

Indian Academy of Pediatrics (IAP)



## GUIDELINES FOR PARENTS

# Home Care of Child on Oxygen and Ventilation

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### 10 FAQs on HOME CARE OF CHILD ON OXYGEN AND VENTILATION

1. Is home oxygen therapy possible and safe for my child?
2. What are the different methods for providing home oxygen therapy?
3. What kind of training is needed for the family members?
4. What kind of monitoring is needed for a child on home oxygen therapy?
5. What kinds of gadgets, equipment, and training are needed, and where can I get it?
6. When should home oxygen therapy be started in children?
7. What are danger signs or alerts when I should contact the doctor or rush to the hospital?
8. When should home oxygen therapy be discontinued?
9. What are the types of oxygen cylinders available in the market? How do I choose for my child? How much does a cylinder cost? What other accessories would I need to buy along with oxygen cylinders?
10. Can I choose oxygen concentrator in place of oxygen cylinder for my child's oxygen therapy at home? How do they work? How much do they cost and what are the maintenance required while using these machines?

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# Home Care of Child on Oxygen and Ventilation

## Q1

### Is home oxygen therapy possible and safe for my child?

- Many children, who because of their disease need oxygen therapy for longer period of time, and may be prescribed oxygen therapy at home. This can help in reducing the hospital length of stay and cost of care. By allowing the child to be with their family at home, home oxygen therapy can also improve the emotional health and well being of the child.
- Oxygen therapy is possible at home once the disease is stabilized, oxygen settings titrated and oxygen delivery devices are finalized by the treating team.
- This is a safe treatment modality under family supervision provided the family members are trained on safety issues of using oxygen at home, and understand what to do when child is not doing well and requires medical attention.

Q2

## What are the different methods for providing home oxygen therapy?

There are a variety of different methods for providing home oxygen therapy.

### Oxygen Source

- At home, it is not preferable to use *oxygen cylinders* as they cannot maintain oxygen flow over longer periods of time.
- The use of *oxygen concentrator* machine is recommended as it can help to generate oxygen flow up to 5 L/min. This machine requires electricity and must be run constantly while oxygen therapy is being used.
- Patients who are receiving continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP) at home can also get additional oxygen through their CPAP or BiPAP machines.

### Devices (Figs. 1A to D)

- *Nasal cannula* can be used for administering oxygen via tubing inserted into the nostrils in younger children.
- The use of *facemask* can provide an adjustment of the level of oxygen support by using different venturi valves, especially when the amount of oxygen is being slowly weaned over time.
- Patients with an advanced airway such as a tracheostomy tube can also receive oxygen through a *humidifier device* through which oxygen can be added to deliver it via a heated tracheostomy collar.



**Figs. 1A to D:** Devices for administering oxygen via tubing inserted into the nostrils in younger children.

### Q3

#### What kind of training is needed for the family members?

To ensure safety of the child on home oxygen therapy, caregivers, and family members should get training on important aspects of care of the child at home. Training should include but not limited to following aspects:

- Basic care of the child on home oxygen therapy
- Proper management of equipment used in home oxygen therapy
- How to provide oxygen therapy with prescribed equipment and devices?
- Early recognition of the clinical signs indicating increased oxygen demand
- Immediate interventions needed for the child with falling SpO<sub>2</sub> or red alert clinical signs.
- How to contact the treating team and transport to hospital in emergency?
- How to contact medical equipment agency for repair or emergency replacement of vital equipment?
- Understanding the risk of smoking and open flames in the household, use of oil based or other fuels near oxygen source.

It is always good to ensure competency and skill checklist for all family members and caregivers.

