HEALTH BASICS

Ventricular assist device

A ventricular assist device is a mechanical pump that helps a weakened heart move blood.

WHAT IT IS
A mechanical pump that helps a heart ventricle move blood

WHERE IT COMES UP
Advanced heart failure care, transplant planning, or temporary heart support

WHY IT MATTERS
Supports blood flow when a heart ventricle pumps too weakly

WHAT IT IS NOT
Not a disease or a complete artificial heart

WHO TO ASK
A ventricular assist device or advanced heart failure team

HOW IT IS CHECKED
Device readings, blood tests, imaging, and regular clinic reviews

Overview

A ventricular assist device, or VAD, is a mechanical pump that helps one of the heart's lower chambers move blood. These lower chambers are called ventricles.

A VAD does not remove or replace the whole heart. It works alongside the heart. The most common type supports the left ventricle, which pumps oxygen-rich blood to the body. This device is called a left ventricular assist device, or LVAD.

A right ventricular assist device, or RVAD, supports the right ventricle, which sends blood to the lungs. Some people need support for both ventricles. This may be called biventricular support.

VADs may be used for different treatment goals. A temporary device can support the circulation during a serious illness or while the heart recovers from surgery. A durable implanted VAD can provide longer-term support for advanced heart failure.

A longer-term VAD may be used:

A VAD is not a diagnosis. It is a treatment that requires surgery, regular monitoring, medicines, and training.

- While someone waits for a heart transplant

- While the care team decides whether transplant or another treatment is suitable
- As long-term treatment when a transplant is not planned
- Less commonly, while the heart is assessed for possible recovery

How it works

In a typical implanted LVAD, a tube carries blood from the left ventricle into the pump. The pump then sends blood through another tube into the aorta, the body's main artery.

Most durable LVADs provide continuous blood flow rather than pumping in beats. Because of this, someone with an LVAD may have a weak pulse or no pulse that can be felt by hand. Standard automatic blood pressure machines may also be unreliable. The VAD team may use a Doppler device, which measures blood flow using sound waves.

The pump is inside the body, but other parts remain outside. A cable called a driveline passes through the skin, usually on the abdomen. It connects the pump to an external controller and power source. The controller displays information and gives alarms if it detects a possible problem.

The device normally uses batteries when the person is moving around. It can connect to another power source when appropriate, such as during sleep. Backup batteries and other emergency equipment must remain available.

Temporary VAD systems work in different ways. Some are placed through a blood vessel, while others require surgery. Their pumps, controls, and treatment times are not the same as those of a durable implanted LVAD.

Why it matters for your health

A VAD can improve blood flow to the brain, kidneys, and other organs when the heart cannot provide enough circulation on its own. This may improve the ability to carry out daily activities and may support someone while awaiting another treatment.

Living with a durable VAD also changes day-to-day care. The equipment needs continuous power. The driveline exit site needs careful attention because it creates an opening through the skin.

Many people with a durable VAD need an anticoagulant like warfarin or apixaban , often called a blood thinner, to reduce the chance of harmful clots. The exact medicine and monitoring plan are based on the device and the person's medical needs. These medicines can also increase

bleeding risk.

VAD follow-up is therefore more involved than a routine heart check. It usually includes device reviews, blood tests, medicine management, wound care, and heart imaging.

What can go wrong

Complications relate to the device, the surgery, the medicines used with it, or the underlying heart condition. They do not mean that the VAD itself is a disease.

Important complications include:

Not every alarm means the pump has stopped. Alarms have different meanings and priorities. Follow the instructions supplied by the VAD team rather than guessing or repeatedly disconnecting equipment.

Call emergency services and contact the VAD team for a person who is unresponsive, has severe difficulty breathing, has major uncontrolled bleeding, or develops possible stroke signs such as sudden facial drooping, arm weakness, speech trouble, or loss of coordination. Treat a device-stop message or critical alarm according to the personal emergency plan.

Contact the VAD team promptly for repeated alarms, new fever, redness or drainage around the driveline, black or bloody stools, dark urine, new swelling, or an unexpected decline in activity. These concerns need timely assessment, but they are not all automatically emergencies.

