

# OXYGEN THERAPY FOR COVID-19



12<sup>th</sup> JUNE 2020  
On GoToWebinar

**Dr. Rashmi Salhotra**  
**Associate Professor**  
**Department of Anaesthesiology**  
**UCMS and GTB Hospital, Delhi**

# Learning Objectives

- What is O<sub>2</sub> therapy?
- What are the devices for O<sub>2</sub> delivery?
- How to use the O<sub>2</sub> delivery devices?
- When and how to initiate?
- Maintenance of oxygen therapy
- When to call for expert help?

# What is O<sub>2</sub> therapy?

- Delivery of oxygen at concentration/pressure higher than that in the ambient atmosphere
- Goals:
  - Maintain adequate tissue oxygenation
  - Minimise the cardiopulmonary workload

# Indications of Oxygen Therapy (AARC)

- Documented hypoxemia as evidenced by
  - $\text{SaO}_2 < 90\%$  or  $\text{PaO}_2 < 60$  mm Hg on room air
  - $\text{SaO}_2$  or  $\text{PaO}_2$  below desirable range for a specific clinical situation
- Acute care situations in which hypoxemia is suspected
- Severe trauma
- Acute myocardial infarction
- Short-term therapy or surgical intervention (e.g., PACU)

Name:  
CHINNAROSIREDDY  
Instrument:  
Model: GEM 3500  
S/N: 14074255

Measured (37.0C)

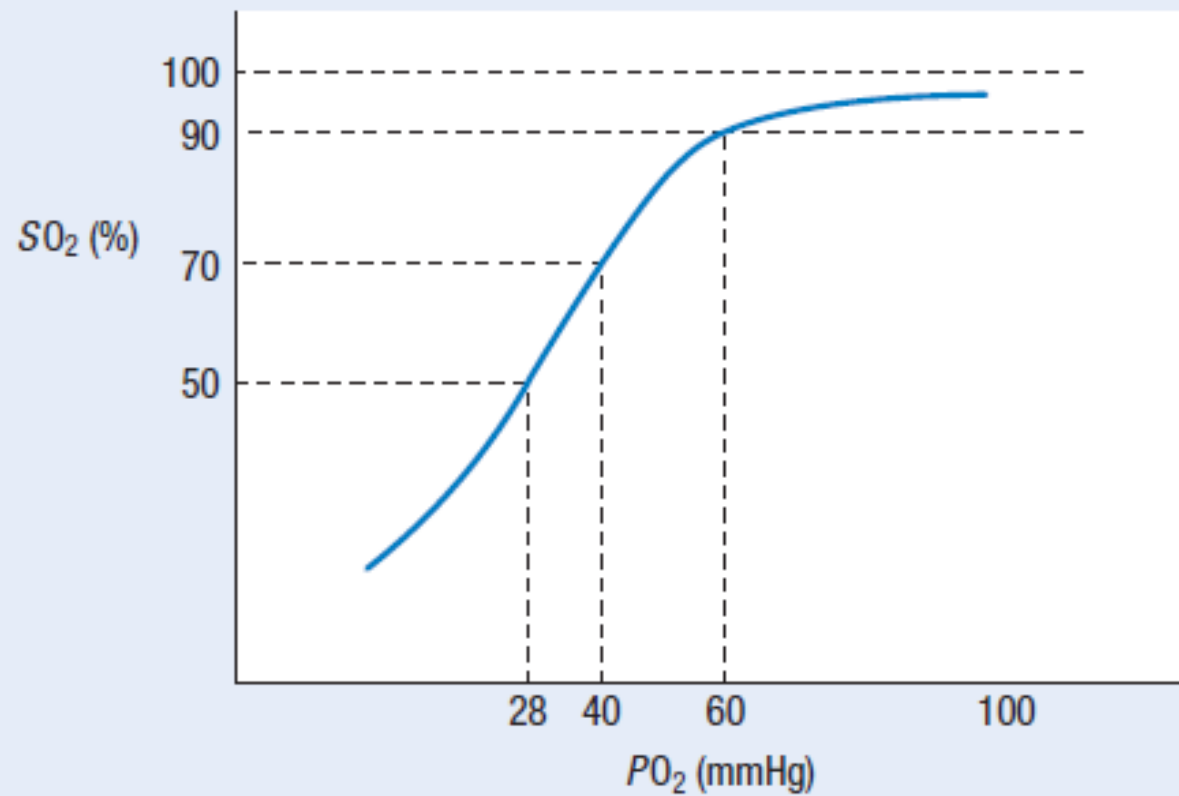
#pH	7.33	
!pO2	11	mmHg
!pO2	250	mmHg
Na+	138	mmol/L
K+	3.8	mmol/L
!Ca++	0.17	mmol/L
#Glu	112	mg/dL
!Lac	2.3	mmol/L
Hct	37	%

Derived Parameters

Ca++(7.4)	0.17	mmol/L
HCO3-	7.4	mmol/L
HCO3std	12.5	mmol/L
TCO2	7.8	mmol/L
BEecf	-18.5	mmol/L
BE(B)	-16.0	mmol/L
S02c	100	%
THbc	11.5	g/dL

- Shortne
- Confusi
- Anxiety
- Tachyp
- Tachyc
- Pallor/c
- SpO<sub>2</sub> <9
- PaO<sub>2</sub> <6





**Fig. 2.22** Oxyhaemoglobin dissociation curve.

# Basic Requirements

- A patient
- Monitors:  $\text{SpO}_2$ , ABG ( $\text{PaO}_2$ )
- Source of oxygen
  - Cylinder
  - Central supply – manifold/liquid oxygen cylinders
  - Oxygen concentrators
- Oxygen delivery devices
- Interface between source and device

