

ECMO

Extracorporeal Membrane Oxygenation



THE OHIO STATE UNIVERSITY

WEXNER MEDICAL CENTER

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ECMO

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Talk to your doctor or health care team if you have any questions about your care.

For more health information, contact the Library for Health Information at **614-293-3707** or e-mail **health-info@osu.edu**.

ECMO

Extracorporeal Membrane Oxygenation

ECMO is a **life support treatment** for people with severe respiratory (lung) failure or heart failure **that does not respond to usual treatments**. The person's blood is brought out of their body through a very large tube. The blood is cycled through the ECMO machine to remove waste and to add oxygen, and then the blood goes back into the body through another large tube. This treatment is also called extracorporeal life support (ECLS). Extracorporeal means outside the body.

Because patients are very sick before receiving ECMO and often have problems from the treatment, death may still occur.

How ECMO works

ECMO is like a heart and lung bypass machine used in open heart surgery. It is used in intensive care areas for days to months of treatment.

The ECMO machine gives the patient's failing heart or lungs a chance to rest and recover.

The ECMO circuit is made up of tubing, a pump, an oxygenator, and a heater.

The **pump** works like a heart and pumps blood with little oxygen out of the body through a **very large tube, called a cannula**.

The **oxygenator works like the lungs**, taking carbon dioxide out of the blood and adding oxygen to the blood.

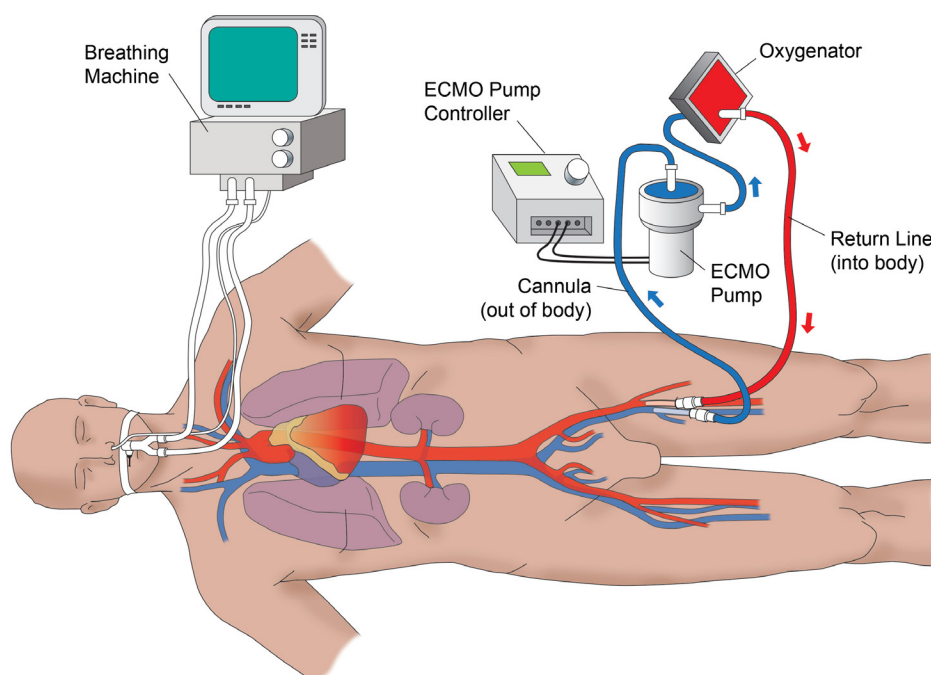
The oxygen-rich blood is pushed through the **heater** to warm the blood to body temperature.

The warmed blood is pumped back into the body through another tube, called a **cannula or return line**.

The cannulas are tubes that are about the size of a garden hose.

- Cannulas may be placed in the neck, chest, or the top of the leg, called the groin.
- The cannulas may need to be moved to other positions in some cases.

There are risks or problems that can occur from the treatment and because the person is so very sick.



Types of ECMO

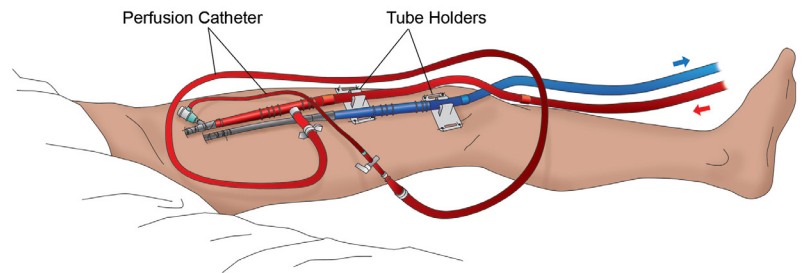
ECMO can support a person's failing lungs, failing heart, or failing lungs and heart. The healthcare team will talk with you about the type of ECMO needed for your loved one's condition.

