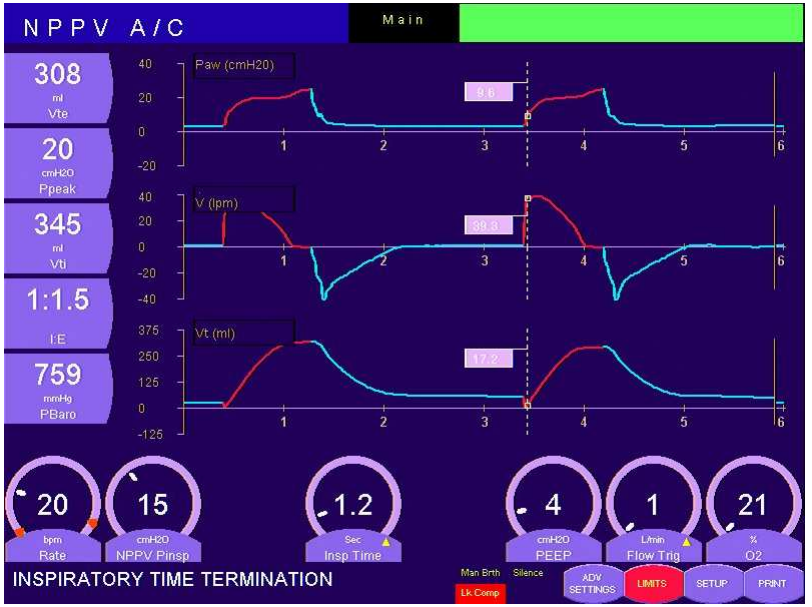
How to set a flow cycle?

- How does it look like
- Freeze the screen and scroll to the start of the increase in the pressure waveform in the inspiratory phase
- Record the amount of flow (15.5 lpm)



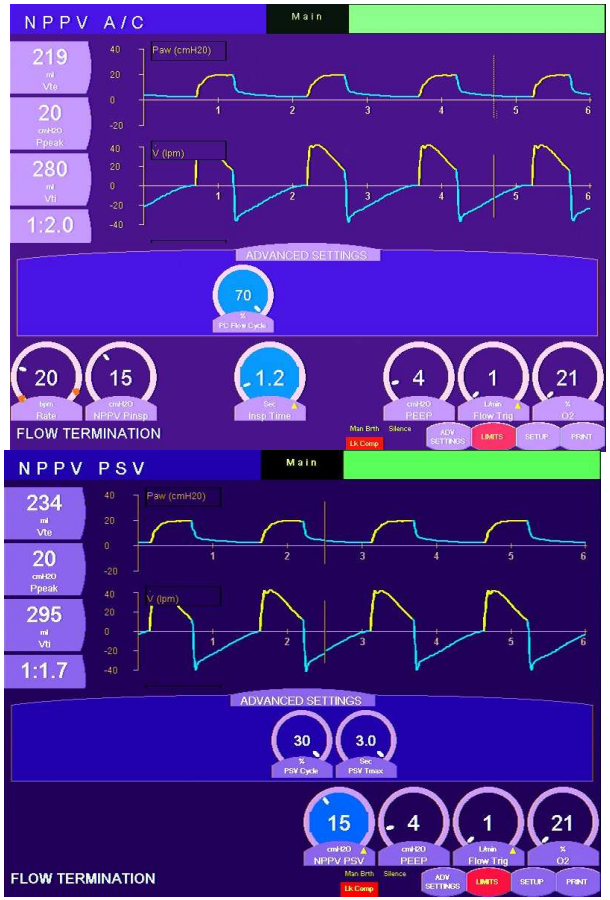
How to set a flow cycle?

- Scroll to the peak flow and memorize the amount of peak flow (39,3 lpm)
- Than (15,5 divide by 39,3) x 100 % = 39,4 % flow cycle
- Setting of flow cycle should be 40%