# Source of Oxygen

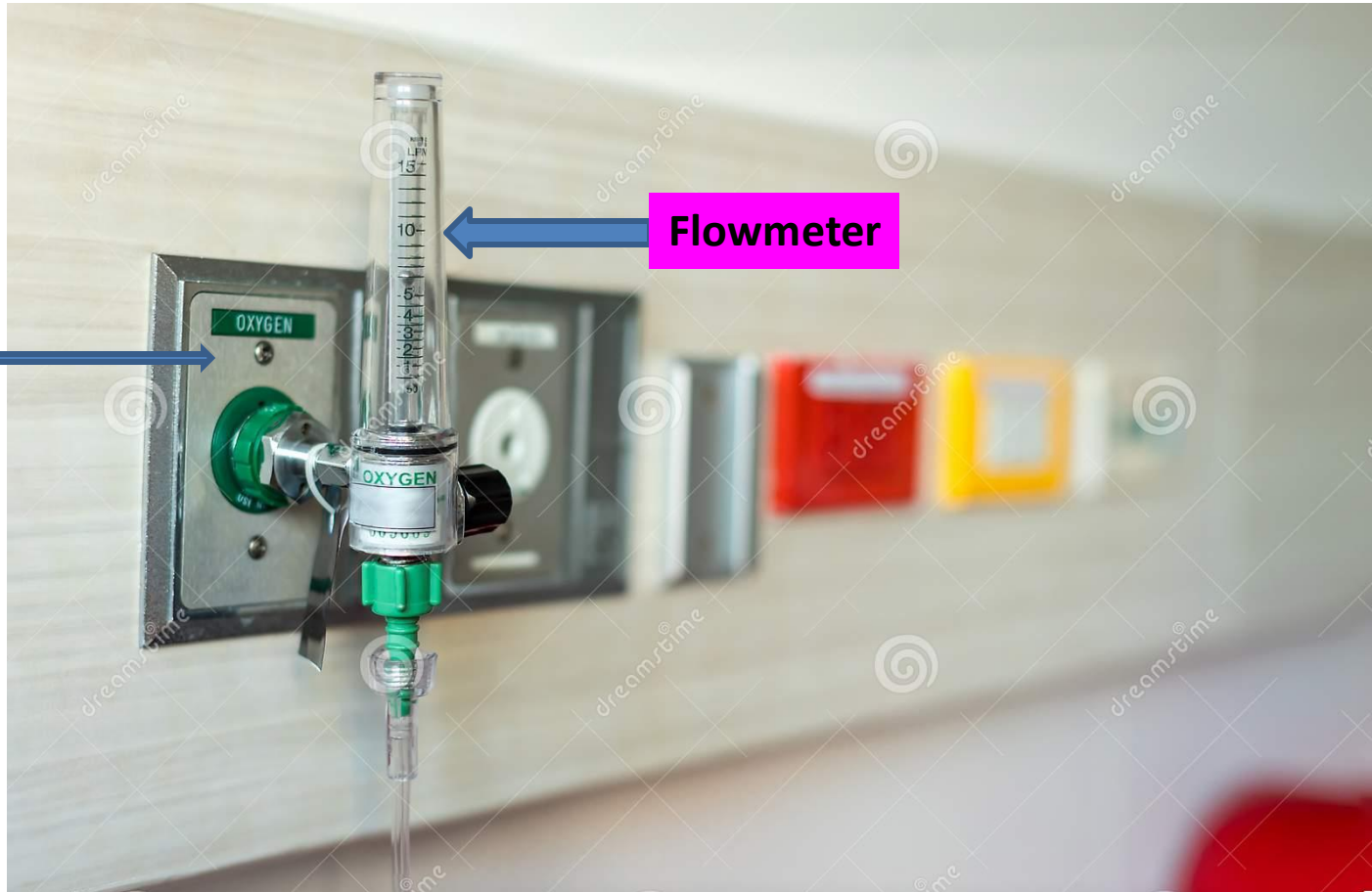


# Oxygen manifold (Central supply)

Oxygen gas pipeline



# Wall outlet for Oxygen



# Oxygen Concentrator



- Light-weight
- Portable
- Home-based oxygen therapy
- Selectively removes  $N_2$  to concentrate  $O_2$  from atmosphere
- Flow rate: 1-5 L/min



