

# ECMO ADVISORY FOR COVID 19

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ECMO SOCIETY OF INDIA TASK FORCE

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# OBJECTIVES OF ADVISORY/ GUIDELINES

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- ❖ To help the clinicians & ECMO specialist to decide on use & management of patient on ECMO in Pandemic condition with Resource limitation
- ❖ To bridge the grey zones in ECMO



# MANAGEMENT GOAL

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- ❖ To Control & Prevent further spread
- ❖ To save patient's life
- ❖ To maximize the use of limited resources
- ❖ Proper Resource allocation

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# PPE ( Personal Protection Equipment)

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- ❖ It is extremely important to safeguard yourselves, avoid blood spill and take precautions against spreading infection
- ❖ Most experienced to do endotracheal intubation, Cannulation & Decannulation under maximal PPE cover
- ❖ Hygiene of entire unit is important
- ❖ Negative pressure cubicles as far as available (will be difficult) but specific beds that are compatible with isolation precautions should also be fine
- ❖ Washing hands is very important
- ❖ Avoid nebulization, aerosol generation as long as possible



# RESOURCE ALLOCATION

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- ❖ Resource Limitation is the Key point in Pandemic
- ❖ Key factor in Decision making – All decision is guided by this right from initiation of ECMO to investigation to transfusion protocol to even withdrawal of support.

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# INCLUSION CRITERIA

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- ❖ Early Institution is key to success same as in any ECMO indications
- ❖ Presence of any 2 criteria observed over a period of 4 to 6 hrs after maximum medical resuscitation from the following –
  - PaO<sub>2</sub>/FiO<sub>2</sub> ratio of < 100
  - Oxygen index of > 30
  - Muray's score of > 3.0
  - Hypercapnia with pH of < 7.2 observed over more than 3 hrs
- ❖ Myocarditis with EF less than 30, Inotropic score more than 40 & rising lactate level



# INCLUSION CRITERIA

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- ❖ Resource Allocation is very crucial
- ❖ Preference to be given to –
  - Higher chances of Survival – can refer RESP Score
  - Younger patient with no comorbid illness
  - Patient with Single Organ Failure

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# EXCLUSION CRITERIA

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- ❖ No absolute contraindications to ECLS
- ❖ Relative contraindications are –
  - Mechanical ventilation at high settings ( $FiO_2 > .9$ , P-plat  $> 30$ ) for 7 days or more
  - Major pharmacologic immunosuppression (absolute neutrophil count  $< 400/mm^3$ )
  - Non recoverable co morbidity such as major CNS damage or terminal malignancy
  - Patient in gross multi-organ failure
  - ECPR – keeping in mind resource limitation & spread of Infection





# WITHDRAWAL OF ECMO support

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- ❖ Difficult to take a call but keeping in mind the resource limitation & high Demand we need to consider withdrawal of ECMO support
- ❖ Clinically futile Exercise
  - Gross MOF
  - Clinically Brain dead



# TYPES OF ECMO – VV ECMO

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- ❖ Purely Acute respiratory failure with Hemodynamically stable
- ❖ Respiratory Failure with Hemodynamically unstable on mild to moderate Inotropes (inotropic score 60) with associated myocarditis but EF  $\geq$  30%
- ❖ Respiratory Failure with Hemodynamically unstable with normal cardiac function on moderate to high Inotropes (inotropic score less than 100)



# TYPES OF ECMO – V VA ECMO

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- ❖ Respiratory failure with associated Myocarditis (LVEF < 30%) with moderate Inotropic support (inotropic support > 60)
- ❖ Respiratory failure with high Inotropic support (Inotropic score > 100) irrespective of cardiac function
- ❖ Respiratory failure with associated Myocarditis (LVEF < 20%) with arrhythmias with mild to moderate Inotropic support (inotropic support < 60)



# CANNULATION PROTOCOL

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- ❖ As per flow requirement – preferably large size as they are likely to go in sepsis & Septic shock
- ❖ Technic – Seldinger or semi seldinger
- ❖ Site – Femoral to Jugular
- ❖ Doppler guidance only – (Avoid contamination of probe)
  - ❖ If you have dedicated doppler machine for ICU
  - ❖ Obese patient
  - ❖ Difficult anatomy



# VENTILATOR MANAGEMENT

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## First 24 hrs

- Pressure controlled ventilation at 25/15, I:E 2:1 or 1:1, rate 5, FiO<sub>2</sub> 21 – 40%.
- If initial PaCO<sub>2</sub> >50, increase sweep slowly to bring PaCO<sub>2</sub> down slowly, 10-20 mmHg/hour

## After 24 – 48 hours:

- Moderate to minimal sedation. Pressure controlled vent at 20/10. I:E 1:1, rate 5 plus spontaneous breaths, FiO<sub>2</sub> – 21 – 40%.