### Q4

#### What kind of monitoring is needed for a child on home oxygen therapy?

A child on home oxygen therapy should be carefully monitored for breathing symptoms and oxygen levels. Evaluate by looking at the following:

- Rate of breathing—count the number of breaths taken in 1 minute
- Flaring of nostrils
- Pulling in of the spaces between the ribs and lower part of neck
- Chest and belly moving rapidly in an alternating manner
- Degree of rise of the chest wall with each breath

Oxygen levels should also be monitored closely in a child receiving home oxygen therapy by using a “Pulse Oximeter” (**Fig. 2**). This can be placed on the child’s finger or toe and can display the oxygen levels on the device’s screen. Generally, the goal of oxygen therapy is to maintain oxygen saturation levels that are >92% at all times. If low readings are obtained, reposition the pulse oximeter to make sure that correct reading is obtained. If the readings remain consistently low, then check it on a healthy person’s finger—if the value is normal in this person, then machine malfunction can be ruled out and the patient should be taken to the doctor for immediate evaluation.



**Fig. 2:** Pulse oximeter.



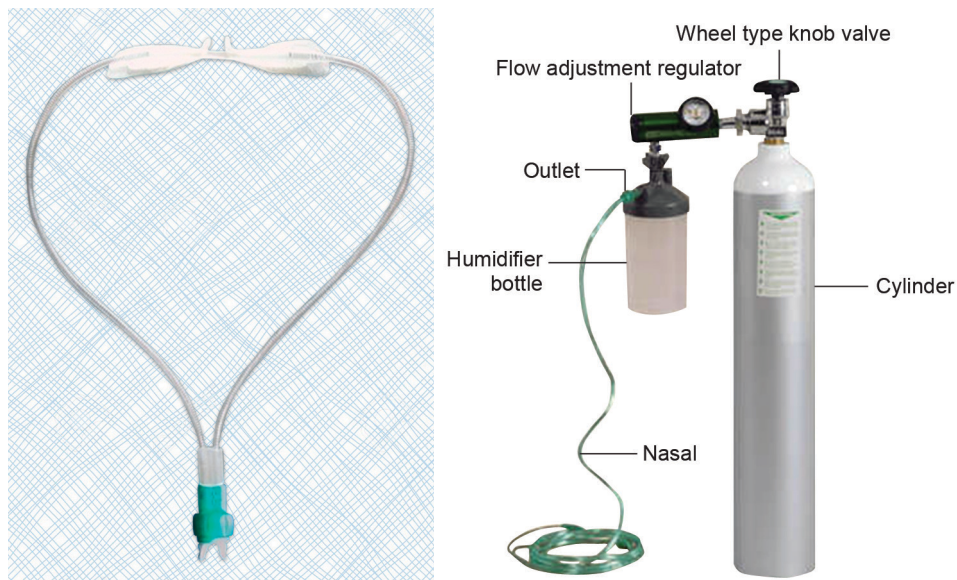
Q5

### What kinds of gadgets, equipment, and training are needed, and where can I get it?

Age-appropriate equipment is needed for safe and effective delivery of oxygen.

- Appropriate size of *oxygen cylinders* can be used in infants and small children as the primary source of home oxygen, if flow rates are low (<0.3 L/min) and if the duration of oxygen therapy is expected to be limited to a few months.
- *Oxygen flowmeter* and oxygen delivery devices are needed to ensure delivery of oxygen at optimum flow and concentration to nose or tracheostomy site (**Fig. 3**).
- *Nasal cannula* is most commonly used oxygen delivery interface in children.
- *Pulse oximeter* is needed to know the level of oxygen in the child's blood.
- An *apnea monitor* alerts you when your baby's breathing rate is slow or heart rate drops below the normal range.
- *Humidification* of the oxygen is needed for flow rates above 1 L/min and can be achieved through heat moisture exchanger (HME). Cold bubble or heated humidification devices can also be used.
- *High-flow nasal cannula* (HFNC) can deliver high flow rates at varying oxygen concentrations.

These items are available in the market but should be bought in consultation with the treating team only. Many hospitals may provide the home oxygen therapy kit on rental basis.



**Fig. 3:** Appropriate size of oxygen cylinder: Oxygen flowmeter and oxygen delivery devices.

Q6

### When should home oxygen therapy be started in children?

The decision to start home oxygen therapy depends on the child's diagnosis, current condition and goals for long-term care, all of which should be discussed with the child's treating physician before starting home oxygen therapy.

Any child with chronic heart or lung disorders that will lead to persistently low oxygen saturation levels can be treated with home oxygen therapy. If they also have signs of chronic respiratory failure in the form of elevated carbon dioxide levels, then home oxygen therapy alone may not be sufficient and may have to be combined with another modality such as BiPAP.

