

# ICU CARE OF COVID-19 POSITIVE PATIENTS WITH ACUTE RESPIRATORY FAILURE

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# HDU VS ICU

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- HDU
- Level 1
- Level 2
- Level 3

# TERMS COMMONLY USED IN COVID ERA BUT FREQUENTLY CONFUSED USE IN CLINICAL PRACTICE

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- **FiO<sub>2</sub>%** - 21% in room air
- **PaO<sub>2</sub> mmHg**- ( Normal 80-100 mmHg) ( Respiratory failure 60mmHg breathing RA)
- **SpO<sub>2</sub>%** - Normal 96-100%
- **PaO<sub>2</sub>/FiO<sub>2</sub>** ( PF ratio normal 500 )
- **SpO<sub>2</sub>/ FiO<sub>2</sub>** ( Normal about 480 to 500 )

# RESPIRATORY SUPPORT FOR COVID INFECTED PATIENTS WITH RESPIRATORY FAILURE

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- O<sub>2</sub> Therapy –
  - Conventional/ standard ( nasal prongs/ face mask/ face mask with reservoir bag)
  - Advanced (HFNC)
- Ventilatory support
  - Non-invasive (NIV), CPAP, BiPAP
  - Invasive (Intubation & Ventilation)

# O<sub>2</sub> THERAPY VS F<sub>i</sub>O<sub>2</sub> & P<sub>A</sub>O<sub>2</sub>

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## **FiO<sub>2</sub> – Fraction of inspired O<sub>2</sub> %**

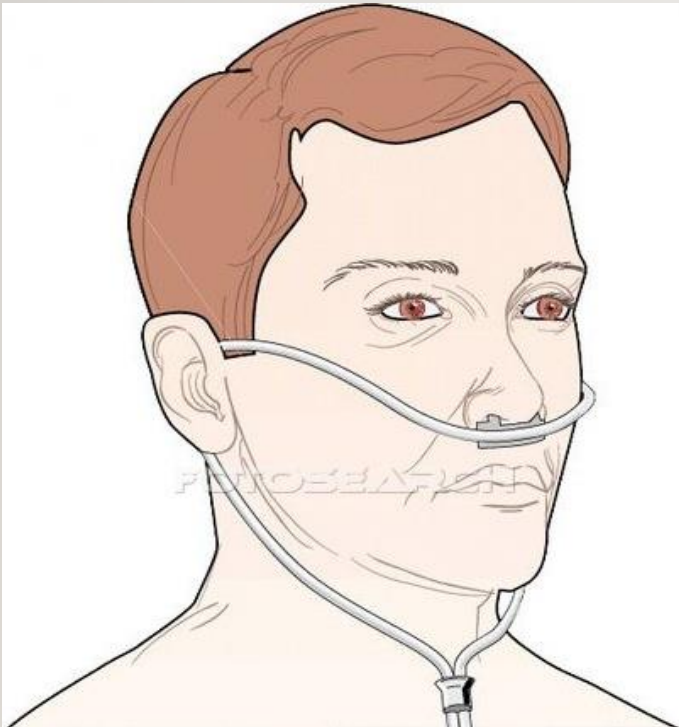
- FiO<sub>2</sub> at room air -- 21% or 0.21
- FiO<sub>2</sub> of O<sub>2</sub> therapy outlet– 100%
- These two mixed during O<sub>2</sub> therapy dilution and variable FiO<sub>2</sub> resulted ( but > 21%)
- Roughly each l/min of O<sub>2</sub> flow rate could increase 4% above room FiO<sub>2</sub> (i.e 21% + ...%)  
e.g 10 l/min provides FiO<sub>2</sub> of (21 + 40% = 61% )

**Increasing FiO<sub>2</sub> resulted in increased PaO<sub>2</sub>**



# O<sub>2</sub> THERAPY VIA NASAL PRONGS

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- For use as supplementary O<sub>2</sub> therapy
- O<sub>2</sub> flow 1-2 l/min will provide **FiO<sub>2</sub> 25-29%**
- Cannot tolerate more than 2l/min O<sub>2</sub> flow for long
- Drying nasal mucosa

