


Exempel på Layout/design enligt grafisk profil (CVI) som jag har skapat för Maquet gällande Critical Care News, samt för Maquet Critical Care AB.

CRITICAL CARE
News



Neonatal NAVA and individualizing treatment at bedside

Workshop Report

Critical Care News is published on www.criticalcarenews.com

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CRITICAL CARE
News

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Selected published references on the subject of Stress Index

Direct links to abstracts when available in PubMed may be accessed by clicking on the corresponding reference.

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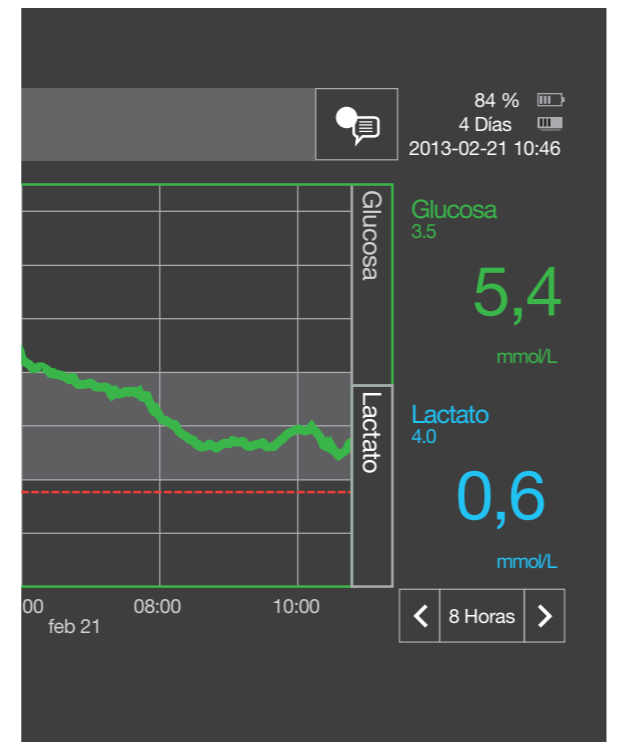
This document is intended to provide information to an international audience outside of the US.

Predicted Body Weight (PBW) Helps lung-protective ventilation



EIRUS – Monitorización continua de la glucosa y el lactato - Marca la pauta

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84 %
4 Dias
2013-02-21 10:46

Glucosa
3.5
5,4
mmol/L

Lactato
4.0
0,6
mmol/L

00 08:00 10:00
feb 21

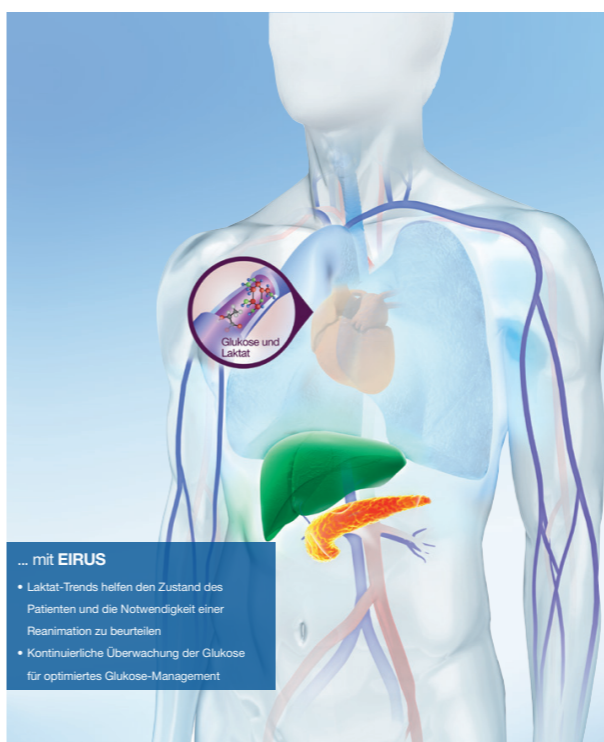
8 Horas

... mit EIRUS

- Laktat-Trends helfen den Zustand des Patienten und die Notwendigkeit einer Reanimation zu beurteilen
- Kontinuierliche Überwachung der Glukose für optimiertes Glukose-Management

Fortlaufende Überwachung von **Glukose** und **Laktat** bei Patienten mit Leberfunktionsstörung...

