PRACTICAL 6 OXYGEN THERAPY

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6.0 OBJECTIVES

After completing this unit you will be able to:
• List down purposes, indications and the contraindications of oxygen therapy;
• Demonstrate and perform various methods of oxygen therapy in newborn;
• Observe flow, concentration of oxygen therapy;
• Provide medication by nebulization; and
• Perform the steps of procedure of oxygen and nebulization therapy.

6.1 INTRODUCTION

Oxygen is a colourless, odourless, tasteless and combustible gas. As you know oxygen is given when there is interference with the normal oxygenation of body tissues.

In this practical you will acquire skills in giving oxygen therapy to newborn by different methods. You will also gain knowledge and skill in nebulization. You will also review the indications, contraindications, procedures and role of nurses in oxygen therapy.
6.2 ADMINISTRATION OF OXYGEN

Oxygen therapy is defined as the administration of oxygen by inhalation from a cylinder, piped in system liquid oxygen reservoir or oxygen concentration by various methods to relieve hypoxia/anoxia.

6.2.1 Purposes

The purposes of oxygen therapy are:

- To facilitate metabolism in the tissues
- To reduce/correct arterial hypoxaemia and tissue hypoxia
- To maintain an atmosphere of moist oxygen to facilitate normal breathing

6.2.2 Indications of Oxygen Therapy

The indications for oxygen therapy are as follows:

- Birth asphyxia
- Cyanosis (exclude congenital cyanotic heart disease without heart failure)
- Respiratory distress due to hyaline membrane disease, pneumonia, cardiac failure and congenital malformation or worsening respiratory distress
- Clinical features of hypoxia are evident
- Arterial oxygen tension is less than 40 mm Hg or arterial oxygen saturation is less than 85 per cent
- Hypothermia
- Recurrent apnea attacks
- Pneumothorax or pneumomediastinum

6.2.3 General Guidelines

- Check name, bed no., and other identification marks of the newborn.
- Check doctors orders for initiation of the therapy and dosage.
- Assess the baby’s vital signs and breathing pattern carefully before starting therapy.
- Careful explanation of all the equipment involved is also very important to minimize anxiety and fear of parents.
- Careful explanation to parents for the need of oxygen therapy will help to maximize cooperation.
- Oxygen should be treated as a drug, the seven rights of medication administration should be followed while giving oxygen therapy.
- Use regulator and humidifier while using oxygen cylinder or central supply of oxygen.
- Every part of apparatus should be cleaned to prevent infection.
- Watch the baby receiving oxygen therapy continuously to detect early signs of oxygen toxicity.
- Take precaution specially when oxygen is on flow e.g. smoking, use of matches, lighters etc. should be avoided.
6.2.4 Equipments

- Oxygen cylinder with stand, central supply of oxygen with a flow meter, humidifier/wolf’s bottle and connecting tubings
- Nasal catheter/prongs
- Mask, head box
- Incubator
- Water-soluble lubricating jelly
- Adhesive tape
- A bowl of water
- Swabstick and normal saline in a container
- Servo heater controller for humidification with aerosal tubings
- Oxygen analyser
- Pulse oximeter and probe.

6.2.5 Steps of Administration

<table>
<thead>
<tr>
<th>Steps</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash hands</td>
<td>Reduces transmission of micro-organisms. Soap and water reduce surface tension and thus remove dirt and check the growth of micro-organisms</td>
</tr>
<tr>
<td>Attach cannula/catheter /mask to oxygen tubing and humidified oxygen source adjusted to the prescribed flow rate</td>
<td>Prevents drying of nasal and oral mucous membranes and airway secretions. Use of humidifier prevents drying of mucus membranes</td>
</tr>
<tr>
<td>Place tips of cannula into the patient’s nares. If mask, apply snugly to face.</td>
<td>Directs flow of oxygen into the upper respiratory tract. Prevents loss of oxygen</td>
</tr>
<tr>
<td>Check cannula/equipment every eight hours</td>
<td>Ensures patency of cannula and oxygen flow. Also ensures safe delivery of prescribed oxygen</td>
</tr>
<tr>
<td>Keep the humidification jar filled at all times</td>
<td>Prevents inhalation of dehumidified oxygen. Prevents drying of mucus membranes</td>
</tr>
<tr>
<td>Observe the patient’s nares and superior surface of both ears for skin breakdown</td>
<td>Oxygen therapy can dry nasal mucosa. Pressure on ears from cannula tubing/elastic can cause skin irritation</td>
</tr>
<tr>
<td>Check the oxygen flow rate and the physician’s orders every eight hours</td>
<td>Ensures delivery of the prescribed oxygen flow rate</td>
</tr>
<tr>
<td>Wash hands before removing the oxygen mask or tube</td>
<td>Reduces transmission of micro-organisms</td>
</tr>
<tr>
<td>Inspect the patient for relief of symptoms associated with hypoxia</td>
<td>Indicating that hypoxia is reduced/treated</td>
</tr>
<tr>
<td>Record procedure in the nurse’s notes</td>
<td>Documents correct use of oxygen therapy and the patient’s response</td>
</tr>
</tbody>
</table>
6.2.6 After Care of the Newborn

