دانشگاه علوم پزشکی و خدمات بهداشتی درمانی کرمان

NON-INVASIVE VENTILATION

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- What is NIV and why it is used
- To be familiar with CPAP, HHHFNC, NIV
- Indications and contraindications of NIV
- Modes of providing NIV in our setup
- NIV and COVID-19

- Respiratory failure is a syndrome where the respiratory system fails in one or both of its gas exchange functions: oxygen uptake and carbon dioxide elimination.
- Respiratory failure may be acute or chronic.
- While acute respiratory failure (ARF) is characterized by life-threatening derangements in ABGs and acid-base status, manifestations of chronic respiratory failure are less dramatic and may not be as readily apparent.

- Respiratory failure can be classified as HYPOXEMIC or HYPERCAPNIC and may be ACUTE or CHRONIC.
- TYPE I : Hypoxemic Respiratory Failure is characterized by a $PaO_2 < 60$ mmHg with a normal or low $PaCO_2$.

Most common form of respiratory failure Can be associated with virtually all acute diseases of the lung

Examples: pulmonary edema, pneumonia, ARDS, PE

- TYPE II : Hypercapnic respiratory failure is characterized by a PaCO2 of > 50 mmHg.

Hypoxemia is common in patients with Type II failure who are breathing room air.

pH depends on the serum bicarbonate level, which, in turn, is dependent on the duration of the hypercapnia

Examples: opiate overdose, neuromuscular disease, status asthmaticus, severe COPD.

- Acute hypercapnic respiratory failure develops over minutes to hours; therefore, pH < 7.3.

- Chronic hypercapnic respiratory failure develops over several days or longer, allowing time for renal compensation and an increase in serum bicarbonate concentration; pH is only slightly decreased.

Hypoxemic Respiratory Failure

- Hypoxemia can be caused by any one of these four mechanisms: Ventilation-Perfusion (V/Q) mismatch, Shunt, Diffusion Impairment, and Hypoventilation.

- V/Q mismatch is the most important and common mechanism. Areas of low ventilation relative to perfusion (low V/Q units) lead to hypoxemia.
- Shunts can be intracardiac or intrapulmonary.

Causes of Hypoxemic Respiratory Failure

- Pneumonia
- Cardiogenic Pulmonary Edema (CHF)
- Non-cardiogenic Pulmonary Edema (ARDS, seizure)
- Pulmonary Fibrosis (IPF, sarcoidosis)
- COPD / Asthma
- Pneumothorax
- Pulmonary Embolism
- Pulmonary Arterial Hypertension (Primary, Scleroderma)
- Pneumoconiosis (Coal-workers)

Causes of Hypoxemic Respiratory Failure

- Hypersensitivity Pneumonitis
- Congenital Heart Disease
- Bronchiectasis
- Fat Embolism Syndrome
- Kyphoscoliosis
- Obesity
- Massive Pleural Effusions
- Pulmonary Hemorrhage

Causes of Hypercapnic Respiratory Failure

- COPD
- Status Asthmaticus
- Drug Overdose
- Poisonings
- Myasthenia gravis
- Guillain-Barre
- Head and Cervical Cord Injury
- Poliomyelitis
- Polyneuropathy
- Primary Alveolar Hypoventilation
- Obesity Hypoventilation Syndrome
- Severe Pulmonary Edema
- Severe ARDS
- Myxedema
- Tetanus

SUMMARY

- Two types of acute respiratory failure:
  - Type I : Hypoxemic , where $PaO_2 < 60$ mmHg
  - Type II : Hypercapnic , where $PaCO_2 > 50$ mmHg

    NB* : for status asthmaticus, $PaCO_2 > 40$ mmHg signifies hypercapnic respiratory failure.
- V/Q mismatch is the most common mechanism for both types of respiratory failure.
- Many conditions can cause both hypoxemia and hypercapnia : e.g., COPD, Obesity, ARDS, severe pulmonary edema, neuromuscular disorders.
- Avoid worsening hypercapnia by judiciously giving the patient supplemental oxygen.
- Some patients may require NIPPV or mechanical ventilation.

What is NIV?

NIV is a form of breathing support delivering air, usually with added oxygen, via a facemask by positive pressure, used in respiratory failure.

The term NIV is often used interchangeably with the trade name **BiPAP** (Bi-level Positive Airway Pressure), which is the most commonly used

NIV delivers differing air pressure depending on inspiration and expiration. The inspiratory positive airways pressure (IPAP) is higher than the expiratory positive airways pressure (EPAP). Therefore, ventilation is provided mainly by IPAP, whereas EPAP recruits under ventilated or collapsed alveoli for gas exchange and allows for the removal of the exhaled gas.