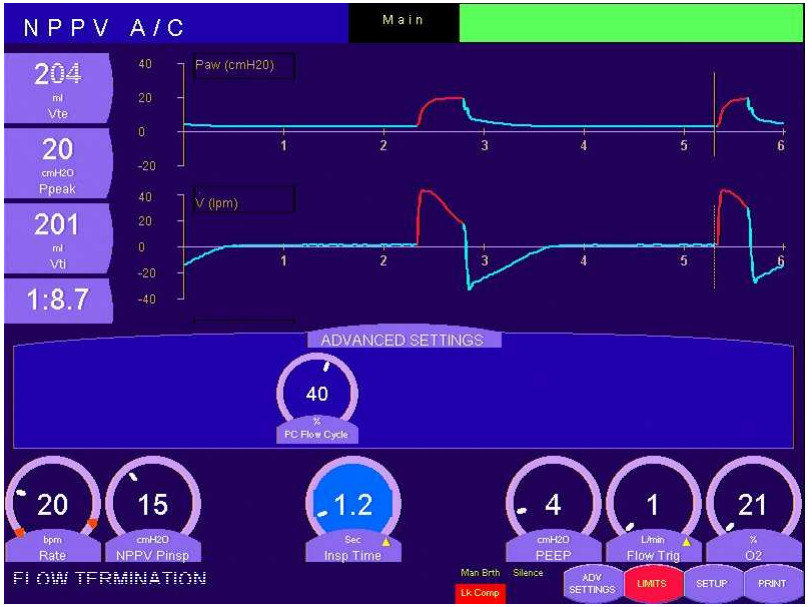
How to set a flow cycle?

- Flow cycle setting
- In NPPV A/C range from off – 70 %
- In NPPV CPAP/PSV range from off – 30 % (new s/w 70%)
- In NPPV CPAP/PSV advanced setting also the maximum inspiratory time

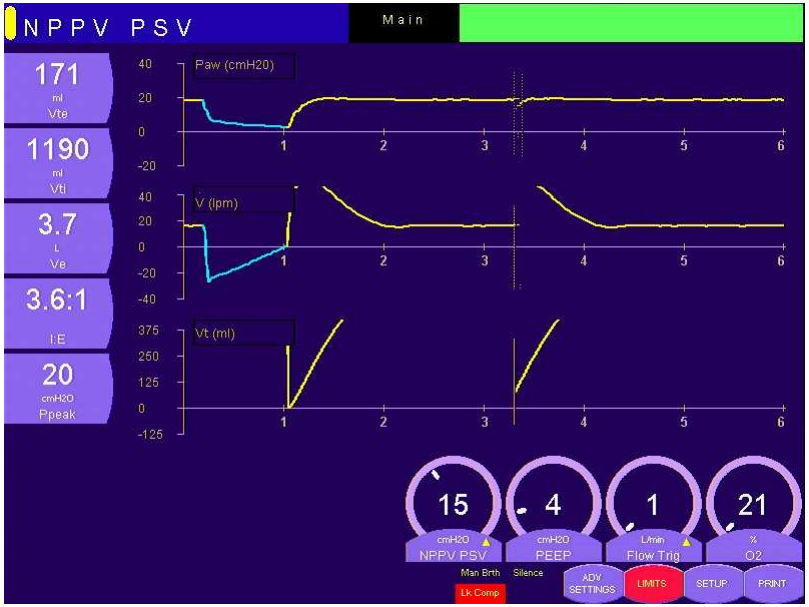


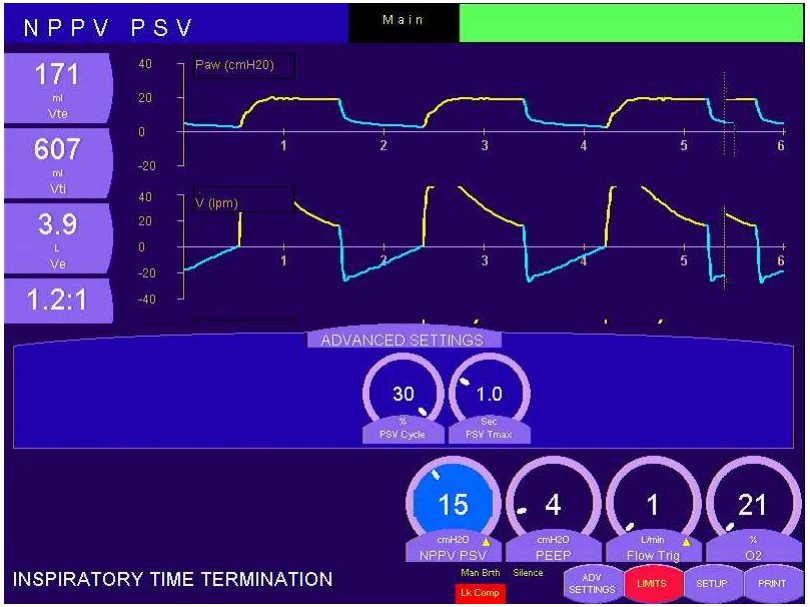
How to set a flow cycle?

