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4th ABUJA PERINATAL SYMPOSIUM

*Let The Newborns Breathe!*

# Respiratory Support Systems


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# OBJECTIVES

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**01**

Maintain adequate Tissue Oxygenation.

**02**

Reduce work of breathing

**03**

Prevent lung injury

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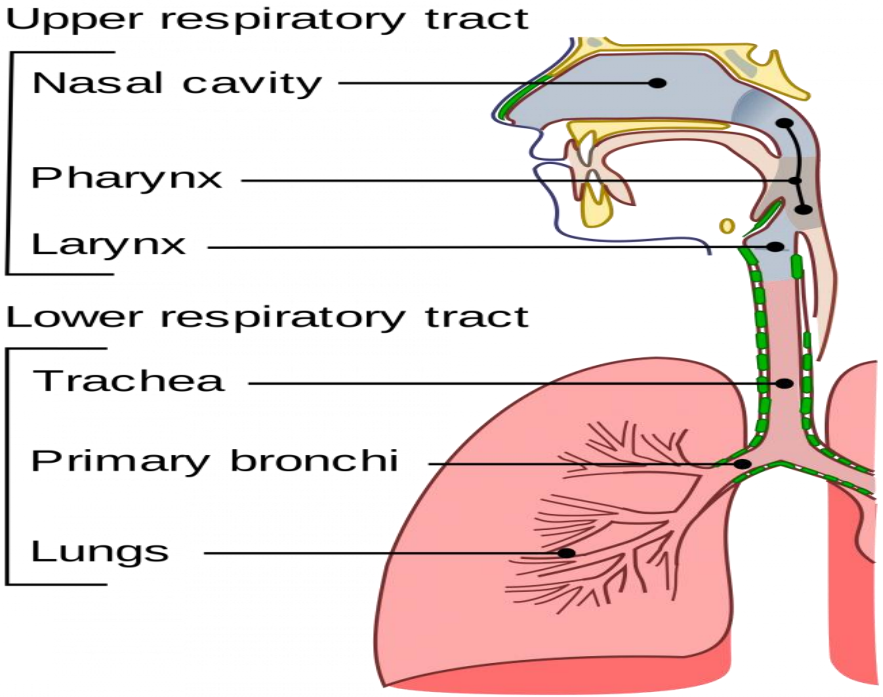
# Overview of the Respiratory System



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# Types of Respiratory Support systems

## Non-Invasive Respiratory Support

- Oxygen Therapy
- High Flow Nasal Cannula
- Continuous Positive Airway Pressure (CPAP: nCPAP, bCPAP)
- Bilevel Positive Airway Pressure (BiPAP)
- **Invasive Respiratory Support**
- Mechanical Ventilation
- Extracorporeal Membrane Oxygenation

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# Oxygen Therapy in Newborns

- **Very Important, why?**
- Conditions that reduce tissue oxygenation can lead to respiratory failure
- Hypoxaemia can lead to cardiac arrest and death
- Supplemental oxygen can be life saving

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# Sources of Oxygen

- Oxygen Concentrator
- Oxygen Cylinder
- Central Wall Piped Oxygen

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# Oxygen Administration Devices

## Nasal Prongs (Nasal Cannulae)

- Ensure Appropriate size
- Humidify the Oxygen and clear mucus plugs
- Standard flow rates (0.5-1L)
- Delivers 30-35% Oxygen
- Aim SPO2 levels ≥90-95%

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# Oxygen Delivery Devices

## Head boxes, Incubator, Tents and Face Masks

- Non-Invasive
- Require high flow Oxygen to prevent rebreathing of exhaled air

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# Devices

- Oxygen Splitter Equipment
- Pulse Oximeters (Hand held, fixed)

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# Oxygen Splitter Device

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# Pulse Oximeter with neonatal probe

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# Steps in Oxygen Administration

- Ensure airway is clear
- Give O2 with nasal prongs or nasal catheter @ 0.5l/min
- Assess after 15-30mins with Pulse Oximeter
- If less than 90%, escalate to 1L/min up to 2L/min
- If still below 90%, change to face mask and deliver oxygen @ 4L/min
- Consider CPAP if no improvement still.

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# Indications to Wean Off and Steps

- Baby can maintain normal saturation and is stable clinically.