- Non-invasive ventilation (NIV) is a relatively new ventilatory mode that has been increasingly used in the acute setting over the past 15 years, demonstrating beneficial effects in the adult and pediatric population with different types of respiratory failure.

NIV recruits the lung, increasing functional residual capacity, improves respiratory dynamics, reduces respiratory work, and optimizes gas exchange

What is CPAP?

CPAP supplies constant fixed positive pressure throughout inspiration and expiration. It, therefore, is not a form of ventilation, but splints the airways open. If delivered with oxygen, it can allow a higher degree of inspired oxygen than other oxygen masks.

- CPAP = EPAP.
- CPAP provides positive pressure on expiration to overcome airway obstruction. At home, CPAP is commonly used for patients with obstructive sleep apnea (OSA).
- There is no inspiratory support with CPAP meaning it isn’t appropriate for patients with any kind of hypoventilation.

- Non Invasive Ventilation (NIV) uses positive pressure on inspiration and expiration in order to support the patient's own efforts.
- Inspiratory positive airway pressure (IPAP): pressure on inspiration to increase tidal volume size. This will ensure sufficient removal of carbon dioxide. This inspiratory support also helps to alleviate the sensation of breathlessness
- Expiratory positive airway pressure (EPAP): splints airways open during expiration to overcome obstruction/ airway collapse. Maintaining a positive pressure in the airways at the end of expiration will improve the compliance of the alveoli, making expansion during inspiration easier.
- Pressure Support: the difference between the IPAP and EPAP. It is the amount of 'help' which the ventilator will give on inspiration

- SPONTANEOUS MODE:

Patient triggers all their own breaths.

IPAP/ PS and EPAP are set.

Trigger sensitivity can be set.

Not ideal for patients who are unable to trigger all their breaths (most likely to occur during sleep)

- SPONTANEOUS/ TIMED MODE:
- As well as the patient being able to trigger their own breaths as they would in spontaneous mode, a back up rate is also set. This means if the machine does not detect a patient breath, a mandatory breath will be delivered.
- IPAP/ PS and EPAP are set
- Trigger sensitivity is set
- A back up respiratory rate and inspiratory time for these breath is set.

- If the trigger is not sensitive enough, the patient may find they receive more mandatory breaths and can feel they are not synchronising with the machine.
- In patients with poor triggering the back up rate should be sufficient to allow patient to achieve adequate ventilation.
- If the back up rate is too high patient triggering may reduce.
- If the inspiratory time is too high/ low the mandatory breaths may be too large/ small

Timed mode (T):

In T mode machine does not rely on patient breath triggering effort.

All the breaths are automatically delivered and set. So it is a machine cycled and machine triggered mode.

- PRESSURE CONTROL:
- Similar to spontaneous/ timed (S/T) mode as allows both patient and ventilator breaths.
- All setting are the same as an S/T mode except that inspiratory time is set for both patient and mandatory breaths.
- Allowing the ventilator to control the length of a spontaneous breath can help ensure that set pressures are reached and allow adequate lung expansion.
- This mode can be uncomfortable and difficult to synchronise with, particularly if the inspiratory time isn’t correct.

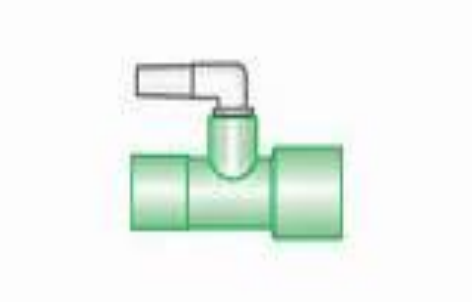
- VOLUME ASSURED MODE:
- A tidal volume (TV) target is set along with an IPAP/ PS range. The ventilator will change the IPAP as necessary to ensure that the set tidal volume is maintained (this is done using either minute ventilation or tidal volume). This means this mode can respond to changes in ventilatory needs without setting changes.
- As well as these settings, all other settings are the same as S/T mode.
- Example: patient has a set TV of 500ml and an IPAP range 12-20cmH20. Initially, the patient needs an IPAP of 12 to achieve this volume, however as they go to sleep their tidal volume drops to 450ml. In response the ventilator increases the IPAP and when the IPAP is 16 the TV return to 500ml. As the patient begins to wake up again their tidal volumes increase to 650ml using an IPAP of 16 so the IPAP reduces itself to 12 again to re-achieve a TV of 500ml.
- If a patient is using their maximum IPAP you would increase their maximum IPAP.
- Some patients can find the fluctuations in pressure associated with this mode uncomfortable.
- For some patients, although they are achieving their tidal volume using their lower IPAP, this may not overcome their sensation of breathlessness. For these people, you would increase their minimum IPAP to reduce their shortness of breath.

