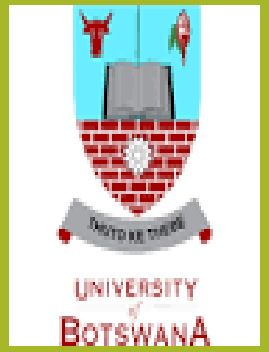


NON INVASIVE VENTILATION

Dr.Rodriguez Fernandez A.FCCP

Intensivist. Senior Lecturer.

Emergency Department

University of Botswana

Overview

- **Noninvasive ventilation (NIV) refers to the administration of ventilatory support without using an invasive artificial airway (endotracheal tube or tracheostomy tube).**

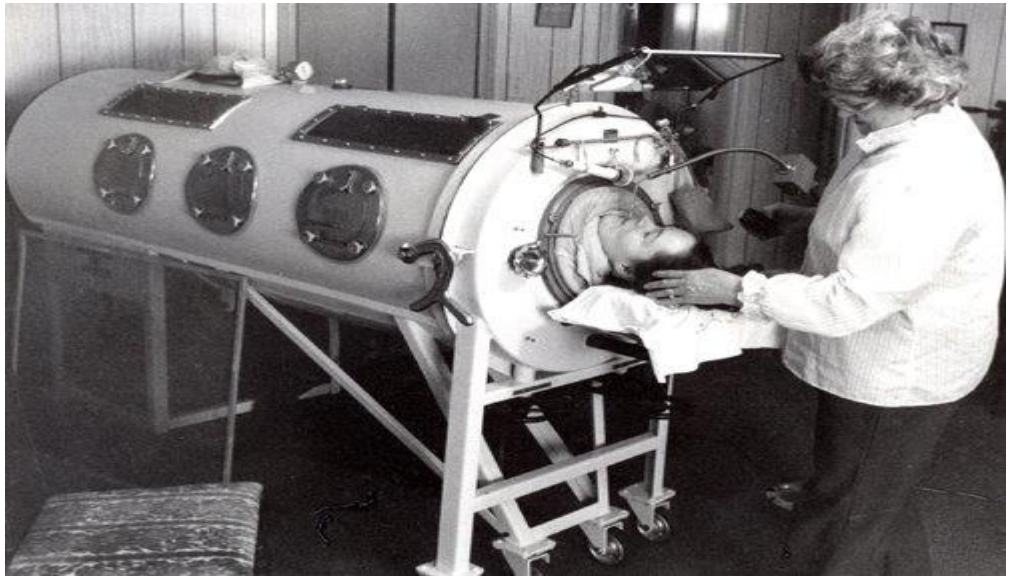
- **In the the past two decades, and noninvasive ventilation has become an integral tool in the management of both acute and chronic respiratory failure.**

- **Noninvasive ventilation has been used as a replacement for invasive ventilation, and its flexibility also allows it to be a valuable complement in patient management.**

Historical background

- **Negative-pressure tank-type ventilator, was a prototype developed by Dalziel in 1832.**
- **This led to the Drinker-Shaw iron lung in 1928, which was the first widely used negative-pressure ventilator.**
-
- **The Emerson tank ventilator was especially crucial in the treatment of poliomyelitis victims.**
- .

Source: Tobin MJ: *Principles and Practice of Mechanical Ventilation, 3rd Edition:* www.accessanesthesiology.com



General Considerations

- The key to the successful application of noninvasive ventilation is in recognizing its capabilities and limitations.
- Identification of the appropriate patient for the application of noninvasive ventilation (NIV).
- Patient selection is crucial for the successful application of noninvasive ventilation.
- This requires evaluation on several levels and time.
- The following variables and factors help identify patients who may be candidates for noninvasive positive-pressure ventilation.