**How?**

1. Reduce the flow rate by 0.5L/Min, recheck SPO2 every 15mins
2. If Saturation is good (Up to 90%) and clinically stable, reduce by 0.5L/Min and recheck SPO2 every 15mins
3. If Saturation drops below 90% and Baby clinically deteriorates, increase the oxygen flow until normal saturation is achieved and patient improves/

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# CPAP

- Tissue Hypoxia can lead to Morbidity and Mortality
- Some conditions that affect Tissue Oxygenation may not improve with Supplemental Oxygen
- CPAP is a cost effective device that keeps airways open and increases alveolar recruitment
- Baby must be breathing Spontaneously.
- HR should be up to 100bpm

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# Mechanism of Action

- Delivery of Mild Air Pressure
- Delivers PEEP that keeps alveolar patent at the end of expiration
- Indicated for infants in severe respiratory distress, hypoxaemia or bradypnoea despite supplemental oxygen.
- CPAP device requires a continuous oxygen airflow (Often air compressor) and usually an oxygen blender connected to the O2 source.
- A CPAP system requires reliable oxygen, adequately trained staff and close monitoring.

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# Bubble CPAP system

- Continuous gas flow into a circuit
- Nasal interface connecting baby to the circuit
- An expiratory limp submerged under water

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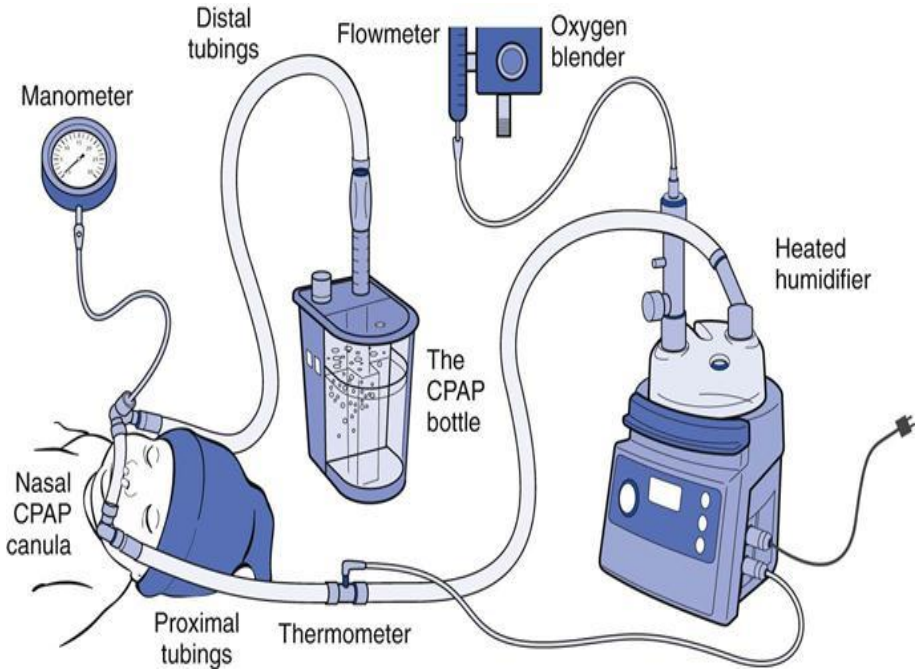
# CPAP device with parts