HUMIDIFICATION

- Air from the ventilator can be drying, particularly if wearing the machine for prolonged periods. This can be uncomfortable for the person using NIV. Heated humidification can help alleviate this.
- Should be considered in patients who struggle with retained secretions that may be dried out by the ventilator.
- Essential for tracheostomy patients as they bypass their own humidification system in their nose and mouth.
- Depending on the ventilator, the humidifier may attach directly to the machine or be a stand alone unit.

OXYGEN

Connector can either attach to machine directly, onto the circuit or entrained through connector on some masks.



EXPIRATORY PORT

- An expiratory port is essential in any single limb circuit (ie one tube) to allow for carbon dioxide to be removed on expiration.
- The port can either be in the mask or circuit.
- It is essential to know where the port is and ensure it is not covered.

CHOSING AN INTERFACE

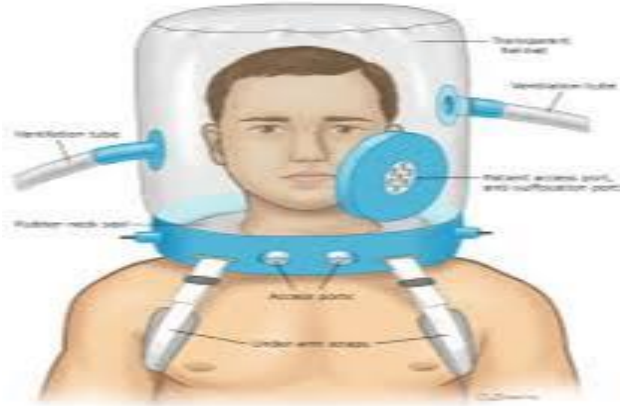
Good mask fit is essential to ensure patient comfort, effective ventilation and to reduce the risk of problems such as pressure sores and eye irritation.

When choosing an interface consider patient preference, ease of putting on the mask (particularly the headstrap and clips), when the patient is wearing the machine and whether they breathe through their nose or mouth.

Types of Interfaces for NIV

- **Nasal Mask**. This mask covers the nose only and rests on the upper lip, the sides of the nose, and the nasal bridge
- Oro-**Nasal Mask** (also referred to as a **face mask**). ...
- **Nasal Pillow Mask**. ...
- Oral Mask. ...
- Total **Face Mask**. ...
- Helmet.

TYPES OF INTERFACE



Helmet NIV

NIV mask

NASAL PILLOWS

PROS:

- Small and unobtrusive
- Ideal to wear during the day as you are still able to talk, eat etc.
- Can be preferable for people who are claustrophobic

CONS:

- Can be uncomfortable as all air is directed into the nostrils (particularly at higher pressures)
- Can cause irritation/ dryness inside the nose, particularly if worn for prolonged periods
- Not effective for people who breathe through their mouth as this will cause leak

NASAL MASK

PROS:

- Newer masks are still relatively small and unobtrusive
- Ideal to wear during the day as you are still able to talk, eat etc.
- Can be less uncomfortable than nasal pillows as the air is not going directly into the nostrils
- Can be preferable for people who are claustrophobic

CONS:

- Larger than nasal pillows
- Can cause irritation/ dryness inside the nose, particularly if worn for prolonged periods
- Not effective for people who breathe through their mouth as this will cause leak

FULL FACE MASK

PROS:

- Ideal for people who breathe through their mouth
- Less drying/irritation of the nose

CONS:

- Much larger interfaces
- Communication is much harder
- You are unable to eat and drink
- Can be difficult to wear if you are claustrophobic

TOTAL FACE MASK

PROS:

- Ideal for patients who have a pressure sore on the bridge of their nose, particularly if they breathe through their mouth
- Can sometimes be better for claustrophobic patients than a full face mask

CONS:

- Much larger interfaces
- Communication is much harder
- You are unable to eat and drink
- Can be difficult to wear if you are claustrophobic

TROUBLE SHOOTING

IF THERE ARE ANY ISSUES CONTACT THE SERVICE WHO HAVE PROVIDED THE EQUIPMENT FOR SUPPORT.

•EQUIPMENT ALARMING:

Often the ventilator will come up with a message to say why it has been alarming which can help you trouble shoot.

The alarms which have been set will vary depending on the patient and the policies of the NIV service providing the equipment.

•VENTILATOR SETTINGS:

Person reports they aren't getting enough support from the machine/ are more short of breath- need increase in IPAP/ EPAP

Person reports they are getting morning headaches, pins and needles or excessive daytime sleepiness- need an increase in IPAP as these are signs of carbon dioxide elevation

Person reports pressure is too much- reduce IPAP/ EPAP and while person acclimatises to ventilator. If person is struggling to wear the machine at night, advise trying during the daytime initially.

TROUBLE SHOOTING

- INTERFACES:

Pressure sore- depending on severity try gel pad or change interface completely.