- ❑ **VV (veno-venous)** - provides support if the person's **lungs are not working**.
 - Used to treat severe respiratory failure from trauma, pneumonia, flu, or other infection, or while waiting for or after a lung transplant.
 - This treatment is often required for **weeks or months**. A long hospital stay should be expected.
- ❑ **VA (veno-arterial)** - provides life support if the person's **heart or lungs are not working**.
 - Used to treat severe heart failure, or while waiting for a heart transplant or device implant.
 - This treatment is often used for **days to weeks**.
 - The surgery incision may be open and covered with a dressing. This is done if there is swelling to prevent extra pressure in the chest. After the swelling decreases, the incision will be closed, either in surgery or in the room.
 - Sometimes after VA ECMO, patients need a temporary ventricular assist device (VAD), and then a permanent VAD or heart transplant.

Risks of treatment

Problems will occur during treatment. There is risk of problems such as:

- **Bleeding** is common and often due to blood thinner medicines needed to prevent blood clots while on ECMO.
- **Infection**.
- **Stroke** either due to bleeding in the brain or from clots.
- **Swelling of the face, arms, and legs**, called edema, because of fluids given for treatment.
- Poor blood flow to arms and legs which could lead to loss of limb. The picture below shows a closer look at the leg site. Anchors are attached to the skin to keep the tubes from being pulled. Another tube, called a perfusion catheter, is connected to the return line to allow more blood flow to the leg below the insertion sites. This is done to reduce the risk of blood flow problems in the leg.



- Irregular heart rhythms, called arrhythmias.
- Various body systems may fail, such as the liver, bowels, or kidneys.
- Other problems may occur.

ECMO Treatment

What to expect

It can be overwhelming to walk into a room to see your loved one on this treatment. He or she will be connected to many tubes and machines. Equipment surrounds the bed with beeping and alarms sounding. Care team members are in and out of the room checking the patient and the equipment. The nurse and others on the team will try to help you understand what is happening.

The patient

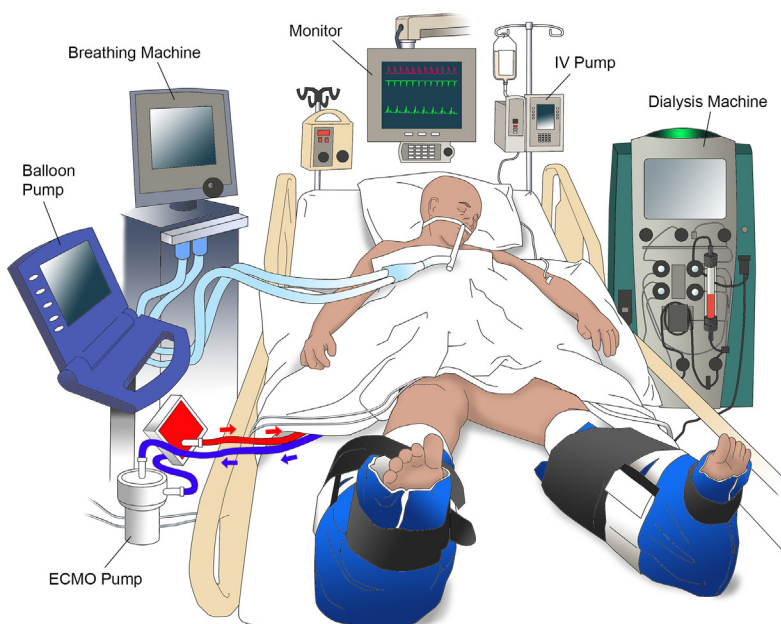
The person often will be sedated, so he or she may not respond to you or they may open their eyes or squeeze your hand. If there is a breathing tube and ventilator, they will not be able to talk to you. It is best to let him or her rest.

Swelling of the arms, face, and legs may change your loved one's appearance and may make it hard for you to recognize him or her at first.

Equipment in the room

The room will be filled with many pieces of equipment to care for the person on ECMO.

- Many **IV pumps** to give IV fluids and medicines and many IV lines.
- A **breathing machine**, also called a **ventilator** or **vent**, may be used with the ECMO machine to push air in and out of the lungs.
- A breathing tube is placed to help direct air in and out of the lungs. This may be an **endotracheal tube (ET)** placed in the mouth and into the trachea. Or it may be a **tracheostomy or trach tube**, placed in the person's neck.
- **Monitors** will be used to check heart rate and rhythm, blood pressure, oxygen levels, breathing rate, temperature, and other measurements.
- A **feeding tube** may be used for nutrition. Sometimes called an NG (nasogastric) or Dobhoff, this is a small tube placed through the nose or mouth and down into the stomach.
- A **Foley catheter** may be placed to drain urine from the bladder into a bag.
- If there are kidney problems, a **dialysis machine** may be added to the ECMO machine to remove toxins from the blood.
- A **balloon pump** may be used to help the heart pump blood through the body.
- There may be **chest tubes** to remove fluid. These tubes connect to drainage containers that sit on the floor of the room.
- A **temporary pacemaker** may be in place to help control the heart beat.
- The **bed** will have a special mattress and the bed may rotate to reduce the chance of bed sores or pressure sores.



