Non Invasive Ventilation

Linda Grady
Clinical Nurse Specialist
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Non-Invasive Ventilation (NIV)

Technique that provides and enhances alveolar ventilation without the use of an endotracheal intubation
Who May Benefit?

**CPAP** - Patients with a reduced Functional Residual Capacity (FRC) may benefit from CPAP therapy.
- Type I Respiratory Failure
  - failure to maintain PaO$_2$
- Acute LVF - needs PEEP

**BiPAP** - Type I Respiratory Failure where patients are tiring
- PaCO$_2$↑  TV↓  LOC↓
- Type II - acute episode of COPD patient
CPAP vs BiLevel

**CPAP**
- Used to improve PaO$_2$
- Reduce WOB
  - $\uparrow$ FRC
  - $\uparrow$ Alveoli ventilation
  - Offset intrinsic PEEP

**Hypoxemia**

**Bilevel**
- Used to improve ABG
- Reduce WOB
  - $\uparrow$ TV
  - $\uparrow$ MV while $\downarrow$ RR
  - $\downarrow$ PaCO$_2$ $\uparrow$ SaO$_2$ $\uparrow$ PaO$_2$
  - Plus CPAP benefits

**Hypercapnia**
So Why NIV & not ETT?

- Less invasive – reduce patient discomfort, anxiety and sedation
- Reduced complications – ↓ cardiac output, aspiration, pneumonia, pneumothorax, bronchospasm, and trauma
- Preservation of speech and swallowing function
- Preservation of airway defence mechanisms
- Feel more involved and in control of their treatment
- Reduce time spent in ICU – use outside ICU
The patient has...

- An intact respiratory drive
- A patent airway
- Intact gag & cough reflexes
- The ability to clear secretions

Caution with...

- The patient has a reduced level of consciousness
- Is confused
- Has emphysema
- Has facial or head injuries

Would you use NIV on a patient who is dying?
Nasal

CPAP -FACIAL

Full face
NIV via Tracheostomy
**BiPAP, BiLevel, Biphasic,**

- Uses Inspiratory pressure **IPAP**
- Uses expiration pressure **EPAP**
- Pressure support **IPAP - EPAP = PPS**
- Supports spontaneous ventilation
- **IPAP**: augments inspiratory efforts
- **EPAP**: CPAP
- **Rise Time**: Rate at which machine increase airway pressure from EPAP to IPAP
Ventilation Use in the ICU

Pre NON Invasive ventilators
Intubation hours  400,000 hrs /yr

Post
Intubation hours  175,000 hrs/yr
Non Invasive Vent  750,000 hrs/yr
Initiating NIV

Need to ask:
'What are we trying to achieve for this patient?' & "Can we do it with this device?"

Consider: Underlying pathophysiology
Can the patient tolerate it
Time of day
Not isolated treatment

- Oxygen therapy
- Nebulised Bronchodilators
- Corticosteroids
- Aminophylline, antibiotics
- Respiratory Consultants
- PLAN - include patient
Setting initial pressures

Mode: Spontaneous
IPAP: 12-14 cmH2O
EPAP: 6-8 cmH2O
Mask: Face
Oxygen: to titrate SaO2 88-92%

- Increase IPAP to increase TV
- Increase EPAP if ineffective effort noted
- Increase FiO2 if SaO2 low and increase EPAP
- Change to nasal mask if more comfortable
IPAP

Inspiratory Positive Airway Pressure

BiPAP senses when an inspiratory effort is being made and delivers a flow to the pre set pressure

Flow stops when the pressure is reached

Dependent on compliance and resistance

Expiration is passive

What do you set the IPAP on?

Start safe  12cm H₂O   watch!!   Reassess
EPAP

Expiratory Positive Airway Pressure

Positive pressure applied to end expiration

EPAP does all the positive elements that PEEP does

What do you set EPAP on?

Start safe 6cm H₂O watch!! Reassess
Positive Pressure Support

Assists spontaneous respiration (↑ TV)

Higher PPS  Greater the support

IPAP - EPAP = PPS

e.g. 14-6 = 8 PPS

Inspiratory time - individual
Improvement in ABGs and Clinical Condition

**NO**
- Check leaks
- ↑IPAP 20cmH20
- ↑EPAP to 10cm H20
- ↑O2 aim SaO2 >90%
- Talk with Resp or ICU Consultant
- Consider need for intubation & mechanical ventilation.
  or DNR

**YES**
- Continue mask ventilation, intermittent periods off NIV to gauge response.
- Taper to meet patients' needs
- 2 hours off 4 hours on
- Withdrawal of NIV
Adverse Effects of NIV

- Pressure areas, skin necrosis *(duoderm)*
- Air swallowing & gastric distension
- Vomiting & aspiration! N/G
- Dry eye & oral mucous membranes
- Discomfort, anxiety

Where are these patients???

Contract with patient for regular breaks if condition allows.
When do we use it?

- Hypercapnia - COPD exacerbation, OD
- Hypoxemia - Pneumonia, ALI, ARDS
- Immunocompromised
- Acute Pulmonary Oedema
- Obese
- Weaning
- Post op respiratory failure
- Post extubation
- DNR status
The Plan....

- Patient selection. Discuss with family & patient prior to event or need for it (COPD)
  “...stay and play or scoop and go?...”
- Early discussion with ICU & transport team
- Have a plan for use of NIV in your area prior to use...discuss with respiratory team
- Liaise with base hospital
- How long are you going to persevere..
- What is your “ceiling”...
Doesn’t replace..

- Sound clinical judgement
- Need for immediate intubation
**When not to use it?**

<table>
<thead>
<tr>
<th>Contraindications to NIV</th>
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</thead>
<tbody>
<tr>
<td>Facial trauma/burns</td>
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<tr>
<td>Recent facial, upper airway, or upper gastrointestinal tract* surgery</td>
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<tr>
<td>Fixed obstruction of the upper airway</td>
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<tr>
<td>Inability to protect airway*</td>
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<tr>
<td>Life threatening hypoxaemia*</td>
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<tr>
<td>Haemodynamic instability*</td>
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<tr>
<td>Severe co-morbidity*</td>
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<tr>
<td>Impaired consciousness*</td>
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<tr>
<td>Confusion/agitation*</td>
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<tr>
<td>Vomiting</td>
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<tr>
<td>Bowel obstruction*</td>
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<tr>
<td>Copious respiratory secretions*</td>
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<tr>
<td>Focal consolidation on chest radiograph*</td>
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<tr>
<td>Undrained pneumothorax*</td>
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</tbody>
</table>

*NIV may be used, despite the presence of these contraindications, if it is to be the “ceiling” of treatment.*
When is enough...enough

- Clinical deterioration: ↑ RR, ↑ WOB, ↑ SOB
- No improvement or worsening gas exchange: ↓ pH, ↑ CO₂
- Haemodynamic instability
- Need for ETT to protect airway
- Failure to improve mental status in patients who are lethargic from CO₂ retention
- Inability to tolerate the mask