Mask is noisey/ air blowing out sides of mask/ dry sore eyes- check mask is cleaned properly/ not old or damaged. If this is not a problem change interface.

- HUMIDIFICATION:

Person is complaining of a dry nose/ mouth- if they have a nasal mask try a full face mask, trial a humidifier.

Secretions have become thicker and harder to clear since starting on NIV- trial a humidifier

Person with a humidifier complaining of water in hose/mask- turn down humidifier temperature, use less water in the humidification chamber, ensure that separate humidification unit is lower than machine

BENEFITS OF NIV

- Symptomatic relief of dyspnea
- Correction of gas exchange
- Improve lung mechanics
- Facilitate sleep
- Correct mental status
- Pre-oxygenate for intubation
- Prevent ETI (endotracheal intubation)
- Avoid complications of ETI
  - VAP
  - Sepsis/shock
  - Tracheostomy
  - GI bleed
  - DVT
- Decrease mortality associated with respiratory failure
- Use NIV in the place of IMV (mechanical ventilation)
- Assist DNI(do-note- intubate) patients with respiratory failure

Contraindications for NIV

Absolute contraindications:

- Coma
- Cardiac arrest
- Respiratory arrest
- Any condition requiring immediate intubation

Other contraindications (rare exceptions)

- Cardiac instability (shock+need for vasopressors, ventricular dysrhythmias, complicated AMI)
- GI bleeding – intractable emesis, uncontrolled bleeding

Contraindications for NIV

- 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 / neck tumors
  - Any other tumor with extrinsic airway compromise
  - Angioedema or anaphylaxis causing airway compromise

Candidates for NIV

- Patient cooperative (excludes agitated, belligerent, comatose patients)

- Dyspnea (moderate to severe, short of respiratory failure / agonal breathing)
- Tachypnea (RR> 24 /min)
- Increased work of breathing (+accessory muscle use, pursed lip breathing)
- Hypercapnic respiratory acidosis (pH range 7.10 – 7.35)
- Hypoxemia (PaO_2/FiO_2 < 200 mm Hg, best in rapidly reversible causes for hypoxemia)

Suitable Clinical Conditions for NIV

Most patients with :

- COPD
- Cardiogenic pulmonary edema

Selected patients with :

- CAP + COPD
- Asthma / CF
- Decompensated OSA/OHS, cor pulmonale
- ARDS
- Immunocompromised state / mild PCP
- Neuromuscular respiratory failure
- DNI +/- DNR status
- Post extubation COPD / post –op respiratory failure

PHYSIOLOGIC MECHANSIMS

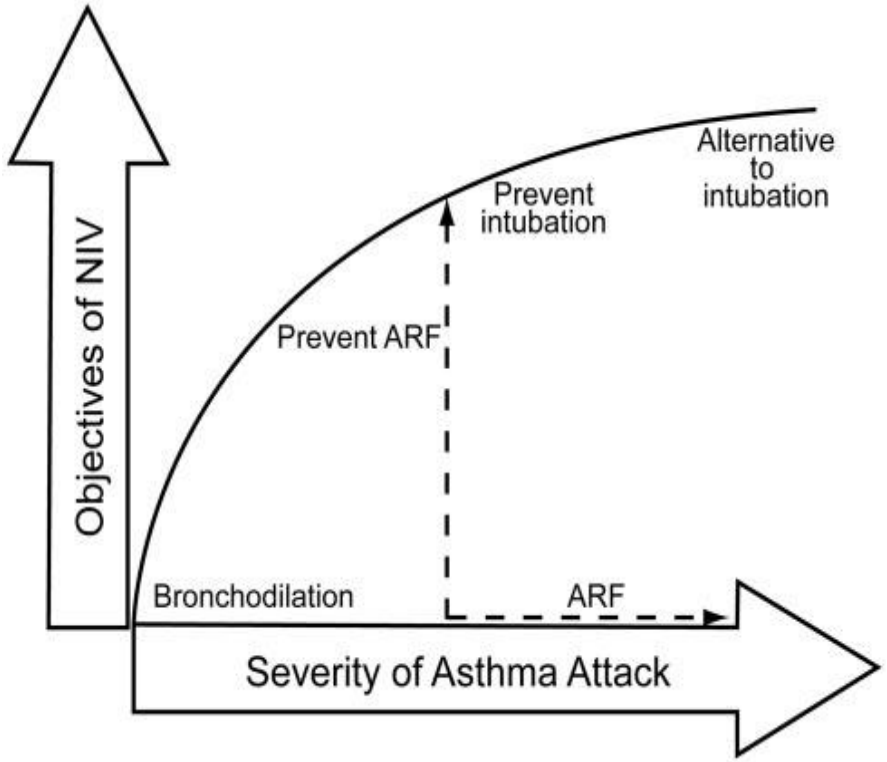
- **Unload respiratory muscles** inspiratory cycle:
  - hyperinflation >> respiratory muscle shortening/disadvantage
  - Decreased compliance of respiratory system
  - **NIPPV** = augments respiratory effort, Increases Vt, decreases RR
- **Overcome intrinsic peep**
  - intrinsic peep>> difficulty in generating pressure gradient for flow
  - **CPAP**
- **Stent open lower airway** expiratory cycle
  - **CPAP to reduce obstruction**
- **Stent open upper airway**
  - **CPAP**

