

02-33000-40

Original Effective Date: 06/15/17

Reviewed: 12/08/23

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Subject: Extracorporeal Membrane Oxygenation (ECMO) for Adult Conditions

THIS MEDICAL COVERAGE GUIDELINE IS NOT AN AUTHORIZATION, CERTIFICATION, EXPLANATION OF BENEFITS, OR A GUARANTEE OF PAYMENT, NOR DOES IT SUBSTITUTE FOR OR CONSTITUTE MEDICAL ADVICE. ALL MEDICAL DECISIONS ARE SOLELY THE RESPONSIBILITY OF THE PATIENT AND PHYSICIAN. BENEFITS ARE DETERMINED BY THE GROUP CONTRACT, MEMBER BENEFIT BOOKLET, AND/OR INDIVIDUAL SUBSCRIBER CERTIFICATE IN EFFECT AT THE TIME SERVICES WERE RENDERED. THIS MEDICAL COVERAGE GUIDELINE APPLIES TO ALL LINES OF BUSINESS UNLESS OTHERWISE NOTED IN THE PROGRAM EXCEPTIONS SECTION.

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DESCRIPTION:

Extracorporeal membrane oxygenation (ECMO) has proven effective and is considered a standard of care in pediatrics, particularly neonates suffering with respiratory and cardiopulmonary failure.

ECMO provides extracorporeal circulation and physiologic gas exchange for temporary cardiorespiratory support in cases of severe respiratory and cardiorespiratory failure. ECMO devices use an extracorporeal circuit, combining a pump and a membrane oxygenator, to undertake oxygenation of and removal of carbon dioxide from the blood.

ECMO has generally been used in clinical situations of respiratory or cardiac failure, or both. In these situations, death is imminent unless medical interventions immediately reverse the underlying disease process, physiologic functions can be supported until normal reparative processes, treatment can occur (eg, resolution of ARDS, treatment of infection), or other life-saving interventions can be delivered (eg, provision of a lung transplant).

POSITION STATEMENT:

The use of extracorporeal membrane oxygenation (ECMO) in adults **meets the definition of medical necessity** for the management of acute respiratory failure when **ALL** of the following criteria are met:

- Age 18 or older
- Respiratory failure is due to a potentially reversible etiology¹
- Respiratory failure is severe, as determined by the Murray score* or other respiratory failure severity criteria**

AND

NONE of the following contraindications are present:

- High ventilator pressure (peak inspiratory pressure >30 cm H₂O) or high fraction of inspired oxygen (>80%) ventilation for more than 168 hours
- Signs of intracranial bleeding
- Multisystem organ failure
- Prior (ie, before onset of need for ECMO) diagnosis of a terminal condition with expected survival less than 6 months
- A do-not-resuscitate directive
- Cardiac decompensation in a person who has already been declined for ventricular assist device or transplant
- Known neurologic devastation without potential to recover meaningful function
- Determination of care futility***

¹The reversibility of the underlying respiratory failure is best determined by the treating physicians, ideally physicians with expertise in pulmonary medicine and/or critical care. Some underlying causes of respiratory failure, which are commonly considered reversible, are:

- Acute respiratory distress syndrome (ARDS)
- Acute pulmonary edema
- Acute chest trauma
- Infectious and noninfectious pneumonia
- Pulmonary hemorrhage
- Pulmonary embolism
- Asthma exacerbation
- Aspiration pneumonitis

The use of ECMO in adults **meets the definition of medical necessity** as a bridge to heart, lung, or combined heart-lung transplantation for the management of respiratory, cardiac, or combined cardiorespiratory failure refractory to optimal conventional therapy.

The use of ECMO in adults for management of cardiogenic shock refractory to standard therapy **meets the definition of medical necessity** when both of the following are met:

- When shock is thought to be due to a potentially reversible condition (e.g., ST elevation acute myocardial infarction, acute myocarditis, peripartum cardiomyopathy, or acute rejection in a heart transplant)
- There is reasonable expectation for recovery

The use of ECMO in adults is considered **experimental or investigational** when the above criteria are not met, including as an adjunct to cardiopulmonary resuscitation (ECPR).