- Bleeding: Surgery and blood-thinning medicines can contribute to bleeding, including bleeding in the digestive tract or brain
- Infection: Bacteria can enter around the driveline or affect deeper parts of the device
- Blood clots and pump thrombosis: A clot can obstruct the pump or travel elsewhere in the body
- Stroke: A blocked or bleeding blood vessel in the brain can cause a stroke
- Right-sided heart failure: After an LVAD is placed, the right ventricle may still be too weak to move blood through the lungs
- Abnormal heart rhythms: The heart can develop rhythms that are too fast or otherwise ineffective
- Device or power problems: The controller, driveline, pump, batteries, or connections can malfunction
- Blood-cell damage: Mechanical forces may break down red blood cells, called haemolysis

- Valve problems: Blood flow through the heart valves can change over time

What you can do

If you or someone close to you has a VAD, keep the VAD team's routine and emergency telephone numbers easy to find. Carry the device identification card and emergency information provided by the implanting centre.

Learn what each alarm means for that specific model. Ask the team to show you how to check connections, change batteries, use backup power, and respond to an alarm. A backup controller should only be changed according to the training and emergency instructions for the device.

Keep a current record of:

Take prescribed medicines exactly as directed. Do not stop or change an anticoagulant because of bruising or a missed dose without getting instructions from the VAD team. Ask what to do if a dose is missed, before dental work, or before another procedure.

Attend scheduled VAD appointments. Follow-up may include a blood count, tests of kidney and liver function, clotting tests, and tests for red blood cell damage. An echocardiogram, which is an ultrasound scan of the heart, can show heart function, blood flow, and valve movement.

Follow the driveline dressing and bathing instructions provided during training. Do not place the controller, batteries, or driveline connections in water. Swimming and full immersion are generally unsafe with an external driveline. Showering may be possible only with the protective method approved by the VAD team.

Before travel, ask about spare equipment, battery charging, security screening, emergency electricity, and nearby VAD centres. Tell any emergency clinician that a VAD is present, because pulse and blood pressure checks may need a different approach.

For someone who does not have a VAD and is not being assessed for one, there is nothing to monitor or test specifically for this device.

- Device model and implanting centre
- Medicines and allergies
- Anticoagulant blood-test results, if monitoring is required
- Device readings that the team asks you to record
- Emergency contacts and the nearest VAD-capable centre

Common questions

Is a VAD the same as an artificial heart?

No. A VAD helps one or both ventricles pump blood while the person's heart remains in place. A total artificial heart replaces the pumping work of both ventricles and the heart valves.

Can someone with a VAD live at home?

Many people with a durable VAD return home after recovery and structured training. A caregiver may also receive training. The home plan includes power management, driveline care, medicines, alarm responses, and emergency contacts.

Does everyone with an LVAD still have a pulse?

No. Continuous-flow devices may produce little or no pulse that can be felt. This can also make ordinary blood pressure equipment inaccurate. The VAD team explains how circulation should be checked.

Can a person with a VAD have an MRI scan?

Do not enter an MRI area unless the VAD team and radiology service have confirmed that the specific device and all related equipment can be managed safely. MRI safety is device-specific.

Does receiving a VAD mean a heart transplant will follow?

Not always. A VAD may support someone while awaiting transplant, but it can also be used as long-term treatment or during further assessment. The treatment goal should be documented and reviewed with the advanced heart failure team.

How long can a VAD be used?

Temporary devices may be used for short-term support, while durable devices are designed for longer use. How long a particular person needs support is shaped by the treatment goal, heart function, complications, and whether another treatment becomes available.

Sources

- National Heart, Lung, and Blood Institute. "Ventricular Assist Device."
- US Food and Drug Administration. "Ventricular Assist Devices."
- International Society for Heart and Lung Transplantation. "The 2023 International Society for Heart and Lung Transplantation Guidelines for Mechanical Circulatory Support: A 10-Year Update." Journal of Heart and Lung Transplantation . 2023;42(7):e1-e222.

- American Heart Association. "Ventricular Assist Device."