PHYSIOLOGIC MECHANSIMS

- **Reduce CO2 production**
  - NIPPV
- Improve gas exchange by **decreasing atelectasis**
  - CPAP/NIP
- **Reduce negative intra-thoracic pressure swings**
  - CPAP
- **Redistribute pulmonary edema**
  - CPAP/NIPPV
- **Increase CO** by decreasing effective LV afterload
  - CPAP

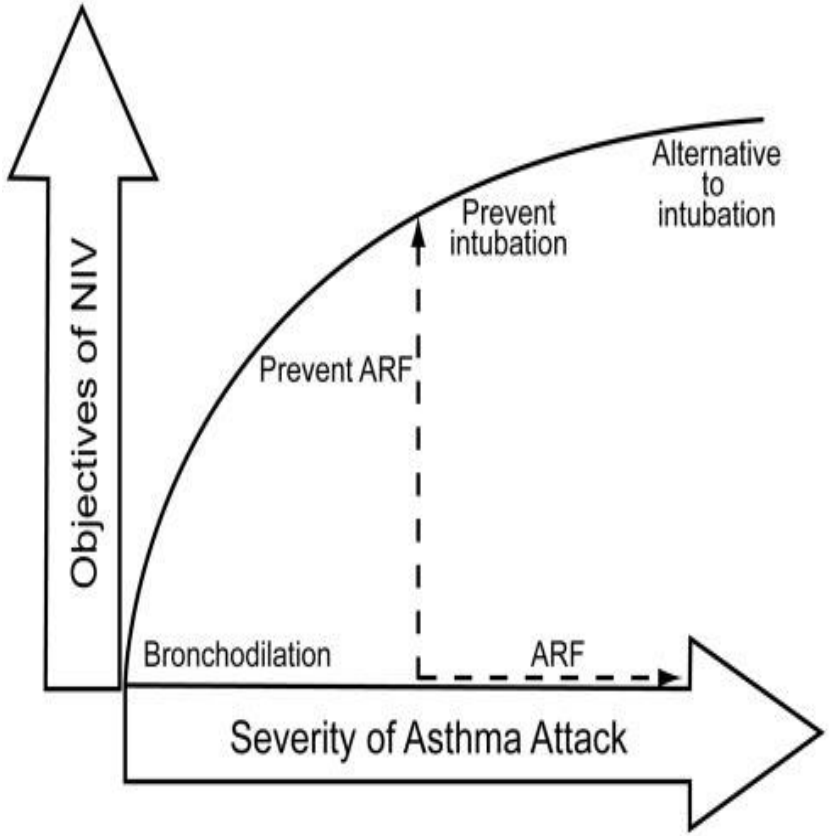
NIV: utilization classification

- **mandatory ventilation**
  - Alternative to intubation
  - severe ARF, meet criteria for IMV
  - Failed medical treatment
  - Trials: NIV vs IMV after failed MT
  - Primary outcome: mortality
- **supportive ventilation**
  - Prevent intubation
  - mild-to-moderate ARF/does not meet criteria for IMV
  - Trials: NIV+MT vs MT
  - Primary outcome: intubation



NIV: utilization classification

- **prophylactic ventilation**
  - To prevent ARF in patients
  - no substantial impairment of gas exchange
  - Trials: NIV+MT vs MT
  - Primary outcome: Blood gas values, FEV1, etc
- **other purpose ventilation**
  - bronchodilation
  - Pre-oxygenation
  - Facilitate sleep



NON-INVASIVE VENTILATION FOR ACUTE EXACERBATIONS OF COPD

BROCHARD, MANCEBO, WYSOCKI: NEJM, 1995 SUPPORTIVE VENTILATION RCT

INCLUSION CRITERIA

COPD with exacerbation of dyspnea > two days and at least two of the following:

- RR>30
- PaO2 < 45 mm Hg
- pH < 7.35 after > 10 min on RA

EXCLUSION CRITERIA

RR< 12 breaths, sedative drugs within the previous 12 hours

CNS disorder unrelated to hypercapnic encephalopathy or hypoxemia

Cardiac arrest (within the previous five days)