Medicines

The patient will be on many medicines that may be given through the IV lines or through the breathing tube. Some of the medicines include:

- Blood thinners or anticoagulants given to reduce the chance of blood clots forming during treatment. These medicines may cause bleeding around the mouth, tubes, and under the skin. Blood transfusions may be needed.
- Medicines given for comfort and to help with rest and sleep. You may hear the term sedation or chemical paralysis to allow more oxygen for healing.
- Antibiotic medicines given to treat or prevent infections.
- Diuretic medicines to reduce fluid causing swelling.
- Other medicines may be given for other health problems, such as to keep the bowels working and to prevent blockages.

Other treatments and tests

- Blood tests to check many things such as:
 - Blood gases, the levels of oxygen, and carbon dioxide in the blood
 - Electrolytes and minerals to check levels of fluids and body functions
 - Blood counts, including hemoglobin and hematocrit
 - Platelet levels and clotting ability of the blood
- Blood and blood products to replace blood loss.
- CT scans to check the head and other body organs for problems.
- Tests may be done to check brain function, such as electroencephalograms (EEGs).
- Bronchoscopies may be done to check the lungs. A flexible tube with a camera and light is placed through the mouth and into the lungs.
- Echocardiograms, sometimes called an echo, uses sound waves to make pictures to check the valves and chambers inside the heart.

Care Team

You can expect that there will be changes to your loved one's care hour by hour, based on his or her response. The early hours and days of treatment will seem chaotic, but know that there is a skilled team that is closely watching your loved one.

Care may be discussed as looking better, worse, or about the same. There will be much information shared with you. Please ask if you do not understand what is being said. It can be a very stressful and emotional time.

There are notes pages in this book. We encourage you to take notes, so you can better remember what was shared. This is also a good place to have your questions written down, so you do not forget to ask them.

Rounding team

Your cardiac surgeon will coordinate care daily with the critical care doctor, or intensivist, who is on site around the clock.

Formal ICU rounds happen each day, often between 8:00 am and 11:00 am. However, informal rounding happens throughout the day, and will include surgeons, intensivists, consulting doctors, pharmacists, nurse practitioners, and bedside nurses. You may also see dietitians, respiratory therapists, social workers, and others from the care team. Family members are encouraged to be present to review the treatment plan and progress of the patient.

ICU care team

- **Registered nurse (RN)** plans and directs nursing care. Nurses provide care and teach you how to care for yourself.
- **Perfusionist** manages the ECMO machine.

- **Pharmacist** monitors and prepares medicines for the patient.
- **Respiratory therapy** helps with breathing problems and treatments. Takes care of oxygen equipment if needed.
- **Physical, speech or occupational therapists** help with movement, self-care, and speech or swallowing problems after illness.
- **Social worker** can help you with care after the hospital stay, coping, and finding resources to meet your needs.
- **Pastoral Care staff** helps with spiritual needs. They can assist persons with or without a religious belief.
- **Patient Experience** can help you with any concerns or questions that you may have during your visit.
- **Dietitian** will help to check that the patient is getting enough nutrition.

Many consulting doctors

It is common to have many doctors involved in the care of a patient on ECMO such as:

- Cardiologist or heart doctor
- Nephrologist or kidney doctor
- Transplant doctor
- Infectious disease doctor
- Palliative care doctor, who can talk to you about your loved one's wishes and will work with the rest of the team to support the patient, you, and your family during this difficult time
- Others as needed to address other problems that come up

Each specialty group of doctors may focus on one problem or organ. Your surgeon will coordinate all of the recommendations for care to manage your loved one's care.

Discontinuing ECMO

Many tests will be done to be sure the heart and lungs are ready to work on their own before stopping ECMO. Surgery is required to remove the tubes and repair the blood vessels.

For the VV patient, the cannulas may be moved to the neck as they progress. Physical therapy, nursing, and others will help the patient get out of bed, sit up in a chair, and start to walk to help them gain strength while still on ECMO. Therapy will be needed for some time after the patient comes off of ECMO.

The ventilator will stay on for a time after ECMO is stopped.

Recovery

It is common to have long term health issues after this treatment. Long periods of time in bed for this treatment cause muscles to weaken and strength to be lost. Most patients will need to go for inpatient rehabilitation to improve their strength and movement skills. This may include a stay at a rehab hospital like Dodd Rehabilitation Hospital or a rehab facility or nursing home.

The length of time required for rehab will vary based on the age of the person, the strength of their heart and lungs before the treatment, and the extent of damage from treatment.

Follow up care

There will be a need to follow up with a number of doctors after discharge. These may include:

- Gastroenterology to follow up on digestive issues
- Nephrology to check on kidney function
- Hematology to follow up on blood work
- Vascular surgery to check circulation and blood vessels
- Infectious disease to check on infections

If damage is too severe

Because many people who need this treatment are so very sick, there are many who will not survive.

If there is no hope of your loved one being able to live because of severe heart, lung, or brain damage, or other organs failing, the care team would talk with you about stopping the treatment.

Care would change to keeping your loved one comfortable until the end of life.



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