ECMO
Extracorporeal Membrane Oxygenation

What is ECMO?
ECMO stands for Extracorporeal Membrane Oxygenation. ECMO is used only after medicine and a breathing machine (ventilator) have failed to make your loved one better. During ECMO, patients appear to be better, but you need to know that the person is still very sick. Your loved one needs the ECMO machine for life support.

The ECMO machine works for the heart and lungs. It is the same heart/lung machine used for open-heart surgery. When your loved one is placed on ECMO, blood will flow through the ECMO tubing where it receives oxygen from the machine’s lung. This happens until the heart and/or lungs are able to work on their own.

We know that all of this is very stressful for families. Please ask questions and talk with us about any concerns you may have. As you think of things, write them down at the end of the handout.

Types of ECMO
There are two types of ECMO: VA and VV. The terms VA and VV refer to the blood vessels used in the treatment.

- In VA ECMO, a tube is placed in both a vein and an artery. VA is used when there are problems with both the heart and lung. It helps the heart and lungs to rest and get better.

- In VV ECMO, one or more tubes are placed in a vein. VV is used when there are lung problems only. Sometimes, a person may start on VV and need to be switched to VA.

What Are the Risks of ECMO?
Your doctor will discuss these risks with you.

- **Bleeding** may occur because the blood must be kept from clotting in the tubing. A drug called heparin is given to prevent clots. Sometimes this can lead to bleeding. Some bleeding is normal. The amount of heparin will be watched closely and steps will be taken to slow any bleeding that happens. If the bleeding increases, your loved one may need surgery. If the bleeding gets too great, ECMO may need to be stopped. There is no way to find out if your loved one has had any damage to the brain from low levels of oxygen before ECMO. If this has happened, there may be an injured area that bleeds when heparin is used. These patients may have more problems.
Infection: This is a risk any time a tube is placed in the body, especially a blood vessel. We will watch closely for signs of infection. Antibiotics will be given, if needed.

Transfusions: A person on ECMO will need blood products. The blood used from the blood bank is checked for both hepatitis and AIDS; however, no test is 100% accurate. When blood is given there is a risk of side effects. In most cases, this can be stopped with medicine.

Small clots or air bubbles can get into the blood from the tubes. Sometimes this can cause injury to other parts of the body. They can even be fatal. Many safety measures are taken so this won’t happen.

Stroke: The carotid artery is tied off when the patient is taken off VA ECMO. This artery is one of the vessels that take blood to the brain. To date, no bad effects from not having this vessel have been reported because other vessels take over. The long-term risks of doing this are not known, so an increased risk of stroke may occur as the person ages. VV ECMO does not require tying off the carotid artery. While this may prove to have fewer risks, not all people are an option for VV ECMO.

While we wish it could, ECMO cannot cure everyone, and death can occur. Be assured the ECMO staff is well trained. They are very at ease with the machines and emergencies. In most cases, your loved one’s risk of dying without ECMO is greater than the risk of dying with it. Don’t be afraid to ask questions.

Tests before ECMO Placement
The doctor will order many lab tests and x-rays before ECMO starts. These tests may also be done during ECMO. Some of them are:

- Head ultrasound – looks at the brain
- Chest x-ray – looks at the lungs and the location of tubes in the chest
- Blood gases (ABG) – to check the oxygen and carbon dioxide levels in the blood
- Echocardiogram – an ultrasound to “look” at the heart and how well it works

How Is a Person Placed on ECMO?
If your loved one needs ECMO, the doctor will talk with you. You will be told of the risks of ECMO. You will need to sign a consent form before ECMO is started. A specially trained surgeon, along with an operating room team, will place the tubes. This may take place at the bedside. Before surgery starts, medicines will be given to sedate the patient and limit movement.

