NIV guide

This is made to simplify the initial settings in different clinical conditions

- What to choose to perform NIV
- Contraindications for NIV
- Predictors of failure of NIV
- What to Monitor during NIV

- Choice of the interface, ventilator and circuit is dependent on the illness severity of each patient and on the clinical expertise of the Physician and/or Respiratory Therapist.
- Suggestions in this guide are NOT a substitute for good clinical judgement.
- Settings values are proposed pressures to start the application of NIV and may go up to the upper limit or even more when needed.
- Settings refer also only to Pressure Support Ventilation (that is by far the most used in clinical practice for NIV) unless specified.
- Backup rate depends on the spontaneous breathing of the patient / "Rise Time" setting depends on the ventilatory demand.
- For adult patient only.
Patient interface classification

- Nasal mask
- Oro-nasal mask
- Full face mask

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How to read
Choose the best material & settings to perform NIV for different type of diseases
For each **category**, start with best choice first and if not available move to **alternatives**

<table>
<thead>
<tr>
<th>Mask</th>
<th>Circuit</th>
<th>Ventilator</th>
<th>Settings</th>
<th>Oxygen supply system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best choice</strong></td>
<td>Mask type #1</td>
<td>Circuit type #1</td>
<td>Ventilator type #1</td>
<td>Settings #1</td>
</tr>
<tr>
<td><strong>1st alternative</strong></td>
<td>Mask type #2</td>
<td>Circuit type #2</td>
<td>Ventilator type #2</td>
<td>Settings #2</td>
</tr>
<tr>
<td><strong>2nd alternative</strong></td>
<td></td>
<td>Circuit type #3</td>
<td>Ventilator type #3</td>
<td></td>
</tr>
</tbody>
</table>

Example: depending on your compatible material stock you could choose the following:

→ mask #1 + circuit type #3 + ventilator #2 + settings #1 + oxygen #1

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# Severe COPD exacerbation pH < 7.30
Protected environment (ICU, respiratory intensive care unit, step-down unit etc.)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Best choice</td>
<td>Oro-nasal</td>
<td>Single limb with intentional leak</td>
<td>• Leak compensation</td>
<td>Low flow external circuit to get</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Backup rate</td>
<td>SaO₂ &gt; 92%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Waveform monitoring¹</td>
<td></td>
</tr>
<tr>
<td>1st alternative</td>
<td>Full face</td>
<td>Single limb with expiratory valve</td>
<td>PAV³</td>
<td>Air-oxygen blender</td>
</tr>
<tr>
<td>2nd alternative</td>
<td>Dual limb</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


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Mild COPD exacerbation $7.30 \leq \text{pH} \leq 7.35$

Possibly out of ICU

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<thead>
<tr>
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<th>Oxygen supply system</th>
</tr>
</thead>
</table>
| **Best choice** | Nasal                            | Single limb with intentional leak  | • Leak compensation  
• Backup rate  | • PEEP = 4-6 cmH₂O  
• PS above PEEP = 8-15 cmH₂O and up  
• Backup rate 8-12 bpm  | Low flow external circuit to get  
SaO₂ > 92% |
| **1st alternative** | Oro-nasal | Single limb with expiratory valve | PAV⁴ | |
| **2nd alternative** | Full face | Dual limb                      | | |

3. PK. Plant, JL. Owen, MW. Elliott: One year period prevalence study of respiratory acidosis in acute exacerbations of COPD: implications for the provision of non-invasive ventilation and oxygen administration. Thorax (2000); 55: 550-554

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## Cardiogenic pulmonary edema

### Pre-hospital, emergency, ICU, ...

### Ventilator Settings

<table>
<thead>
<tr>
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<th>Settings</th>
<th>Oxygen supply system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best choice</strong></td>
<td>High flow system generator with CPAP valve and oro-nasal mask(^1)</td>
<td>In case of hypercapnia: Leak compensation</td>
<td>• PEEP = (\sim 10) cmH(_2)O to get a SaO(_2) &gt; 92(^2)</td>
<td>High pressure oxygen &amp; venturi</td>
</tr>
<tr>
<td><strong>1(^{st}) alternative</strong></td>
<td>Full face</td>
<td>Single limb</td>
<td>• CPAP = 6-10 cmH(_2)O(^3) • PS above PEEP = 6-10 cmH(_2)O</td>
<td>Air-oxygen blender</td>
</tr>
<tr>
<td><strong>2(^{nd}) alternative</strong></td>
<td>• Nasal mask • Helmet(^4) (only w/ High Flow CPAP)</td>
<td>Dual limb</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Hypoxic respiratory failure
Pre-hospital, emergency, ICU, …

<table>
<thead>
<tr>
<th>Best choice</th>
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<th>Settings</th>
<th>Oxygen supply system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oro-nasal</td>
<td>Single limb with intentional leak</td>
<td>• Leak compensation</td>
<td>• PEEP = 4-8 cmH₂O¹</td>
<td>Air-oxygen blender</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Backup rate</td>
<td>• PS above PEEP = 12-25 cmH₂O and up²</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Waveform monitoring</td>
<td>• Backup Rate 12-16 bpm</td>
<td></td>
</tr>
<tr>
<td>1st alternative</td>
<td>Full face</td>
<td>Single limb with expiratory valve</td>
<td></td>
<td>PAV³</td>
<td></td>
</tr>
<tr>
<td>2nd alternative</td>
<td>Helmet⁴</td>
<td>Dual limb</td>
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Contraindications to non invasive ventilation

**Absolute contraindications**

- Cardiac or respiratory arrest
- Non-respiratory organ failure (i.e., GI bleeding, hemodynamic instability...)
- Upper airways obstruction
- Need to protect the airways
- Inability to clear secretion
- Facial surgery or trauma

**Relative contraindications**

- Coma and severe sensorium impairment
- Agitation or diaphoresis
- Severe hypoxia (i.e. $\text{PaO}_2/\text{FiO}_2 < 100$)
- Very limited spontaneous breathing

2. R. Scala, M. Naldi, S. Nava: Non-invasive positive pressure ventilation in COPD patients with acute hypercapnic respiratory failure and altered level of consciousness. Chest (2005); 128: 1657-1666
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Predictors of failure for NIV

**COPD exacerbation**
- Arterial blood gases at 2 hrs
  - If pH does NOT improve ≥ 7.25 and/or respiratory rate is still ≥ 35 breath/min then rate of NIV failure is very high
- SAPS II > 29 at admission

**Cardiogenic pulmonary edema**
- **At admission**
  - pH < 7.25
  - Acute myocardial infarction
  - Hypercapnia
  - Ejection fraction < 30%
  - Blood pressure < 140 mmHg

**Acute hypoxic respiratory failure**
- SAPS II > 34 at enrolment
- PaO₂/FiO₂ < 175 after 1 hr of NIV

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1. S. Nava, P. Ceriana: Causes of failure of non-invasive ventilation. Respir Care (2004); 49: 295-303
What to monitor during NIV

- Breathing frequency
- \( \text{SaO}_2 \) (continuous monitoring)
- SAPS II
- Heart rate (continuously) and eventually EKG
- Sensorial status (Kelly scale)

- Leaks
- Accessory muscles activities
- Compliance to NIV
- Expired tidal volume (measured or estimated)

Warning: if necessary do not delay intubation