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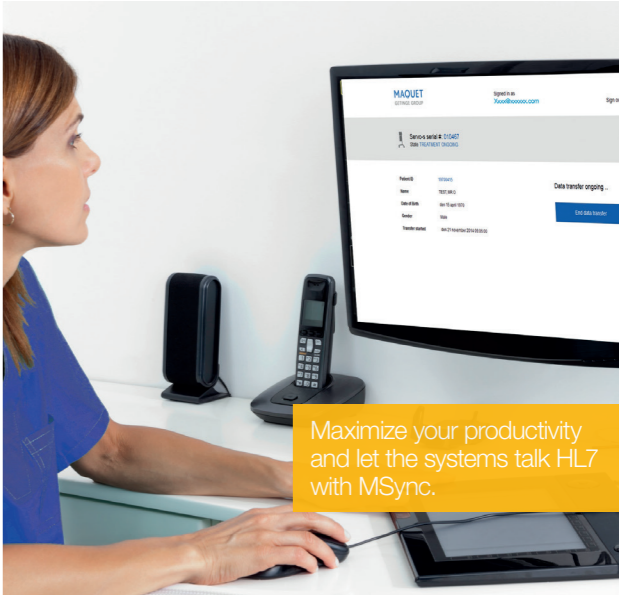


... mit EIRUS

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MSync is Maquet's own solution for data transfer, no need for third party systems.