Absolute contraindications

- Coma
- Cardiac arrest
- Respiratory arrest
- Any condition requiring immediate intubation
- Other contraindications (rare exceptions) are as follows:
- Cardiac instability - Shock and need for pressure support,
- ventricular dysrhythmias,
- complicated acute myocardial infarction
- GI bleeding - Intractable emesis and/or uncontrollable bleeding
- Inability to protect airway - Impaired cough or swallowing, poor clearance of secretions, depressed sensorium and lethargy
- Status epilepticus
- Potential for upper airway obstruction - Extensive head and neck tumors, any other tumor with extrinsic airway compression, angioedema or anaphylaxis causing airway compromise

Indication

- :

- **Chronic obstructive pulmonary COPD**
- **Cardiogenic pulmonary edema**

-

- After discontinuation of mechanical ventilation (COPD)
- Community-acquired pneumonia (and COPD)
- Asthma
- Immunocompromised state (known cause of infiltrates)
- Postoperative respiratory distress and respiratory failure
- Neuromuscular respiratory failure (better in chronic than acute; avoid if upper airway issues)
- Decompensated obstructive sleep apnea/cor pulmonale
- Cystic fibrosis
- Mild *Pneumocystic carinii* pneumonia
- Rib fractures, lung contunsion
- Use with caution in the following clinical conditions:
- Idiopathic pulmonary fibrosis (exacerbation)
- Acute respiratory distress syndrome (consider helmet ventilation

Application of Noninvasive Ventilation

- **<u>Location of application:</u>**

- **It can be used in the ICU, especially if there is the possibility of intubation.**

- **It can be used in an Intermedium ward (lower severity of illness)**

Emergency department **- Local considerations, expertise with ICU training doctors and nurses**

Patient-----interface(mask)-----ventilator

Patient interfaces

Nasal masks

orofacial masks were the earliest interfaces

mouthpieces

nasal pillows

helmets

Nasal masks and orofacial masks are still the most commonly used interfaces.

Orofacial masks are used almost twice as frequently as nasal masks.

Both have advantages and disadvantages in the application of noninvasive ventilation.

Orofacial mask general :

Best suited for less cooperative patients

Patients with a higher severity of illness

Patients with mouth-breathing

In edentulous patients


Department of
Veterans Affairs
GOVERNMENT PROPERTY
NOT FOR SALE
99.8
17
12
7.4
18.4
15
583
10.5
5
70


RESPIRONICS

RESMED

PRODUCT CODE

ResMed Hospital Full Face Mask (vented)	
Small	**60700**
Medium	**60701**
Large	**60702**
Headgear (10 per pack)	**60710**

ResMed Hospital Nasal Mask (vented)	
Medium	**61104**
Large	**61105**
Headgear (10 per pack)	**61118**

RESMED

Disposable Masks

Quick to fit. Effective to use.

ResMed, a leading global supplier of masks, has developed a line of custom-designed products for hospital use. **Quick to fit and easy to use**, ResMed's disposable masks and circuits provide **cost-effective, time-saving solutions** for the clinical environment. Ideally suited for CPAP, bilevel pressure treatment and non-invasive ventilation therapy. **Single patient use only. Maximum 7 days.**

Two people firmly open the collar using their finger tips and thumbs along the ring, so that the patient's head can pass through.

Fermer le clamp. La pompe peut être retirée.


lex-Ohmeda

Modes of ventilation

- **Choosing the initial mode of ventilation is based in part on:**

past experience

the capability of ventilators available to provide support.

the condition being treated.

Most patients who are provided noninvasive ventilation with continuous positive airway pressure (CPAP), may be especially useful in patients with *congestive heart failure or obstructive sleep apnea*.

- ***Bilevel*** **positive airway pressure (BiPAP) is probably the most common mode noninvasive positive pressure ventilation and requires provisions for inspiratory positive airway pressure (IPAP) and expiratory positive airway pressure (EPAP**

Predictors of success, with a response to a trial of NIV (1-2 h), are as follows:

- Decrease in $PaCO_2$ greater than 8 mm Hg
- Improvement in pH greater than 0.06
- Correction of respiratory acidosis

Predictors of failure are as follows:

- Severity of illness - Acidosis (pH <7.25)
- hypercapnia (>80 and pH <7.25)
- Acute Physiology and Chronic Health Evaluation II (APACHE II) score higher than 20
- Level of consciousness - Neurologic score (>4 = stuporous, arousal only after vigorous stimulation; inconsistently follows commands), encephalopathy score (>3 = major confusion, daytime sleepiness or agitation), Glasgow Coma Scale score lower than 8
- Failure of improvement with 12-24 hours of noninvasive ventilation

Troubleshooting problems with noninvasive positive pressure ventilation

Authors:
Nicholas S Hill, MD
Naomi R Kramer, MD
Section Editors:
Talmadge E King, Jr, MD
Polly E Parsons, MD
Deputy Editor:
Geraldine Finlay, MD

Contributor Disclosures.

