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Title or Role: _____

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Questions?

Your questions are important. Talk with your doctor or healthcare provider if you have questions or concerns.

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A Family Guide to ECLS

Extracorporeal life support

UW Medicine is committed to improving health by providing the best patient and family centered care in an environment of education and innovation.

In the Intensive Care Unit (ICU), our highly trained staff use advanced research, treatments, and technology to provide each patient with excellent care and to improve outcomes.

Our Extracorporeal Life Support (ECLS) team has created this booklet to help you understand ECLS. It explains what ECLS is, how it works, and some risks and benefits.



At UW Medicine, we are committed to providing the best patient and family centered care.

Introduction

We hope that the information in this booklet will make talks with your loved one's healthcare team more meaningful. Please ask questions and share your concerns at any time.

Who needs ECLS?

Extracorporeal life support (ECLS) is used for patients with life-threatening *respiratory (lung) or cardiac (heart)* failure that may be able to be reversed. Another name for ECLS is *extracorporeal membrane oxygenation (ECMO)*.

ECLS is used **only** when:

- The patient's lung and/or heart condition have not improved with other treatments.
- There is still a chance that the patient can recover.

Your healthcare team will tell you why your loved one needs ECLS.

What is ECLS?

ECLS, also known as ECMO or *extracorporeal membrane oxygenation*, is a short-term form of life support treatment. When someone is placed on ECLS, a special machine does the work of their heart and/or lungs.

The goal of ECLS is to give these organs time to rest and hopefully improve while doctors treat the illness that is causing them to fail. ECLS is similar to the heart-lung bypass used during surgery, but the ECLS system can be used for days instead of just hours.



Journal

Date _____

Events of the day, feelings and emotions, questions to ask the doctor or nurse.



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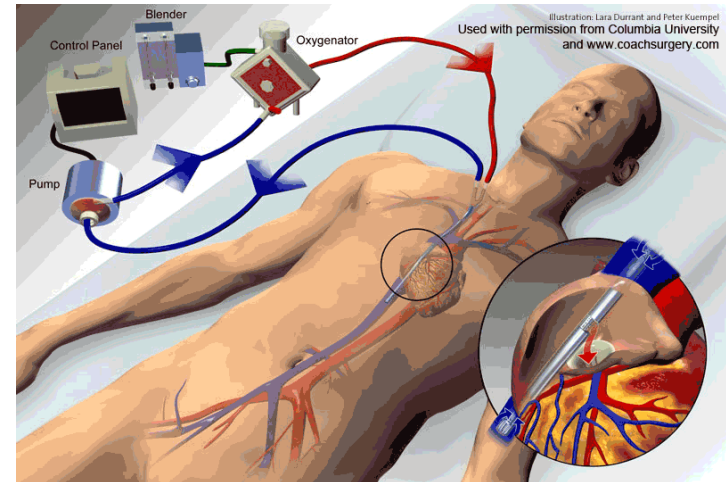
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How does ECLS work?

ECLS supports the heart and/or lungs by continuously pumping some of the patient’s blood out of their body to an *oxygenator* (artificial lung). Here is how the ECLS works:

- Blood leaves the patient’s body through a large tube called a *cannula*.
- The cannula carries the blood to a pump, which pushes the blood through the oxygenator.
- The oxygenator puts oxygen into the blood and removes *carbon dioxide* (a waste product the body makes).
- A heat exchanger warms the blood back up to body temperature.
- The blood returns to the body through a cannula.

The pump speed and the level of oxygen are adjusted based on the patient’s needs.



Placement of a cannula for veno-venous ECLS.

What are the different types of ECLS?