Model available in our set up

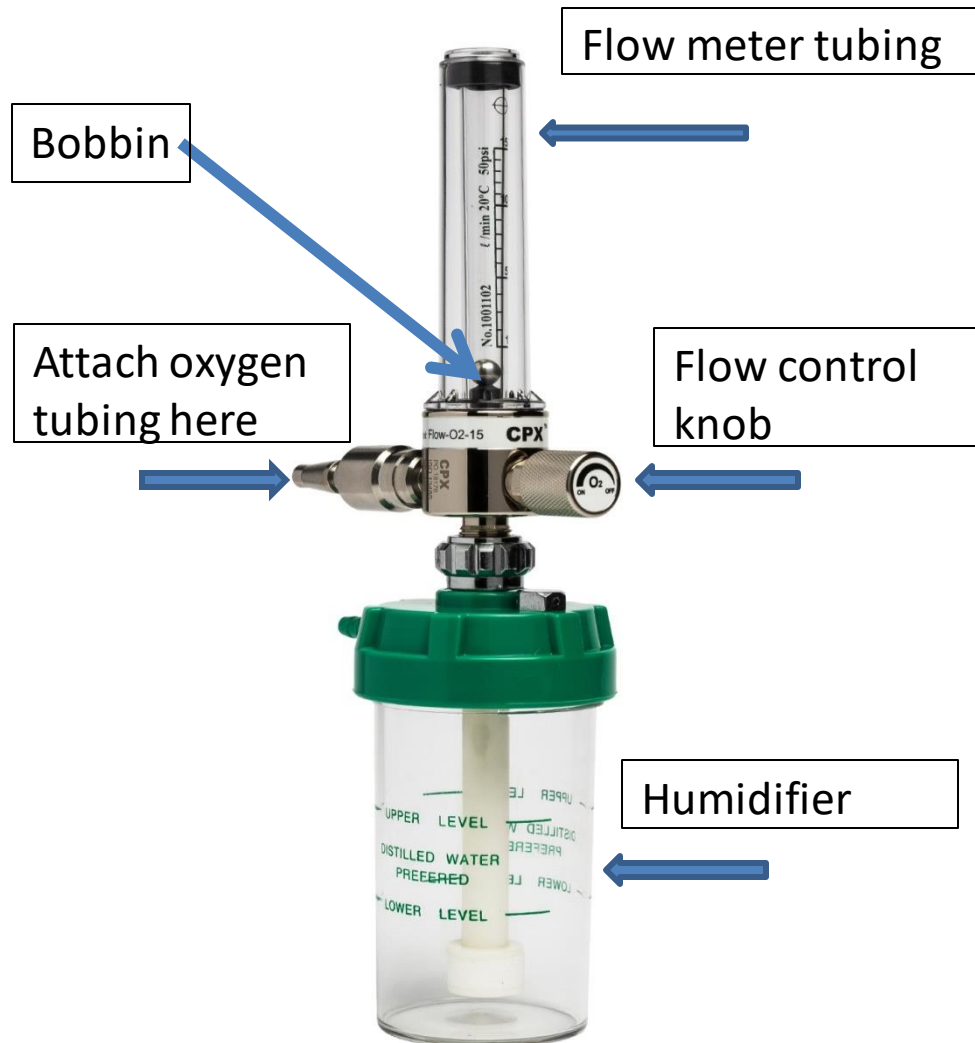
# Oxygen Cylinder



- Pressurised medical grade O<sub>2</sub>
- Facility/Home-based O<sub>2</sub> therapy
- Flow range as per flow meter
- Key for opening

**Interface between patient  
and  $O_2$  source**

# Flow meter assembly



# Oxygen Delivery Devices

# Classification

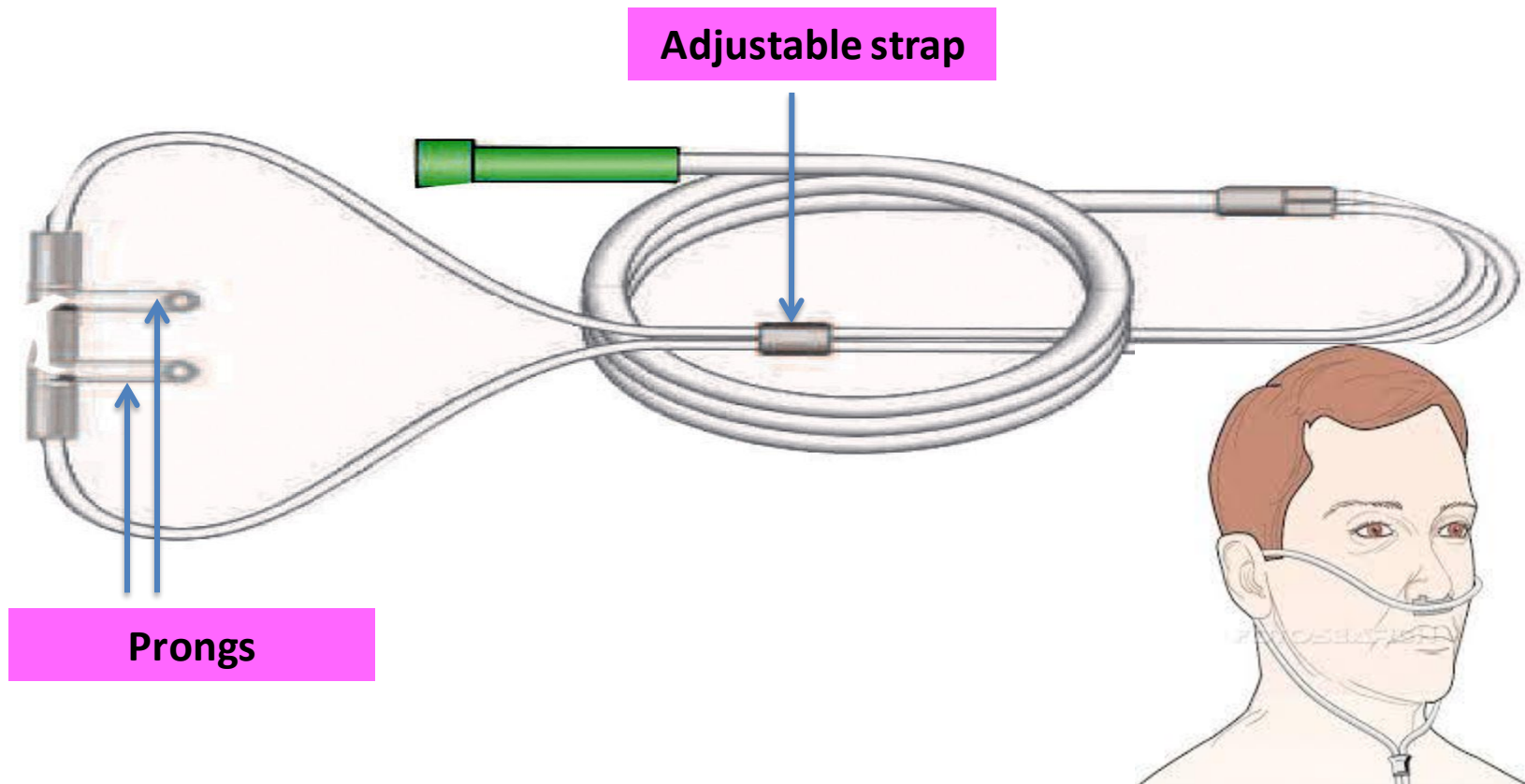
- Low flow systems
- Reservoir systems
- High flow systems
- Enclosures