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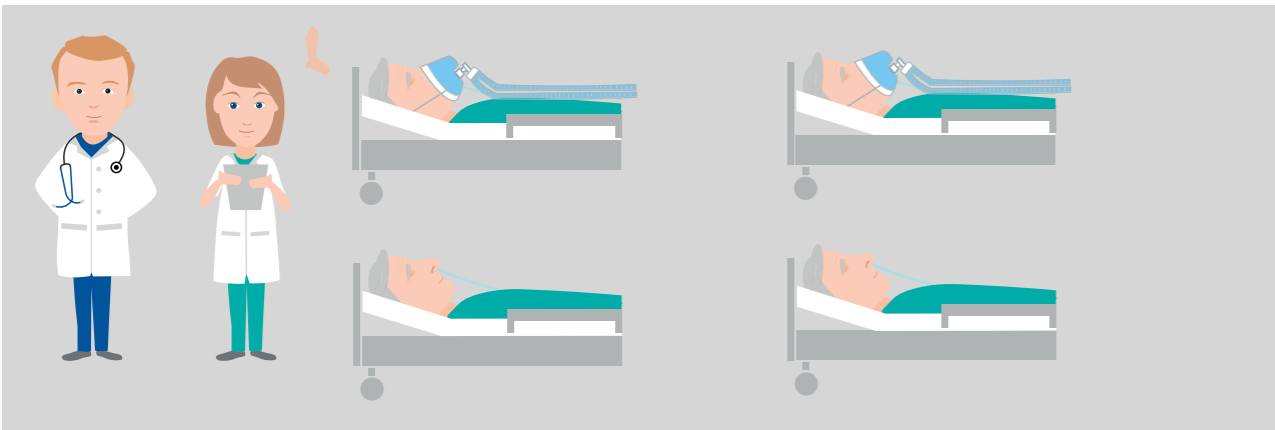
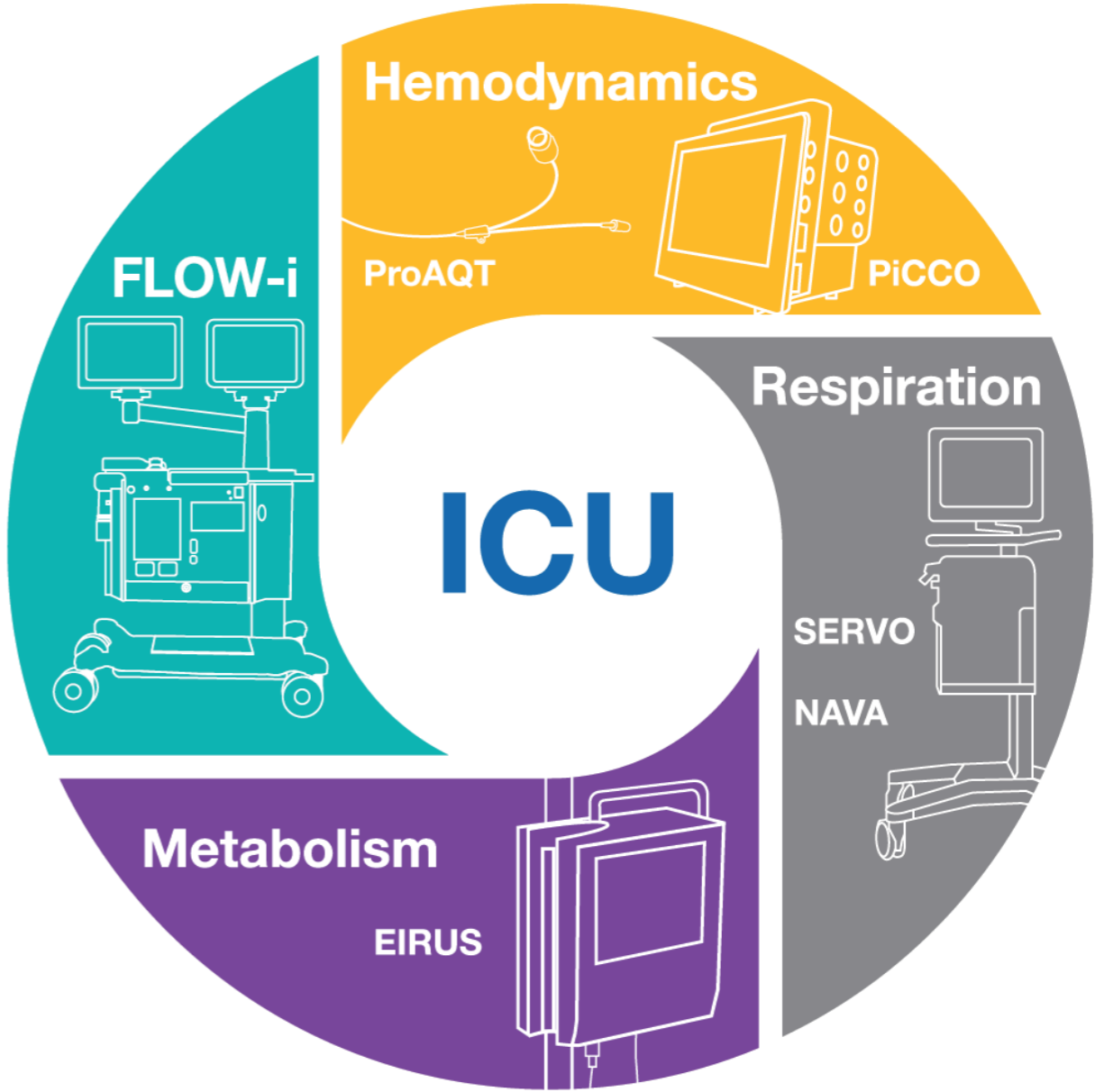
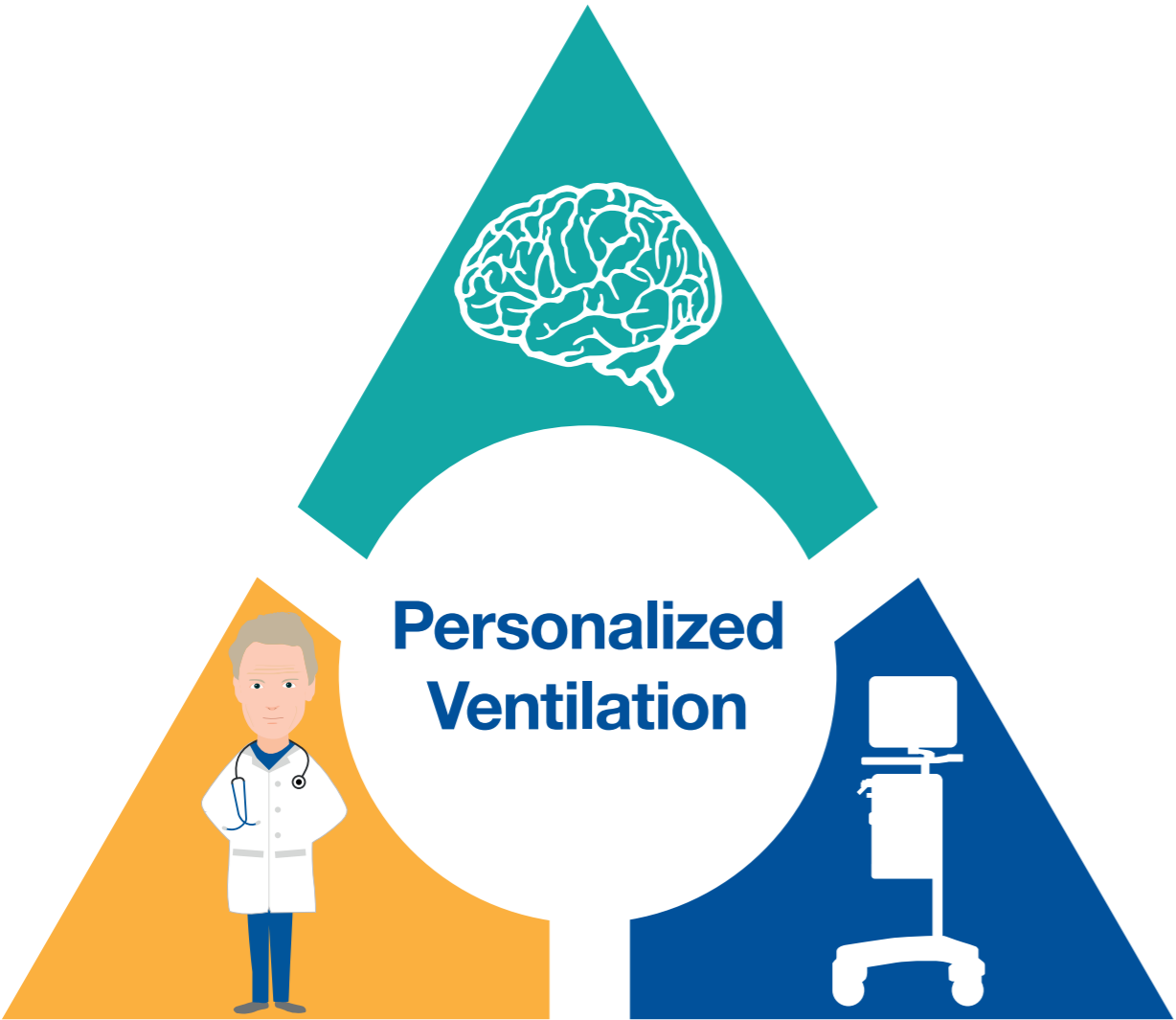
- MAQUET FLOW[®]
- The SERVO ventilator family