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# A CPAP device

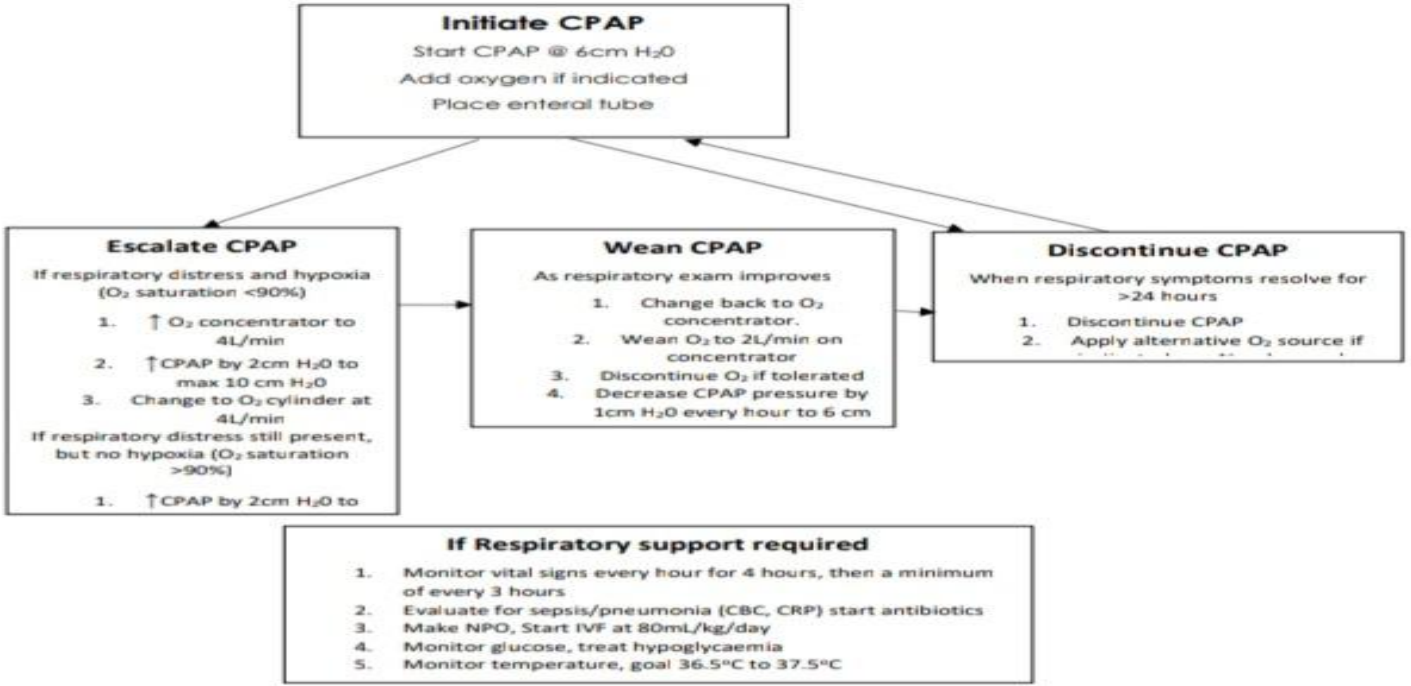


***Figure 12.7:*** *An algorithm for the management of a newborn on CPAP*

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# Indications

- Increased work of breathing
- RDS
- Apnoea of prematurity
- After Neonatal Resuscitation
- Congenital Pneumonia
- Severe Transient Tachypnoea of the Newborn
- PPHN
- MAS (Without air trapping)
- NNS with severe resp distress
- Weaning off Mechanical ventilation

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# Contraindications

- Upper airway anomalies: Coanal Atresia, Cleft palate, Unrepaired TEF
- Congenital diaphragmatic Hernia
- Severe CVS instability and impending respiratory failure
- Unstable respiratory drive
- Ventilatory failure (Inability to keep Pa CO2 < 60mmHg or PH > 7.25)

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# Procedure

- Assemble the machine, choosing the appropriate nasal prong and ensure functionality of device
- Prepare the baby (Wash hands and glove properly, suction mouth and nose, insert orogastric tube)
- Attach baby to the machine
- Set at 5-8cm H2O

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# Weaning off CPAP

- Resp rate < 60cpm for 6hrs
- SPO2 >90% for >6hrs
- No grunting, recessions, flaring, apnoea or bradycardia.
- Reduce by 1cm of water  ever 12-24hrs

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# Complications

- Gastric Distension (CPAP Belly)
- Air leak syndrome
- Reduction of cardiac output
- Nasal obstruction from mucus
- Excoriations of the nose, septal distorsion, pressure necrosis, scarring
- Skin irritation of head and neck from improperly secured bonnets

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# Mechanical Ventilation

- Non Invasive (HFNC)
- Invasive

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# Mechanical Ventilation

- Delivery of flow and pressure to baby's airways to effect change in lung volume.
- A mechanical Ventilator is a machine that generates controlled flow of gas into a patient's airway and takes over the act of breathing.