Literature review current through: Apr 2017. | **This topic last updated:** May 31, 2016.

INTRODUCTION — Noninvasive positive pressure ventilation (NPPV) is now commonly used, especially at night, to assist ventilation in patients with a variety of neuromuscular and chest wall diseases. Most patients have some difficulty adapting to nocturnal use of NPPV, although occasional patients adapt within days. Facilitating adjustment to NPPV is important as regular use of NPPV has been shown to lengthen survival in patients with neuromuscular disease [1]. In addition, greater than four hours of use per night has been associated with increased CO_2 responsiveness and lower partial pressure of carbon dioxide ($PaCO_2$) levels when compared to less than four hours per night [2].

Approaches to resolving the most common side effects of NPPV and to addressing failure of NPPV to improve gas exchange are reviewed here. The indications for and the initiation of nocturnal and daytime NPPV are discussed separately. (See "Practical aspects of nocturnal noninvasive ventilation in neuromuscular and chest wall disease" and "Continuous noninvasive ventilatory support for patients with respiratory muscle dysfunction" and "Types of noninvasive nocturnal ventilatory support in neuromuscular and chest wall disease".)

- **NASAL CONGESTION OR DRYNESS —**
- **Both nasal congestion and dryness occur commonly during noninvasive positive pressure ventilation (NPPV), sometimes in the same patient..**
- **.**
- **Dryness may also respond to nasal saline and water based nasal gels. These thicker gels can be applied in a thin layer along the inside of the nose and can help with mucosal discomfort. These gels are also helpful to decrease local irritation, when using the nasal pillow interface.**
- **Nasal congestion may be ameliorated by use of inhaled nasal glucocorticoids or antihistamine decongestant combinations.**

- **SECRETION CLEARANCE**
- **Secretion clearance and cough assistance for patients on noninvasive ventilation, particularly those with neuromuscular disease, is discussed separately**
- **AL BRIDGE REDNESS OR ULCERATION**
- **Nasal bridge redness or ulceration is caused by excessive mask tension on the**
- **Some patients develop acneiform skin rashes where the mask contacts the skin. Low potency corticosteroid creams, oral doxycycline, or clindamycin lotion may be helpful. Washing the face with a mild soap prior to application of the mask may help as well.**

- **GASTRIC INSUFFLATION**
- **Pressures used during NPPV rarely exceed 25 cm H_2O. However, a reduction in inflation pressure or addition of oral simethicone may help if intolerable symptoms occur.**

- **AIR LEAKING THROUGH THE MOUTH**
- **Leakage of air through the mouth is universal among users of nasal noninvasive positive pressure ventilation (NPPV).**
-

- **FAILURE TO IMPROVE DAYTIME GAS EXCHANGE —**

- **Most patients have improvements in gas exchange within weeks of initiating noninvasive positive pressure ventilation (NPPV).**

- **Rebreathing has been identified as a potential problem when blood gases fail to improve during use of portable pressure support-type ventilators (such as bilevel positive airway pressure [BiPAP])**

- **AIR LEAKING THROUGH THE MOUTH**
- **Leakage of air through the mouth is universal among users of nasal noninvasive positive pressure ventilation (NPPV).**

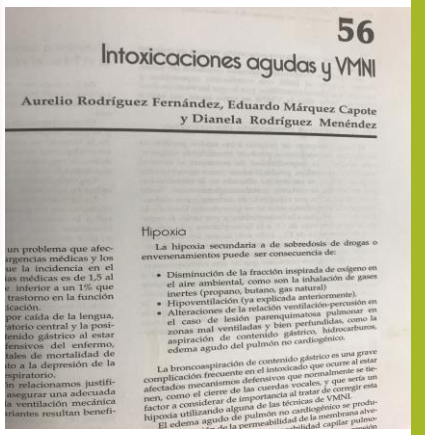
- **Leak compensation during volume-limited ventilation requires an upward adjustment in tidal volume. Some ventilators can sort out leaking itself**