## After 48 hours:

- Minimal to no sedation.
- PCV as above or CPAP20 plus spontaneous breathing.
- Trach or extubate within 3-5 days

## Recruiting trials:

- None until significant aeration on CXR and > 4 cckg/ min tidal volume.
- CPAP with spontaneous breathing at 25cm H<sub>2</sub>O. OR PSV at 25/10 rate 5, I:E 3:1 , 10 min/hr. then return to rest settings.



# Ventilator Management – exceptions

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- ❖ Air leak syndrome –
  - Peak pressures < 20, PEEP 0 – 6,
  - Keep on pressure supports.
  - Differential ventilation
- ❖ Pulmonary Haemorrhage – we might require higher PEEP & prolonged inspiration time to decrease bleed.
  - APRV – P<sub>high</sub> ~ 25, P<sub>low</sub> ~ 10 – 12, T<sub>high</sub> ~ 4 – 5 sec, T<sub>low</sub> ~ 0.6 – 0.8 seconds, FiO<sub>2</sub> – 21 – 40%
- ❖ Avoid Proning in view of man power availability & to avoid contact
- ❖ Bronchoscopy only if Indicated avoid in view of unnecessary spread of infection



# Anticoagulation Management

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- ❖ As Routine for any other patient on ECMO
- ❖ Maintain ACT – 160 – 180 secs for VV ECMO & 180 – 200 for V AV ECMO
- ❖ Heparin – 20 units/kg/hr for maintenance Titrate as per ACT. To be started once ACT comes to 200 after bolus of heparin
- ❖ If HIT use direct thrombin inhibitors like Bivalirudin, Bivalirudin – 1mg/kg bolus followed by 0.2 mg/kg/hr



# Hemodynamic Management

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- ❖ As Routine for any other patient on ECMO
- ❖ Mean arterial pressure to be maintained at 70 mm Hg. Neonates MAP ~ 40 & paediatric – 60
- ❖ Initial hypotension usually response to fluid, if not use noradrenaline
- ❖ Most common is hypertension





# Hemodynamic Management – Hypertension

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- ❖ Sedation
- ❖ NTG – 0.25 – 0.5  $\mu\text{g}/\text{kg}/\text{min}$  titrate as per BP
- ❖ Labetolol
- ❖ Nitroprusside – 0.3 – 0.5  $\mu\text{g}/\text{kg}/\text{min}$



# Hemodynamic Management – Hypotension

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- ❖ Fluid Resuscitation – 30 ml/kg of isotonic crystalloid in adults in the first 3 hours. In children give 20 ml/kg as a rapid bolus and up to 40-60 ml/kg in 1 hr.
- ❖ Inotropic & Vasopressors
  - Norepinephrine first line treatment
  - Epinephrine and vasopressin can be added
- ❖ Convert to V VA ECMO – if
  - Associated with severe myocarditis with EF less than 20
  - Associated with myocarditis but EF ~ 30% & Inotropic score > 60
  - If no myocarditis (normal EF) but inotropic score above 100
- ❖ Vasoplegic Shock – Methylene Blue &/or High dose Ascorbic Acid can be tried



# Fluids

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- ❖ Fluid restriction – most of the cases
- ❖ Fluid transfusion – if fluid depleted usually in first 48 hrs
  - Capillary leak syndrome – fluid goes to 3<sup>rd</sup> space. This usually settles in 48 – 72 hours
  - High flow ECMO
  - Bleeding
  - Diuresis



# Transfusion strategy

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- ❖ Restricted Transfusion Strategy to be followed in view of resource limitation.
- ❖ Packed cell transfusion if Hb < 7 gm%, if SPO<sub>2</sub> < 80% then keep Hb > 10 (can be guided by lactate level)
- ❖ Platelet transfusion –
  - No bleeding – accept platelets up to 10,000
  - If bleeding keep platelet > 75,000
- ❖ FFP –
  - if Coagulopathy, elevated PT with INR
  - If heparin resistant, to supplement AT3



# Transfusion strategy

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- ❖ Cryoprecipitate –
  - If fibrinogen  $< 100$
- ❖ Albumin –
  - Only if albumin is less than 2 & is clinically demanding like
    - Significant capillary leak
    - Oliguria

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# Nutritional

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- ❖ As Routine for any other patient on ECMO
- ❖ Enteral nutrition if possible preferably as a continuous feeding
- ❖ Calorie ~ 60 – 90 cal/kg/day, ~ 3000kcal for adults.
- ❖ High protein diet ~ 2gm/kg/day
- ❖ Supplement trace elements like mg, zn, etc. & essential amino acids
- ❖ Parenteral Nutrition –
  - if not tolerating enteral feeding
  - In neonates due to compromised blood flow to intestine
  - Avoid intralipid



