



ECMO Committee

(Policy No 1)

Adan ICU Veno-Venous Extracorporeal Membrane Oxygenation

(VV-ECMO) Referral POLICY 2017

Policy owner: ECMO Committee. MOH	Applies to: All Staff in MOH and private Hospitals in Kuwait
Section Location: Departments of Anaesthesia, Adult Intensive Care and Pain Management in all MOH and private Hospitals in Kuwait.	Effective date: 01-11-2017 Revision date: 01-11-2020
Approved by: Head of ECMO committee, ECMO committee members	
Final Approval by: MOH Undersecretary	

Purpose:

- 1- To provide guidance and facilitate referrals for the physicians involved in the management of any patient that requires the use of VV-ECMO (veno-venous extracorporeal membrane oxygenation) service for severe respiratory failure in any hospital in Kuwait. This service is provided through the ECMO team that is based in Adan Hospital.
- 2- To outline the referral process to Adan Hospital

Policy Statement:

1. This policy is designed to provide guidelines for referral to the ECMO team for vv-ECMO, and initial management.
2. It does not include advice on further aspects of management while the patient is in the ICU(e.g. equipment, setup, complications, trouble shooting) which are outlined in a separate policy(ECMO general management policy).
3. The policy is subjected to update when there are new recommendations prior to the renewal date.

Introduction

Extracorporeal membrane oxygenation (ECMO) is a form of modified cardiopulmonary bypass system (artificial heart and lung) used for patients with severe respiratory and cardiac failure. The ECMO system uses a pump to circulate the patients' blood through an artificial lung (membrane lung) where oxygen is added and carbon dioxide is removed. The venous blood is drained from the major veins in the body(the IVC or SVC), actively pumped through a specially designed circuit and then returned to the venous system(VV ECMO) or arterial tree (VA ECMO).

There are 2 types of ECMO, veno-venous (VV) for severe respiratory failure and veno-arterial (VA) for severe cardiac failure, each of which have its own indications and contraindications. This policy will highlight only the VV-ECMO type which is used for patients with severe respiratory failure that has failed to respond to conventional supportive therapies and may benefit from a period of lung rest.

The VV-ECMO service has been established in Adan Hospital adult ICU as it has performed the highest number of VV-ECMO for severe respiratory failure out of all the general ICUs in the country to date. In addition, it has fulfilled all conditions for ECMO centre establishment as determined by the MOH (see separate policy).As patients may need the ECMO service in any hospital in Kuwait (both private and governmental), An ECMO team has been established in order to evaluate these patients and make the appropriate decision regarding starting the service if needed. The ECMO team will travel to retrieve patients that are not stable for transfer where they will insert the cannula and establish the pump at their hospital and then escort them back to Adan ICU where further management of the patient will be taking place. For stable patients, they should be transferred to Adan Hospital after being accepted by the ECMO Consultant and the ECMO service will be started in Adan ICU.

Section 1: Indications and contraindications for veno-venous ECMO

In order to identify which patients may benefit from the ECMO service, a good knowledge of the indications and contraindications is required by the general ICU consultant in order to call for advice in the appropriate time. Late referrals may result in poor outcome and so is inappropriate indications.

Indications

Any reversible, life-threatening form of respiratory failure where the risk of mortality is 80%* or greater and where cardiac function is adequate. This includes the following:

- 1- PaO₂/FiO₂ < 100 despite optimal ventilator support.
- 2- Murray score 3-4** despite optimal care for 6 hours or more
- 3- PH < 7.2 due to CO₂ retention on mechanical ventilation despite optimal ventilation with high Pplat (>30 cm H₂O)
- 4- Severe air leak syndromes (e.g. pneumothorax secondary to trauma, fistula)
- 5- Need for intubation in a patient on lung transplant list

VV-ECMO should also be considered for:

- 1- PaO₂/FiO₂ < 150 despite optimal ventilator support
- 2- Murray score 2-3** despite optimal care for 6 hours or more
- 3- Immediate cardiac or respiratory collapse (PE, blocked airway, unresponsive to optimal care)
- 4- Duration of conventional mechanical ventilation >7 days, with single organ dysfunction.