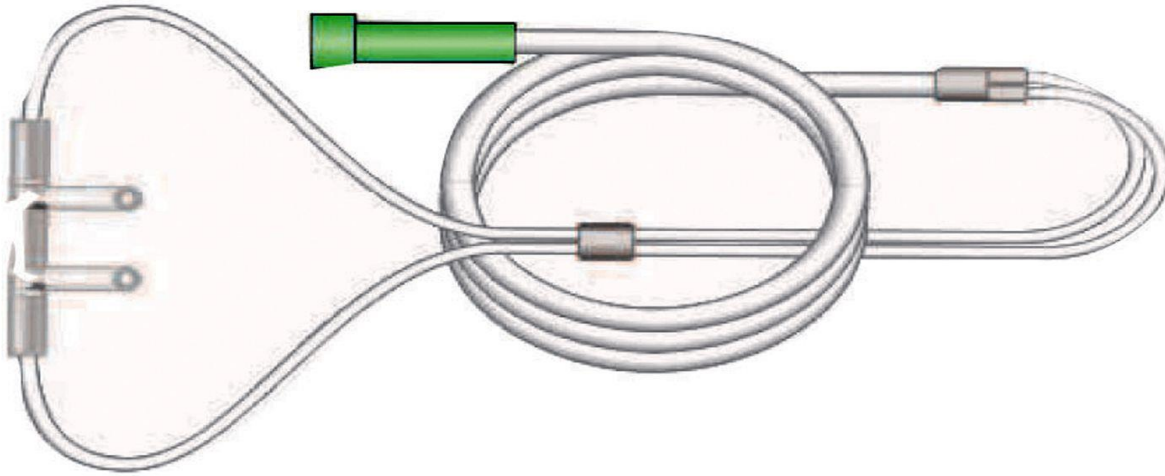




Nasal cannula, Binasal cannula,  
Nasal prongs

# Nasal cannula, Binasal cannula, Nasal prongs





- Home based Oxygen therapy
- Comfortable
- Patient can talk, eat etc.

# Nasal cannulae, Binasal cannula, Nasal prongs

Oxygen flow rates(L/min.)	Fio <sub>2</sub>
1	0.24
2	0.28
3	0.32
4	0.36
5	0.40
6	0.44

**Fio<sub>2</sub> increases by 4% for every 1 litre increase in flow rate**

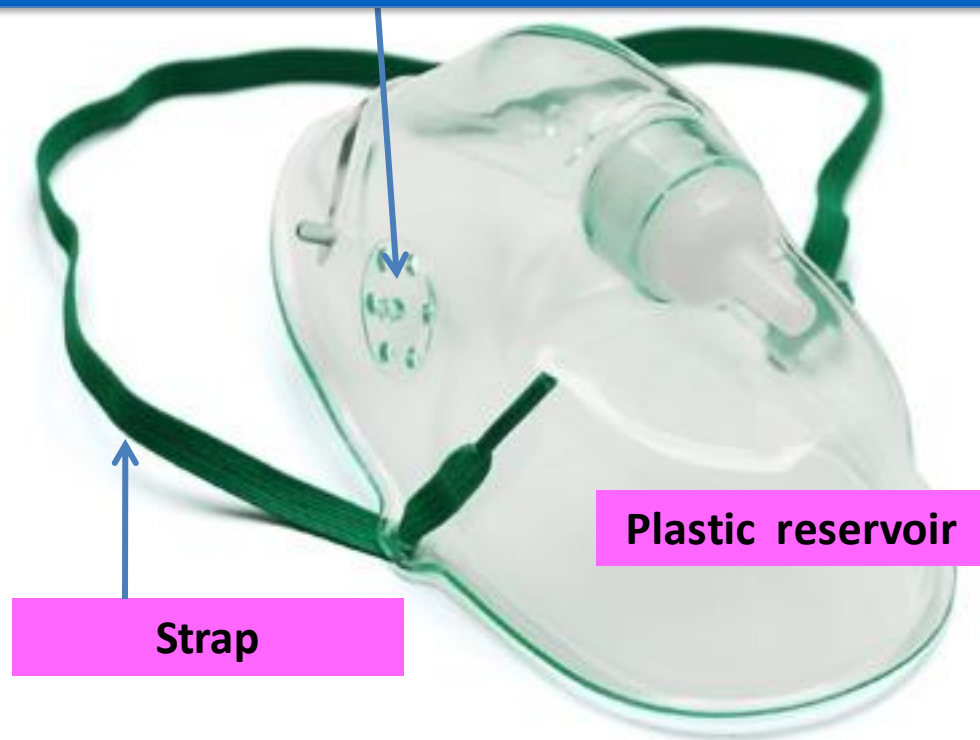
**Higher flow rates do not result in much higher Fio<sub>2</sub>, rather drying and irritating effect on nasal mucosa and increased patient discomfort**