# O<sub>2</sub> THERAPY VIA FACE MASK

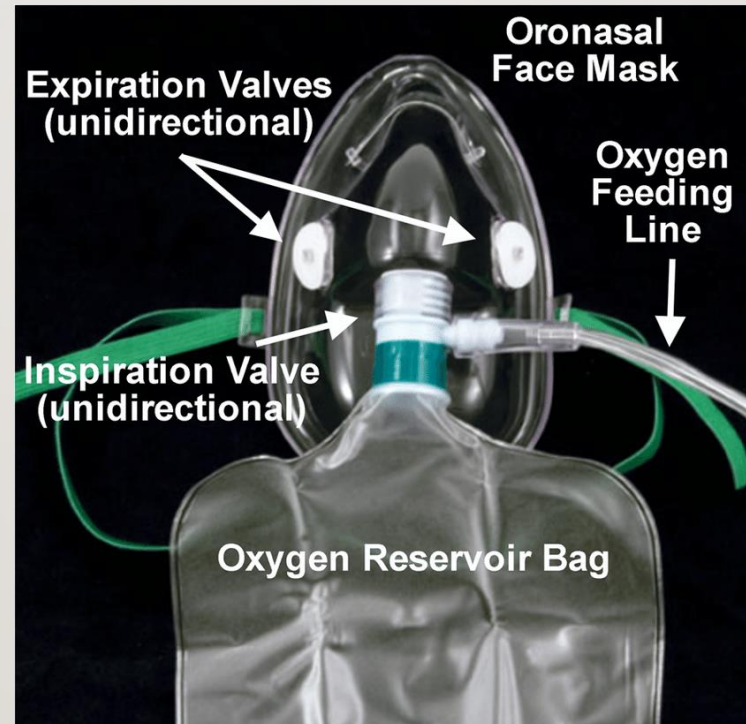
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- Provide  $\text{fiO}_2$  roughly above 36% & above
- At least  $>4\text{l/min}$   $\text{O}_2$  flow to vent out  $\text{CO}_2$  while breathing out
- Indicated for supplemental  $\text{O}_2$  therapy, weaning , recovery

# O<sub>2</sub> THERAPY VIA FACE MASK WITH RESERVOIR BAG

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# FACE MASK WITH RESERVOIR BAG

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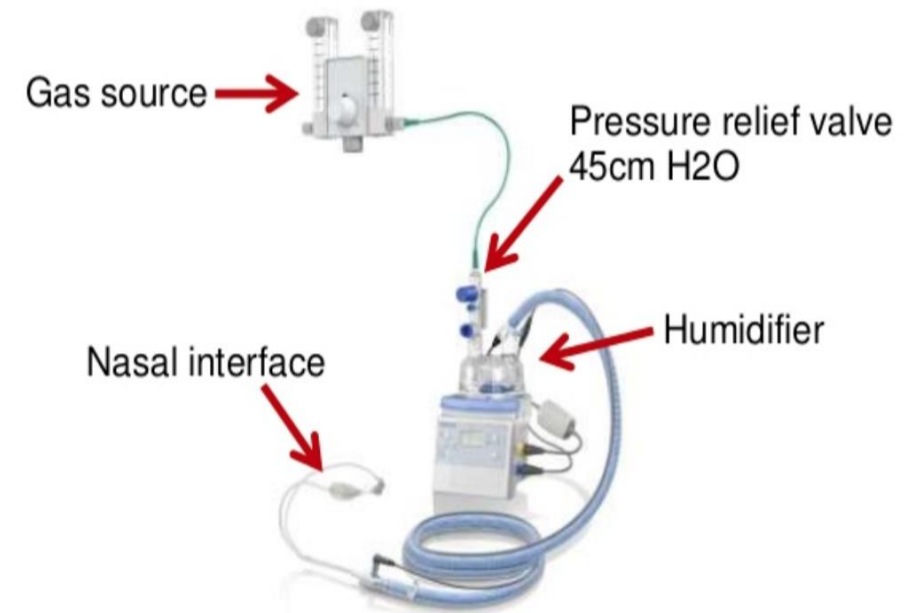
- At least 10-15 l/min of O<sub>2</sub> flow to fill reservoir bag
- Could provide FiO<sub>2</sub> 60% - 80% and above