A
B
C
D
E

Esquinas Rodriguez A, Tratado de Ventilacion no invasive

Nasal vs. oronasal (full-face) masks: advantages and disadvantages

Variables	Nasal	Oronasal
Comfort	+++	++
Claustrophobia	+	++
Rebreathing	+	++
Lowers CO2	+	++
Permits expectoration*	++	+
Permits speech•	++	+
Permits eatingΔ	+	-
Function if nose obstructed	-	+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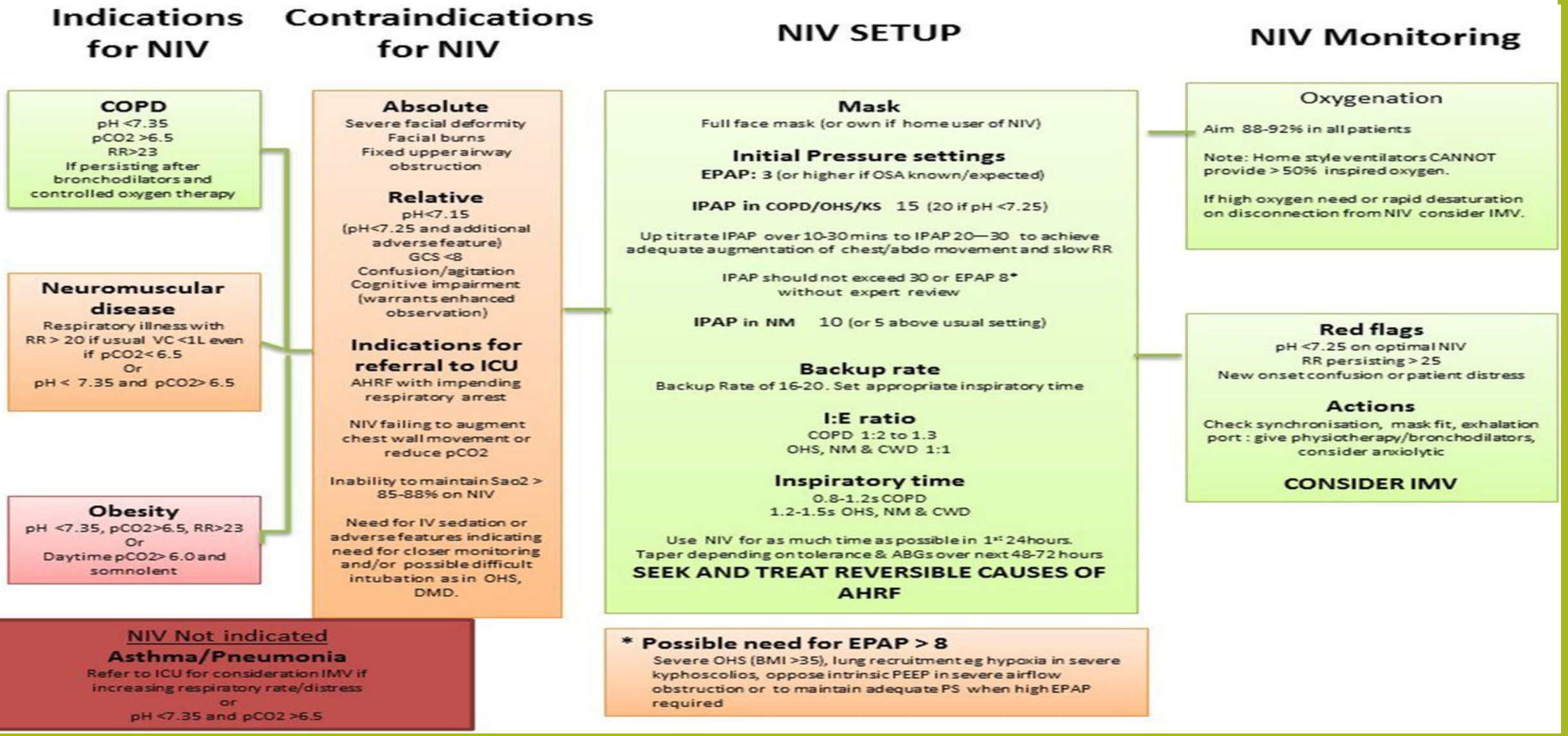
Intoxicaciones agudas y VMNI
Aurelio Rodríguez Fernández, Eduardo Márquez Capote y Dianela Rodríguez Menéndez
Hipoxia
La hipoxia secundaria a de sobredosis de drogas o envenenamientos puede ser consecuencia de:
• Disminución de la fracción inspirada de oxígeno en el aire ambiental, como son la inhalación de gases inertes (propano, butano, gas natural)
• Hipoventilación (ya explicada anteriormente).
• Alteraciones de la relación ventilación-percusión en el caso de lesión parenquimatosa pulmonar en zonas mal ventiladas y bien perfundidas, como la aspiración de contenido gástrico, hidrocarburos, edema agudo del pulmón no cardiogénico.
La broncoaspiración de contenido gástrico es una grave complicación frecuente en el intoxicado que ocurre al estar afectados mecanismos defensivos que normalmente se tienen, como el cierre de las cuerdas vocales, y que sería un factor a considerar de importancia al tratar de corregir esta hipoxia utilizando alguna de las técnicas de VMNI.