## Simple Face Mask - Hudson Mask



**Minimum flow rate of 5 L/Min. required to replace exhaled gases and prevent CO<sub>2</sub> rebreathing**



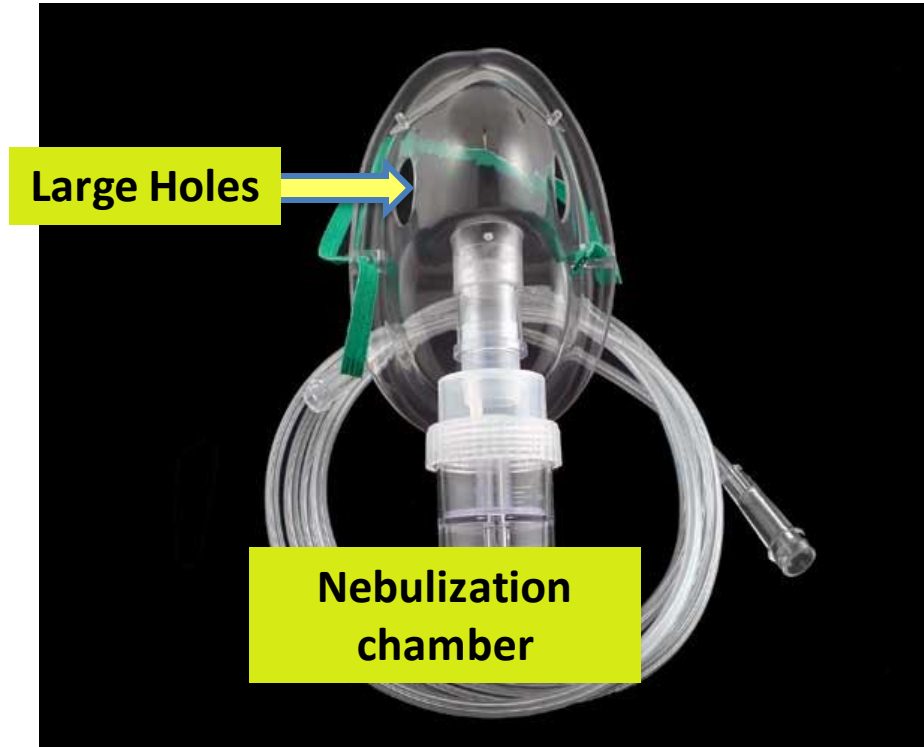
**Oxygen gets collected in the apparatus dead space at the end of expiration and is inhaled at the beginning of next breath**

# Face Mask

Oxygen flow rates(L/min.)	Fio <sub>2</sub>
5-6	0.35
6-7	0.40
7-8	0.50
8-10	0.60



# Face Mask - variants



**Humidified oxygen can be delivered**



# Nebulizer Mask in use





Partial rebreathing mask



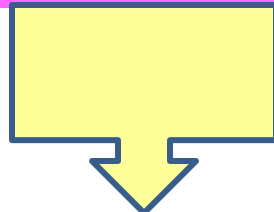
Non-rebreathing mask

Oxygen mask with reservoir bag



**Reservoir Bag**

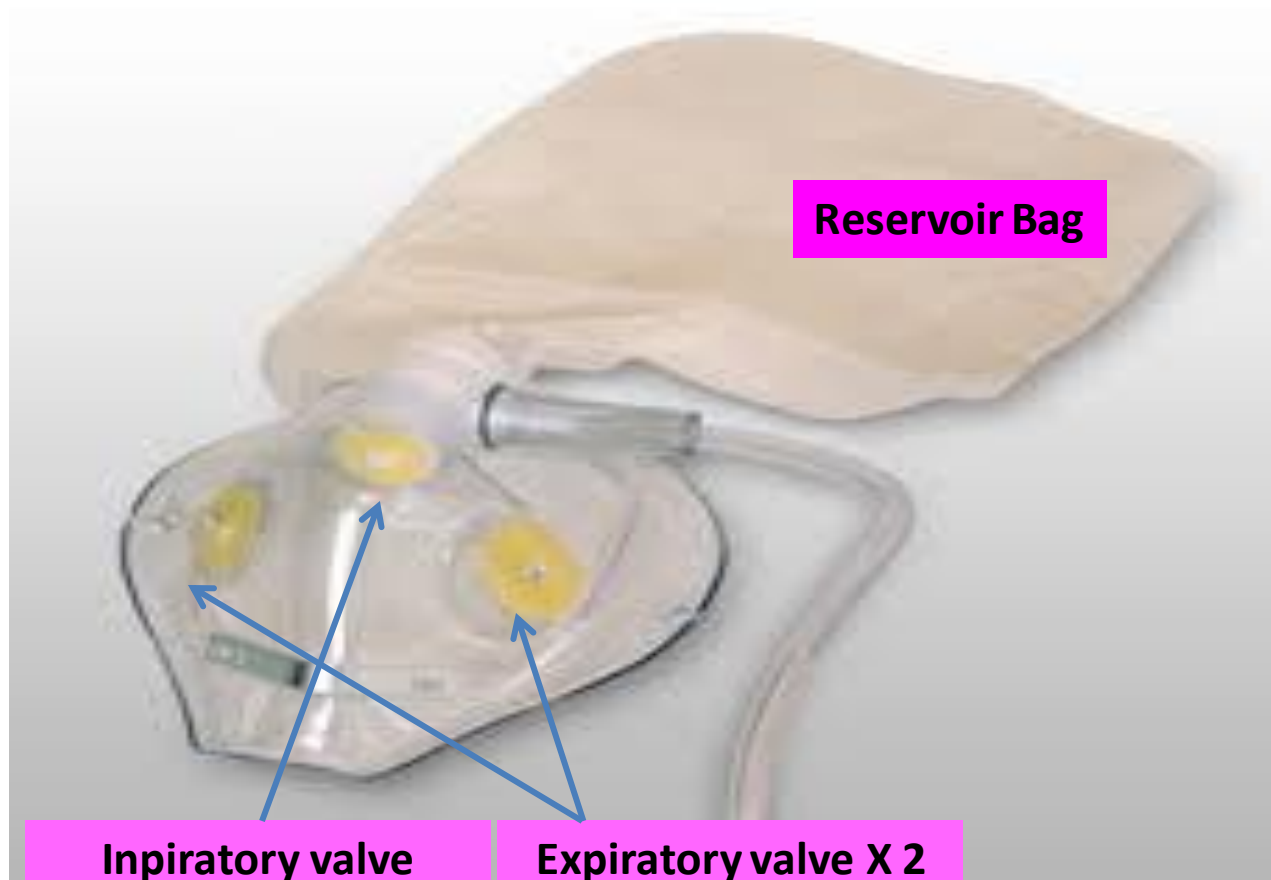
**No valve  
Only exhalation port**



**Partial rebreathing**

# Partial rebreathing mask in use







# Practical Considerations

- Minimum flow: 10-15L/min
- Reservoir bag should remain inflated
- Partial collapse during inspiration
- Partial rebreathing mask: 40-70%
- Non rebreathing mask: 70-90%



