Noninvasive Ventilation Made Easy®

With Interactive DVD-ROM



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CHAPTER 4

INDICATIONS OF NONINVASIVE VENTILATION

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PURPOSE OF TEXT

After reading this chapter the reader will be able to know:

1. The appropriate indications and prerequisites for noninvasive ventilation.
2. Selection of patients likely to be benefitted by non-invasive ventilation.
3. The key to success for noninvasive ventilation.

In previous chapters, introduction and mechanism of noninvasive ventilation were discussed. Next step is to start the noninvasive ventilation, but before starting it is mandatory to know indications of noninvasive ventilation. Various indications are summarized in Table 4.1.

Since, practice of noninvasive ventilation is developing and many things we will know in near future, level of indications for noninvasive ventilation differ from disease to disease, e.g. for some diseases this form of ventilation is strongly recommended, for some diseases this type of ventilation is recommended with reservations and for some diseases this is recommended with caution. In general this type of ventilation is strongly recommended and highly effective in COPD while on the other hand it is comparatively less effective in other forms of respiratory failure.

Thus it is clear that indications of NIV are almost same as that of mechanical invasive ventilation except that it is indicated in early stage of respiratory failure. It can also be tried before intubation in awake patient if conditions permit and patient is not in gasping stage. Usually NIV is more successful in obstructive airway disease than any other form of respiratory insufficiency.

Proper selection of patients is a key factor for successful noninvasive ventilation. The physician should carefully review the patients for NIV. He must remember on one hand,

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TABLE 4.1: Indications for noninvasive ventilation

1. Obstructive sleep apnea.
2. Respiratory failure caused by:
   - COPD (If Respiratory acidosis persists despite maximum medical treatment and oxygen.)
   - Pneumonias
   - Cystic fibrosis
   - Asthma
   - Bronchiectasis
3. Hypoventilation due to neuromuscular diseases:
   - Muscular dystrophies
   - Post-polio syndrome
   - Neuropathies
   - Motor neuron disease
   - Cervical spinal cord lesions
4. Chest wall disorders:
   - Scoliosis
   - Thoracoplasty
   - Fibrothorax
   - Gross pleural fibrosis
   - Hypoventilation due to obesity.
5. Acute cardiogenic pulmonary edema (patients who remain hypoxic despite maximum indicated treatment).
6. Patients who have declined endotracheal intubation but deserve ventilatory assistance.
7. Do not intubate patients due to any reason.
8. Weaning from invasive ventilation in those patients in whom effective spontaneous ventilation is not established.
9. NIV is also used to prevent extubation failure. NIV is also used in unplanned extubation.
10. Acute respiratory distress syndrome.
11. Obese patients with co-existing respiratory diseases in postoperative phase as a prophylactic measure against respiratory failure and well established postoperative respiratory failure.
12. Occasionally for splinting of airway to prevent laryngeal or tracheal stenosis.
13. For deliberate hyperventilation, e.g. head injury.
14. Acute respiratory failure in immunocompromised patients.
15. To reverse dynamic airway trapping.

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the patients may recover, however on the other hand the patients may need intubation in case of failure of NIV. The various selection factors for successful noninvasive ventilation are summarized in Table 4.2.

Window of Opportunity

All patients should be selected for noninvasive ventilation in window of opportunity (Fig. 4.1). This window opens at time of becoming distressed enough to take ventilatory support and closes as patient progresses to severe forms of respiratory failure. Appropriate timing is one of the key factors for success of noninvasive ventilation.

TABLE 4.2: Selection of patients for noninvasive ventilation

- Appropriate indication.
- Appropriate timing.
- Appropriate equipment.
- Establishment of need for ventilatory support as clinically judged by
  1. Respiratory distress
  2. Tachypnea
  3. Accessory muscles of respiration working
  4. Abdominal paradox
  5. Cyanosis
  6. Restlessness
  7. Deranged blood gases–Reduced PaO_2, increased $PaCO_2$, pH < 7.35
  8. Increased work of breathing.
- Exclude contraindications to NIV.
- Establish prerequisites.
- Exclude patients needing immediate intubation.
- Tolerant patient (many patients do not tolerate NIV even with low pressures).