- Stay with the baby till he/she is at ease
- Keep the baby warm and comfortable
- Evaluate babies progress by observing the vital signs and symptoms
- Watch the baby for any deteriorating symptom after the removal of oxygen.

6.3 METHODS OF ADMINISTERING OXYGEN

6.3.1 Head Box/Oxygen Hood (Fig 6.1a and b)

Procedure:
- Place a head box over the baby’s head.
- Ensure that the baby’s head stays within the head box even when the baby moves.
- Use shoulder roll if necessary. Do not seal space between infant’s neck and hood.
- Attach the oxygen tube to the nozzle located on the head end side of the box.
- Raise the concentration of oxygen in the head box till cyanosis disappears and arterial oxygen saturation of the baby is kept between 90 -95%.
- Adjust the flow of oxygen to achieve the desired flow and concentration.
  - Low - 3 L per minute
  - Moderate - 3 to 5 L per minute
  - High - more than 5 L per minute
- Adjust oxygen flow to desired level so as to obtain desired O$_2$ concentration.
- Check every hour that oxygen delivery system is intact.
- Monitor baby for respiratory rate, distress and colour.
- Remove hood in case of accidental disruption of oxygen supply.
- As oxygen is toxic, it should be used in the lowest concentration to relieve cyanosis or maintain normal arterial oxygen saturation.
- Discontinue oxygen when it is no longer required.

Fig. 6.1a: Head Box
6.3.2 Nasal Catheter

- Use a 6-8 Fr size catheter.
- Determine the distance, for which the tube should be passed by measuring the distance from the nostril to the inner margin of the eye brow.
- Gently insert the catheter into nostril. If a gastric tube is already in place in one nostril, insert the catheter into the same nostril that the gastric tube is in, if possible.
- Ensure that catheter is correctly positioned
  - Look into the baby’s mouth
  - The catheter should not be visible at the back of the mouth
  - If the catheter is visible at the back of the mouth, pull the catheter out slowly until it is no longer visible
- Adjust the flow of oxygen to achieve the desired concentration
  Low = 0.5 L per minute
  Moderate = 0.5 to 1 L per minute
  High = More than 1 L per minute
- Change nasal catheter twice daily.
- Keep the nostril free of any crust.
- Give oxygen using a face mask while cleaning and disinfecting the catheter if necessary.

6.3.3 Nasal Prongs (Fig 6.2)

Procedure

- Use 1 mm twin holed nasal prongs for a small baby (less than 2.5 kg at birth or born before 37 weeks gestation) and use 2 mm prongs for a term baby.
- Place the prongs just within the baby’s nostrils.
- Secure the prongs in place and attach catheter using elastic or a piece of adhesive tape.
- Adjust the flow of oxygen to achieve the desired concentration
  Low - 0.5 L per minute
  Moderate - 0.5 to 1 L per minute
  High - 1-2 L per minute
- Change the nasal prongs twice daily. Give oxygen using face mask while cleaning and disinfecting the prongs if necessary.
6.3.4 Face Mask

Procedure

- Give oxygen using face mask while cleaning and disinfecting the prongs.
- Place the mask over the baby’s mouth and nose.
- Secure the mask in place using elastic or a piece of adhesive tape.
- Adjust the flow of oxygen to achieve the desired concentration and flow
  Low = 1 L per minute
  Moderate = 1 to 2 L per minute
  High = More than 2 L per minute

6.4 PULSE OXIMETRY AND OXYGEN SATURATION

- The infant who presents with any kind of respiratory distress should have a baseline recording of arterial saturation of oxygen (\( \text{Sa O}_2 \)) measured with a pulse oximeter. In a healthy newborn/infant the percentage saturation of oxygen should be 95-98%.
- Pulse oximeter is non-invasive, painless and reliable technique for management of \( \text{Sa O}_2 \). When used properly it will detect hypoxaemia before clinical signs become evident.
- A sensor or a probe is placed around the fleshy part of the body for e.g. A fingertip in the older child, around the nail bed of the toe in the newborn/infant.
- The sensor emits red and infrared light and has a photo detector which detects the amount of light absorbed by the tissues.
- The different colors of oxygenated and deoxygenated blood absorb different amount of infrared light. This information in then converted into an average value which is displayed as percentage saturation. Pulse oximeter measurements have been shown to correlate to arterial blood gas value.