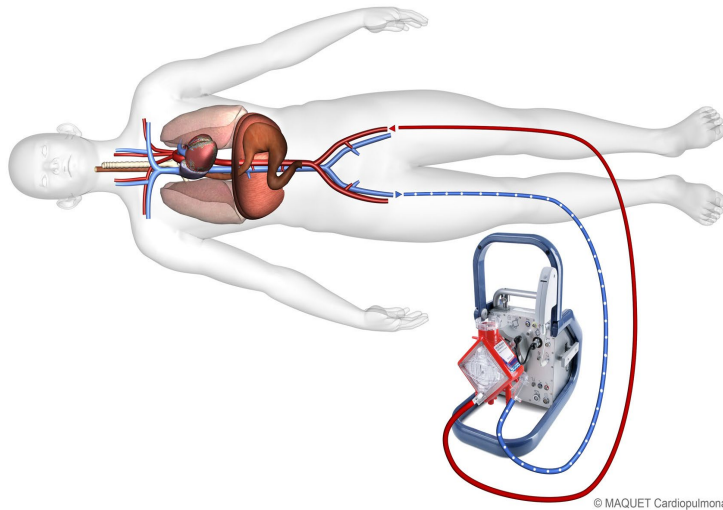
There are 2 different reasons to use ECLS:

- For cardiac (heart) support
- For respiratory (lung) support

ECLS can be used for patients who need both heart and lung support (*veno-arterial ECLS*), or for those who need only lung support (*veno-venous ECLS*).

Veno-arterial ECLS

Veno-arterial (VA) ECLS supports both the heart and the lungs. For VA ECLS, two cannulas are used: one is placed in a large vein and one is placed in a large artery. Blood is drained from the vein through the cannula. It is enriched with oxygen and then pumped back to the body through the cannula in the artery.



In VA ECLS, one cannula is placed in a large vein, and another cannula is placed in an artery.



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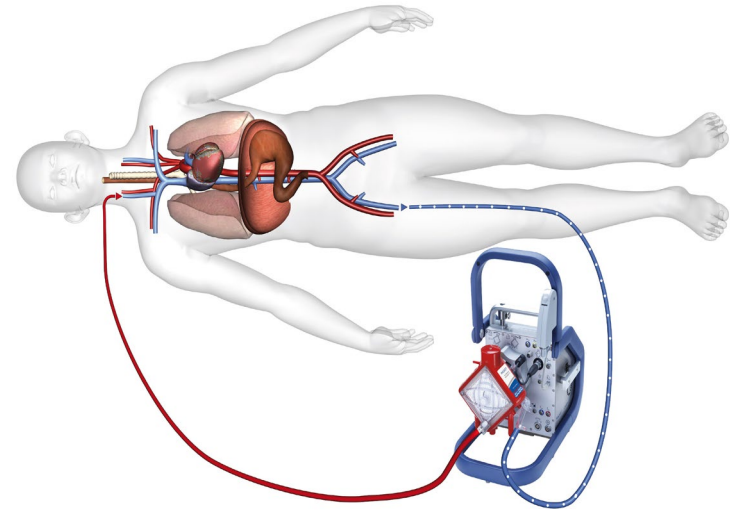
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Veno-venous ECLS

Veno-venous (VV) ECLS is used for lung support only. For veno-venous ECLS, one or two cannulas are placed in large veins. Blood is drained from the vein, enriched with oxygen, and pumped back to the vein.



In VV ECLS, one or two cannulas are placed in large veins.

Note: In the drawings on pages 4 and 5:

- **Solid lines** show blood that is rich in oxygen (*oxygenated blood*).
- **Dashed lines** show blood that needs oxygen (*un-oxygenated blood*).

What Are the Risks of ECLS?

Anyone who needs ECLS is very sick and may die without this added support. But, there are risks and complications with ECLS. Your doctor will talk with you about all the risks, such as:

Bleeding or Hemorrhage

Your loved one will receive blood-thinning medicines to keep blood clots from forming in the ECLS tubes. This means that bleeding can happen more easily. Some bleeding is normal for ECLS patients. We will watch closely for signs of bleeding and will take steps to slow any bleeding that happens.

Infection (*Sepsis*)

When anything is inserted into the body, there is a risk of infection. Your loved one may receive antibiotics to treat infection if one occurs and/or when the cannulas are inserted. We will watch closely for any signs of infection.

Blood Clots (*Thrombus*)

Blood clots or air bubbles can form in the ECLS tubes and travel to the bloodstream. These can be fatal if they reach the heart, lungs, or brain. We will take every step possible to prevent this from happening.

Equipment Malfunction

ECLS pump failure is rare, but any machine can stop working. If this happens, we will keep your loved one as stable as possible until ECLS can be restarted. We will restart ECLS as soon as we can. A back-up ECLS system is available at all times.