Cardiogenic pulmonary edema

Asthma

NON-INVASIVE VENTILATION FOR ACUTE EXACERBATIONS OF COPD

BROCHARD, MANCEBO, WYSOCKI: NEJM, 1995 SUPPORTIVE VENTILATION RCT

kyphoscoliosis as the cause of chronic respiratory failure

neuromuscular disorder as the cause of chronic respiratory failure

Upper airway obstruction, facial deformity, tracheotomy

need for immediate intubation = a clear cause of decompensation requiring specific treatment (e.g., peritonitis, septic shock, AMI)

pulmonary thromboembolism

pneumothorax, hemoptysis

severe pneumonia

recent surgery or trauma

Primary outcome: need for intubation

Secondary outcomes: LOS hosp, complications, length of MV, in hosp mortality

Standard treatment arm

- ↗`O2 via Nasal Canula up to 5 liters for target sat > 90%
- ↗Medications: SQH, antibiotics, bronchodilators, IV corticosteroids or aminophylline

NIPPV treatment arm:

- ↗same as above and
- ↗BIPAP at least 6 hours/day, NC for at least 2 hours/day
- ↗IP=20, EP=0, flow cycled, PAC if patient is apneic

Primary outcome: need for intubation
Secondary outcomes: LOS hosp, complications, length of MV, in hosp mortality

Major Criteria for intubation:

- ↗respiratory arrest, pauses with LOC, gasping, requiring sedation, HR<50 with lethargy, SPB<70

Minor Criteria for intubation:

- ↗RR> 35 and > on admission, pH < 7.3 and < admission, PaO2<45 despite O2, worsening MS

One Major Criteria or 2 Minor Criteria after one hour of RX would be indication for intubation.

In the NIPPV group if 2 minor criteria met off NIV, they can be placed back on it. But if problem persisted then intubation performed

RECOMMENDED ALGORITHM

Noninvasive ventilation in acute exacerbations of COPD
M.W. Elliott, Eur Respir Rev 2005

