HEALTH BASICS

Mechanical ventilator - infants

A mechanical ventilator is a machine that supports an infant who cannot breathe well enough alone.

WHAT IT IS
A machine that supports an infant's breathing

WHERE IT COMES UP
Intensive care, surgery, emergencies, or home ventilation

WHY IT MATTERS
Maintains gas exchange while breathing improves

WHAT IT IS NOT
Not a disease or diagnosis

WHO TO ASK
Neonatal, intensive care, respiratory therapy, or home ventilation team

HOW IT IS CHECKED
Oxygen levels, blood gases, chest movement, and ventilator readings

Overview

A mechanical ventilator is a machine that helps move air into and out of an infant's lungs. It is a form of breathing support, not a disease or diagnosis.

An infant may need a ventilator because the lungs are immature, injured, infected, or affected by another medical condition. Ventilation may also be used during surgery, when medicines prevent normal breathing.

Most infants receiving mechanical ventilation are cared for in a neonatal intensive care unit, often called a NICU, or a pediatric intensive care unit. Some infants with long-term breathing needs use a portable ventilator at home after their caregivers receive specialized training.

Mechanical ventilation can be invasive or non-invasive . With invasive ventilation, a tube passes through the mouth or nose into the windpipe. This is called an endotracheal tube. An infant who needs longer-term support may have a tracheostomy, which is a surgically made opening in the neck leading to the windpipe.

Non-invasive ventilation uses small nasal prongs or a mask instead of a tube in the windpipe. Continuous positive airway pressure, or CPAP, is another form of breathing support. It keeps the airways open but does not always provide full mechanical breaths.

How it works

The ventilator delivers a mixture of air and oxygen through tubing called a breathing circuit. It may provide every breath, assist breaths started by the infant, or supply background support while the infant breathes independently.

The clinical team adjusts several settings. These can control:

The last setting is often called positive end-expiratory pressure, or PEEP. It can help stop the tiny air sacs in the lungs from collapsing after each breath.

Ventilator settings are chosen for the infant's size, lung condition, breathing effort, and test results. They may change often. There is no single correct setting for all infants.

Monitoring usually includes a sensor that continuously estimates the oxygen level in the blood. The team also watches heart rate, breathing effort, chest movement, skin color, and ventilator measurements. Blood gas tests may be used to measure oxygen, carbon dioxide, and blood acidity more precisely.

The breathing tube may need suctioning when mucus collects inside it. Suctioning removes secretions but can briefly disturb breathing or oxygen levels, so trained staff use it only when needed.

As the infant improves, the team gradually reduces support. This process is called weaning. Before removing a breathing tube, the team assesses whether the infant can breathe effectively with less help. Some infants then move to CPAP, nasal oxygen, or another less invasive form of support.

- How often supported breaths are given
- How much pressure or air enters the lungs
- How long each breath lasts
- The oxygen concentration
- The pressure that keeps the lungs partly open between breaths

Why it matters for your health

The lungs bring oxygen into the body and remove carbon dioxide, a waste gas. When an infant cannot do this well enough, oxygen may fall or carbon dioxide may build up. Mechanical ventilation supports this gas exchange while the underlying condition is treated or the lungs mature.

Ventilation can also reduce the effort needed to breathe. This may allow an infant to use energy for growth, healing, and other body functions.

The aim is usually to provide enough support while limiting pressure, oxygen exposure, and time on invasive ventilation. Premature lungs are especially delicate. Teams therefore use measurements and repeated assessments to balance breathing support against its risks.

The length of ventilation differs greatly. Some infants need it only during a procedure or brief illness. Others need support for weeks or longer because of extreme prematurity, lung disease, airway problems, muscle weakness, or conditions affecting the brain's control of breathing.

Needing a ventilator does not by itself show how an infant will develop. The reason ventilation is needed, the infant's gestational age, and other medical conditions are important parts of the overall picture.

What can go wrong

Mechanical ventilation can be lifesaving, but it has risks. Some come from the breathing tube, while others relate to pressure, oxygen, infection, or the infant's underlying condition.

Possible problems include:

These problems are not inevitable. The care team checks tube position, oxygen levels, lung expansion, secretions, and the infant's response. Imaging or blood tests may be needed when a complication is suspected.

Ventilator alarms can indicate a disconnection, blockage, air leak, change in breathing, or equipment issue. They can also sound because an infant moves or coughs. An alarm needs assessment rather than being ignored or permanently silenced.