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How is ECLS therapy started?

Your loved one will have a procedure done to insert the ECLS cannulas. This is called *cannulation*. This procedure may be done at the bedside or in the operating room by a surgeon.

Before cannulation, your loved one will receive:

- Pain relief medicine
- *Sedatives* or *sedation* to make them sleepy

Your loved one will need to stay very still during cannulation. Because of this, we may also give them medicine that relaxes all of their muscles and causes *paralysis* (inability to move) for a short time.

Once your loved one is asleep, the areas where the cannulas will be inserted are numbed with a medicine called Lidocaine. The cannulas are then inserted in the neck or groin area (or both).

The cannulas are moved through the blood vessels and placed close to the heart. An X-ray or ultrasound will be done to check their position. The cannulas are then connected to the ECLS circuit.

Even though ECLS takes over the work of the lungs, your loved one may still be on a *ventilator* (breathing machine) to help clear *secretions* (mucus) from their lungs and keep their lungs inflated.

Is ECLS painful?

Once the cannulas are in place, ECLS is not painful. Your loved one will receive pain relief medicine and sedation. This will help prevent discomfort from lying in bed. It will also keep them from getting too restless or pulling on the tubes.

How will my loved one be cared for while on ECLS?

Bedside Care by the ECLS Team

- Your loved one’s ECLS care will be supervised by **our ICU doctors and surgeons** who are trained in ECLS therapy and high-level ICU care.
- An **ECLS specialist** will be at your loved one’s bedside to monitor the system. This is a nurse or respiratory therapist with special training in managing the ECLS pump. This person will care for the cannulas, monitor the pump and circuit, and help the ICU nurse care for your loved one.
- An **ICU nurse** with special training in ECLS will provide care. This nurse will check vital signs, give medicine, give your loved one blood and platelets, and work with the ECLS specialist.

Rounds

Each day, the healthcare team will come to your loved one’s bedside to talk about their progress. These sessions are called “rounds.” We invite you to be present for rounds, to hear how your loved one is doing, to ask questions, and to learn about the plan of care.



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Other ECLS Care Information

There are some unique things about your loved one's care while on ECLS:

- Your loved one may receive liquid nutrition and fluids (*hydration*) through a feeding tube or an *intravenous* (IV) line. This will provide the nutrition your loved one needs for energy and healing.
 - A **feeding tube** goes through the nose or mouth into the stomach. With this tube, small amounts of food are always entering the stomach.
 - **IV nutrition**, also called *total parenteral nutrition* (TPN), goes directly into the vein and bypasses the stomach.
- Your loved one will receive an anti-clotting medicine (either *heparin* or *bivalirudin*) to keep their blood from clotting in the ECLS tubing. We will do an *anti Xa* (*anti 'ten-ay'*) or *prothrombin time* (PTT) blood test often. These tests make sure your loved one is getting the right amount of anti-clotting medicine.
- Your loved one may have bleeding. Because of this, blood and *platelets* will be given when needed. Platelets are the cells in our blood that help stop bleeding. Platelets may be damaged by the ECLS pump and may need replacing.
- Chest X-rays and *echocardiograms* (heart ultrasounds) will also be done to see how well your loved one's heart is pumping and to make sure the cannulas are still in the right position.

- Your loved one may have *restraints* placed on their wrists to keep them from accidentally pulling on their cannulas.

How long will my loved one be on ECLS?

How long your loved one is on ECLS depends on how quickly their heart and/or lungs recover. Most patients stay on ECLS for about 1 to 4 weeks.

Every day, we will watch for signs that will help us decide the best time to try to *wean* your loved one off ECLS. Please talk with the healthcare team every day so you have the most current information.

What can I do for my loved one?

We encourage you to be involved, be present at rounds and the nursing shift report, ask questions, and tell us your concerns.

To help make your loved one's ICU room feel less like a hospital room, we invite family members to:

- Ask for and fill out a "Get to Know Me" poster.
- Ask for the best places to hang photos, cards, and other items.

While your loved one is on ECLS, you can:

- Hold your loved one's hand.
- Talk and read greeting cards aloud.
- Write in the journal section of this booklet.

