Home ventilation

Introduction

As tertiary care in pediatric and neonatal intensive care treatment (PICU & NICU) is improving, and there is an early diagnosis and intervention of respiratory failure, more and more children are surviving, and there is a greater dependency on assisted ventilation both mechanical ventilation and non - invasive ventilation, leading to longer hospitalization and an escalating cost of treatment.

Hence there is an increasing need to transfer these children requiring prolonged assisted ventilation from PICU's to the home environment or to less acute areas. There is a larger involvement and role of the primary care physicians in the care of these children in a total team effort with pediatric intensivists & pulmonologists.

Home ventilation becomes the best option for these children's psychosocial development, social integration & quality of life.

Indications of long- term ventilation

Increased respiratory load	Chronic cardiopulmonary disorders	○ Upper airway obstruction: vocal cord paralysis, craniofacial syndromes ○ Chronic lung disease: broncho-pulmonary dysplasia, Lung hypoplasia, Cystic fibrosis ○ Congenital heart disease
	Skeletal deformities	○ Kyphoscoliosis ○ Thoracic wall deformities
Ventilatory muscle weakness	Neuromuscular disorders	○ Spinal muscular atrophy, muscular dystrophies (e.g. Duchenne) ○ Polio ○ Phrenic nerve paralysis
	Spinal cord injury (above C-3)	
Failure of control of ventilation	Congenital	○ Congenital Central Hypoventilation Syndrome (CCHS) (Ondine's curse) ○ Myelomeningocele: Arnold Chiari type II
	Acquired	○ Trauma ○ Tumour ○ Surgery ○ Haemorrhage ○ Radiation

Methods of Pediatric Home Ventilation

- Positive Pressure Ventilation via Tracheostomy
- Non-invasive Positive Pressure Mask Ventilation
- Humidified High Flow Nasal Cannula (HHFNC)
- Diaphragmatic Pacing
- Negative Pressure Ventilation

✓ **Positive Pressure Ventilation via Tracheostomy**

It is a traditional method used to provide ventilation in infants and small children. It is also the safest airway access when ventilating children at home.

The tracheostomy tube size is selected as follows:

- As small as possible to ensure adequate ventilation
- To allow leak for maintenance or development of speech.

✓ **Non-invasive Positive Pressure Mask Ventilation**

This is an elegant technique to provide respiratory support without tracheostomy and is an important tool in pulmonary medicine

Advantages:

- Avoidance of disadvantages & complications of tracheostomy
- Lower cost when compared to ventilation via tracheostomy.

Who are the best candidates?

The best candidates are those children with chronic respiratory failure due to

- Progressive neuromuscular disorders
- Chronic lung diseases
- Chest wall deformities
- Hypoventilation syndromes.

Disadvantages:

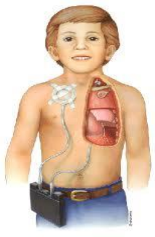
- Inadequate ventilation due to leakage through the mouth or mask.
- The lack of a secure airway: more anxiety, more frequent hospitalisation and intubations during respiratory deterioration caused by simple respiratory tract infections.
- Mask pressure may affect facial growth: mid-facial hypoplasia.
- Pressure sores & air swallowing
- Upper respiratory tract infections

✓ **Humidified high flow nasal cannula**

It is a form of non-invasive respiratory support as well as a method of delivering air or oxygen and humidification. The system uses nasal cannulae which allow delivery of high flows (up to 60 L/min) of humidified air or oxygen.

✓ **Diaphragm Pacing**

- Based on electrical stimulation of the phrenic nerves to generate breathing by activation of the diaphragm
- Important alternative mode of respiratory assistance for children who require respiratory support during both wakefulness and sleep
- Commonly performed bilaterally



- The patients wear an external radiofrequency transmitter over an implanted receiver.
- A stimulating current is induced without the need for any transcutaneous wires.

  Advantage: the transmitter is small, portable, allows more mobility.

  Disadvantages:

  - Expensive
  - Requires surgical implantation
  - Lacks an alarm system in case of malfunction.
  - Managing diaphragmatic pacers requires expertise with implantation, gradual conditioning of diaphragm and adjustment of the electro-phrenic pacer to provide adequate ventilation.

So, I hope that this write up was meaningful and gives hope to those parents and children who need assisted ventilation in the secure and comfort of your home and helps to make a knowledgeable choice when it comes to the various devices available.