**COVID-19**

**Oxygen therapy by  
high flow nasal cannula**

**High Flow Nasal Cannula (HFNC)  
aka Heated humidified HFNC**

# High Flow Nasal Cannula (HFNC)

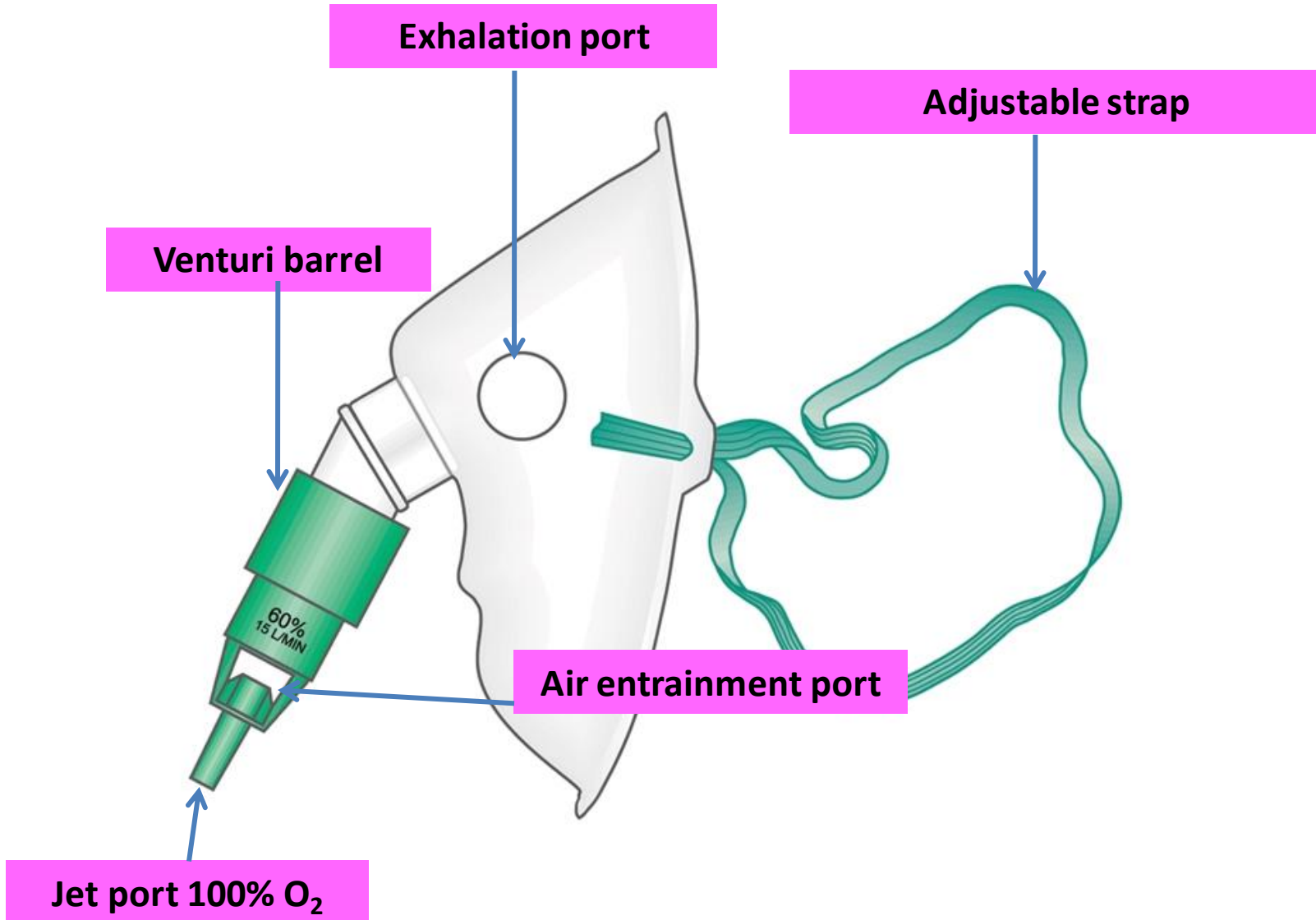
- High flow: up to 70 L/min
- Humidified- 100% relative humidity
- Heated to 37°C
- Generates up to  $\text{FiO}_2$  1.0 @flow rate up to 60L/min
- Lightweight, flexible delivery tubing
- Adjustable head strap
- Soft and flexible nasal prongs





Venturi mask

# Venturi mask

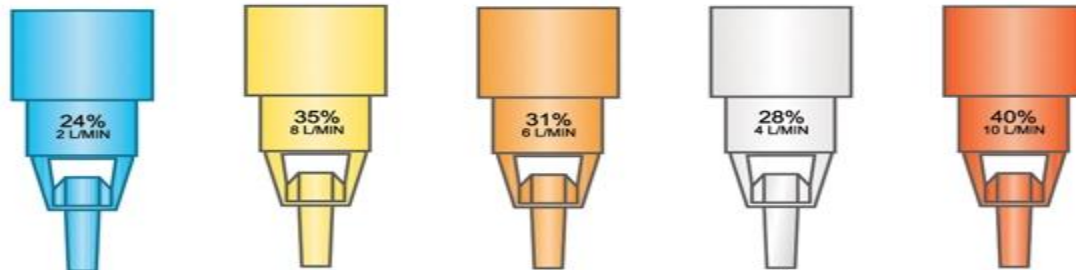
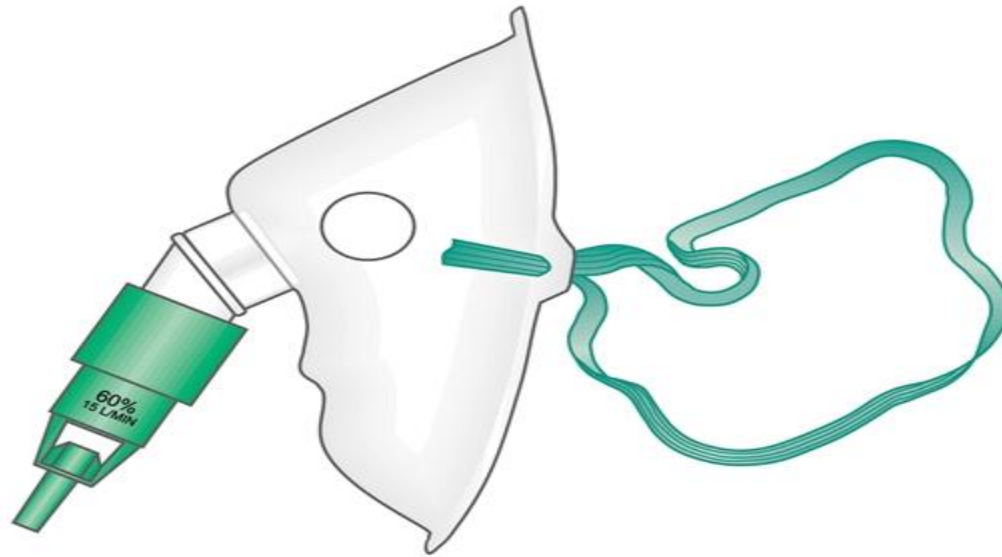