Your loved one may not remember much of what happens during this time period – but they can hear you, and will have questions when they wake up. Please ask questions for them.



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Where can I learn more?

If you have any questions or would like to learn more about ECLS, your loved one's condition, or support services you can access, please ask a member of the healthcare team.

When can I visit my loved one?

Important: If you or any family member is feeling sick or has a cold, the flu, or COVID-19, please do NOT visit the ICU.

We encourage family members and friends to visit your loved one while they are in the ICU. Please note that the ICU has Quiet Hours from 2 to 4 p.m. and from 10 p.m. to 6 a.m. During these hours, we ask that friends and family help us provide a peaceful environment for rest and healing.

Here are some things family members and other visitors can do to help reduce noise levels in the ICU:

- Turn phones and other electronic devices to vibrate, silent, or OFF.
- Try to have only 1 or 2 visitors at a time.
- Talk quietly in the hallways.
- Tell the care team if you hear a lot of noise anywhere in the ICU.

Family and friends will be asked to leave the bedside and wait in the waiting room for short periods when it is time for complex procedures, patient personal care, or to allow your loved one to rest. If cannulation is done in an ICU room, having only staff who are doing the procedure in the room will help keep the room as germ-free as possible.

While Visiting Your Loved One

Only 2 visitors may be in the room at the same time. This leaves room for the equipment and allows staff to properly care for your loved one. Family and friends may enter the patient room when the curtain is open. If the curtain is closed, please check with a staff member before entering.

Children are welcome on the unit, but it is best to prepare them for what they may see and hear before the visit. Parents know their children best, and they know if seeing their loved one in the ICU is something that they can handle. We require that children be supervised by an adult at all times.

If you have questions about being with your loved one or having other people visit your loved one, please check with your nurse or the charge nurse.

You may also call the unit for updates when you cannot visit. Please ask your nurse for a card with the unit phone number.

Family Resources

We will do our best to make you feel as comfortable as possible during your loved one's hospital stay. Please understand that your loved one's medical care is our first priority. Sometimes we may not be able to respond to questions right away, but will answer your questions when your loved one is stable.

Spiritual Care, Palliative Care, and Social Work staff are here to support families, and the ICU team is always happy to do what we can to support you. Please ask your nurse or ECLS specialist if you would like to speak to someone from one of these teams.



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- **Cardiothoracic Surgical Attending:** A surgeon trained in managing heart and lung problems with surgery. Most times, this doctor is in charge of starting ECLS therapy.
- **Charge Nurse:** An experienced ICU nurse who oversees the unit during a given shift
- **Clinical Nurse Specialist (CNS):** A nurse with advanced schooling who ensures quality of patient care through teaching at the bedside
- **ECLS/ECMO Coordinators:** A team of experienced ECLS specialists who manage the hospital's ECLS program and provide support to specialists and ECLS patients and families.
- **ECLS Specialist:** A nurse or respiratory therapist with special, intensive training in managing the ECLS circuit, cannulas, and pump.
- **ICU Attending:** A doctor (surgeon, anesthesiologist, or emergency room physician) with training in intensive care and ECLS therapy. This doctor oversees the care of ICU patients.
- **ICU ECLS Registered Nurse (RN):** An ICU nurse with special training in ECLS.
- **Nurse Manager, Assistant Nurse Manager, and RN3:** A team of nurses that oversees management of the ICU. This team makes sure your loved one is receiving the best possible care.
- **Occupational Therapist:** A provider who helps the patient do activities of daily life when there are physical limitations.



Journal

Help Us Serve You

Consider writing down answers to these questions and sharing some of your answers to help us serve you better:

- How do you see your loved one's situation?
- What are you hoping for during this uncertain time?
- What are you most concerned about?
- What are your strengths that are getting you through this?
- Have you ever had a friend or family member who faced a serious illness before this?
If yes, what went well and what would you never want to go through again?
- What is most important to your loved one?
- What is most important to you?
- What is your understanding of your situation?
- What questions do you have?
- Is there anything that would help us take better care of you or your loved one?

Pump: A device that moves the blood through the ECLS circuit and returns it to the patient.

Pump flow: The amount of blood being pumped through the ECLS circuit.