# General nursing care

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- ❖ As Routine for any other patient on ECMO
- ❖ Eye care
- ❖ Skin care
- ❖ Chest physiotherapy & suction – here the extra care to be taken to prevent suction trauma, so as to avoid bleeding complication
- ❖ GI prophylaxis
- ❖ Bowel care
- ❖ Change of lines & catheters should be avoided as it increase the risk of bleeding
- ❖ Change heat moisture exchanger if malfunctions or soiled otherwise every 5-7D



# INVESTIGATION PROTOCOLS

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- ❖ Minimize Investigation – Do when necessary
  - Resource limitation
  - Risk of spread of Infection – avoid unnecessary transport like CT, etc
  - To avoid Unnecessary overloading of the pathology & diagnostic staff
- ❖ CBC twice a day initially & then once a day
- ❖ ABG initially twice a day & then might be once a day & sos
- ❖ Routine ICU investigation as per protocol & need be
- ❖ ACT 4 hourly & depends on the fluctuation
- ❖ PTT & PT with INR once daily & then once in 3 to 4 dys for long term ECMO
- ❖ Fibrinogen once a three days





# ANTI VIRAL & OTHER THERAPY

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- ❖ Lopinavir/Ritonavir –
  - Standard dose (and dose used against coronaviruses) is 400 mg / 100 mg PO BID
  - Generally no adjustment is made in renal dysfunction
  - Crushing and administering tablets via a gastric tube may decrease absorption by ~50%. Increased doses might be considered in this situation (Best et al. 2011).
- ❖ Chloroquine – 500 mg BD in adult patient
- ❖ HCQ – 400 mg BD for day 1 & then 200 mg BD



# Protection & staffing

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- ❖ Contact Precautions are utmost important. ECMO specialist should take care of Hand washing &/or sanitizing hand before & after touching machine, knob of blood flow, sweep gas & FiO<sub>2</sub> adjustment.
- ❖ It will be ideal to cover machine with plastic or fluid resistant covers as barrier protections
- ❖ Staffing can be an issue especially experienced staff. One ECMO specialist can manage 3 to 4 ECMO patient along with skilled ICU staff



# Weaning & Decannulation

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- ❖ Weaning protocol remains the same as in other cases of VV & V VA ECMO
- ❖ Decannulation criteria remains same but special cares to be followed while decannulating
  - Use of proper PPE is essential
  - Wound should be sutured & proper dressing to be done with chlorhexidine
  - Cannula & circuit should be discarded with standard biomedical waste management protocol
- ❖ For Decannulation of dead patient, the puncture holes or wounds should be disinfected with 1% hypochlorite and dressed with impermeable material



# Protection

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- ❖ Before removing equipment from patients room, medical equipment must be disinfected
- ❖ Disinfection of ECMO machine is to be done as per manufacturer instructions regarding disinfection. If not specified by manufacturer then Ethyl alcohol or isopropyl alcohol (60%–90%, v/v) can be used.
- ❖ Cannula, wire, circuit & even dilators to be discarded as per Biomedical waste protocol



# TRANSPORT ON ECMO

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- ❖ Preferably avoided but if it is mandatory care should be taken to prevent spread
  - N 95 mask for those managing airway (doctor and nurse)
  - Ensure no cuff leak prior to transfer
  - During retrieval, ambulance and other institution to be made aware of the requirements and consent for transfer
  - Prior intimation and use of a designated lift for the purpose of transfer
  - ETA to ICU to be informed to clear traffic during transport to the isolation area



# COMMUNICATION TO RELATIVE

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- ❖ Appropriate history
- ❖ Take appropriate protection to avoid any transmission (since relative may transmit the infection)
- ❖ Avoid close contact with patient for any relative
- ❖ Detailed discussion about the benefit, complications, outcome & even possibility of withdrawal of support in case when it is futile
- ❖ VIDEO CONFRENCING/ COMMUNICATION MAY BE ENCOURAGED



# REPORTING PRPHYLAXIS & SURVILLANCE

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- ❖ INTIMATE APPROPRIATE AUTHORITIES AS PER THE MOH & FW GUIDELINES
- ❖ PROPHYLAXIS FOR HIGH RISK STAFF (THOUGH INSUFFICIENT EVIDENCES)
  - TAB HYDROXYCHOLOROQUIN 400 mg on DAY 1 & DAY 2 & then WEEKLY
  - Caution for G6PD deficiency & known hypersensitivity
- ❖ IF ANY TEAM MEMBER IS HAVING FEVER COUGH COLD OR BREATHING DIFFICULTY
  - REPORT IMMEDIATELY
  - QUERANTINE/ SELF ISOLATION
  - TESTING AS PER THE ICMR GUIDELINES



# COVID 19 & ECMO EXPERIENCES

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- ❖ China Experience – 29 cases, Weaned off – 5, Death – 11, on support – 13
- ❖ Japan Experience – 20 patient on ECMO, 4 weaned off, Discharge – 0, Death – 0, on support – 13

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