British Thoracic Society/Intensive Care Society Guideline for the ventilatory management of acute hypercapnic respiratory failure in adults. 2016



- **Bronchoscopy During Non-Invasive Mechanical Ventilation: A Review of Techniques and Procedures. Dr A. Esquinas. 2102.**

. Intensicve Care Medicine 2013 Jul;39(7):1171-80. doi: 10.1007/s00134-013-2901-4. Epub 2013 Apr 10.

Noninvasive ventilation in chest trauma: systematic review and meta-analysis.

- Chiumello D[1], Coppola S, Froio S, Gregoretti C, Consonni D.
- Author information

- Abstract:
- RESULTS:
- Ten studies (368 patients) met the inclusion criteria and were included for the meta-analysis. Five studies (219 patients) reported mortality and results were quite homogeneous across studies, with a summary relative risk for patients treated with NIV compared with standard care (oxygen therapy and invasive mechanical ventilation) of 0.26 (95 % confidence interval 0.09-0.71, p = 0.003). There was no advantage in mortality of continuous positive airway pressure over noninvasive pressure support ventilation. NIV significantly increased arterial oxygenation and was associated with a significant reduction in intubation rate, in the incidence of overall complications and infections.
- CONCLUSIONS:
- These results suggest that NIV could be useful in the management of acute respiratory failure due to chest trauma

- Critical Care Medicine | January 2016New *versus* Conventional Helmet for Delivering Noninvasive Ventilation: A Physiologic, Crossover Randomized Study in Critically Ill Patients.
- Carlo Olivieri , Federico Longhini et als.

- Results: Compared with SH, NH improved comfort (5.5 [5.0 to 6.0] *vs*. 8.0 [7.8 to 8.0]), respectively, $P < 0.001$),
- inspiratory trigger delay (0.31 [0.22 to 0.43] *vs*. 0.25 [0.18 to 0.31] s, $P = 0.007$), and pressurization ($PTP_{300\text{-}index}$: 0.8 [0.1 to 1.8] *vs*. 2.7 [7.1 to 10.0]%; $PTP_{500\text{-}index}$: 4.8 [2.5 to 9.9] *vs*. 27.3 [16.2 to 34.8]%; PTP_{200}: 13.6 [10.1 to 19.6] *vs*. 30.4 [24.9 to 38.4] cm H_2O/s, $P < 0.01$ for all comparisons) and $Time_{synch}/Ti_{neu}$ (0.64 [0.48 to 0.72] *vs*. 0.71 [0.61 to 0.81], $P = 0.007$).
- Respiratory drive and frequency, ABGs, and rate of asynchrony were not different between helmets. Endotracheal tube outperformed both helmets with respect to all variables, except for respiratory rate, ABGs, and asynchronies.
- Conclusions: Compared with a H, a NH improved comfort and patient–ventilator interaction.

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rodriguezaurelio555@gmail.com