Reperfusion cannula: Acatheter (thin tube) that is placed into a major artery to supply blood to the lower leg.

Sepsis: An infection that spreads through the bloodstream and causes low blood pressure.

Shock: A condition that can lead to low blood pressure. Many things can cause shock.

Thrombus: A blood clot that forms in the bloodstream and may block blood flow in parts of the body.

Total parenteral nutrition (TPN): Nutrition given by IV when tube feeding is not an option.

Vein: Blood vessel that usually carries the less-oxygenated blood back to the heart from the body.

Ventilator: A breathing machine that delivers oxygen to the lungs through a tube in the windpipe.

Weaning: The process of slowly doing less treatment as the patient's health improves. This may include relying on the ECLS less, using the ventilator less, and/or using fewer medicines.

- **Palliative Care Team:** A team of specialists who will work with you and your loved one's healthcare team to make treatment choices that are right for you, your loved one, and your family.
- **Patient Care Technician (PCT) or Hospital Assistant (HA):** A certified nurse assistant who is trained to help the nurse.
- **Perfusionist:** A specialist trained in using and managing all parts of the ECLS machine and the heart-lung bypass machine during surgery.
- **Physical Therapist:** A provider who can examine, evaluate, and treat physical problems with special exercises, heat or cold, and other treatments.
- **Respiratory Therapist:** A specialist trained in care of the lungs and managing a *ventilator* (breathing machine).
- **Social Worker:** A support person who will help your family cope through counseling and connecting you with in-hospital and out-of-hospital resources.
- **Surgical Resident:** A doctor who is completing specialty training in surgery and critical care.

Medical Terms

You may hear many of these words and phrases while you are in the hospital. Please ask about any that you do not understand.

Anti Xa (anti 'ten-ay'): A test that measures how long it takes for the blood to form a clot. This is similar to a *prothrombin time* test (see page 17).

Arterial blood gas (ABG): A blood test that uses a small amount of blood from an artery to check how much oxygen and carbon dioxide are in the blood.

Artery: A blood vessel that circulates oxygen-filled blood away from the heart to the rest of the body.

Cannula: The part of the ECLS circuit that sits inside the body. It drains blood out of the body or returns blood to the patient.

Cannulate: To insert a large tube into a part of the body, such as a vein or artery.

Chest tube: A tube that is placed in the space between the lungs and chest wall to remove air or fluid from the chest cavity.

Circuit: The tubing with blood in it that comes out of the patient, goes through the ECLS pump, and then returns the blood to the patient.

Clot: A thickening or buildup of blood that can block the flow of blood through blood vessels or the ECLS circuit. (Not all clots cause problems. They are treated based on where they form.)

Decannulate: To remove the cannula.

Electroencephalogram (EEG): A test that records the electrical activity of the brain.

Embolus: An air bubble or blood clot that travels through the bloodstream and may block blood flow to vital areas of the body.

Endotracheal (ET) tube: A tube that is placed in the *trachea* (windpipe). It is connected to a ventilator to help with breathing.

Hematoma: Internal bleeding that seeps into soft tissue under the skin. It causes bumps and bruising.

Hemodialysis (HD): A process that takes over the job of the kidneys by filtering certain waste products out of the blood.

Hemorrhage: Loss of a lot of blood. There are many causes. The most common cause is surgery.

Heparin: A drug used to prevent blood clots.

Keofeed: A feeding tube that goes through the nose and into the small intestine for nutrition.

Lung protective ventilation (LPV): A setting on the ventilator that is used while the ECLS pump is doing the work of the lungs.

Mean arterial pressure (MAP): The average blood pressure measured in the arteries.

Nasogastric (NG) tube: A feeding tube that goes through the nose and into the stomach.

Neuromuscular blockade (NMB): Medicine that relaxes muscles of the body for a short time; used during procedures to keep patients from moving.

Orogastric (OG) tube: A feeding tube that goes through the mouth and into the stomach.

Oxygenator: The “artificial lung” of the ECLS circuit that adds oxygen and removes carbon dioxide from the blood.

Platelets: Cells in the blood that help stop bleeding.

Prothrombin time (PTT): A test that measures how long it takes for the blood to form a clot. This is similar to an *anti Xa* test (see page 15).