

## Evidence Based Guideline

# ECMO Extracorporeal Membrane Oxygenation

**File Name:** ecmo\_extracorporeal\_membrane\_oxygenation  
**Guideline Number:** EBG.MED1110  
**Origination:** 10/1988  
**Last Review:** 3/2006

**Active guideline, no longer scheduled for routine literature review.**

### Description of Procedure or Service

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Extracorporeal Membrane Oxygenation (ECMO) can be considered an extension of [cardiopulmonary bypass](#). It is used to keep a patient alive while their lungs are healing. Blood that is lacking in oxygen is removed using a catheter placed in the patient's vein. It is oxygenated, warmed, and returned to the patient's body using the same [venous](#) access. This procedure is considered a rescue therapy for patients with acute, reversible respiratory failure that does not respond to conventional therapy. It is used when a patient's lungs are so damaged by disease or trauma, that the patient would die if it were not used. The patient is placed on a ventilator with settings just high enough to prevent the lungs from collapsing. This allows the lungs to heal. As the lung function improves, the use of ECMO is decreased to allow more blood to flow through the lungs.

### Evidence Based Guideline for ECMO

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The efficacy of ECMO in providing cardiorespiratory support in postneonatal children is proven. The survival in this group of patients is reasonably well known from the worldwide Extracorporeal Life Support Organization (ELSO) database. While the evidence relating to neonates cannot be generalized to adults, who have more heterogeneous indications for the procedure, ECMO has become a more or less accepted standard in the algorithm of advanced acute respiratory distress syndrome therapy in adult patients when all other treatment options have failed.

ECMO may be appropriate when used to treat respiratory or cardiac failure that is unresponsive to all other measures, but is considered to have a reversible cause. ECMO may be appropriate in the following clinical situations:

1. [Hypoxemic](#) respiratory failure
  - a. failure of mechanical ventilation (including pressure control/inverse ratio ventilation)
  - b. diffusely abnormal chest X.-ray;
  - c. transpulmonary shunt greater than 30% when FiO<sub>2</sub> is greater than or equal to 60;
  - d. total static lung compliance is less than 0/5 ml/cmH<sub>2</sub>O/kg. OR less than 30 ml/cm H<sub>2</sub>O at tidal volume of 10 ml/kg
  - e. lack of PEEP recruitment response (over PEEP 5-15 cm H<sub>2</sub>O)
2. [Hypercarbic](#) respiratory failure
  - a. uncorrectable hypercarbia, with pH less than 7 and PIP greater than 45

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- b. PaCO<sub>2</sub> greater than 45 despite minute ventilation greater than 200 cc/kg/min
3. After heart surgery to assist the transition from cardiopulmonary bypass to ventilation

### Medical Evidence regarding ECMO indicates it is not recommended in the following situations:

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ECMO is not recommended when it is contraindicated.

#### 1. Absolute contraindications to the use of ECMO include:

- a. contraindication to systemic [anticoagulation](#)
- b. terminal disease with expectation of short survival
- c. underlying moderate to severe chronic lung disease
- d. advanced multiple organ failure (MOD) syndrome
- e. unresponsive septic shock
- f. uncontrolled metabolic acidosis
- g. Central Nervous System injury

#### 2. Relative contraindications to the use of ECMO include:

- a. mechanical ventilation greater than 7 days
- b. myocardial dysfunction (Cardiac Index less than 3.5) on inotropes
- c. severe pulmonary hypertension (mean PA pressure greater than 45 or 75% of systolic B/P)
- d. [cardiac arrest](#)**
- e. age over 65

### Benefits Application

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Please refer to certificate for availability of benefit. This guideline relates only to the services or supplies described herein. Benefits may vary according to benefit design; therefore certificate language should be reviewed before applying the terms of the policy.

### Billing/Coding/Physician Documentation Information

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This policy may apply to the following codes. Inclusion of a code in this section does not guarantee that it will be reimbursed. For further information on reimbursement guidelines, please see Administrative Policies on the Blue Cross Blue Shield of North Carolina web site at [www.bcbsnc.com](http://www.bcbsnc.com). They are listed in the Category Search on the Medical Policy search page.

*Applicable codes: 36822, 33960, 33961*

### Medical Term Definitions

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#### Anticoagulation

suppression of clotting of the blood.

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### Cardiac arrest

the heart suddenly stops beating.

### Cardiopulmonary bypass

a process of placing a patient onto a machine that circulates and oxygenates the blood outside of the body. The machine takes blood from the body, oxygenates it and then returns it to the body. The goal is to enable the surgeon time to perform heart surgery on a temporarily non-functioning heart

### Hypercarbic

excess of carbon dioxide in the blood.