- Air leak , including pneumothorax, when air escapes from a lung into the space around it
- Ventilator-associated lung injury , caused when delicate lung tissue is overstretched or repeatedly opens and closes
- Bronchopulmonary dysplasia , a long-term lung condition seen mainly in very premature infants who need prolonged oxygen or breathing support
- Ventilator-associated pneumonia , a lung infection that develops during invasive ventilation
- Airway irritation or injury from the breathing tube
- Mucus plugging , when thick secretions partly or completely block the tube
- Accidental extubation , when an endotracheal tube comes out unexpectedly

- Ventilator asynchrony , when the machine's breaths do not match the infant's breathing efforts
- Reduced blood return to the heart when pressure inside the chest is too high

What you can do

If your infant is ventilated in hospital, ask the bedside team to explain what type of support is being used and what the current goals are. Useful questions include:

You do not need to interpret the ventilator screen yourself. Numbers and wave patterns must be considered alongside the infant's condition. Do not change settings, reposition a breathing tube, or silence an alarm unless trained staff have directed you to do so.

For home ventilation, keep the written care plan and emergency instructions where caregivers can reach them. Record equipment checks, alarms, changes in secretions, and concerns about breathing if the home ventilation team has asked you to do so. Use only the settings and equipment specified in the plan.

Routine follow-up may involve a pediatric lung specialist, home ventilation service, respiratory therapist, primary care clinician, and other specialists involved in the infant's care. Bring the ventilator record and questions about alarms, supplies, sleep, feeding, travel, or power backup.

For an infant using ventilation at home, get emergency help for blue or gray color, unresponsiveness, absent or severely difficult breathing, no chest movement, a displaced tracheostomy tube, or an alarm that continues after the steps in the emergency plan. Begin the actions taught by the home ventilation team while emergency help is coming.

- Is the ventilator providing every breath or assisting my infant?
- What measurements show whether the support is working?
- What needs to happen before support can be reduced?
- Are there current concerns about the lungs or breathing tube?
- How can I safely touch, hold, or provide comfort to my infant?

Common questions

Is a ventilator the same as oxygen?

No. Oxygen therapy increases the amount of oxygen an infant breathes. A ventilator also supports the movement of air into and out of the lungs. A ventilator may deliver room air, extra

oxygen, or a changing mixture.

Is CPAP a mechanical ventilator?

CPAP is a type of non-invasive breathing support. It supplies continuous pressure to keep the airways and lungs open, but it does not usually provide the same level of breath-by-breath support as invasive mechanical ventilation.

Can parents hold an infant who is ventilated?

Sometimes. Whether holding is safe depends on the infant's stability, the type of breathing tube, and the equipment in use. NICU staff may help with skin-to-skin contact or another supported position while protecting the tube and lines.

Why might an infant receive medicine while ventilated?

Some infants receive pain relief or sedation for comfort, procedures, or difficulty coordinating with the ventilator. These medicines are not required in every case. The team weighs comfort against effects such as reduced breathing effort or blood pressure.

Does an infant always need sedation before the tube is removed?

No. Sedation plans are individualized. Medicines that reduce alertness or breathing may be lowered before extubation, but decisions depend on the medicine, the infant's condition, and the planned breathing support afterward.

Can an infant go home on a ventilator?

Some infants can, usually with a tracheostomy and portable equipment. Discharge requires a stable care plan, trained caregivers, emergency preparation, suitable equipment, and follow-up from a specialist home ventilation service.

Sources

- MedlinePlus Medical Encyclopedia. Breathing support for premature babies . U.S. National Library of Medicine.
- MSD Manual Professional Edition. Respiratory support in neonates and infants . Merck & Co.
- Sweet DG, Carnielli VP, Greisen G, et al. European Consensus Guidelines on the Management of Respiratory Distress Syndrome: 2022 Update . Neonatology . 2023;120(1):3-23.
- National Institute for Health and Care Excellence. Specialist neonatal respiratory care for babies born preterm . NICE guideline NG124.

- Sterni LM, Collaco JM, Baker CD, et al. An Official American Thoracic Society Clinical Practice Guideline: Pediatric Chronic Home Invasive Ventilation . American Journal of Respiratory and Critical Care Medicine . 2016;193(8):e16-e35.