In VA ECMO, one tube will be placed in a large vein and another in an artery. In VV ECMO, a double tube is placed in a large vein. These tubes are then hooked to the ECMO machine. An x-ray will be taken right away to make sure the tubes are in the right place. A person on the ECMO machine (pump) will remain on the breathing machine (ventilator). This will make it easier to remove fluids from the lungs and to give small breaths to keep the lungs working and help them heal.
The ECMO Machine
Blood flows through the tubes, by gravity, and is pushed along by the turning motion of the pump. How fast the blood goes depends on how fast the pump turns. This flow number may be high at the beginning meaning the machine is doing most of the work. As your loved one gets better, the flow will slowly be decreased because less support is needed. The amount of time this takes depends on how the heart and lungs heal. Beyond the pump, the blood goes to the machine’s lung that puts oxygen in the blood and takes out carbon dioxide. The blood is then warmed to body temperature and given back to your loved one through the arterial or one portion of the tube. You will notice that the blood coming from your loved one will be dark because it contains little oxygen. The blood going back in will be bright red because it carries lots of oxygen. The blood is taken out and given back at the same speed so your loved one’s body doesn’t miss the blood going through the tubing.

Who Will Take Care of My Loved One?
After your loved one is placed on ECMO, the doctors and the intensive care staff will work closely with the other teams of doctors. The staff may ask to meet with doctors such as a cardiologist (heart), radiologist (x-ray), a neurologist (brain), infectious disease (infections), or hematologist/oncologist (blood/cancer).

Along with the nurse caring for your loved one and a respiratory therapist who takes care of the breathing machine, you will see an ECMO specialist daily. These nurses and therapists are specially trained. A perfusionist oversees them. A perfusionist is someone who has a special degree in working with heart/ lung machines.

There are also people who are there to take care of you and your family. Ask your loved one’s nurse to call the social worker if you need help dealing with issues like a place to stay, meal tickets, parking passes or have emotional needs. A chaplain is on call 24 hours a day.

What Medicines Will Be Given?
While on ECMO, certain medicines may be given. These may include:

- **Heparin** – prevents blood from clotting in the tubing
- **Antibiotics** – prevent or treat infection
- **Sedatives, pain medicine, medicine to limit motion** – prevent agitation, limit pain, improve sleeping
- **Lasix** – helps the kidneys get rid of urine
- **Electrolytes** – salts and sugars to keep the body in balance
- **Blood products** – replace blood loss
Weaning from the ECMO Machine

Coming off ECMO is done when the heart and/or lungs are better. A weaning or a trial off will let us know if the lungs are able to work and put oxygen in the blood. The speed of the blood flow through the ECMO pump is decreased, and help from the breathing machine is increased. The breathing machine then gives more help with breathing. The blood still flows through the ECMO. If your loved one does not do well during the weaning, ECMO is continued. A repeat weaning is done later. When the heart and lungs have improved enough, ECMO is stopped.

The tubes are taken out of the blood vessels during a surgery that is much like the one when they were placed. The place where the tubes were placed is closed with stitches, and a dressing is placed on the site. There may be a small scar, which will fade with time.

Even though your loved one is off ECMO, a breathing machine is still needed until your loved one gets better. The amount of time it takes to come off the breathing machine varies.

Nutrition

While on ECMO, your loved one will receive all nutrition needed for energy and healing through an IV or will be fed through a tube placed in the nose or mouth that goes into the stomach. If you are breast feeding your baby, talk to the nurse about pumping and storing the milk for this and future use.

Visiting

Family plays an important part in recovery. While on ECMO, there are some things you can do to help.

1. Bring photographs, blankets, or toys.
2. Touch your loved one and talk to her. If you are afraid to touch your loved one, ask the nurse or ECMO specialist for help.
3. Make tapes of you reading stories, singing songs, or talking. Bring them in or send them if you cannot be with your loved one right away.
4. Take care of yourself! Eat well and get plenty of rest. Getting sick yourself will not help either of you.
5. Children can draw or color pictures to be placed at the bedside or choose a small toy to send. Some units will let children visit. Ask the nurse.
6. Call at any time, day or night, to check on your loved one. We are always happy to talk to you and answer questions.

Your health care team may have given you this information as part of your care. If so, please use it and call if you have any questions. If this information was not given to you as part of your care, please check with your doctor. This is not medical advice. This is not to be used for diagnosis or treatment of any medical condition. Because each person's health needs are different, you should talk with your doctor or others on your health care team when using this information. If you have an emergency, please call 911. Copyright © 3/2015. University of Wisconsin Hospitals and Clinics Authority. All rights reserved. Produced by the Department of Nursing. HF#5760