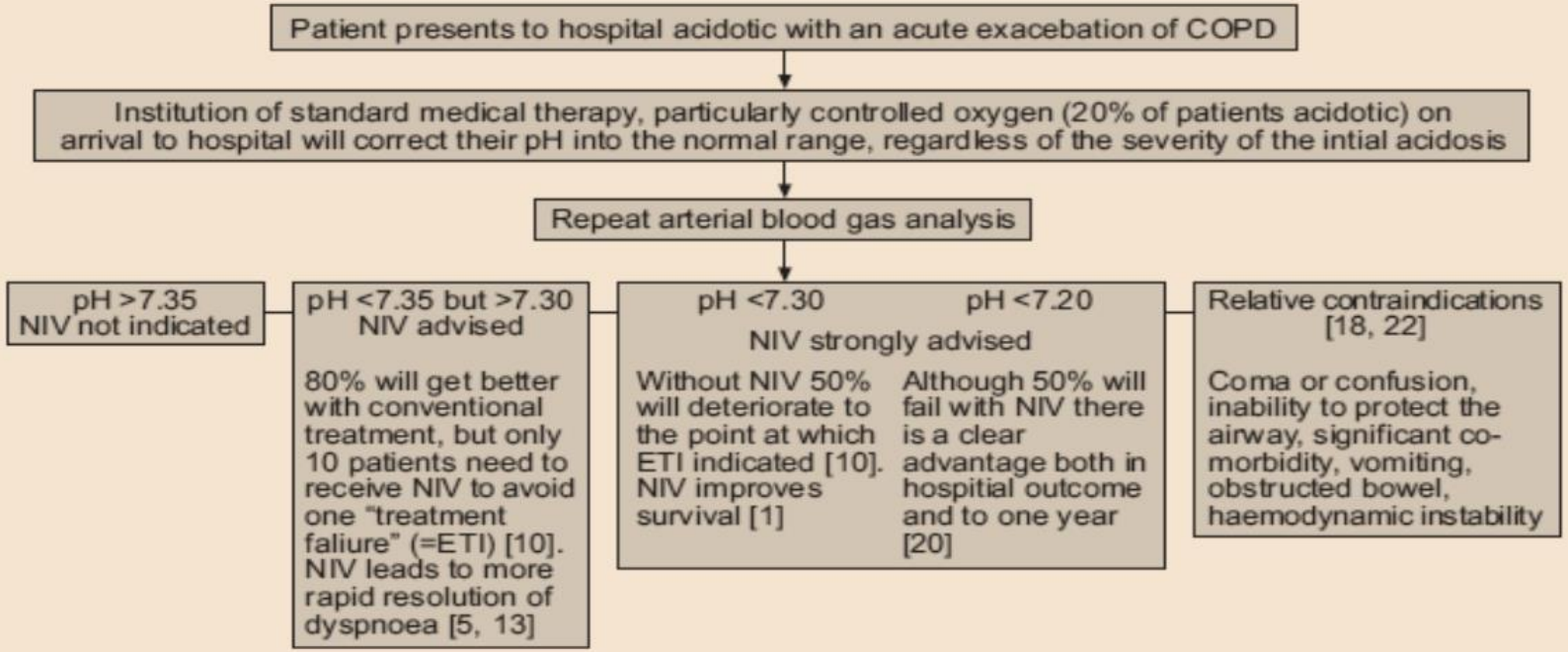


FIGURE 1. Suggested algorithm for the management of ventilatory failure in acute exacerbations of chronic obstructive pulmonary disease (COPD). NIV: noninvasive ventilation; ETI: endotracheal intubation.

Factors for NIV Failure

NIPPV failure: likely to need intubation

- APACHE 2 score higher than 29
- Higher PaCO2 on admission (>85)
- Lower pH(7.2 or less) leads to higher intubation rates but not worse outcomes

- Failure to reduce PaCO2 in 1-2 hours
- often related to air leak/poor interface
- Hypercapnic encephalopathy
- Asynchrony, copious secretions

Despite higher ETI in the likely to fail group this did not lead to higher mortality from trial of NIV

SET UP (NEJM june 2015, BTS 2008)

1. Explain to the patient, if time permits take an ABG
2. Select the mode.
3. Patients with hypercapneic respiratory failure, BIPAP is better than CPAP.
4. If BIPAP is used, set initial settings as IPAP 10. EPAP 5cm of H2O. Initial settings of IPAP 10cms H2O titrated rapidly in 2-5 cms increments at a rate of approximately each 10 minutes with a usual pressure target of 20cms H2O or until a therapeutic response is achieved or patient tolerability has been reached.

SET UP

5. Strap the mask to the patient. Optimally tight. 2 fingers should pass between strap and head.
6. Should fit around nose and mouth, not extend beyond chin.
7.Non-invasive ventilation can be used with a naso-gastric tube in place, in which case this should be a fine bore tube to minimise mask leakage. It is not necessary to place a naso-gastric tube simply because a patient is to receive NIV.
8. Initial Fio2 to adjust SPO2 > 90%.
9. Do ABG after 30 min and adjust the ventilator settings.
If hypercapnea is present increase TV by increasing difference between IPAP& EPAP.
10. If persistent hypoxemia, increase FiO2 or EPAP(but proportionately increase IPAP to maintain PS)

We recommend that intubation should be considered in patients receiving NPPV who do not show clinical improvement or have signs and symptoms of worsening disease, including increased respiratory rate, increased work of breathing, worsening gas exchange, or an altered level of consciousness.

MONITORING •

Monitoring should include a mixture of physiological measures and clinical assessment parameters (A) - Monitoring should include continuous pulse oximetry and ECG monitoring for the first 12 hours and RR, PR, BP and assessments of consciousness regularly [B] - Arterial blood gases (ABG)should be taken as a minimum at 1, 4 and 12 hours after the initiation of NIV

These should be used to assist in both formulating a management plan and, within the first 4 hours of NIV, the decision as to the appropriateness of escalating to intubation [A] • Compliance with NIV, patient-ventilator synchrony and mask comfort are key factors in determining outcome and should be checked regularly

ESCALATION·

A management plan in the event of NIV failure should be made at the outset [C]

- A decision to proceed to invasive mechanical ventilation should normally be taken within 4 hours of initiation of NIV [A]
- Intubation where appropriate is the management of choice in late (>48hrs) NIV failures [B]

Treatment Duration

- Patients who benefit from NIV during the first hours of treatment should receive NIV for as long as possible during the first 24 hours [A]
- Treatment should last until the acute cause has resolved, commonly 2-3 days [C]
- In patients in whom NIV is successful (pH ≥7.35 achieved, resolution of underlying cause and symptoms, respiratory rate normalized) it is appropriate to start a weaning plan [C]

Weaning

- Treatment reduction should affect day time ventilation periods first [C].
- After withdrawal of ventilatory support in the day a further night of NIV is recommended [C]
- The weaning strategy should be documented in the nursing and medical records [C]