MSync Data Transfer:

- Patient data for selected patients
- Real-time clinical data

Maquet - The Gold Standard.

Specialritad infografik där jag för Maquet har skapat grafik för både tryck, digital grafik samt animeringsgrafik.



- 1 Assess respiratory drive
- 2 Start gentlest therapy
- 3 Let patient participate
- 4 Initiate "self-weaning"
- 5 Monitor respiratory drive



The Superiority of NAVA the evidence

24-sidig beskrivning av NAVA som beskriver funktioner för NAVA och dess fördelar. Infografik är vektorbaserad från skärmdumpar. Design och form är en hybrid mellan Maquet-CVI och egen design. Sid-utdragen är exempel inifrån själva layouten.

Page 6 NAVA - the evidence

Low Diaphragm contraction

High Diaphragm contraction

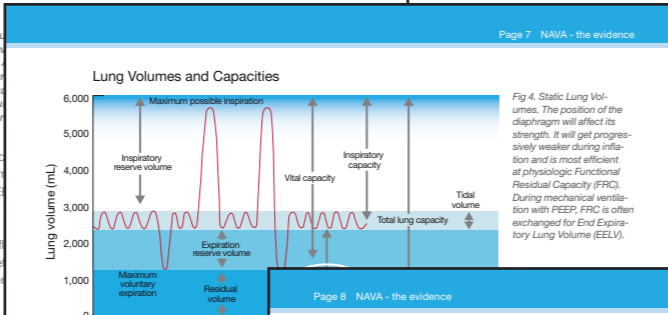
- Inspiration is started in the respiratory centres. The signal is transmitted by the phrenic nerve or other nerves.
- The tidal volume achieved by the respiratory muscles is continuously fed back to the respiratory centres, which modulates its output to achieve the desired volume.
- The repeated cycle is referred to as neuro-ventilatory coupling, and involves both neural control and mechanical achievements by the respiratory muscles.