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# Indications for Mechanical Ventilators

- Apnoea
- Inadequate respiratory drive
- Circulatory failure.
- Cardiogenic shock
- Failed CPAP (FiO2>0.6, PH<7.2 after surfactant)
- Inability to protect airway (low GCS/BCS)
- Congenital anomalies (Diaphragmatic Hernia/ Large tumours)

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# Mechanical Ventilator Parameters

- Inspiratory Time (Ti)
- Expiratory Time (Te)
- Inspiratory/Expiratory ratio I:E ratio
- RR.Frequency
- FiO2
- Flow Rate (V insp) and V exp)
- Flow Rate (V insp) and V exp)
- Peak inspiratory pressure
- PEEP
- MAP (Mean Airway Pressure)
- Tidal Volume (VT)
- Minute Volume

# Ventilator modes

## Generally

- SMV
- SIPPV
- PTV
- AC
- PC
- PSV
- VCV
- HFOV
- HFJV

- GE machines

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# Ventilator Modes on GE machine

- Assist Control (AC): Ventilator Delivers a set of breaths and volume but patient can initiate additional breaths at their own rate.
- Pressure Support (PS): Theventilator provides pressure support during patient's own i.spiratory effort, allowing for weaning from ventilation.
- Volume Control (VC): Ventilator delivers a set pressure with each breath.
- Synchronised  Intermittent Mandatory Ventilation (SIMV): The ventilator  delivers a set number of breaths, but the patient can also breathe spontaneously  between the mandatory breaths.

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# Monitoring

- Ensure Correct Settings
- Check the parameters
- Assess for ETT displacement
- Monitor Patient's clinical state
- Assess the baby on taking over (Appearance, RR.effort, adequancy and symmetry of chest)
- Document ventilator settings and parameters
- Note adequacy of humidification
- Set ventilator alarms appropriately
- Suction PRN
- Monitor SPO2
- Positioning and pressure/.

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# Weaning Off Ventilator

- Improvement or resolution of indication
- Adequate gas exchange
- Low PEEP
- Low Fi02
- Presence of respiratory drive
- Stable Haemodynamic state

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# Post Intubation Mgt

- Start Bcpap OF hfnc
- Commence Methylxanthine or Caffeine Citrate
- Systemic Steroids and Diuretics
- Supportive care: Anaemia correction, adequate nutrition, close monitoring
- Prone positioning to stabilize chest wall and improve diaphragmatic excursion.

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# CONCLUSION

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# Conclusion

- Respiratory Support is a life saving component of neonatal care
- Meticulous choice of support and appropriate monitoring and weaning off when indicated can reduce morbidity and mortality in newborn infants.

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# Thank you for your time!

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# Who is Limi Children Hospital?_____

The Limi Children's hospital is a is an arm of the Limi Hospital Group located at **No. 39 Ademola Adetokunbo Crescent, Wuse 2, Abuja,** A designated specialty hospital for pediatrics, neonatology and general medical care for children.

Under the auspices/system of the **>40yr old Limi Hospitals** founded in 1982.

The Limi Children's Hospital was commissioned by the Honorable Minister of the FCT in October 2017 amidst glowing commendations and accolades for the vision and contribution to healthcare delivery.

World class Healthcare, All Day, Everyday

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"...A healthy child is a happy child"

# What are the Limi Children Hospital's services?

The Limi Hospitals
Reversing Medical Tourism

We provide **24/7 world-class healthcare solutions** for patients, hospitals, and their doctors in:

- General Paediatrics
- Paediatric Haematology
- Paediatric Dermatology
- Paediatric Neurology
- Paediatric Cardiology
- Paediatric Endocrinology
- Paediatric Gastroenterology
- Paediatric Otorhinolaryngology (ENT)
- Emergency Medicine
- Child and Adolescent Psychiatry


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The Limi Hospital Since 1982

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# How to refer patients to Consider The Limi Children Hospital?

The Limi Hospitals
Reversing Medical Tourism

1. Give a standard referral letter & preferably attach any available results
2. **Call:** 08090599994, 09081841655
3. **WhatsApp:** 09024294618
4. **Email:** Limichilrenhospital@gmail.com
5. **Visit:** **No. 39 Ademola Adetokunbo Crescent, Wuse 2, Abuja,**
6. Kindly indicate Doctor's name, & email/phone number especially if you wish to receive a medical report afterwards.


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