- Flow setting of 40%
- Decrease in expiratory effort of the patient
- No increase visible in the pressure waveform



Use of inspiratory time termination





Clinical application

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Essential to care™

Patient interface

- Helmet
- Full face mask
- Total face mask

- What do we have?
- The new Tiara mask!!

- Acceptance of the interface is patient depending, standardization affects comfort!!

Interfaces

Total face mask **Full face mask** **Helmet**

The helmet

- Large compressible volume[1]
- Increase patient comfort [1]
- Noisy
- Decreased leak
- Warm inside helmet
- Large deadspace -> rebreathing [1]

VAS: lower the number ->increase in comfort

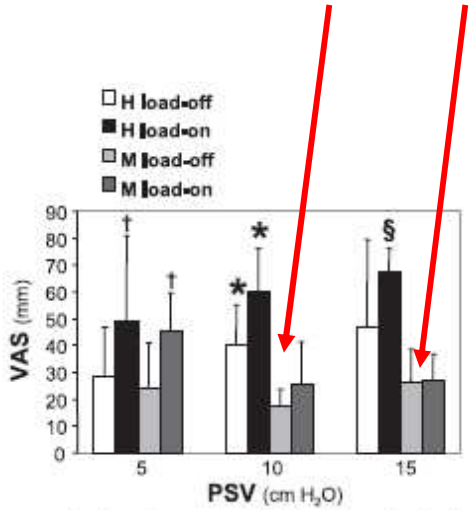

Fig. 8. Dyspnea visual analog score (VAS) during load-off and load-on conditions during mask and helmet PSV. †$P < 0.05$ load-on vs. load-off; *$P < 0.01$, §$P < 0.001$ helmet vs. mask; ANOVA for repeated measures with Bonferroni/Dunn post hoc test.

[1] Effectiveness of mask and helmet interfaces to deliver noninvasive ventilation in a human model of resistive breathing
Fabrizio Racca,1 Lorenzo Appendini,2 Cesare Gregoretti,3 Elisa Stra,1 Antonio Patessio,2 Claudio F. Donner,2 and V. Marco Ranieri1
1*Dipartimento di Anestesia e Rianimazione, Universita` di Torino, Ospedale S. Giovanni Battista-Molinette, Torino;*
2*Divisione di Pneumologia, Fondazione Salvatore Maugeri, IRCCS, Istituto Scientifico di Veruno, Veruno (NO);*
and 3*Servizio di Anestesia e Rianimazione, Azienda Ospedaliera CTO-CRF-Maria-Adelaide, Torino, Italy*
J Appl Physiol 99: 1262–1271, 2005.

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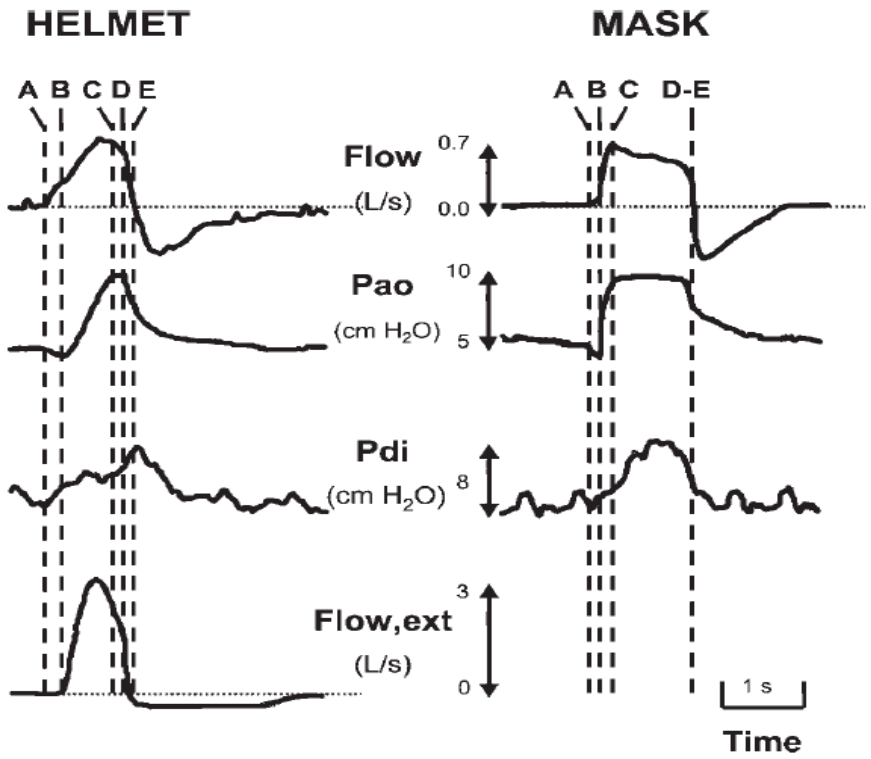
First published June 16, 2005; doi:10.1152/japplphysiol.01363.2004.