Risk mitigation

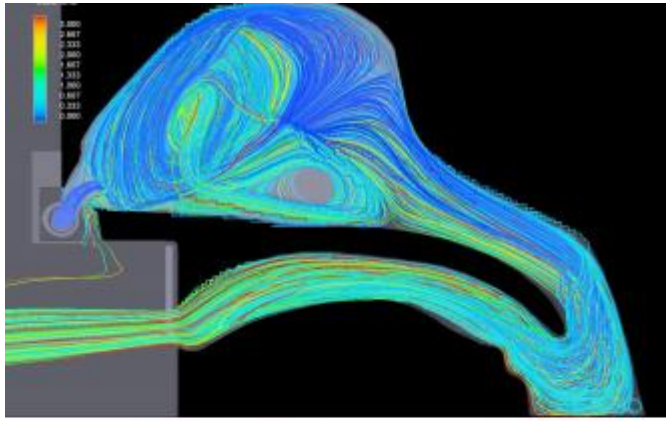
- Attempt to use ventilation equipment and methods with the least aerosol generation
- Noninvasive positive pressure ventilation (NIPPV) and HFNC have a higher risk of aerosol generation than invasive mechanical ventilation and therefore are not routinely recommended in confirmed COVID-19 cases
  - Requirements if NIV or HFNC
- Room: Airborne precautions
- Equipment: Full face mask and filtered circuits

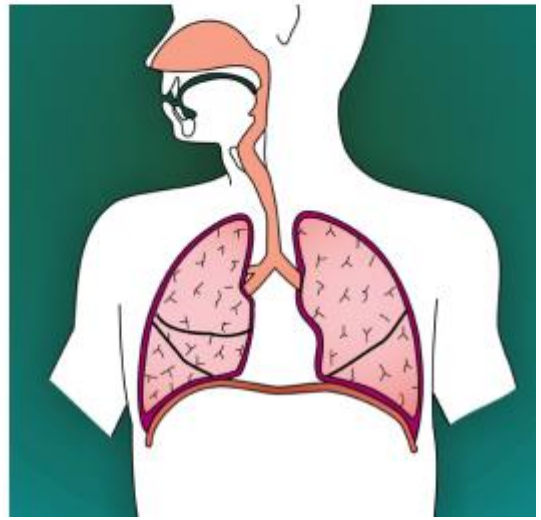
Risk mitigation (cont.)

- NIPPV: Initiation of NIPPV (bilevel positive airway pressure [BiPAP]/ continuous positive airway pressure [CPAP]) requires attending approval; strongly recommended to avoid NIPPV (BiPAP/CPAP) in persons under investigation and confirmed COVID-19 cases
  - Rare exceptions are
  - No intubation for those with acute indications for NIV or HFNC
- Patients who use NIV chronically or are currently stable or improving on NIV or HFNC
  - Exacerbations that are expected to have a rapid reversal such as congestive heart failure
- Extubation failure or high risk for reintubation
- Equipment shortages in which milder disease could be managed to save invasive ventilation devices

Quick review of HFNC

- HFNC is recommended over NIV
- Use minimal flow to maintain SpO2 greater than 88% to 94%; lower flow rates under 30 L/min may have less aerosolization
- To minimize flow, titrate fraction of inspired oxygen (FIO2) to maximum support before increasing flow greater than 30 L/min
- Ensure proper size and fit of nasal canula
- Once HFNC has been initiated, an attending needs to assess the patient after 1 hour and after 3 hours to determine if the patient needs to be intubated
- While on HFNC, the patient should have on a loosely fitting surgical mask or face tent
- Do not delay intubation if there is a lack of improvement





Review of device set-up

- Requirements
- Gas source and blender
- Flowmeter: 40 to 60 L/min
- FIO2 analyzer
- Humidifier
- Surgical mask to reduce aerosol

Respiratory care committee of Chinese Thoracic S. [Expert consensus on preventing nosocomial transmission during respiratory care for critically ill patients infected by 2019 novel coronavirus pneumonia]. Zhonghua jie he he hu xi za zhi. 2020;17(0):E020.

Quick review of NIV

- NIV provides ventilation assistance with positive pressure at 2 levels:
  - Unload respiratory muscles
- Lung volumes
- Successful NIV attempt requires that the patient
- Can maintain an airway
  - Is alert and oriented with a strong respiratory drive
- Has no facial abnormalities that would prohibit a mask seal
- Typical settings
- Spontaneous mode
- Peak airway pressure range from 8 to 20 cm H2O
- CPAP or positive end-expiratory pressure (PEEP) range from 5-15
- General guidelines
- If you need more ventilation (more carbon dioxide [CO2] removal), adjust the peak airway pressure
- If you need better oxygenation, adjust the CPAP/PEEP

NIV starting settings

- NIV typical starting pressures
- Inspiratory pressure (peak inspiratory pressure [PIP], inspiratory positive airway pressure [IPAP]) 10 cm H2O
- Expiratory pressure (CPAP/PEEP) 5 cm H2O
- FIO2 1.0
- Titrate to effect
- If FIO2 >0.6 to keep SpO2 greater than 92%, consider increasing expiratory pressure level
- If respiratory rate continues to be high, consider increasing the inspiratory pressure level

Thanks for Your Attention