# HFNC (HIGH FLOW NASAL CATHETER), HFNOT



## High-Flow Nasal Cannula



# HFNC/HFNOT VS STANDARD O<sub>2</sub> THERAPY

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## HFNC

- Heated and humidified
- High flow 40-60L/min (less dilution O<sub>2</sub>Rx)
- High flow provides PEEP ( FRC, O<sub>2</sub> store)
- Reduced inspiratory work of breathing
- Meet peak inspiratory flow of tachypnea
- Can tolerate more than tight face mask of NIV

- Cold & dry

- 10 -15 l/min

( normal Peak inspiratory flow 30l/min

Covid can reach 60- 120l/min



# HFNC

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- Benefits for mild to moderately severe ARDS, P:F 200 -300 (not absolute indication)
- Alternative to NIV
- False security of oxygenation and delayed in decision to intubate
- Needs close monitoring and assess deterioration or improvement ( should be used in monitored setting and care for by experienced personnel capable of performing ET intubation)
- High aerosol generation
- Rare risk of aspiration, abdominal distension, barotrauma



# HFNC

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- Initial setting 40-50l/min with FiO<sub>2</sub> 100%
- If patient deteriorate PF ratio < 200 or SpO<sub>2</sub> fall below < 93% RR> 30/min after 1 hour  
→ not likely to be effective

# NIV ( NON- INVASIVE VENTILATION)

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## **Indication in Covid infected Acute Respiratory Failure**

- Mild to moderate ARDS
- Weaning from invasive Ventilation

## **BiPAP (IPAP, EPAP)**

Initial setting, FiO<sub>2</sub> 100%

- IPAP 8- 10 cmH<sub>2</sub>O (increase 5cmH<sub>2</sub>O each 10min up to 20 cmH<sub>2</sub>O)
- EPAP 4-5 cmH<sub>2</sub>O
- Adjust with V<sub>t</sub> and therapeutic response (1-2 hr)

# NIV ( NON- INVASIVE VENTILATION)

## **Absolute Contraindications**

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- Poor respiratory drive (Apnoea)
- Unstable cardiovascular status
- Uncooperative patients
- Inability to protect airway ( impaired swallowing & cough)
- Reduced consciousness
- Trauma (face), facial/esophageal/gastric surgery

**Relative CI** --- (Risk of aspiration, Copious secretion, Asthma, )

Increase Aerosol generation

# ENDOTRACHEAL INTUBATION AND MECHANICAL VENTILATION

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- Severe ARDS ( $P:F < 150$  )
- Deterioration or not improved with HFNC/NIV
- Reduced conscious level
- $RR > 35/\text{min}$
- Severe Acidosis
- Haemodynamic instability



# FOR MECHANICALLY VENTILATED PATIENTS

## Lung Protective strategies ( SIMV VC, SIMV-PC, Assist Control, APRV)

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- Low  $V_t$  : 4-8ml/kg
- Plateau pressure of <30 cm H<sub>2</sub>O
- Higher PEEP
- Refractory hypoxemia despite optimized ventilation, recommend prone ventilation for 12-16 hrs / day
- If persistent patient-ventilator dyssynchrony, patients requires deep sedation, prone ventilation, or persistently high plateau pressure, and then using continuous NMBA infusion for up to 48hrs

# TO IMPROVE OXYGENATION

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## **Position**

- Prop up/ head up 30-45 degree
- Prone position

**Clear the airway** - secretions (Advised closed suction catheter)

# PLACE OF CARE

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- Severe illness: RR>30/min , SpO<sub>2</sub> < 94% on room air, PaO<sub>2</sub>/FiO<sub>2</sub> <300mm Hg or lung infiltrates >50% → HDU/ICU
- Critical illness : Severe ARDS/ Respiratory failure, Shock, &/or Multi-organ dysfunction  
→ICU
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# ADMISSION TO ICU