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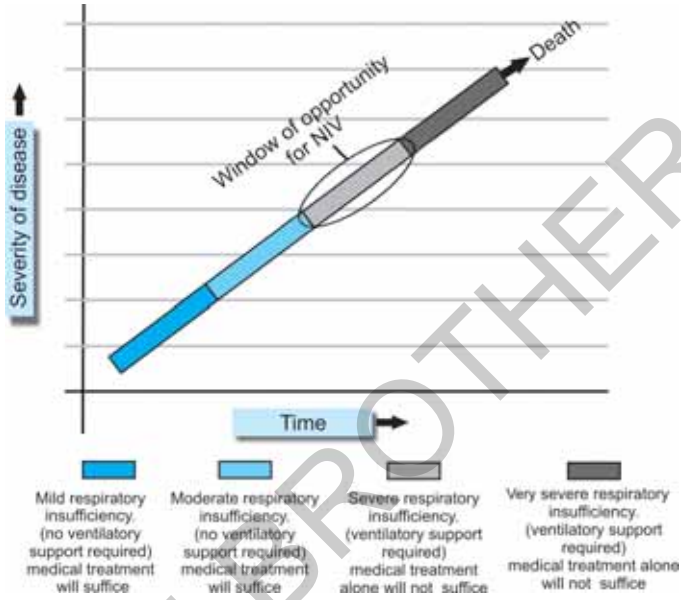

Figure 4.1: Graphical display—window of opportunity

Note: Some patients may deteriorate very fast needing urgent intubation and invasive ventilation. In this situation the window of opportunity is absent or very little. After starting NIV, physician should observe signs for successful start. He should remain with patient for some time.

Successful Start is indicated by:

- Improvement in arterial blood gases, correction of pH, increase in PaO_2, decrease in $PaCO_2$.
- Improvement in level of restlessness.

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- Reduction in respiratory rate.
- Reduction in pulse rate.
- Accessory muscles of respiration stop working.
- Patient starts feeling comfortable.
- Reversal of abdominal paradox.
- Reversal of cyanosis.
- Increase in tidal volume.

Physician should take other appropriate steps in case of deterioration of patient's condition in form of intubation and invasive ventilation, etc. (Starting of NIV will be dealt in detail in separate chapter).

Various factors for successful completion of NIV and exclusion of patients for NIV are summarized in Tables 4.3 and 4.4.

TABLE 4.3: Factors for successful completion of noninvasive ventilation

- Chosen for proper indication
- Started at proper time
- Cooperative patient
- Synchronous breathing and tolerance after starting NIV
- Minimal air leaking
- Minimal secretions
- Successful start
- Conscious patient
- Absence of co-morbidities (Malnutrition, diabetes, multiple organ failure, cardiac problems, electrolyte imbalance, etc.).
- Patient's acceptance of equipment

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TABLE 4.4: Exclusion of patients for NIV

1. Cardiorespiratory arrest.
2. Severe cardiorespiratory instability.
3. Patients needing frequent suction of respiratory secretions.
4. Facial skin is not intact.
5. Severest forms of respiratory failure.
6. Highly intolerant patient.

Clinical Pearl

Noninvasive ventilation should be started with facilities of arterial blood gases analysis, monitoring, intubation, and mechanical invasive ventilation. Remember in case of failure of noninvasive ventilation, you will need invasive ventilation immediately. Exclusion of contraindications for noninvasive ventilation is equally important as knowing indications for the same.

In A Nutshell

NIV should be started early in course of respiratory failure. It can be used in COPD, non-COPD respiratory diseases, non-respiratory diseases, e.g. neuromuscular disorders, chest wall deformities, sleep apnea. The proper selection of patients in appropriate settings is key to success. Before starting NIV, all contraindications should be carefully ruled out. Properly applied NIV is a beneficial tool to all intensivists.

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- Separate chapter on selection of equipment
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ISBN 978-93-5025-030-3