I. Description
Extracorporeal membrane oxygenation (ECMO) is defined as the use of a cardiopulmonary bypass circuit for temporary life support for patients with potentially reversible cardiac and/or respiratory failure. ECMO provides a mechanism for gas exchange as well as cardiac support thereby allowing for recovery from existing lung and/or cardiac disease. ECMO is an accepted treatment modality for neonatal, pediatric and adult patients with respiratory and/or cardiac failure failing to respond to maximal medical therapy. It is initiated with the expectation that cardiorespiratory function will improve sufficiently to allow discontinuation of ECMO within two weeks.

ECMO can be venovenous (VV) or venoarterial (VA):
- VV ECMO provides respiratory support only. Blood is extracted from the vena cava or right atrium and returned to the right atrium.
- VA ECMO provides both respiratory and hemodynamic support. Blood is extracted from the right atrium and returned to the arterial system, bypassing the heart and lungs.

II. Criteria/Guidelines
A. ECMO is covered (subject to Limitations and Administrative Guidelines) for critically ill newborns (age 28 days or younger) with respiratory failure after conservative management (medication and mechanical ventilation) is found to be ineffective and all of the following clinical criteria are met:
   1. The newborn’s corrected gestational age is 34 weeks and surgical cannulation is possible (corresponding to a birth weight of approximately 2000 grams);
   2. The newborn has reversible lung disease; and
   3. The newborn has not been on mechanical ventilation for more than 14 days.

B. ECMO is covered (subject to Limitations and Administrative Guidelines) for adults and children with acute severe cardiac or pulmonary failure that is potentially reversible after conservative management (medication and mechanical ventilation) is found to be ineffective. Clinical situations that may prompt the initiation of ECMO include the following:
   1. Hypoxemic respiratory failure with a ratio of arterial oxygen tension to fraction of inspired oxygen (PaO₂/FiO₂) of <100 mmHg despite optimization of the ventilator settings,
including the tidal volume, positive end-expiratory pressure (PEEP), and inspiratory to expiratory (I:E) ratio;
2. Hypercapnic respiratory failure with an arterial pH less than 7.20;
3. Refractory cardiogenic shock;
4. Failure to wean from cardiopulmonary bypass after cardiac surgery; or
5. As a bridge to either cardiac transplantation or placement of a ventricular assist device (VAD).

C. The underlying disease is not the only consideration when evaluating the need for ECMO but also an assessment of:
   1. Gas exchange in relation to current levels of mechanical ventilation;
   2. The rate of deterioration; and
   3. The success of other rescue therapies.

D. Specific cut-offs at which ECMO should be offered or withheld have not been firmly established and therefore it should be evaluated on a case-by-case basis.

III. Limitations
A. ECMO for children and adults is not known to be effective in improving health outcomes for all other indications (e.g., burn and smoke inhalation injury) because of insufficient evidence of its safety and effectiveness.

B. ECMO is not known to be effective in improving health outcomes in patients with any of the following absolute contraindications:
   1. Neonates with major intracranial hemorrhage (grade III and IV);
   2. Neonates with uncorrectable cardiac lesions;
   3. Neonates with lethal congenital anomalies;
   4. Evidence of severe irreversible brain damage; or
   5. Irreversible respiratory or cardiac failure.

C. ECMO for patients with any of the following relative contraindications may be considered on a case by case basis:
   1. When anticoagulation is contraindicated (e.g., bleeding, recent surgery, recent intracranial injury).
   2. For patients with respiratory failure, if mechanically ventilated for longer than seven days.
   3. For patients with cardiac failure, when a VAD or transplantation is contraindicated (e.g., the patient has preexisting renal failure, preexisting hepatic failure, significant aortic valve insufficiency, or inadequate social support).
   4. Other characteristics that may exclude some patients from receiving ECMO include advanced age, morbid obesity, neurologic dysfunction, or poor preexisting functional status.

D. Standard durations with ECMO vary by condition. It is initiated with the expectation that cardiorespiratory function will improve sufficiently to allow discontinuation of ECMO within 14-21 days.

E. ECMO should be discontinued if there is no hope for healthy survival (severe brain damage, no heart or lung recovery or no hope of organ replacement by VAD or transplant).