Home oxygen therapy can be used to stabilize chronically ill children as their primary underlying condition improves slowly. Some children may take longer to recover from a severe respiratory illness and can benefit from home oxygen therapy as long as the underlying condition is reversible. For patients with chronic conditions that are known to be life-limiting or associated with a poor prognosis, home oxygen therapy can be started as a means to keep the child comfortable. The goals of care for children with chronic irreversible/progressive conditions which may not be curable with oxygen therapy should be established in consultation with their treating physician.

Q7

### What are danger signs or alerts when I should contact the doctor or rush to the hospital?

Clinical monitoring is very important that includes change in respiratory rate, work of breathing, color (discoloration) or behavior of the child. Pulse oximetry is the primary method of monitoring SpO<sub>2</sub> while child is on home oxygen therapy. Appropriate training for family and caregivers is needed on understanding of when to apply the pulse oximeter and how to interpret the measurements.

Any change in these parameters or fall in SpO<sub>2</sub> should immediately alert the caregivers to detect any interruptions in oxygen delivery and ensure necessary interventions such as increasing oxygen flow and concentration, clearing and suctioning of airway, changing the position or chest physiotherapy. If there is no improvement with these interventions, then condition should be discussed with the treating team.

As SpO<sub>2</sub> may improve transiently with increased oxygen flow or concentration, and may mask the actual clinical status, children with increased work of breathing, shallow respiration or hypoventilation should be assessed by a clinician, regardless of SpO<sub>2</sub>.

Q8

### When should home oxygen therapy be discontinued?

Home oxygen therapy can be discontinued when the goals of care have been met. In patients recovering from a severe respiratory illness, a slow weaning of the oxygen support will facilitate independence from the use of oxygen over time. This slow weaning should be undertaken in consultation with the child's treating physician with continued monitoring of the oxygen levels with a pulse oximeter.

In some obstructive disorders, where the source of airways obstruction has been relieved and airway swelling has subsided in the postoperative period, then oxygen therapy should be slowly weaned and discontinued.

In children who have progressive chronic medical conditions such as neuromuscular disorders, oxygen therapy will not be beneficial, and they should be provided with other positive pressure modalities such as BiPAP for ongoing respiratory support.

Q9

### What are the types of oxygen cylinders available in the market? How do I choose for my child? How much does a cylinder cost? What other accessories would I need to buy along with oxygen cylinders?

- Oxygen cylinders come in different sizes and they are named based on the amount of oxygen, they hold in cubic feet and *prefix M is added to denote that cylinder is meant for medical use (Fig. 4).*
- The most common oxygen cylinder which is used in home care is M-6 (earlier known as B).
- Central Drugs Standard Control Organization regulates color coding of different medical gases, ensures that all the cylinders are properly labeled, and safety procedures are displayed.
- Choice of oxygen cylinder depends on prescribed flow rate for the child and also on the mobility of the child.



- Commonly used portable cylinder size M-6 or B is around 5,000 rupees. Many agencies also provide oxygen cylinders on rent with periodic refilling facility.
- Caregiver would also need to buy a *regulator* which determines the flow rate at which oxygen is released. Regulator valves come in two types: CGA-870, which is used on portable cylinders (up to size E), and CGA-540 style for larger and nonportable cylinders.
- An optional accessory is a *conserver*, which senses breathing and synchronizes oxygen delivery with inhalation thus saving the oxygen. A cart to hold and mobilize the cylinder is also available for cylinder size up to M-6.