BILLING/CODING INFORMATION:

CPT Coding:

33946	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; initiation, veno-venous
33947	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; initiation, veno-arterial
33948	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; daily management, each day, veno-venous
33949	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; daily management, each day, veno-arterial
33952	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; insertion of peripheral (arterial and/or venous) cannula(e), percutaneous, 6 years and older (includes fluoroscopic guidance, when performed)
33954	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; insertion of peripheral (arterial and/or venous) cannula(e), open, 6 years and older
33956	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; insertion of central cannula(e) by sternotomy or thoracotomy, 6 years and older
33958	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; reposition peripheral (arterial and/or venous) cannula(e), percutaneous, 6 years and older (includes fluoroscopic guidance, when performed)
33962	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; reposition peripheral (arterial and/or venous) cannula(e), open, 6 years and older (includes fluoroscopic guidance, when performed)
33964	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; reposition central cannula(e) by sternotomy or thoracotomy, 6 years and older (includes fluoroscopic guidance, when performed)
33966	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; removal of peripheral (arterial and/or venous) cannula(e), percutaneous, 6 years and older
33984	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; removal of peripheral (arterial and/or venous) cannula(e), open, 6 years and older
33986	Extracorporeal membrane oxygenation (ECMO)/extracorporeal life support (ECLS) provided by physician; removal of central cannula(e) by sternotomy or thoracotomy, 6 years and older
33987	Arterial exposure with creation of graft conduit (eg, chimney graft) to facilitate arterial perfusion for ECMO/ECLS (List separately in addition to code for primary procedure)
33988	Insertion of left heart vent by thoracic incision (eg, sternotomy, thoracotomy) for ECMO/ECLS
33989	Removal of left heart vent by thoracic incision (eg, sternotomy, thoracotomy) for ECMO/ECLS

REIMBURSEMENT INFORMATION:

Refer to section entitled [POSITION STATEMENT](#).

PROGRAM EXCEPTIONS:

Federal Employee Program (FEP): Follow FEP guidelines.

State Account Organization (SAO): Follow SAO guidelines.

Medicare Advantage products: No National Coverage Determination (NCD) and/or Local Coverage Determination (LCD) were found at the time of the last guideline review date.

If this Medical Coverage Guideline contains a step therapy requirement, in compliance with Florida law 627.42393, members or providers may request a step therapy protocol exemption to this requirement if based on medical necessity. The process for requesting a protocol exemption can be found at [Coverage Protocol Exemption Request](#)

DEFINITIONS:

*Murray Lung Injury Score

Scale	Criteria	Score
Chest x-ray score	No alveolar consolidation	0
	Alveolar consolidation confined to 1 quadrant	1
	Alveolar consolidation confined to 2 quadrants	2
	Alveolar consolidation confined to 3 quadrants	3
	Alveolar consolidation in all 4 quadrants	4
Hypoxemia score	PaO ₂ /FIO ₂ >300 mm Hg	0
	PaO ₂ /FIO ₂ 225-299 mm Hg	1
	PaO ₂ /FIO ₂ 175-224 mm Hg	2
	PaO ₂ /FIO ₂ 100-174 mm Hg	3
	PaO ₂ /FIO ₂ ≤100 mm Hg	4
PEEP score (when ventilated)	PEEP ≤ 5 cm H ₂ O	0
	PEEP 6-8 cm H ₂ O	1
	PEEP 9-11 cm H ₂ O	2
	PEEP 12-14 cm H ₂ O	3
	PEEP ≥15 cm H ₂ O	4
Respiratory system compliance score (when available)	Compliance >80 mL/cm H ₂ O	0
	Compliance 60-79 mL/cm H ₂ O	1
	Compliance 40-59 mL/cm H ₂ O	2
	Compliance 20-39 mL/cm H ₂ O	3
	Compliance ≤19 mL/cm H ₂ O	4