### Hypoxemia

deficiency of oxygen in the blood.

### Immunosuppression

a slowing down of the immune system and the body's ability to make antibodies.

### Venous

pertains to the veins in the body.

## Scientific Background and Reference Sources

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BCBSA Medical Policy Reference Manual

Medical Director 10/88

11/93 ECRI Executive Briefing

Bartlett RH, Wvifschemberger JB. Extracorporeal Membrane Oxygenation (ECMO) in Critical Care Text-book. 1995

Stoll C, Haller M. Health related quality of life. Long term survival in patients with ARDS following extracorporeal membrane oxygenation (EMCO). *anaesthesist*. 1998; 47(1);24-9.

Peek GJ, White S. Severe acute respiratory distress syndrome secondary to acute pancreatitis successfully treated with extracorporeal membrane oxygenation in three patients. *Ann Surg*. 1998;227(4):572-4

Medical Policy Advisory Group 8/99

Specialty Matched Consultant Advisory Panel - 8/2000

Medical Policy Advisory Group - 10/2000

ECRI Target Fact Sheet Extracorporeal membrane oxygenation (ECMO) for adult respiratory failure. Report #19, 7/1999.

Specialty Matched Consultant Advisory Group - 9/2002

Wolfson PJ. (December 2003). The development and use of extracorporeal membrane oxygenation in neonates. *Ann Thorac Surg*, 76(6), S2224-9. Retrieved on April 12, 2004 from [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=14667691](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14667691).

Morris MC, Ittenbach RF, Godinez FI, Portnoy JD, Tabbutt S, Hanna BD, Hoffman TM, Gaynor JW, Connelly JT, Helaer MA, SPray TL, Wernovsky G. (April 2004). Risk factors for mortality in 137 pediatric cardiac intensive care unit patients managed with extracorporeal membrane oxygenation. *Crit Care Med*, 32(4), 1061-1069. Retrieved on April 12, 2004 from [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=15071402](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15071402).

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Specialty Matched Consultant Advisory Group - 06/2004

National Institute for Clinical Excellence (NICE) Interventional Procedure Guidance #38. (2004, January) Extracorporeal membrane oxygenation (ECMO) in postneonatal children. Retrieved December 9, 2005 from <http://www.nice.org.uk/pdf/ip/IPG038guidance.pdf>

National Institute for Clinical Excellence (NICE) Interventional Procedure Guidance #39. (2004, January) Extracorporeal membrane oxygenation (ECMO) in adults. Retrieved December 9, 2005 from <http://www.nice.org.uk/pdf/ip/IPG039guidance.pdf>

### Policy Implementation/Update Information

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- 10/88 Original policy issued
- 4/93 Reviewed
- 12/96 Revised: Combined National and Local policies. No other changes.
- 5/99 Revised based on new clinical guidelines from the Bartlett and Vwifschemberger textbook.
- 8/99 Medical Policy Advisory Group - Specific respiratory distress criteria added.
- 9/99 Reformatted, Medical Term Definitions added.
- 8/00 Specialty Matched Consultant Advisory Panel Review.
- 9/00 System coding changes.
- 10/00 Medical Policy Advisory Group review. No changes to criteria. Approve.
- 9/02 Specialty Matched Consultant Advisory Group review. Revised age of relative contraindication to 65.
- 3/04 Benefits Application and Billing/Coding sections updated for consistency.
- 7/29/04 Specialty Matched Consultant Advisory Group review 06/08/2004 with no changes made to policy criteria. References added. Code descriptions for applicable codes removed.
- 3/16/06 Specialty Matched Consultant Advisory Panel review 2/27/06. Clarified wording in "When ECMO is covered" section to indicate ECMO may be medically necessary when used to treat respiratory or cardiac failure that is unresponsive to all other measures, but is considered to have a reversible cause. Added statement to indicate ECMO may be medically necessary "after heart surgery to assist the transition from cardiopulmonary bypass to ventilation." Deleted "severe immunosuppression" from list of absolute contraindications in "When EMCO is not covered" section. Added policy number to Key Words. Updated references. Policy status changed to: "Active policy, no longer scheduled for routine literature review."
- 9/18/06 Medical Policy changed to Evidence Based Guideline. (adn)

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Medical policy is not an authorization, certification, explanation of benefits or a contract. Benefits and eligibility are determined before medical guidelines and payment guidelines are applied. Benefits are determined by the group contract and subscriber certificate that is in effect at the time services are rendered. This document is solely provided for informational purposes only and is based on research of current medical literature and review of common medical practices in the treatment and diagnosis of disease. Medical practices and knowledge are constantly changing and BCBSNC reserves the right to review and revise its medical policies periodically.