Fig 3. The diaphragm is a dome shaped musculo-tendinous structure, which separates the thoracic and abdominal cavities. It has sternal, costal, abdominal and lumbar connections. Stabilisation of the chest-wall (lifting motion), the diaphragm will descend, thus lowering the pressure in the thorax, resulting in air flowing into the lungs. Greater activation will result in recruitment of more muscle cells resulting in increased force generation.

In essence, the pressure-generating capacity is critically related to the position of the diaphragm, which in turn is related to the resting End Expiratory Lung Volume (EELV) or in the spontaneously breathing patient Functional Residual Capacity (FRC).

The transformation of neural activity into inspiratory force and volume can be referred to as neuro-ventilatory efficiency, measured as the volume generated for a given diaphragm electrical activity (Edi).

However, the resultant flow and volume generated by pressure drop induced by respiratory muscle activation are fed back to the respiratory centres, which continuously corrects its output to the respiratory muscles in order to maintain respiratory homeostasis.

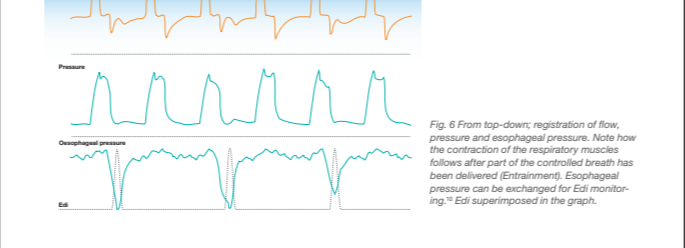
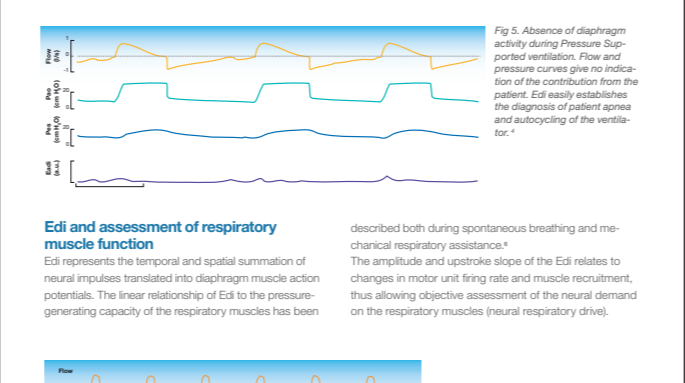


volume generation progressively with a falling assist level or by reducing excessive sedation. With traditional monitoring systems this is very difficult to determine, frequently leading to the erroneous conclusion that the patient is breathing well, while a controlled respiratory pattern is sustained by auto-triggering or ventilator activation by the intercostal muscles.

An observed flat or low Edi amplitude in this situation is diagnostic and in most cases easily corrected by increasing the assist level or by reducing excessive sedation.

Edi monitoring will allow immediate detection of asynchrony (ventilator delays of mechanical trigger off), asynchrony (wasted efforts, double triggering) or auto-triggering.

The potentially injurious consequences of



Page 4 NAVA - the evidence

Superiority of NAVA – The Evidence

Electrical Activity of the Diaphragm – Edi

Organisms are equipped with regulatory systems that display a variety of dynamic behaviour, ranging from simple stable steady states to switching and multi-stability, and to oscillations. The value of the parameter to be maintained is recorded by a receptor system and conveyed to a regulation module via an information channel. Examples of this regulation are insulin oscillations¹ or gene modulation.

All muscles performing work must be coordinated by the brain or the effort will be inefficient. Respiratory function is a complex motor act involving several types of muscles and functions. To be efficient the contractions of muscles must be perfectly coordinated (e.g. glottation and contraction synchronized to inspiratory recruitment of accessory respiratory muscles meet increased respiratory demands). This is achieved by the respiratory centres and by the motor that integrate central and peripheral inputs.²

The integration of the central command and synchronization is obvious as the laryngeal muscles, diaphragm and intercostals are all controlled by motor neurons in the same area of the brain.² The electrical activity of the diaphragm (Edi) is the only human bio feedback that is possible to study in real time. It is controlled by the respiratory center, based on the chemical input circulating blood levels of pH, PaO₂ and PaCO₂ mented by mechanical pressure and stretch receptors.