Effectiveness of mask and helmet interfaces to deliver noninvasive ventilation in a human model of resistive breathing

Fabrizio Racca,[1] Lorenzo Appendini,[2] Cesare Gregoretti,[3] Elisa Stra,[1] Antonio Patessio,[2] Claudio F. Donner,[2] and V. Marco Ranieri[1]

[1]*Dipartimento di Anestesia e Rianimazione, Università di Torino, Ospedale S. Giovanni Battista-Molinette, Torino;* [2]*Divisione di Pneumologia, Fondazione Salvatore Maugeri, IRCCS, Istituto Scientifico di Veruno, Veruno (NO);* *and* [3]*Servizio di Anestesia e Rianimazione, Azienda Ospedaliera CTO-CRF-Maria-Adelaide, Torino, Italy*



Anesthesiology 2004; 100:16–24

Noninvasive Positive Pressure Ventilation Using a Helmet in Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease

A Feasibility Study

Massimo Antonelli, M.D., Mariano Alberto Pennisi, M.D.,† Paolo Pelosi, M.D.,‡ Cesare Gregoretti, M.D.,§ Vincenzo Squadrone, M.D.,‖ Monica Rocco, M.D.,# Luca Cecchini, M.D., ** Davide Chiumello, M.D., †† Paolo Severgnini, M.D., ‡‡ Rodolfo Proietti, M.D., §§ Paolo Navalesi, M.D., ‖‖ Giorgio Conti, M.D.**

Table 5. Carbon Dioxide Measurement with Helmet and Mask in Three Healthy Subjects

	Mask PSV	Helmet PSV
TV, ml	933 ± 251	1,166 ± 58
RR, breaths/min	12 ± 3	11 ± 4
$Etco_2$, mmHg	36 ± 1	33 ± 12
$Pico_2$, mmHg	4.48 ± 1	5.22 ± 0
CO_2 concentration, %	0.55 ± 0.1	0.95 ± 0.55
$CO_{2_{bag}}$, mmHg	16 ± 3	7 ± 3

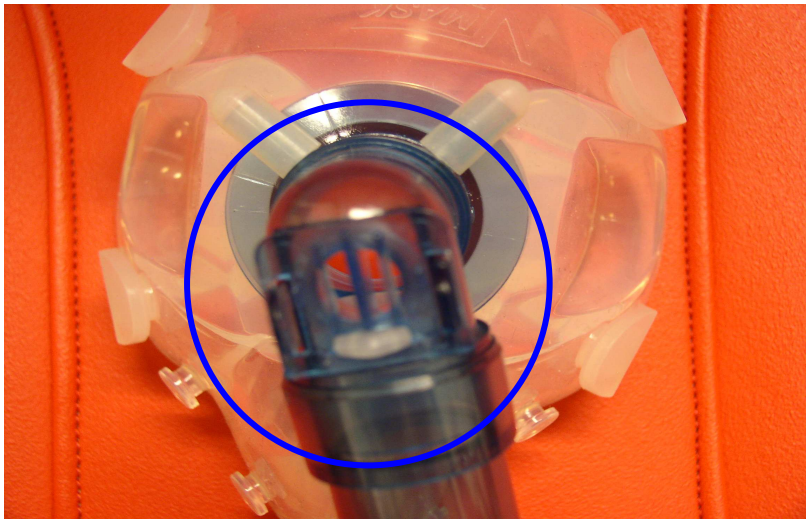
CO_2 = carbon dioxide; $CO_{2_{bag}}$ = carbon dioxide partial pressure; $Etco_2$ = end-tidal carbon dioxide; $Pico_2$ = partial pressure of intramuscular carbon dioxide; PSV = pressure supported ventilation; RR = respiratory rate; TV = tidal volume.