*Mortality Risk

ECMO	Murray score	PaO ₂ /FiO ₂	Mortality Risk
Indicated	3-4 despite optimal care for 6 hours or more	< 100 on FiO ₂ > 90%	≥ 80%
Considered	2-3	< 150 on FiO ₂ > 90%	≥ 50%

**Murray Score

This is a score that determines the severity of respiratory failure. It looks at 4 different parameters which are:

- 1- PaO₂ (mmHg)/FiO₂ ratio (< 200 moderate ARDS, < 100 severe ARDS)
- 2- Number of quadrants with infiltration on the CXR (alveolar consolidation) (1 point per quadrant, minimum 0, maximum 4)
- 3- PEEP
- 4- Compliance (ml/cmH₂O). Calculated as = tidal volume/ PIP (peak inspiratory pressure) - PEEP

Each parameter scores between 0 and 4 and an average of the 4 parameters scoring is calculated to get the final Murray score. **A score of ≥ 3 is an indication of VV-ECMO.**

Murray Score	0	1	2	3	4
PaO ₂ /FiO ₂ on 100% O ₂	≥40kPa (300mmHg)	30-40kPa (225-299 mmHg)	23-30kPa (175-224 mmHg)	13-23kPa (100-174 mmHg)	<13KPa (100mmHg)
CXR quadrants	Normal	1	2	3	4
PEEP (cmH ₂ O)	≤5	6-8	9-11	12-14	≥15
Compliance (ml/cmH ₂ O)	≥80	60-79	40-59	20-39	≤19

Murray score can be calculated through the CESAR trial website (conventional ventilation or ECMO for severe adult respiratory failure) on:

<http://cesar.lshtm.ac.uk/murrayscorecalculator.htm>

Absolute contraindications to veno-venous ECMO

1. Severe (medically unsupportable) heart failure/cardiogenic shock
2. Severe chronic pulmonary hypertension and right ventricular failure (mean pulmonary artery pressure approaching systemic blood pressure)
3. Cardiac arrest (ongoing)
4. Advanced/ terminal malignancy
5. Graft versus host disease
6. Cachexia due to an underlying progressive chronic disease

Section 2: Referral Process

Once the ICU consultant from the referring hospital identifies a potential patient that may require VV-ECMO according to the above indications, they should contact the ECMO consultant in Adan hospital to discuss the case over the phone and fill the referral form (appendix I) and send it to them so that a decision is made whether ECMO insertion is required or not and the patient is accepted to be transferred to Adan ICU. In addition, the decision to retrieve the patient will be made by the ECMO consultant depending on the patient condition.

Please follow the following steps for ECMO referral to Adan ICU:

- 1- Referral is done by the consultant in charge of the referring speciality
- 2- ECMO Referral form has to be completed (see appendix I)
- 3- ECMO referral form has to be sent to the ECMO consultant by fax to Adan ICU on the following number (23946102) or through the Adan-ECMO application (once its available).
- 4- The case will have to be discussed verbally by the referring consultant with the ECMO consultant by contacting the following number: 96623263

Section 3: Retrieval Team

Once the case is accepted by the ECMO consultant, the patient can be transferred to Adan ICU to receive the ECMO service. If the patient condition is unstable for transfer, the ECMO team will travel from Adan Hospital to the referring hospital to insert the ECMO there and retrieve the patient. Adan ICU nursing staff will have to call the special ECMO ambulance (The ICU ambulance, see transport policy and follow the special ambulance requesting steps) and inform them about the case that needs to be transported to Adan ICU as early as possible once the patient is accepted for ECMO. The ICU ambulance should head to the referring hospital waiting to transfer the patient to Adan ICU with the ECMO team once the ECMO is inserted in the referring hospital. In addition, the ICU nurse should contact the ECMO transport car (through the transportation directorate, see transport policy and follow steps for request) who will transfer the whole team (nurses, doctors, perfusionists) from Adan ICU to the referring hospital as well as transferring all the necessary equipment needed for inserting the ECMO at the referring hospital (e.g. ECMO machine, portable echo, ventilator and monitor ...ect / see transfer equipment list). As these circumstances are considered lifesaving, all staff including ambulance crew, nursing staff, medical staff and perfusionists will be authorized to travel out of their hospital and provide the service wherever it's needed in the State of Kuwait.