Page 5 NAVA - the evidence

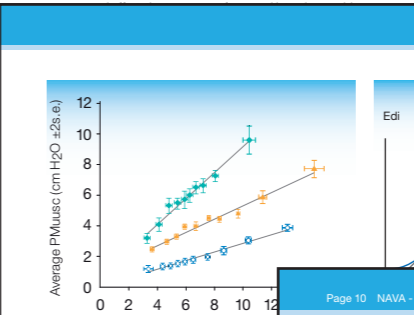
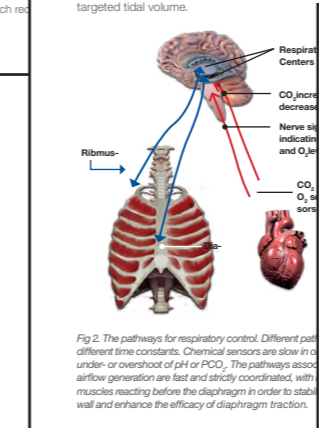
Basically the respiratory centres will issue a demand for the respiratory muscles to produce a specific tidal volume for the maintenance of homeostasis. Sensors in the lungs and the respiratory muscles will continuously feedback the results produced by the respiratory muscles to the brain, and if these muscles do not produce the expected amounts, the respiratory centres will increase the signal (Edi) level.

The increased signal amplitude will result in recruitment of additional muscle fibers and the maintenance of the targeted tidal volume.

From Neural activation to pressure generation

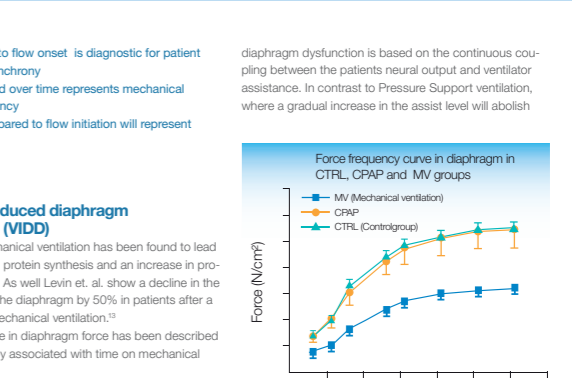
Clinically, inspiratory effort is frequently associated with the measurement of changes in airway pressure and flow. The result can be predicted by the equation of motion $[P = (Flow \times R) + (Volume \times E) + PEEP]$. The same variables are often referred to when describing the degree of unloading by mechanical ventilation.

Although mechanical effort does not always represent



Diaphragm force appears to diminish very soon after the start of mechanical ventilation. It has been debated whether the deep sedation associated with mechanical ventilation is an additional factor leading to the fast decline in muscle efficiency. Ventilator induced diaphragm dysfunction may become one severe limitation during weaning, complicating and prolonging the process. To prevent muscle atrophy during mechanical ventilation, monitoring of diaphragm function is very important. Edi is a versatile and simple instrument to monitor diaphragm activity, compared to an esophageal balloon catheter, which is influenced by many factors and is often unreliable, even in experienced hands.⁹

The potential of NAVA to reduce ventilator induced



diaphragm dysfunction is based on the continuous coupling between the patients neural output and ventilator assistance. In contrast to Pressure Support ventilation, where a gradual increase in the assist level will abolish

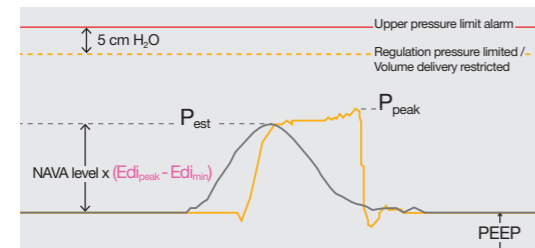
Fig 8. Reduction in force (40%) after 6 hours of mechanical ventilation in rats.²¹ The rate of force reduction is different in different species, but as shown by Levin it is present in humans at a higher rate than previously expected. (Adapted from Wysocki et al. 2006)

the electrical activity of the diaphragm, an increase in the NAVA level will unload the muscle, but still maintain muscle activity. Hence, over-assist by Pressure Support will function as a semi-controlled mode where the patient may be triggering the ventilator, by a small activation of the intercostal muscles. In contrast, NAVA will maintain the same tidal volume and physiologic diaphragm activation.