Full face mask

- Less CO_2 rebreathing [1,2,3]
- More accurate Vt delivery compared to helmet [1,2,3]
- Size is important for optimal patients comfort

- [1]Anesthesiology 2004; 100:16–24
- [2]*Chest* 2006;129;1424-1431
- [3]*J Appl Physiol* 99: 1262–1271, 2005

Full face mask



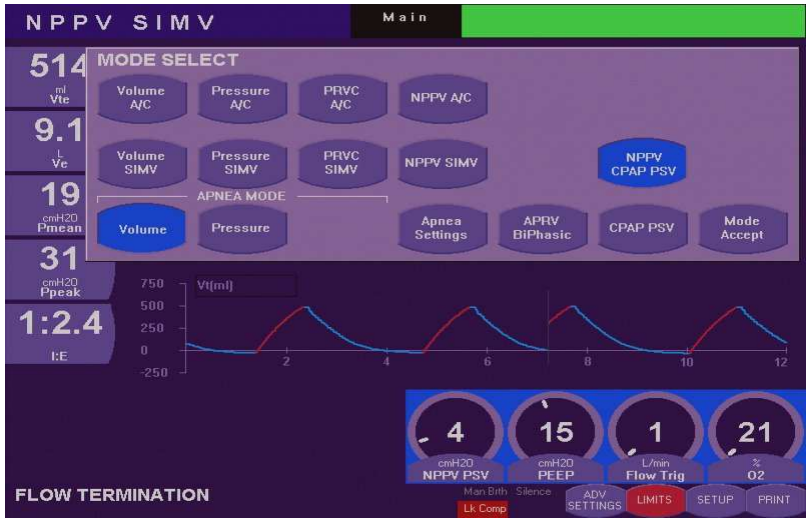
For optimal use of the Vela, use non valve mask!!

NPPV nursing cooperation

- Most important
- Protocol?
- Coaching
- Calm and professional
- Knowledge:
  - NPPV
  - Ventilator
- Optimal cycling (in and expiratory)

Summary NPPV

- NPPV is favorable in many patients
- Easy to apply
- Reduces hospital costs
- Improves patients outcome
- Reduces mortality
- Interfaces and nurses are important for success
- Reduction learning curve
- Vela is useful as an invasive, transport and non invasive ventilator. The most complete on the market!!



Thank you

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Additions

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Vela overview

- Transportable:
- Turbine
- Internal battery (6 hrs)
- Low weight
- Small footprint
- Bed rail mounting

Vela overview

- Pediatric and adult application:
- Vt < 50ml
- New 5 kg approval
- Nebulizer options
- MIP/NIF
  - Reflects muscle strength of respiratory system

Vela overview

- Low cost of ownership:
- Easy excess to expiratory valve
- The turbine lifetime > 60.000 hours

Vela overview

- Patient data management connections:
  - PDMS
  - Patient monitor
  - Trending

Vela overview

- Ease of use:
- 2 menu levels
- Main screen availability everywhere
- Three applications one user interface
  - Reduce learning curve

NPPV content

- NPPV success
- Invasive vs non invasive
- Evidence
- Costs
- NPPV needs
- Settings
- Application
- Nursing
  - Preparation
  - Start up
  - Monitoring

New s/w .14

- Toevoeging EtCO2
- Toevoeging f/Vt (ook gedurende CPAP/PSV en spontane NPPV Modes)
- Toevoeging Patient Circuit Resistance berekening bij insp hold in VC
- Flow cycle naar 70% zowel in PC/AC als in PSV
- Verbetering transitie van pressure nivo's in APRV/BiPhasic
- Verbetering Leak compensatie gedurende NIV
- Auto trigger situaties t.g.v. het niet onderkennen van het verschil tussen BIAS Flow en Exhalatie Flow opgelost.
- Van 10 naar 5 kg lichaams gewicht limiet. (LTV als "predicate device").
- Alarm "ON BATTERY POWER" kan alleen ge-reset worden als er daadwerkelijk weer stroom is. Zonder stroom gedurende een transport of stroom onderbreking, kan alleen het alarm ge-deactiveerd worden. Het bericht ON BATTERY POWER blijft ten alle tijde zichtbaar in het alarm venster.