

## High flow nasal prong HFNP oxygen therapy

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### Introduction

Humidified high flow nasal prong (cannula) oxygen therapy is a method for providing oxygen and continuous positive airway pressure (CPAP) to children with respiratory distress. It is used for the same indications as the traditional method of CPAP using a nasopharyngeal tube. HFNP may reduce need for NCPAP/intubation, or provide support post extubation. At high flow of 2 litres per kg per min, using appropriate nasal prongs, a positive distending pressure of 4-8 cmH<sub>2</sub>O is achieved. This improves functional residual capacity thereby reducing work of breathing. Because flows used are high, heated water humidification is necessary to avoid drying of respiratory secretions and for maintaining nasal cilia function.

### Aim

The aim of this guideline is to describe the indications and procedure for using high flow nasal prong oxygen

### Indications

HFNP are used for the same indications as the traditional method of CPAP using a nasopharyngeal tube:

- Respiratory distress from bronchiolitis, pneumonia, congestive heart failure, etc
- Respiratory support post extubation and mechanical ventilation
- Weaning therapy from mask CPAP or BIPAP
- Respiratory support to children with neuromuscular disease
- Apnoea of prematurity

High flow can be used if there is hypoxaemia (SpO<sub>2</sub><90%) and signs of moderate to severe respiratory distress despite standard flow oxygen.

### Contraindications

- Blocked nasal passages/choanal atresia
- Trauma/surgery to nasopharynx

# Management

## Equipment

- Oxygen and air source
- Blender
- Flow meter
  - <7Kg use standard 0-15L/min flow meter
  - >7Kg use high flow oxygen flow meter which delivers up to 50L/min flow
- Humidifier (Fisher and Paykel® MR850)
- Circuit tubing to attach to humidifier
  - Children <12.5kg: small volume circuit tubing (RT 329)
  - Children ≥12.5kg: adult oxygen therapy circuit tubing (RT203) and 22mmF oxygen stem connector (Intersurgical 1568)
- Nasal cannula (prongs) to attach to humidifier circuit tubing (size to fit nares comfortably)
  - Newborn: OPT312 Premature or OPT314 Neonatal (maximum flow 8L/min)
  - Infants and children up to 10kg: OPT316 Infant (max flow 20L/min) or up to 12.5kg: OPT318 Paediatric cannula (max flow 25L/min)
  - Children >10kg: Adult cannula size S OPT542, size M OPT544, size L OPT546
- Water bag for humidifier
- Nasogastric tube

## Set Up of equipment

- Select appropriate size nasal cannula and circuit tubing for patient size
- Connect nasal cannula to adaptor on circuit tubing, and connect circuit tubing to humidifier
- Attach air and oxygen hoses from blender to air and oxygen supply
- Connect oxygen tubing from blender to humidifier
- Use 22mmF Oxygen stem connector (Intersurgical 1568) to attach oxygen tubing to humidifier chamber with adult circuit (RT203)
- Attach water bag to humidifier and turn on to 37°C. The water bag must run freely and be placed as high as possible above the humidifier to achieve flow of water into the humidifier chamber. The system is then ready for use.
- [HFNP setup diagram](#)



## Patient management

- Secure nasal cannula on patient using supplied "wiggle pads™", ensuring the prongs sit well into the nares
  - prongs should not totally occlude nares
- Start the high flow nasal cannula system at the following settings:
  - Flow rate
    - $\leq 10\text{Kg}$  2 L per kg per minute
    - $> 10\text{Kg}$  2 L per kg per minute for the first 10kg + 0.5L/kg/min for each kg above that (max flow 50 L/min)
      - i.e. 16kg = 20L (2 x first 10kg) + 3L (0.5 x 6kg) = 23L/min; 40kg = 20L (2 x first 10kg) + 15L (0.5 x 30kg) = 35L/min
      - Start off at 6L/min and increase up to goal flow rate over a few minutes to allow patient to adjust to high flow
      - high flow meter flow should be rounded down to nearest available flow (only certain flows available)
  - FiO<sub>2</sub>
    - Always use a blender, never use flow meter off wall delivering FiO<sub>2</sub> 100%
    - Start at 50-60% for bronchiolitis and respiratory distress
      - Lower FiO<sub>2</sub> (e.g. 21% - 25%) may be needed for cyanotic congenital heart disease with balanced circulation
    - Target range for SpO<sub>2</sub> of 94%-98%
      - 75-85% in cyanotic congenital heart disease with balanced circulation
  - Humidification
    - Because flows used are high, heated water humidification is necessary to avoid drying of respiratory secretions and for maintaining nasal cilia function