2-sidig Flowchart som beskriver funktioner för NAVA och NIV-NAVA. Min grundidé för Flowchart NAVA var att den är vikbar och passar skjortfickan. Design, typografi och layout, samt alla illustrationer följer Maquet-CVI-standard.

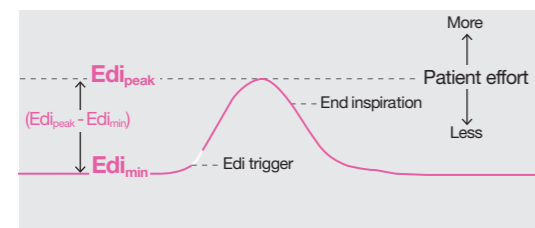
Optional method to set NAVA level

1. Open NAVA preview window
2. Adjust NAVA level so that P_{est} is slightly below P_{peak}



Note: In NAVA and NIV NAVA the available pressure is limited to 5 cm H₂O below the set upper pressure limit.

Edi = Patient's respiratory drive



Trouble shooting

No or Low Edi signal

- High sedation level?
- Patient overassisted?
- Edi catheter out of position?
- Phrenic nerve injury?

Increased Edi signal

- Too low NAVA level? Patient underassisted?
- Too low PEEP?
- Airway obstruction, e.g. secretion?
- Worsened disease condition?
- Too low pH and/or high PaCO₂?
- Patient not ready for a support mode?

Switching to NAVA(PS)

- PS flow trigger set too sensitive?
- Consider change to pressure triggering

Message: Regulation pressure limited/ Volume delivery is restricted

- Upper pressure limit alarm set too low?

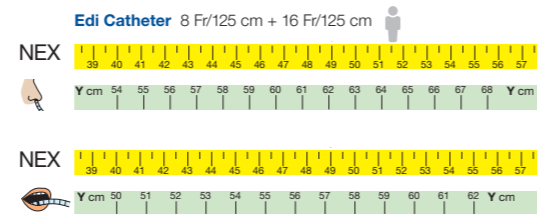
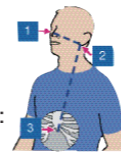
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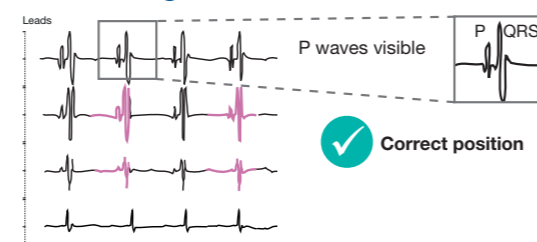
Edi catheter insertion

1. Connect the Edi module and cable
2. Perform the Edi module function check
3. Measure NEX the distance in cm (1-2-3):
4. Determine the insertion distance



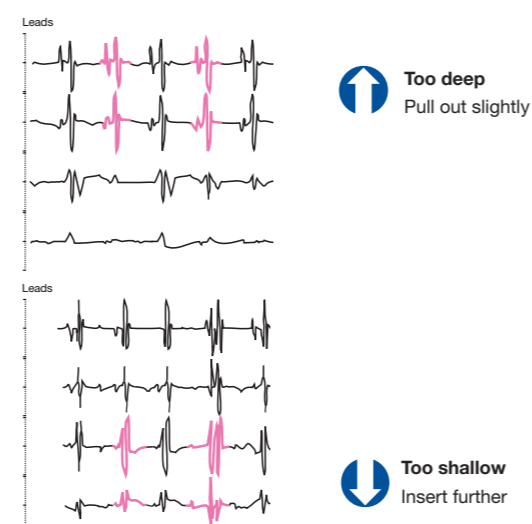
5. Dip the Edi catheter in water and insert
6. Connect the Edi cable to catheter
7. Verify the position in the positioning window
8. Secure the Edi catheter
9. Make a note of the insertion distance
10. Verify the position regularly

Positioning window



Note: The Edi catheter is correct positioned if the second and third leads are highlighted in pink/blue and the Edi signal is present.