F. Patients undergoing ECMO treatment should be periodically reassessed for clinical improvement. ECMO should not be continued indefinitely if the following criteria are met:
   1. The patient has neurologic devastation as defined by the following:
Extracorporeal Membrane Oxygenation (ECMO)

1. Consensus from 2 attending physicians that there is no likelihood of an outcome better than “persistent vegetative state”; and
   a. At least one of the attending physicians is an expert in neurologic disease and/or intensive care medicine; and
   c. Determination made following studies including CT, EEG and exam.
2. Inability to provide aerobic metabolism, defined by the following:
   a. Refractory hypotension and/or hypoxemia; or
   b. Evidence of profound tissue ischemia based on creatine phosphokase (CPK) or lactate levels, lactate-to-pyruvate ratio, or near-infrared spectroscopy (NIRS);
3. Presumed end-stage cardiac or lung failure without “exit” plan (i.e., declined for assist device and/or transplantation).

IV. Administrative Guidelines
A. Precertification is not required since ECMO is generally provided on an emergency basis. However, after the initiation of ECMO, a written and signed treatment plan must be made available to HMSA upon request which documents the following:
1. Discussion with patient or patient’s representative of advance care planning
2. Explanation of ECMO’s use as a temporary measure for life-threatening conditions
3. Estimated timetable for withdrawal of ECMO support, given scenarios of various clinical parameters (e.g., discontinuation of ECMO if no clinical improvement in identified time frame). Note that use beyond 21 days must be justified on clinical grounds specific to the affected patient.
B. HMSA reserves the right to perform retrospective review using the above criteria to validate if services rendered met payment determination criteria.
C. Supporting documentation must be submitted with the claim to be reviewed by a Medical Director if the patient receives ECMO services for more than 14 days or has a contraindication listed in Limitations B.1-4.

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<thead>
<tr>
<th>CPT Codes</th>
<th>Description</th>
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<tr>
<td>33946</td>
<td>Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; initiation, veno-venous</td>
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<tr>
<td>33947</td>
<td>initiation, veno-arterial</td>
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<tr>
<td>33948</td>
<td>daily management, each day, veno-venous</td>
</tr>
<tr>
<td>33949</td>
<td>daily management, each day, veno-arterial</td>
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<td>33951</td>
<td>insertion of peripheral (arterial and/or venous) cannula(e), percutaneous, birth through 5 years of age (includes fluoroscopic guidance, when performed)</td>
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<tr>
<td>33952</td>
<td>insertion of peripheral (arterial and/or venous) cannula(e), percutaneous, 6 years and older (includes fluoroscopic guidance, when performed)</td>
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<td>Insertion of central cannula(e) by sternotomy or thoracotomy, birth through 5 years of age</td>
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<td>Removal of central cannula(e) by sternotomy or thoracotomy, 6 years and older</td>
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<td>33987</td>
<td>Arterial exposure with creation of graft conduit (e.g., chimney graft) to facilitate arterial perfusion for ECMO/ECLS</td>
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| 33988    | Insertion of left heart vent by thoracic incision (e.g., sternotomy,}
Extracorporeal Membrane Oxygenation (ECMO)

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<th>Description</th>
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<td>Extracorporeal Membrane Oxygenation (ECMO)</td>
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## V. Important Reminder

The purpose of this Medical Policy is to provide a guide to coverage. This Medical Policy is not intended to dictate to providers how to practice medicine. Nothing in this Medical Policy is intended to discourage or prohibit providing other medical advice or treatment deemed appropriate by the treating physician.

Benefit determinations are subject to applicable member contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control.

This Medical Policy has been developed through consideration of the medical necessity criteria under Hawaii’s Patients’ Bill of Rights and Responsibilities Act (Hawaii Revised Statutes §432E-1.4), generally accepted standards of medical practice and review of medical literature and government approval status. HMSA has determined that services not covered under this Medical Policy will not be medically necessary under Hawaii law in most cases. If a treating physician disagrees with HMSA’s determination as to medical necessity in a given case, the physician may request that HMSA reconsider the application of the medical necessity criteria to the case at issue in light of any supporting documentation.

### VI. References

10. UptoDate. Extracorporeal Membrane Oxygenation (ECMO) in Adults. Last update March 2015.