- Set humidifier on 37° C invasive setting (length from temperature probe to nares will result in temperature drop to comfortable level whilst maintaining optimal humidity)

## Patient monitoring

- Monitor patient for response
  - Respiratory rate
  - Heart rate
  - Degree of chest in-drawing
  - SpO<sub>2</sub>
- Within 2 hours it should be possible to reduce the FiO<sub>2</sub> and clinical stabilisation should be seen
  - The FiO<sub>2</sub> required to maintain SpO<sub>2</sub> in the target range (as above) should decrease to <40%
  - The heart rate and respiratory rate should reduce by 20%
  - Chest in drawing and other signs of respiratory distress should improve
- Seek medical review if any of the following occurs:
  - The patient is not stabilising as described above
  - The degree of respiratory distress worsens
  - Hypoxaemia persists despite high gas flow
  - Requirement for >50% oxygen
- Note that on high flow if high FiO<sub>2</sub> is used, oxygen saturation may be maintained in an infant despite the development of hypercarbic respiratory failure
- If there is rapid deterioration of oxygen saturation or marked increased work of breathing, a chest x-ray should be done to exclude a pneumothorax

## Patient nursing care

- All infants on high flow should have a nasogastric tube
  - Once stable on high flow, the infant should be assessed as to whether they can feed. Some infants can continue to breast feed, but most require feeding via a nasogastric tube
  - Regularly aspirate the NG 2-4 hourly for air
- Oral and nasal care must be performed 2-4 hourly
- Note nasal prongs are in correct position and no pressure areas to nares
  - Spare "wiggle pads™" available to change as required to ensure prongs secure
    - wiggle pad™ OPT010 for OPT312 Premature nasal cannula
    - wiggle pad™ OPT012 for OPT314 Neonatal, OPT316 Infant or OPT318 Paediatric nasal cannula
- Gentle suction as required to keep nares clear
- Check humidifier water level hourly

## Documentation

- Document hourly on MR100 PICU observation chart:
  - Flow rate, FiO<sub>2</sub> & humidifier temp
  - Document RR,HR, SpO<sub>2</sub> & WOB

## Weaning of high flow nasal cannula oxygen

- When the child's clinical condition is improving as indicated by:
  - Decreased work of breathing
  - Normal or improved respiratory rate
  - Return to normal cardiovascular parameters

### For infants <10Kg

- The first step is to wean the FiO<sub>2</sub> to <40% (usually within the first 1-2 hours, as above)

40%

- Reduce flow to 5 L/min then change to standard low flow 100% oxygen (1 to 2L/min) or cease oxygen therapy if stable

### For children >10Kg

- Wean FiO<sub>2</sub> to 40%
- Once the indication for using high flow has resolved, and the patient is stable in 40% oxygen the flow can be weaned to 1-2 L/min with FiO<sub>2</sub> of 100% via standard nasal prong therapy, or oxygen therapy ceased. Generally there is no need for a prolonged weaning process, better to be on high flow, standard low flow or off oxygen therapy.

## Complications

- Gastric distension
- Pressure areas
- Blocked HFNP due to secretions
- Pneumothorax

## Links

- [Oxygen delivery clinical practice guideline](#)

## References

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