All patients started on ECMO should have a baseline CT of the head, chest, and abdomen after ECMO insertion to identify any pathology that maybe responsible for the development of the ARDS , in addition to the exclusion of intracranial haemorrhage as it is one of the complications of ECMO therapy and its exclusion will aid the decision regarding the anticoagulation therapy. It is preferable to do the PAN CT in the referring hospital after the insertion of the ECMO and this should be arranged by the referring team. If this is not feasible, the patient should have the CT as soon as they arrive to Adan Hospital and prior to admission to Adan ICU to minimise extra transfer of the patient. This has to be arranged by the ECMO team registrar/SR prior to leaving the referring hospital.

ECMO TEAM:

Retrieval of the patient from the site of referral will be done by the following:

- 1- ICU ECMO Consultant
- 2- ICU ECMO SR/ Registrar
- 3- Perfusionist
- 4- ECMO nurse (Plus the Icu bedside nurse)
- 5- Cardiac/vascular surgeon (if open approach is required)

The roles and responsibilities of each member of the team are outlined in the transport policy.

References

1. Clinical Guideline. Extracorporeal Membrane Oxygenation (ECMO) for acute respiratory failure. Guy's and St Thomas NHS Foundation Trust. October 2011. Dr Nicholas Barrett.
2. ELSO (extracorporeal life support organization) patients care practice guidelines. <https://www.else.org/Resources/Guidelines.aspx>

APPENDIX I

ECMO Referral Form (page 1)

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Adan Adult ICU ECMO Referral Form

Please complete this consultation form for all ECMO referrals to Adan Hospital.

Referring Hospital ----- Patient name -----
Referring Specialty ----- civil ID number -----
Referring consultant ----- Gender M / F Age -----
Referral date ----- Unit ---- Ward ---- Bed ----
Admission diagnosis ----- File no -----

History (including comorbidities) -----

Patient parameters (*has to be completed, otherwise the consultation will be rejected):

* Pre-morbid functional status bed bound chair bound mobile
* Pre-morbid conscious status Alert and oriented Demented Coma/ vegetative status
* Current GCS E --- V --- M --- Total score ---/15

Ventilation

* Duration of conventional mechanical ventilation ----- Days
* SpO2 -----% PO2 ----- mmHg * FiO2 ----- * PaO2/FiO2 ratio ----- mmHg
* PIP (peak insp pressure/ PAW) ----- cmH2O * PEEP ----- * TV ----- * RR -----
* Lung Compliance (mls/cmH2O) ----- (calculated as TV/(PIP – PEEP)
* CXR quadrants (number of quadrants with infiltrations seen on CXR: alveolar consolidation) 1 point per quadrant, minimum 0, maximum 4) -----

Cardiovascular parameters:

* HR ----- * BP ----- * CVP ----- * Temp -----
* CO ----- * cardiac index ----- L/min/m2 * left ventricular ejection fraction ----- %
Inotropes/vasopressors) Agent: ----- Dose ----- mcg/kg/min
Agent: ----- Dose ----- mcg/kg/min
Sedation : Agent: ----- Dose -----
Agent: ----- Dose -----
Muscle relaxants: Agent: ----- Dose(bolus/infusion) -----

Investigation results:

* wbc ----- * Hb ----- * Plt ----- * INR ----- * PT ----- * APTT ----- * Bil ----- * AST ----- * ALT -----
* urea ----- * Cr ----- * Lactate ----- * UO ----- mls/hr * Dialysis Yes / NO
* Blood Gas : PH --- PO2 --- * PCO2 ----- HCO3 --- BE ---

Signature and stamp of referring Doctor ----- Date: -----

Designation (minimum Specialist) ----- Telephone number -----

Consultations has to be discussed verbally with the ECMO Consultant in Adan Hospital. For adult ICU ECMO referral please contact the ICU on-call doctor by phone (96623263) as well as filling this form and Faxing it to (23946102) to ensure a prompt response to the referral.

APPENDIX I

ECMO Referral Form (page 2)

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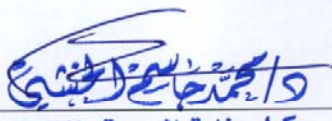
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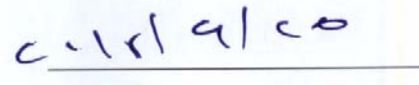


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وكيل وزارة الصحة بالإنابة
MOH Undersecretary


Date: