Policy Name: ECMO Set Up and Management Policy

Effective Date: 05/02/15

Policy Primary: DUH ECMO Medical Director

Status: Published

Final Approval: Approved by: DUH ECMO Steering Committee Date: 07/01/14

Glossary:
Term:
Definition:

Definitions:
ECMO- extracorporeal membrane oxygenation

Level: Interdependent - asterisked [*] items require an order from a health care practitioner licensed to prescribe medical therapy.

Personnel:
This applies to all healthcare professionals caring for an ECMO patient.

Competencies/Skills:

Required Resources:

Policy Statement:
Purpose: To establish policy for the use of simplified ECMO systems including patient selection, instructions for set up, priming, and monitoring these systems in addition to staffing coverage.

Patient Selection for Sprinter and Cardiohelp ECMO:

- Patient selection for ECMO Cannulation outside of OR per ECMO Deployment Protocol.
- Intraoperative ECMO support with Sorin S5 ECMO circuit.
- All patients requiring ECMO support greater than 24 hours will be supported with a Cardiohelp or Sprinter ECMO system.
- Neonatal/Pediatric patients under 20kg will have a modified 1/4" Cardiohelp circuit.
- Cardiohelp priority will first go to patients transported from outside facility, then to patients on VA ECMO with priority to neonatal and pediatric patients, then all other patients.

ECMO Pump Set Up and Priming Procedure:

All ECMO Pumps will be assembled using aseptic technique which includes hand hygiene prior to procedure and wearing hat, mask, and gloves. All alterations to the manufactured circuit will be done in a sterile manner to include alcohol prep and sterile scissors/blade cuts.

Sorin S5
Supplies needed:
- Hardware: S5 console with SCP driver, O2 flow meter, two metal tubing clamps, CDI
- Disposables: Sorin ECLS Base Pack, AV Loop (1/4" for < 20kg, 3/8" for 20kg or >), Maquet Quadrox iD SOFTLINE oxygenator, 2-3 pressure transducers
- Fluids: 1 liter of Normosol-R or Plasmalyte-A

Set Up and Priming
- Ensure console and all hardware clean
- Validate sterility and expiration of unopened disposables.
- Open tubing pack, transducers, and oxygenator.
- Seat oxygenator in holder, transducers in holders
- Connect red tubing stub to oxygenator outlet, and outlet from put to oxygenator inlet.
- Place transducers pre-membrane and in venous line. Optional placement of post membrane pressure transducer.
- Connect oxygen line from oxygenator to O2 flow meter.
- Change vented caps to non-vented caps.
- Clamp roberts clamps on venous and arterial tubing stubs.
- Spike 1L of Normosol-R or Plasmalyte A with provided spike line. Gravity prime the assembled ECMO circuit including manifold and pressure transducer lines.
- Vent all ports for de-airing.
- Zero pressure transducers.
- Attach arterial portion of AV loop to arterial tubing stub.
- Gravity prime the AV loop and prepare an air-free connection to venous tubing stub.
- Recirculate to ensure adequate de-airing.
- Label circuit with set up date, expiration date, “no additives”, and initials on disposable and priming bag using an adhesive label. Expiration date is 30 days from initial set up.

Storing the Primed ECMO Circuit:
- Turn off RPMs and the pump.
- Remove bubble detector and ensure e-clamp is off or in open position.
- Cover pump with surgical drape or equipment bag. Label outside of cover with set up date, expiration date, and initials. Expiration date is 30 days from initial set up.

Initiation
- Calibrate CDI and insert in manifold line.
- Continue to recirculate via prime bag until the surgeon is ready for the lines.
- Clamp the arterial and venous lines using a metal tubing clamp.
- Peel the blue wrapping from the AV loop exposing the sterile sleeve. Place hands inside sleeve pockets and pull away to expose a sterile portion of tubing. Instruct the surgeon pull the sterile tubing onto the field while pulling back the sleeves. Surgeon will clamp the venous and arterial sides and cut between the termination of the red and blue tapes.
- Verify air free connections to appropriate cannula.
- Initiate ECMO at > 1600 RPMs and 1-3LPM O2.
- Titrate flow as appropriate for patient maintaining 1:1 O2 flow rate until ABG results available or as clinically indicated.
Cardiohelp

- Supplies needed:
  - Hardware: Cardiohelp-i on cart, O2 flow meter, two metal tubing clamps
  - Disposables: Maquet HIT Advanced Disposable Set
  - Fluids: 2 liters of Normosol-R or Plasmalyte-A.

- Set Up
  - Ensure console and all auxiliary pieces are clean.
  - Open the guard on the Cardiohelp-i.
  - Validate sterility and expiration of unopened disposables.
  - Open the sterile packaging and remove the disposable.
  - Attach the disposable to the Cardiohelp-i drive. Make sure that the disposable is correctly inserted and fastened in the locking mechanism.
  - Add pigtail with stopcock to post-membrane port.
  - Check that all connections are secure.
  - Leave the de-airing membrane open. (Yellow cap taped to top of disposable).
  - Plug the cable for the integrated sensors into the connector of the disposable.
  - Close the guard on the Cardiohelp-i.
  - Attach the Cardiohelp flow/bubble sensor to the ARTERIAL side. Ensure the flow probe arrows point in the direction of flow.
  - Connect one end of the gas tube to the gas inlet and the other end to the O2 flow meter.
  - Place table tray on top of Cardiohelp-i.
  - Turn on the Cardiohelp. Activate the Global Override. Carry out calibration for each pressure parameter of the integrated pressure sensors. SYSTEM MUST BE FREE FROM LIQUIDS TO CALIBRATE!

- Priming
  - Fix the priming bag on the holder to allow easy access.
  - Close both 2-way stopcocks at the top of the priming bag.
  - Close the clamp on the blue line of the priming bag.
  - Fill the priming bag with at least 1.5L of Normosol-R or Plasmalyte-A.
  - Close the clamp on the quick-priming line of the priming bag.
  - Make sure there is sufficient distance in height (approximately 60cm) between the upper protective frame of the Cardiohelp-I and the lower edge of the priming bag.
  - Open the connection of the quick-action couplings in the priming line and connect the red tube line of the priming bag to the red line of the table set bowl. Repeat for blue line.
  - Make sure all the clamps in the red line are open.
  - Open the clamps on the blue line to allow gravity priming of disposable.
  - As soon as the disposable is full and flow has stopped, set a speed of 3000 RPM for two minutes, then increase the speed to 4000 RPM for one minute. If bubbling sounds remain, repeat process.
  - Turn Cardiohelp RPMs to 0. Take the table tray off of the cardiohelp. De-air the Luer locks and pigtail.
  - Make sure the entire set is completely de-aired by removing the disposable from the Cardiohelp-I and inspecting the entire disposable.
  - Deactivate Global Override. Reset the bubble alarm.
o Set speed to 4000-4500 RPM for one minute with intermittent back pressure by partially clamping arterial line. If any bubble alarms are triggered de-air and repeat 4000-4500 RPM for one minute.

o Close the de-airing membrane with the yellow protective cap.

o Activate the bubble alarm intervention (to stop flow if bubble sensed).

o Connect the venous probe correctly to the venous cell on the disposable.

o Label circuit with set up date, expiration date, "no additives", and initials on disposable and priming bag using an adhesive label. Expiration date is 30 days from initial set up.

- Storing the Primed ECMO Circuit:
  o Turn off RPMs and the pump.
  o Cover pump with surgical drape or equipment bag. Label outside of cover with set up date, expiration date, and initials. Expiration date is 30 days from initial set up.

- Initiation
  o Continue to recirculate via prime bag until the surgeon is ready for the lines.
  o Clamp the red line on the clamp symbol on the blood outlet side using a metal tubing clamp.
  o Clamp the blue line on the clamp symbol on the blood inlet side using a metal tubing clamp.
  o Zero the flow probe.
  o Close all clamps on the red and blue lines.
  o Separate the priming bag from the table set bowl by disconnecting the quick-action couplings. Connect the red and blue lines together.
  o Open the table set bowl. Instruct the surgeon to clamp the red and blue lines on the clamp symbol and cut distal to the clamps with respect to the pump.
  o Verify air free connections to appropriate cannula.
  o Initiate ECMO at >1600 RPMs and 1-3LPM O2.
  o Titrate flow as appropriate for patient maintaining 1:1 O2 flow rate until ABG results available or as clinically indicated.

- Priming Modifications for Neo/Peds <20kg
  o Additional Equipment needed:
    - A gas blender with CO2 tank and gas wye
    - Heater/Cooler with associated adapters
  o For patients less than 20kg, a ¼" loop with bridge, manifold access, and blood prime capabilities will be used.
    - Begin by priming Cardiohelp as indicated above.
    - After de-airing process of disposable is complete, steriley cut in the ¼” loop w/ manifold adaptation.
    - Connect manifold draw to post membrane port. Connect Quick Prime Line and Fluid to manifold port. Prime loop and manifold adaptation.
    - Warm prime to desired temperature (34-37C). See also Neuro Cooling Protocols.
  o Blood Prime:
    - Introduce one unit of RBC via the manifold adaptation and Quick Prime Line. Remove crystalloid via an empty transfusion bag on venous limb of bridge.
• 50ml FFP, 25mEq NaHCO3, and 100units Heparin may be introduced to the priming bag.

• Hold calcium until circuit is primed and recirculating. 500mg-1g of CaGlu may be introduced via the manifold to an actively recirculating circuit. Recirculate thru AV loop until surgeon is ready to divide lines. Ensure circuit is circulating thru the manifold after the surgeon clamps the AV loop. Clamp the AV loop on the pump side as well.

• An ECMO Prime Gas is recommended prior to initiation of VA ECMO. An ECMO Prime Gas is necessary prior to initiation of VV ECMO to include electrolytes.

• Initiate ECMO at >1200 RPMs and 0.5-1 LPM Sweep Gas (100% FiO2 for VV, 70% FiO2 for VA, up to 0.25 LPM CO2).

• Immediately upon initiation of ECMO begin platelet infusion to patient.

• After initiation of ECMO, send one circuit arterial blood gas, and one patient arterial blood gas with lactate and electrolytes (shock panel).

• After initiation of ECMO, send coagulation labs per Anticoagulation policy.

**Sprinter**

- Supplies needed:
  - Hardware:
    - Rotaflow on Sprinter care
    - 02 flow meter
    - Transonic flow meter
    - Two metal tubing clamps
  - Disposables:
    - Sorin Assist Pack
    - Rotaflow Pumphead
    - Maquet Quadrox-iD Adult Softline coated Oxygenator
  - Fluids:
    - 1 liter of Plasmalyte-A (double spiked bag).
  - Set Up
    - Attach Quadrox iD to oxygenator holder. Ensure a metal oxygenator bracket is securely connected to the oxygenator inlet and outlet.
    - Validate sterility and expiration of unopened disposables.
    - Open oxygenator, pump, and tubing pack.
    - Connect blue venous line to pump inlet.
    - Connect short tubing stub to pump outlet and oxygenator inlet.
    - Connect red arterial line to oxygenator outlet.
    - Attach pressure tubing (pigtail) to pre-membrane luer.
    - Attach ¼” tubing stub with stopcock to post-membrane connector.
    - Turn all stopcocks off to circuit.
    - Remove Yellow de-airing cap.
    - Turn Rotaflow power on.
    - Acknowledge “Valve”.
    - Zero RPMs.
    - Ensure Rotaflow in “Free Mode”.
    - Silence flow/RPM alarm.
- Priming
  - Spike Plasmalyte-A with venous line.
  - Gravity prime circuit, burping all luer connections and access lines.
  - Spike Plasmalyte-A with arterial line.
  - Apply ultrasonic grease to Rotaflow sensor.
  - Turn Rotaflow RPMs to 1800.
  - Label circuit with set up date, expiration date, "no additives", and initials on disposable and priming bag using an adhesive label. Expiration date is 30 days from initial set up.

  o Storing the Primed ECMO Circuit:
    - Turn off RPMs and the pump.
    - Cover pump with surgical drape or equipment bag. Label outside of cover with set up date, expiration date, and initials. Expiration date is 30 days from initial set up.

  o Initiation
    - Prior to handing lines off to surgeon, turn pump off again to inspect for air.
    - Clamp Roberts clamps on blue and red lines.
    - Clamp the lines proximal to the sterile wrapping with respect to the pump.
    - Peel back sterile wrap exposing lines for surgeon.
    - Instruct the surgeon to clamp the lines and cut distal to their clamps with respect to the pump.
    - Ensure air free connections to appropriate cannula.
    - Initiate ECMO at 1800 RPMs and 1-3 LPM O2.
    - Titrate flow as appropriate for patient maintaining 1:1 O2 flow rate until ABG results available or clinically indicated.

**ECMO MANAGEMENT**

**ECMO Settings**

- The Cardiohelp will be managed in RPM mode.
  o Initial pressure audible alarms set as follows:
    - Internal (pre-membrane): 300/325
    - Arterial (post-membrane): 300/325
    - Delta: 75
    - Venous (negative): -75/-100 (neonatal -20)
  
  o SvO2 audible alarm set to 50%, Hb=7/HCT21.
  o Hi Temp=37.5, Lo Temp=34 (Venous and Arterial)
  o Flow audible alarms set to 25% above and below desired flow rate.
  o Alarm parameters may be adjusted for clinical condition after notification of attending physician of outliers.

  o Bubble Detector
    - The perfusionist may wish to start with bubble sensor on venous side for initiation of ECMO particularly in open chest cases or in situations where risk of venous decannulation is high.
The case will be maintained with the bubble sensor on the arterial side, approximately 10-12 inches from the oxygenator outlet, and the intervention set to stop the pump.

A venous bubble sensor will be used as an alarm. Consider arming intervention for high-risk procedures.

- The Rotaflow will be managed in FREE mode with a transonic flow meter.
  - Flow audible alarms set to 25% below desired flow rate.
  - Anticoagulation and patient management per ECMO policy.

### ECMO Flow

**VA ECMO**

- Neonatal VA ECMO Flows as ordered, typically 100-120ml/kg/min to maintain MAP 45-60 and SvO2>65%
- Infant VA ECMO Flows as ordered, typically 80-100ml/kg/min to maintain MAP 50-65 and SvO2>65%
- Pediatric VA ECMO Flows as ordered, typically 60-80ml/kg/min to maintain MAP 60-80 and SvO2>65%
- Adult VA ECMO Flows as ordered, typically Cl of 1.8 to maintain MAP 65-85 and SvO2>65%
- Accurate SvO2 reading on the ECMO Pump require d/c of all shunts/oxygenated vents pre-saturation probe.

**VV ECMO**

- Flow is dynamic based on patient cardiac output and titrated by ECMO Specialist or Perfusionist. Minimal flow to achieve optimal SpO2 should be reassessed Q2 hours and PRN.
- Pump SvO2 serves as an indication of recirculation.

### ECMO Gases

- Sweep gas titrated per patient arterial blood gas results to normalize pH/pCO2 per physician ordered goals in coordination with ventilator changes as appropriate.
- A repeat patient arterial blood gas will be sent after all ECMO and ventilator changes.
- Neonatal/Pediatric Veno-Arterial ECMO FiO2=70%
- All other ECMO FiO2=100%
- **The ECMO Sweep Gas is NEVER to be turned off on VA or VAV ECMO.**

### Respiratory System

- Neonatal/Pediatric Veno-Arterial ECMO
  - Ventilator settings shall be minimized to allow the lung to “rest”. Typical pressure ventilator settings are:
    - FiO2 0.21-0.30
    - Delivered PIP 20 cm H2O (delta-P 10 cm H2O)
    - PEEP 10 cm H2O
o rate 10 bpm
o Dynamic compliance should be obtained every 24 hours – unless otherwise ordered compliance measurements should be obtained at PIP 25 cm H2O and PEEP 5 cm H2O.

- Adult Veno-Arterial ECMO
  
o Rest Ventilator Settings per CTICU protocol.

- Femorally Cannulated Veno-Arterial ECMO (Pediatric and Adult)
  
o FiO2 >30% for all femorally cannulated VA ECMO Patients.
  
o Blood gases to be obtained from right radial arterial line for all femorally cannulated VA ECMO Patients.

- Veno-Venous ECMO
  
o Ventilator settings will be adjusted to provide ventilatory support as clinically indicated. The settings required will vary between patients and for a given patient over time. Settings shall be determined by the managing attending physician in consultation with the respiratory staff.
  
o Post-lung transplant patients ventilator settings per CTICU SOLT/BOLT protocol.

- Extubated patients
  
o Continue pulmonary toilet.
  
o Aspiration precautions should be taken.

### Nutrition
- Advance feeds as clinically indicated.
- Lipid infusions via patient access, not ECMO pump.

### Renal
- CVVHD/Hemofiltration/Pump-driven Dialysis as ordered via ECMO circuit for patients less than 20kg or patient access greater than 20kg.
- Hemofiltration and pump-driven dialysis to be primed and initiated by ECMO Specialist/Perfusionist. Fluid removal/dialysate per renal orders. I/O recorded by nursing.
- Pump access for renal replacement for patients greater than 20kg on approval of ECMO Manager and Medical Director.

### Neurologic System
- The patient should be comfortable. Any significant agitation influencing hemodynamic stability, gas exchange, or safety should be brought to the attention of the bedside nurse and/or physician caring for the patient for assessment. Any seizures or abnormal neurologic activity should also be noted. Neuro exams per unit policy.
- *Neonates/Infants: A head ultrasound will be performed prior to cannulation, approximately 24 and 48 hours after cannulation, and otherwise as clinically indicated.*

### Hematology
- Maintain current type and screen on all ECMO patients and blood products on hold in Transfusion Services.
- Hematocrit
  - Neonatal/Pediatric ≥ 30 or as ordered
  - Adult as ordered.
  - When indicated, transfuse PRBCs – 15 ml/kg up to 1 unit of PRBCs for adult patients.
  - Re-check prior to continued transfusion except during emergency/resuscitative measures.
- Platelets, FFP, and Fibrinogen per ECMO Anticoagulation Policy.
  - Neonatal/Pediatric- transfuse FFP after 3 PRBC transfusions in a 24 hour period.
- Hematologic variables should be monitored at least every 12 hours.

Nursing Care

- Nursing care per ECMO Nursing Policy.
- The nursing team will manage all drips including heparin. The primary access should be the patient's lines. Should access via the ECMO manifold be required, the ECMO specialist or perfusionist will make all connections to the ECMO circuit. The nurse will monitor the infusion and alert the ECMO specialist or perfusionist if attention is required. Platelets and lipids will only be given via patient access.
- CVVHD, Hemofiltration, and Plasmapheresis may utilize the ECMO manifold. The ECMO Specialist or Perfusionist will make all connections to the ECMO circuit. The ECMO Specialist or Perfusionist will set up ECMO pump-driven dialysis; the nurse will manage the dialysate and effluent pumps per nephrology orders.
- All I/O will be documented by nursing per unit policy.

Cannulation Site

- Dressing changes per Central Line Protocol.
- Surgery to assess site Q 7 days.
- No hemostatic agents without order from surgery.
- Assess peripheral pulses Q1 hour.

Weaning ECMO:

Veno-arterial:

- The following will be considered as indicators the patient is ready to wean from VA ECMO:
  - Cardiac:
    - Hemodynamics stable/improving with minimal or stable inotropic support.
    - Cardiac function stable/improving by echo.
  - Respiratory:
    - Chest Radiograph is stable or improving.
    - Respiratory system compliance is stable or improving.
    - Vasodilator therapy (e.g., iNO or Veletri) dose is stable or decreasing.
A rapid wean from ECMO may be indicated, despite suboptimal cardiopulmonary function, in the setting of ECMO complications as determined by the medical and surgical teams.

- The medical teams and surgical teams will communicate with the ECMO specialist and/or perfusionists prior to an attempted wean trial.
  - The appropriate perfusionist will be made aware of wean trial.
  - Transfuse as clinically indicated to optimize oxygen carrying capacity prior to wean trial.
  - Weaning parameters will be pre-determined by the medical/surgical teams in coordination with the ECMO specialist and/or perfusionist and respiratory therapist.
  - Parameters to include starting and maximum ventilator FiO\textsubscript{2}, minimal PaO\textsubscript{2} and pH, as well as MAP goals, PA and CVP goals when appropriate
  - Inotrope doses will be discussed prior to initiating a VA ECMO wean.
  - Anticoagulation parameters to be discussed with team prior to reducing ECMO flow. Increased PTT goals may be ordered

- VENT SETTINGS: Per unit standards.
- ECMO:
  - Upon confirmation with surgical and medical teams and after patient and vent settings have been optimized, the ECMO flow may be reduced to 50% by the perfusionist or ECMO specialist.
  - It is recommended to have echo imaging prior to reduction of ECMO flow to less than 50%.
  - Do not alter the ECMO sweep gas unless indicated by ABG.
  - Flow below 1LPM not recommended on the 3/8" ECMO circuit.
  - Flow below 250ml/min on 1/4" ECMO circuit requires the AV bridge open and patient flow monitoring with Transonic Flow meter. Titrate RPMs to achieve desired patient flow. Lines may be clamped with flow confirmed through the AV bridge with cannulas flashed at 3minute intervals. Confirm flash by transonic flow meter for >10 seconds.

- MONITORING:
  - SpO\textsubscript{2} and hemodynamics should be closely monitored.

- DECANNULATION:
  - Anticoagulation management will be by order of the surgical team.
  - All transfusion parameters as ordered will be met prior to decannulation.
  - A cooler with 4 RBCs and 1 FFP will be made available at the bedside prior to decannulation. This is to be kept under ice in the cooler in the patient’s room in the event of a surgical emergency during decannulation. The cooler should be returned to blood bank prior to expiry.
  - The case will be posted with the OR as “Removal of Cannulas for Extracorporeal Support”. CTOR nursing may be declined as determined by the attending surgeon.
  - The ECMO Specialist or Perfusionist will confirm with the decannulating surgeon that the ECMO lines are clamped prior to suture removal.
  - All ECMO-related documentation including decannulation time will be recorded by the ECMO Specialist/Perfusionist.

**Veno-venous:**

- The following will be considered as indicators the patient is ready to wean from VV ECMO:
  - Chest Radiograph is stable or improving.
  - Respiratory system compliance is stable or improving.
  - Vasodilator therapy (e.g., iNO or Veletri) dose is stable or decreasing.
  - A rapid wean from ECMO may be indicated, despite suboptimal lung function, in the setting of ECMO complications as determined by the medical and surgical teams.

- The medical teams and surgical teams will communicate with the ECMO specialist and/or perfusionists prior to an attempted wean trial.
  - Transfuse as clinically indicated to optimize oxygen carrying capacity prior to wean trial.
Weaning parameters will be pre-determined by the medical/surgical teams in coordination with the ECMO specialist and/or perfusionist and respiratory therapist.

- Parameters to include starting and maximum ventilator FiO₂, minimal PaO₂ and pH, and duration of wean trial.
- Typical parameters for ARDS: PaO₂ > 65 on FiO₂ ≤ 0.6, pH > 7.30
- Post-SOLT/BOLT patients weaning criteria will be determined per attending transplant surgeon.

- **VENT SETTINGS:**
  - **Respiratory Distress, non-transplant:**
    - Optimize Vent Settings at least 15 minutes prior to an attempted VV ECMO Wean Trial according to the Duke Ventilator Management protocol.
    - Continuous pulse oximetry and capnography should be utilized.
  - **Post-BOLT/SOLT:**
    - Optimize Vent Settings at least 15 minutes prior to an attempted VV ECMO Wean Trial according to the Duke Ventilator Management protocol for BOLT/SOLT.
    - Continuous pulse oximetry and capnography should be utilized.

- **ECMO:**
  - Upon confirmation with surgical and medical teams and after Hb and vent settings have been optimized as outlined above, the sweep may be discontinued and gas line clamped by the perfusionist or ECMO specialist.
  - Do not alter the ECMO flow.

- **MONITORING:**
  - SpO₂ and arterial blood pressure should be closely monitored.
  - After approximately 15 min, draw a patient arterial blood gas sample. Alert medical and surgical team of ABG results.
  - Draw patient ABG q1 x 3 hours (and as clinically indicated) as long as all indications for continued wean trial are met. Alert medical/surgical team of results.

- **ENDPOINTS:**
  - SpO₂ < 85% on pre-determined FiO₂ with a reliable tracing is an indication to abort the wean trial unless otherwise ordered.
  - Any hemodynamic compromise is an indication to abort the wean trial unless otherwise ordered.
  - Weaning is considered successful if pre-determined parameters are met, patient remains comfortable, and hemodynamics have remained stable after 4 hours of no sweep gas. Thereafter, decisions to remove ECMO system is at the discretion of the medical and surgical team.