### Sample Oxygen Cylinder Specifications\*



Older Name		A		B		C	D	JD	E			H
<b>Newer Name</b>	M-2	M-4	ML-6	M-6	M-7	M-9	M-15	M-22	M-24	M-60	M/MM/M122	M-250
<b>Diameter (in.)</b>	2.5	3.2	4.3	3.2	4.3	4.3	4.3	5.3	4.3	7.3	8	9
<b>Height (in.)</b>	5.3	8.5	7.6	11.5	9.1	11	16.5	16.5	25.5	23	36	52
<b>Empty Weight (lb)</b>	0.7	1.6	2.8	2.2	3.3	3.7	5.3	8	7.9	22.3	39.5	114
<b>Capacity (L) at 2,200 psi</b>	42	113	165	164	198	255	425	640	680	1738	3455	7080
<b>Transport method</b>	Carrier Bag	Carrier Bag	Carrier Bag	Carrier Bag	Carrier Bag	Carrier Bag	Carrier Bag	Carrier Bag	Wheelchair Bag or Cart	Not portable	Not portable	Not portable
<b>Regulator type</b>	CGA 870	CGA 870	CGA 870	CGA 870	CGA 870	CGA 870	CGA 870	CGA 870	CGA 870	CGA 540	CGA 540	CGA 540

**Fig. 4:** Different sizes of oxygen cylinders and their specifications.

## Q10

**Can I choose oxygen concentrator in place of oxygen cylinder for my child's oxygen therapy at home? How do they work? How much do they cost and what are the maintenance required while using these machines?**

Oxygen concentrator generates oxygen by absorbing nitrogen from ambient air.

- It runs on electricity and has no power backup so a back-up source of either electricity or oxygen is required. Battery-powered portable oxygen concentrators are also available.
- It delivers oxygen flows ranging from 0.5 to 5 L/min and these are called low-flow oxygen concentrators.
- High-flow oxygen concentrators can generate flow up to 10 L/min. They are recommended for long-term oxygen therapy, if child needs >1.4 hours.
- Oxygen concentrators weigh about 15 kg and can be moved with wheels installed at the base (**Figs. 5A and B**).
- New machine costs about 50,000 rupees and is available on monthly rental.
- Average lifespan of a machine is around 5 years or 10,000 hours. It does not require any external oxygen source, hence recurring cost is negligible.
- Accessories required are nasal cannula and humidifier bottle, which usually come with the set itself. Maintenance involves ensuring that gross particle filters at air inlet are kept clean. They are required to be cleaned regularly. Most filters would need replacement in a year. Cannula needs to be cleaned at least once a week by washing it in warm water and soap.



**Figs. 5A and B:** Oxygen concentrators weigh about 15 kg and can be moved with wheels installed at the base.

### Precautions while giving Oxygen Cylinder

- Oxygen cylinders kept at home should be kept away from flames such as matches, candles, cigarette lighters or lit cigarette, flammable liquids, etc. **(Fig. 6).**
- It should also be kept at least 5 feet away from any kind of heat source like heaters.
- Similarly, electric appliances should also be kept away from the cylinders.
- Fire extinguisher should always be available near oxygen cylinder in case of accidental fire.
- Oxygen can even react with oily substances such as petroleum jelly and cause burns so oil and grease-based products should also be avoided.
- One should also ensure that cylinder is secured in upright position so that it does not topple.



**Fig. 6:** Precautions while giving oxygen cylinder.

### Precautions while Giving Oxygen Concentrator

- When using oxygen concentrator parents should ensure that the electric switch being used for oxygen concentrator is properly grounded.
- It should not be connected through extension cord as it may cause short circuit.
- Amperage requirement of machine should be checked, and it should not be plugged into the outlet with lesser amperage.
- One must ensure that electric cords and oxygen tubing are not getting pressed under the furniture or getting covered with rugs.

### Risk to the Family and Safety Precautions to Follow

Oxygen is a flammable gas and it should be handled carefully at home. It is generally safe, however, family needs to follow certain safety precautions as mentioned here:

- Room of the child should be well ventilated with open doors for good air flow. Unnecessary items should be removed from the room to make it less stuffy.
- There should be no smoking in the house when a baby is receiving oxygen. Hanging a sign board to remind people not to smoke in the house is a good idea. Ensure that the smoke detectors are functional and fire escape plan is in place.
- Keep your child at least 6 feet away from open flames, heaters, fireplaces, radiators or gas appliances. All the oxygen tanks and cylinders should be kept at least 6 feet away from any source of heat or fire.
- Spray cans, rubbing alcohol, and petroleum jelly should not be used near a child on oxygen therapy.