# Venturi mask - single venturi valve

Adjustable venturi valve



# Venturi mask -venturi valves



Interchangeable Venturi Valves





**Oxygen Hood**

# Oxygen Hood

- Clear, plastic cylinders that encompass the infant's head
- $\text{FiO}_2$  - 0.80 to 0.90
- Flow rates of 10 to 15 L/min
- Oxygen enters the hood through a gas inlet
- Exhaled gas exits through the opening at the neck



BiPAP mask





Nasal BiPAP mask



**BiPAP machine**

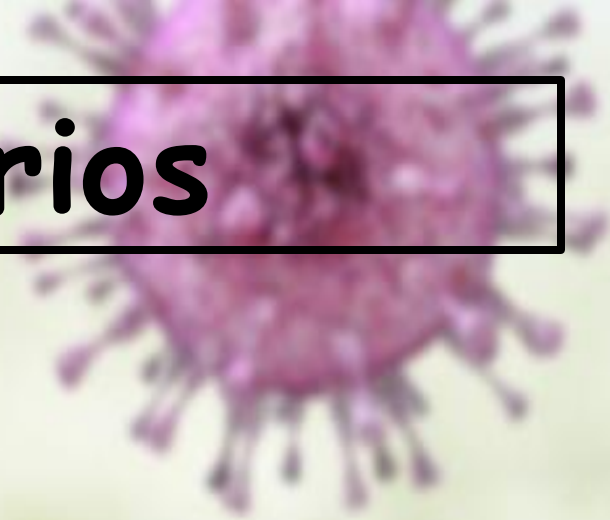
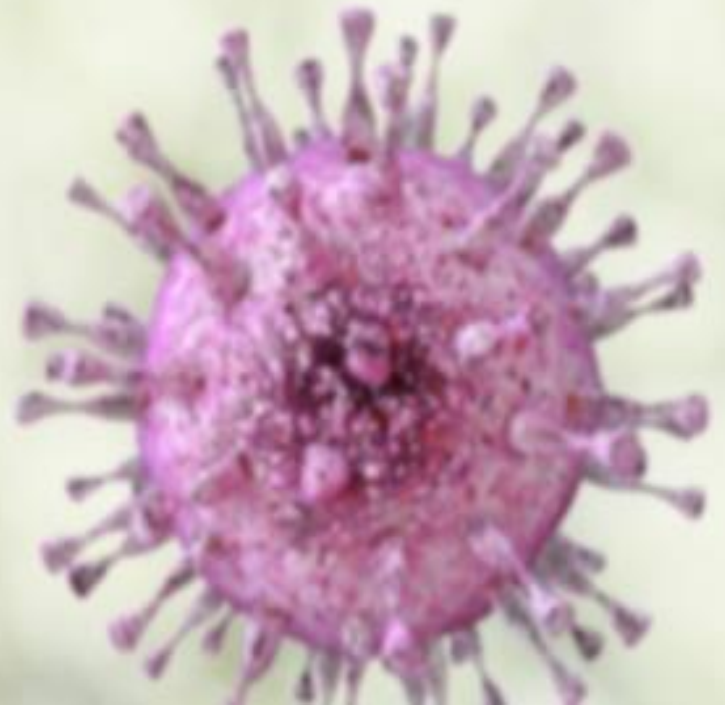
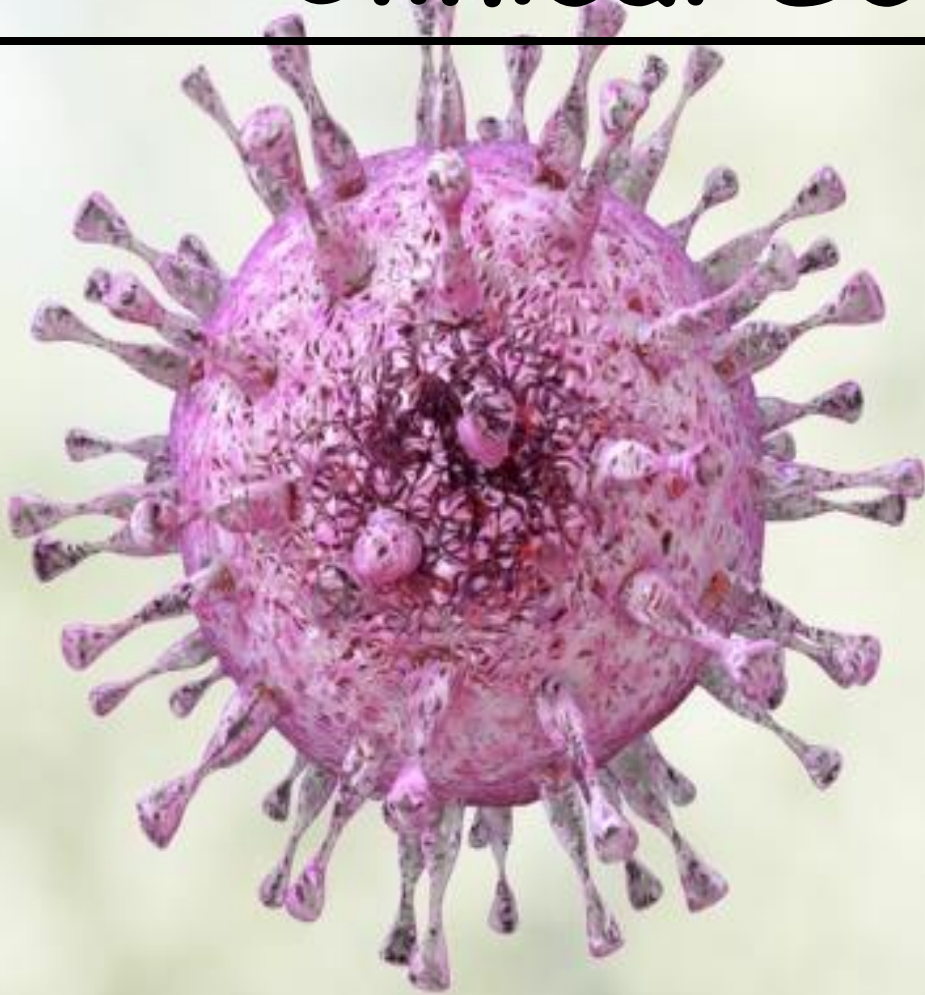
# 3P's Approach: Choosing the delivery system?

- **Purpose:**
  - Improve FiO<sub>2</sub> and general well being
- **Patient:**
  - Severity and cause of hypoxemia
  - Patient age group (infant, child, adult)
  - Degree of consciousness and alertness
  - Presence or absence of tracheal airway
  - Stability of minute ventilation
  - Mouth breathing vs. nose breathing patient
- **Performance:**
  - More critically ill patient, higher FiO<sub>2</sub> requirement
  - Less critically ill patient, lower FiO<sub>2</sub> requirements



# Personal Protective Equipment Kit

# Clinical Scenarios



# Clinical Scenario: 1 (Casualty)

- A 40 yr old male patients comes to you with fever and shortness of breath. No h/o other comorbid conditions. Covid report +ve.
- Examination: RR: 34/min. SpO<sub>2</sub>=85% on room air.
  - Severe pneumonia
  - Non-rebreathing face mask capable of delivering nearly 100% FiO<sub>2</sub>
  - O<sub>2</sub> flow rate: 10-15L/min

## Clinical Scenario: 2 (Ward)

- Same patient is shifted to the ward with reservoir mask with O<sub>2</sub>.
- RR: 32/min. SpO<sub>2</sub>= 90% with O<sub>2</sub>@8L/min
  - Adjust the flow rate to 10-15 L/min
  - Recheck SpO<sub>2</sub> after some time



## Clinical Scenario: 3 (Ward)

- Same patient.
- Continuous O<sub>2</sub> therapy for 6-8 h
- RR: 22/min. SpO<sub>2</sub>= 96%
  - Clinical signs of improvement
  - Switch to a device which delivers lower FiO<sub>2</sub>: Venturi mask with titrable FiO<sub>2</sub>
  - Monitor SpO<sub>2</sub> levels



## Clinical Scenario: 4 (Casualty)

- You are in the casualty. A 52 yr old male patients with mild **“Happy hypoxia”** rbidities.
- H/o forcible **“Happy hypoxia”** by son after Covid report +ve.
- Examination: RR: 28/min. SpO<sub>2</sub>: 90% on room air.
  - Partial rebreathing face mask capable of at least 60% FiO<sub>2</sub>
  - Monitor SpO<sub>2</sub> levels

## Clinical Scenario: 5 (ICU)

- 40 yr old male patient. H/o dry cough, fever, SOB x3d. K/c/o DM. Covid report +ve.
- RR: 32/min; SpO<sub>2</sub>: 75% on room air
  - Awake self proning
  - Partial rebreathing face mask
  - Close monitoring of SpO<sub>2</sub> levels
  - SpO<sub>2</sub> remains same or falls, switch to non-rebreathing face mask

# Awake self-proning



SpO<sub>2</sub> picked up from  
75% before proning to  
94% with O<sub>2</sub> and proning

# GOALS



➤  $\text{SpO}_2 > 90-96\%$  (stable patients)

➤  $\text{SpO}_2 > 94\%$  (unstable patients)

➤  $\text{SpO}_2 > 92-95\%$  (pregnant)

## Clinical Scenario: 6 (Ward)

- 65 yr old patient with h/o COPD. SpO<sub>2</sub>: 82% on room air
  - Venti-mask (start with 24% to 28%. Titrate accordingly)
- Goal: SpO<sub>2</sub>: 85% to 92% with PaO<sub>2</sub>: 50 to 70 mm Hg
- Patient accepting oral feeds:
  - Nasal O<sub>2</sub> cannula/Nasal mask

# When to call an expert?

- Unresponsive patient
- Depressed consciousness level
- Unstable haemodynamics
- Signs of respiratory fatigue
- Hypercapnia/respiratory acidosis
- Acute deterioration despite all therapy
- Multiorgan failure

**SQL HOUSE**

**I WILL SOLVE  
YOUR QUERIES**





# An initiative of:

- COVID Training cell and
- Medical Education Unit

GTB Hospital and UCMS, Delhi

Email: [mededu.ucms@gmail.com](mailto:mededu.ucms@gmail.com)

Website:

[www.medicaleducationucms.weebly.com](http://www.medicaleducationucms.weebly.com)