- **DECANNULATION:**
  - Discontinuation of anticoagulation will be by order of the surgical team.
  - All transfusion parameters as ordered will be met prior to decannulation.
  - A cooler with 4 RBCs and 1 FFP will be made available at the bedside prior to decannulation. This is to be kept under ice in the cooler in the patient’s room in the event of a surgical emergency during decannulation. The cooler should be returned to blood bank prior to expiry.
  - The case will be posted with the OR as “Removal of Cannulas for Extracorporeal Support”. CTOR nursing may be declined as determined by the attending surgeon.
  - The ECMO Specialist or Perfusionist will confirm with the decannulating surgeon that the ECMO lines are clamped prior to suture removal.
  - All ECMO-related documentation including decannulation time will be recorded by the ECMO Specialist/Perfusionist.
Anticoagulation per ECMO Anticoagulation Policy.

Patient Mobility

- Mobility as tolerate.
- Turn Q2 hours unless otherwise ordered.
- All ECMO patient movements require the bedside RN and ECMO Specialist/Perfusionist present.

Ambulation per ECMO Ambulation Guidelines.

Emergency Resuscitation Measures

- The ECMO Specialist/Perfusionist may utilize ECMO circuit access to volume resuscitate the patient as ordered by physician at ECMO initiation, in the operating room, during invasive procedures, and in emergency circumstances.
- See also ECMO Circuit Change Policy/Procedure.

Responsibilities of Perfusionist and/or ECMO Specialist for Sprinter and Cardiohelp ECMO in all units:

- Receive complete patient history, shift updates, and plan of care from off-going shift.
- Cannula to cannula pump check with both off-going and on-coming provider.
- Documentation per policy.
- Ensure back up equipment/disposables present and functional.
  - Quick prime line with spring-loaded connector, 1 liter physiologic fluid, two 60cc syringes, 4 clamps, three appropriately sized connectors, a pair of sealed sterile scissors, alcohol swabs, and prepping solution should be available on the pump console at all times.
  - An appropriate back up pump/cart/gas flowmeter and associated disposables and fluids will be present within a two minute retrieval time of the location of patient support.
- Review Rotaflow/Cardiohelp quick reference guide at the beginning of each shift including basic troubleshooting and emergency response.
- The care nurse will draw and run all necessary labs.
  - Diagnostic labs for ECMO function or per physician order from the ECMO circuit will be drawn by a perfusionist or ECMO Specialist “Primer”.
  - Routine Circuit gases need not be ordered, run, or drawn for these devices. Circuit gas may be drawn if oxygenator function is in question.
- Anticoagulation per policy.
- Alert the bedside nurse when leaving immediate vicinity, i.e. if you are going to the lounge or the restroom, assisting w/ another patient, etc.
- Assist bedside nurse with all patient movements. Help bedside nurse with care as needed.
- Assist with patient ambulation by securing and monitoring cannula sites per Ambulatory ECMO Guidelines.
- Work with care team to adjust plan of care as needed.

Sprinter/Cardiohelp ECMO Staffing:
The ECMO Provider will be either a Licensed Perfusionist or ECMO Specialist.

Primary Areas of Coverage
  o ECMO Specialists will provide primary ECMO Coverage for the maintenance of ECMO in the PICU, PCICU, and MICU; CTICU as noted below.
  o Perfusionists will provide primary ECMO Coverage for the maintenance of ECMO in the CTICU; PICU, PCICU, and MICU as noted below.

A Perfusionist will be available as a resource to the ECMO Specialist 24-7 with a 5 minute callback and 30 minute in-house response time.

An ECMO Provider will be available in the unit where an ECMO patient is located in a staffing ratio ultimately determined in conjunction with ECMO Manager and ICU team based on acuity and staffing needs.

Process of initiating ECMO Coverage outside of primary coverage areas:
  o ***Concurrent VAD or IABP excludes patient from solo ECMO Specialist coverage in CTICU.
  o ***Patients with ongoing resuscitation are not eligible for ECMO Specialist coverage in the CTICU unless approved by the ECMO Manager or designee.
  o When ECMO coverage needs outside of primary coverage areas is anticipated, the ECMO Manager (970-3793) will be contacted during daylight hours to attempt coverage arrangements by contacting the Chief Perfusionists and Director of Respiratory Care. Any gaps in coverage will be filled by the primary coverage team per department policy.

REFERENCES