6.5 NEBULISATION THERAPY

Nebulizers produce aerosol particles of uniform size by the arrangement of baffle mechanism. It is the device to deliver the drug to the newborn’s lung using compressed air (Fig 6.3).
6.5.1 Purposes
To provide inhaled medication to newborn and infant when delivering the upper or lower airways as desired.

6.5.2 Equipments
- Nebulizer
- Oxygen tubings with hood or mask
- Resuscitation bag with mask (for an infant on mechanical ventilation)
- Compressed air supply
- Appropriate medication and saline solution

![Nebulizer Diagram](image)

Fig. 6.3: Nebulizer

6.5.3 Steps of Procedure
1) Monitor the heart rate before and after the treatment of baby using bronchodilator drugs.
2) Explain the procedure to the parents.
3) Place the baby in mother’s lap with head supported.
4) Add the prescribed amount of medication and saline to the nebulizer at the ratio of 1:3 (3 part of saline and 1 part of bronchodilator).
5) Connect the tubing to the compressor and set the flow at 6 to 8 L/minute.
6) Observe expansion of chest.
7) Monitor vital signs and breath sounds before and after treatment.
8) Let all the medication get nebulized. Drug should be nebulized over a period of 8-10 minutes. If the procedure takes more than 10 minutes, the chamber is either malfunctioning or supply of compressed air is defective.
9) See that a good mist is formed. It indicates that the nebulization procedure is satisfactory.
10) Record medication used and description of secretion.

11) Disassemble and clean nebulizer after each use with light detergent followed by plain water. 1% vinegar solution can be used for overnight immersion to disinfect the nebulizer and tubings.

12) Before next use, the nebulizer should be run dry for a few minutes.

6.5.4 **Advantages of Nebuliser**
- Generates particles of uniform size
- Useful for all ages
- Convenient for high dose nebulisation
- Heart lung coordination is not required

6.6 **ACTIVITIES AND GUIDELINES**

**Activity 1**
Identify newborn in your work place (nursery) who requires oxygen therapy and provide care to the baby

- Observe the oxygen hood, mask and nasal catheter/nasal prongs for oxygen administration
- Monitor concentration of oxygen being administered by oxygen analyser. Monitor by transcutaneous blood gas monitor

**Guideline for Oxygen Therapy**

Follow the given guidelines for Oxygen Therapy:

**Identification Data:**

- **Date of Oxygen Therapy:** ..............................................................
- **Name:** .................. **Ward No:** ..............................................
- **Age:** ...................... **Bed No:** ...........................................
- **Sex:** ........................
- **Hospital Record Number:** .................................................
- **Date of Admission:** ............................................................
- **Diagnosis:** ............................................................

**Methods of delivery of \( O_2 \) therapy**

- **Head box**
- **Nasal catheter**
- **Nasal prongs**
- **Face mask**

- **Rate of flow/min** ..................
- **Concentration of oxygen** ............

**Care provided during oxygen therapy**
- Check vital signs and symptoms
Techniques in Newborn and Infant Care

- Explain to parents
- Check equipment every eight hours
- Keep the humidification jar filled at all times
- Check O₂ flow rate
- Observe for complication
- Record the procedure

Remarks: ....................................................................................................................

Activity 2

- Identify newborn who needs nebulization therapy
- Monitor heart rate before and after treatment
- Preparation of medication used in nebulizer
- Record of administration of medication

Guidelines for Nebulization Therapy

Identification data

Name: ........................................ Ward No: ..................................................
Age: .............................. Bed No: ..................................................
Sex: ..............................
Date: ..............................
Time of Nebulization .........................
Pre-procedure vital signs ..........................................................
Preparation of medication for nebulization
Observations made during procedure
Care provided during procedure
- Monitor heart rate before and after treatment
- Explain the procedure
- Position of the baby (propped up position)
- Preparation of medication
- Record medication

6.7 LET US SUM UP

In this practical we have discussed about administering oxygen and nebulization. We have focused on general guidelines, indications and different methods of administering oxygen therapy in newborn and infant. We have also discussed nebuliser therapy, its importance and steps.