

# Extracorporeal Life Support

## What is ECLS?

Extracorporeal Life Support (ECLS) refers to a type of life support that involves using a machine outside the body to replace the work of the heart and/or lungs. Extracorporeal means 'outside the body' and when a patient is on ECLS, their blood is removed and then returned into their body. ECLS is used when the heart and/or lungs are failing, despite all other treatments. This type of life support allows the injured organ(s) the opportunity to rest and recover.

## Why ECLS?

ECLS is used on infants and children with severe, but reversible heart or lung disorders that have not responded to the usual treatments of extra oxygen, intravenous medications and mechanical ventilation (ventilator).

Patients who need ECLS usually have one of the following problems:

- heart failure
- severe pulmonary hypertension (high blood pressure in the lungs)
- pneumonia
- breathing failure from trauma or severe infections.

ECLS alone will not cure these conditions, but (along with other aspects of medical management) can provide support and allow time for the heart and/ or lungs to recover while maintaining the function of other organ systems.

We offer two types of ECLS: Extracorporeal Membrane Oxygenation (ECMO) and Ventricular Assist Device (VAD).

## ECMO

The ECMO machine is similar to the heart-lung bypass machine used during heart surgery. The machine functions as a heart (pump) and lungs (oxygenator). The pump moves the blood while the oxygenator adds oxygen to and removes carbon dioxide from the blood.

## What is the goal of ECMO?

The goal of ECMO is to ensure the body receives enough oxygen and blood flow while the heart and/or lungs are impaired. It does not heal the heart or lungs but gives them time to rest and recover. ECMO is used only when other less invasive methods have been tried and the patient's condition has not improved. Medications and ventilator support can often be reduced during ECMO. When the heart and/or lungs have healed and can work on their own, ECMO can be gradually withdrawn under controlled circumstances.

## Is ECMO a new procedure?

ECMO was first used in 1971. In the years since, more than 50,000 people worldwide have received ECMO therapy. Our ECLS program commenced in May 2008.

## How ECMO works

ECMO functions as a partial substitute for the heart and lungs by gently removing blood from the body via a cannula in a large vein in the neck/groin or the heart itself. This blood is dark because it contains very little oxygen.

The pump pushes the blood through an artificial lung (oxygenator) which adds oxygen and removes carbon dioxide. This artificial lung also warms the blood before it is returned to the patient. This blood is bright red as it contains oxygen.

As your family member improves, we will decrease the level of ECMO support to allow their own heart and/or lungs to take over some of the work.

## Types of ECMO

There are two types of ECMO:

- **VA (veno-arterial)**—cannulas are placed into a vein and an artery. The ECMO circuit partially substitutes for the function of both heart and lungs.
- **VV (veno-venous)**—cannula(s) are placed into one or two veins. The ECMO circuit partially substitutes for the function of the lungs only.

## Ventricular Assist Device

Ventricular Assist Device (VAD) is used to partially or completely replace the function of a failing heart. It can assist either the right ventricle (RVAD), the left ventricle (LVAD), or both ventricles at once (BiVAD). The type that is used depends on the cause of the heart failure, however, LVAD is the most commonly used method.

VAD uses a similar setup to ECMO except that it does not contain an oxygenator in the system. In VAD, the blood is oxygenated by the patient's own lungs. As there is no mechanism within the circuit to warm the blood, your family member's temperature is unable to be regulated through the circuit. In this case we use other measures such as overhead heaters to maintain body temperature.

## What happens on ECLS?

All ECLS patients have a daily routine; this includes a chest x-ray each morning, regular blood tests from the arterial line and constant monitoring of vital signs. Babies will also have a cranial (head) ultrasound. Patients are allowed to rest as much as possible while they are on ECLS.

## Medications

- Pain relief medications are given by a constant infusion to prevent any discomfort.
- The majority of patients require medicine to keep them asleep.

- This decreases the amount of oxygen used by the muscles and ensures that they do not move too much and dislodge the cannula.
- Heparin is given continuously whilst the patient is on ECLS as it prevents the blood from clotting.
- Sometimes a patient requires additional medications to support other organs such as the kidneys.

## What about nutrition?

While on ECLS, your family member will receive nutrition either directly into their stomach through a feeding tube, or directly into their blood stream through an intravenous infusion.

## Can mothers still breastfeed babies on ECLS?

Your child will not be able to breastfeed while on ECLS. However, we are able to feed them your expressed breast milk (EBM) through a feeding tube into their stomach. This is why it is important for you to continue to express and freeze your milk.

### The ECLS team

**Cardiologist:** Doctors specially trained in treating disorders of the heart.

**Cardiovascular surgeon:** Doctor responsible for inserting the cannulae into the veins and/or artery. They will continue to be a part of the team whilst on ECLS.

**Consultant intensivist:** Primary doctor in charge of the patient's care.

**ECLS specialists:** Specially trained PICU nurses who do the minute-to-minute monitoring of ECLS patients and the management of ECLS equipment. Your loved one will have an ECLS specialist at his or her bedside at all times.

**Perfusionist:** Cardiovascular perfusionists are responsible for many types of extracorporeal support, the most common being the bypass machine used during heart surgery. They advise and support the ECLS specialists.

**PICU nurses:** Registered nurses in the PICU who manage the bedside care around-the-clock and help with your involvement in caring for your loved one.

**Registrars and fellows:** Doctors who are obtaining specialty training in PICU. They carry out much of the around-the-clock bedside medical care, under the supervision of the consultant intensivist.

**Social worker/pastoral care worker:** Social workers and pastoral care workers can help you with accommodation, financial concerns (insurance, parking, or meals), emotional issues such as coping with a life-threatening illness, or spiritual concerns.

## ECLS terms

**Arterial blood gas (ABG):** a small amount of blood taken from an artery and tested to determine the amount of oxygen and carbon dioxide (often referred to as “a gas”).

**Blood flow:** the amount of blood that moves through the circuit per minute.

**Cannula:** a plastic tube that the surgeon places into a blood vessel. These tubes carry the blood from the patient to the ECLS circuit and return it to the patient.

**Chest drain:** a tube placed into the chest cavity to drain air and/or fluid.

**Decannulate:** to remove a cannula from the blood vessel.

**Echo:** echocardiogram, an ultrasound to look at the heart to see how well it is functioning and assess structural features.

**Heparin:** a drug used to prevent blood clotting.

**Oxygenator:** an artificial lung that adds oxygen and removes carbon dioxide.

**Platelets:** blood cells that contribute to clotting and help prevent bleeding.

**Pump:** the artificial heart of the circuit, which generates blood flow.

**Trial off ECLS:** a test period off ECLS. The ventilator settings are increased and other medication may be commenced while the ECLS support is stopped for a period of time. This will show us how the patient’s heart and/or lungs are healing. The method used varies for different types of ECLS.

**Weaning:** the process of decreasing the level of ECLS support as the heart and/or lungs improve.

## What happens after ECLS?

Each patient is different and their specific disease dictates how long they will need to recover. After ECLS, patients will still need ventilator support. It may take a few days or weeks before a patient is ready to come off the ventilator. Again, each patient will respond differently in this area. The intensivist will discuss this with you.

## Follow-up care

Your child may require follow-up visits due to the illness that led to their need for ECLS. Your child's doctor will speak to you about any follow-up care required before you leave hospital. They will be able to answer your questions about this process.

## Contact us

**Paediatric Intensive Care Unit**  
Level 4, Lady Cilento Children’s Hospital  
501 Stanley Street, South Brisbane  
t 07 3068 1400 | 07 3068 1111 (general enquiries)

**In an emergency, always contact 000 for immediate assistance.**

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