**Other Respiratory Failure Severity Criteria

Respiratory failure is considered severe if the adult meets one or more of the following criteria:

- Uncompensated hypercapnia with a pH less than 7.2, or
- PaO₂/FIO₂ of <100 mm Hg on fraction of inspired oxygen (FIO₂) >90%, or
- Inability to maintain airway plateau pressure (Pplat) <30 cm H₂O despite a tidal volume of 4 to 6mL/kg ideal body weight (IBW), or
- Oxygenation Index >30: Oxygenation Index = FIO₂ x 100 x MAP/PaO₂ mm Hg. [FIO₂ x 100 = FIO₂ as percentage; MAP = mean airway pressure in cm H₂O; PaO₂ = partial pressure of oxygen in arterial blood], or
- CO₂ retention despite high Pplat (>30 cm H₂O)

Berlin Definition of Acute Respiratory Distress Syndrome

Criteria	
Timing	Within 1 week of a known clinical insult or new or worsening respiratory symptoms
Chest imaging (CT or CXR)	Bilateral opacities-not fully explained by effusions, lobar/lung collapse, or nodules
Origin of edema	Respiratory failure not fully explained by cardiac failure or fluid overload. Need objective assessment (eg, echocardiography) to exclude hydrostatic edema if no risk factors present.
Oxygenation, mild	200 mm Hg < Pao ₂ /Fio ₂ <300 mm Hg with PEEP or CPAP >5 cm H ₂ O
Oxygenation, moderate	100 mm Hg < Pao ₂ /Fio ₂ ≤200 mm Hg with PEEP or CPAP ≥5 cm H ₂ O
Oxygenation, severe	Pao ₂ /Fio ₂ ≤100 mmHg with PEEP or CPAP ≥5 cm H ₂ O

***Assessment of ECMO Futility

Adults undergoing ECMO treatment should be periodically reassessed for clinical improvement. ECMO should not be continued indefinitely if the following criteria are met:

- Neurologic devastation as defined by the following:
 - Consensus from 2 attending physicians that there is no likelihood of an outcome better than “persistent vegetative state” at 6 month, **AND**
 - At least one of the attending physicians is an expert in neurologic disease and/or intensive care medicine, **AND**
 - Determination made following studies including computed tomography, electroencephalography, and exam

OR

- Inability to provide aerobic metabolism, defined by the following:
 - Refractory hypotension and/or hypoxemia, **OR**
 - Evidence of profound tissue ischemia based on creatine phosphokinase (CPK) or lactate levels, lactate-to-pyruvate ratio, or near-infrared spectroscopy (NIRS)

OR

- Presumed end-stage cardiac or lung failure without “exit” plan (ie, declined for assist device and/or transplantation)

RELATED GUIDELINES:

[Ventricular Assist Devices and Total Artificial Hearts, 02-33000-25](#)

OTHER:

None applicable.

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COMMITTEE APPROVAL:

This Medical Coverage Guideline (MCG) was approved by the Florida Blue Medical Policy and Coverage Committee on 12/08/23.

GUIDELINE UPDATE INFORMATION:

06/15/17	New Medical Coverage Guideline.
06/15/18	Scheduled review. Added criteria for cardiogenic shock and guideline for respiratory failure reversibility. Updated references.
06/15/19	Scheduled review. Revised description, maintained position statement and updated references.
06/15/20	Scheduled review. Revised description. Maintained position statement and updated references.
07/15/21	Scheduled review. Added Berlin Definition of Acute Respiratory Distress Syndrome table. Updated references.
11/15/22	Scheduled review. Maintained position statement and updated references.

05/25/23	Update to Program Exceptions section.
01/01/24	Position statements maintained.