Re-positioning

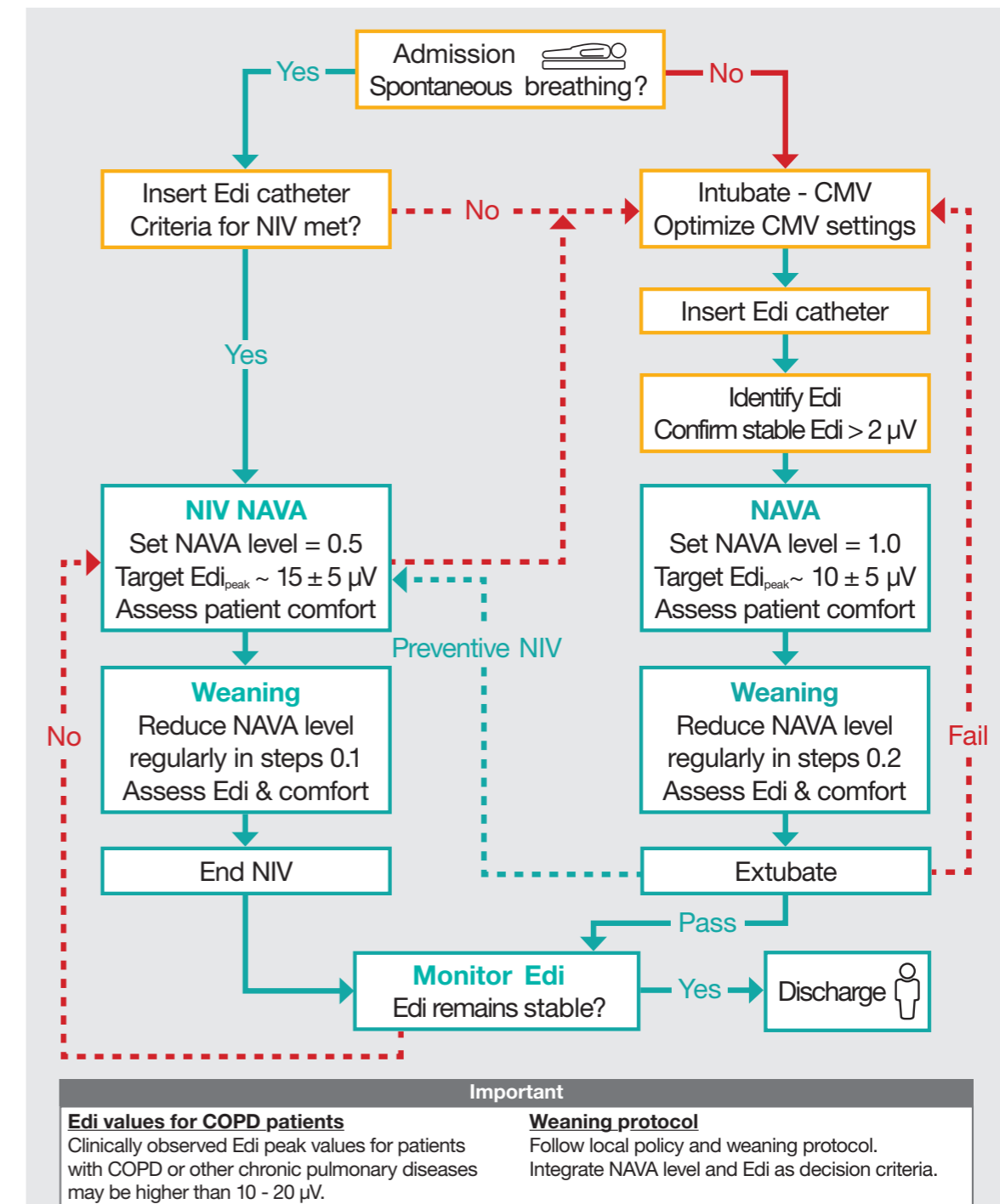


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NAVA Flowchart – Adult

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Edi values for COPD patients
Clinically observed Edi peak values for patients with COPD or other chronic pulmonary diseases may be higher than 10 - 20 µV.

Weaning protocol
Follow local policy and weaning protocol. Integrate NAVA level and Edi as decision criteria.

Refer to the SERVO-i/U User's Manual for operation of the ventilator

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