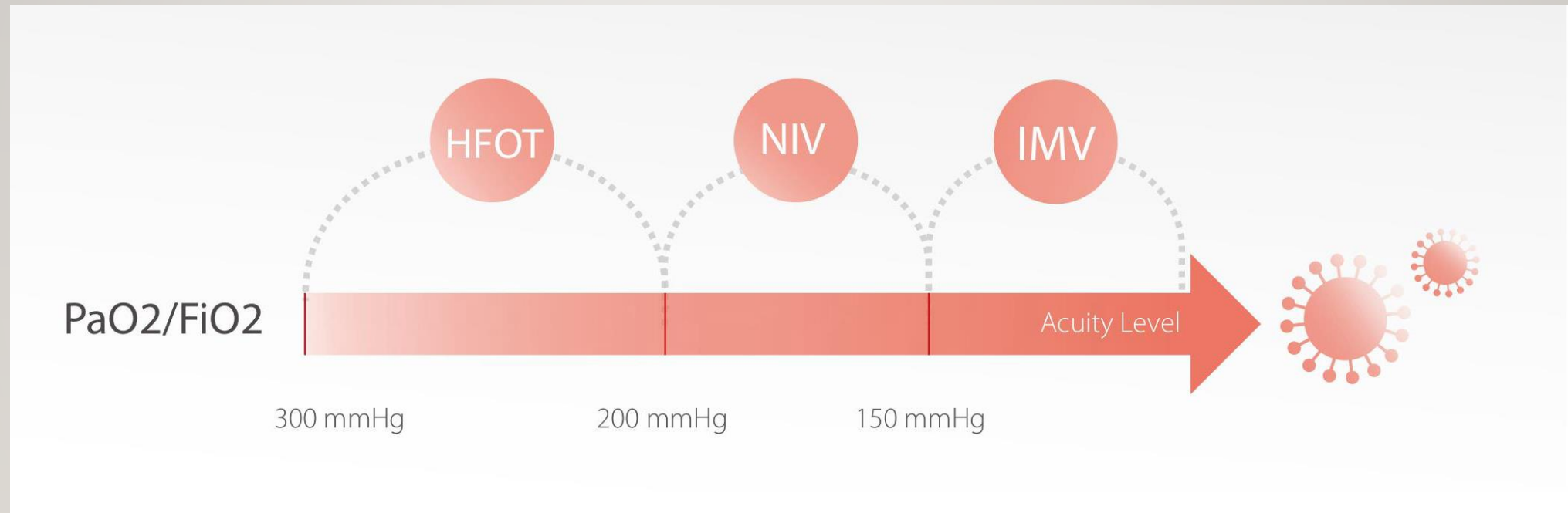
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## **If any of one**

- 1. RR > 30/ min
- 2. SpO<sub>2</sub> < 90% with standard O<sub>2</sub> therapy ( FM with RB 10-15 L/min)
- 3. PaO<sub>2</sub>/ FiO<sub>2</sub> < 200 ( if ABG available )
- 4. SpO<sub>2</sub>/ FiO<sub>2</sub> < 315
- 5. Severe pneumonia with shock



# ROUGH GUIDE



# CRITERIA FOR ENDOTRACHEAL INTUBATION

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**Should be based on individual situation. Followings are red sign:**

- Respiratory rate  $> 35/\text{min}$ , severe respiratory distress with increased work of breathing
- $\text{PaO}_2/\text{FiO}_2 < 200$  if ABG available or  $\text{SpO}_2/\text{Fio}_2 < 150$
- Severe acidosis  $\text{pH} < 7.2$  ( if ABG available)
- Worsening hypercapnia
- Altered mental status
- Haemodynamic instability (  $\text{MAP} < 65\text{mmHg}$ ) after fluid resuscitation and vasopressor/ inotrope support

# CLOSE MONITORING

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- SpO2% to keep above 90% (Permissive- SpO2 88 %)
- FiO2 requirement
- Respiratory rate
- Conscious level
- Haemodynamic stability ( to control arrhythmia, inotropes/vasopressor support)
- If ABG available- pH > 7.25
- ( PaCO2 or EtCO2- Permissive hypercapnia )

# APACHE SCORING ( FIRST 24 HRS OF ICU ADMISSION) – PREDICTING MORTALITY

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- **Acute Physiological status ( clinical/ lab data)**

GCS,T, MAP, HR, RR, Oxygenation status, Hct,WBC,Arterial pH, Serum bicarb, serum K, serum creatinine, AKI )

- **Chronic Health Evaluation (Comorbid diseases and end organ damage)**

History of Severe Organ Insufficiency or Immuno-compromised

- **Age**

- **Post operative**



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THANK YOU