CONDITION

Beta-blockers overdose

Learn how beta-blocker overdose affects the heart and nervous system, which symptoms require emergency care, and how poisoning is diagnosed and treated.

WHAT IT IS
Poisoning from taking too much beta-blocker medicine

BODY SYSTEM
Heart and circulation, nervous system

MAIN SYMPTOMS
Slow or irregular pulse, low blood pressure, fainting, drowsiness

WHAT CAUSES IT
Excess beta-blocker ingestion

HOW IT IS DIAGNOSED
Clinical assessment, ECG and blood tests

MAIN TREATMENT
Emergency supportive care

CAN IT BE CURED?
Sometimes - depends on severity and treatment

IS IT AN EMERGENCY?
Sometimes - collapse, seizure, breathing trouble or unresponsiveness

LONG-TERM OUTLOOK
Depends on the overdose and speed of effective care

Overview

Beta-blockers like metoprolol or propranolol are medicines that reduce the effects of stress hormones such as adrenaline. They are used to treat high blood pressure, abnormal heart rhythms, chest pain, heart failure, tremor, migraine, and several other conditions.

A beta-blocker overdose happens when someone takes more of the medicine than their body can safely handle. This may occur after an accidental extra dose, a child swallowing medicine, a medication error, or intentional self-harm. The amount that causes serious poisoning varies by the specific medicine, its formulation, the person's health, and whether other substances were taken.

Examples of beta-blockers include atenolol, carvedilol, labetalol, metoprolol, nadolol, propranolol, and sotalol. They do not all behave the same way in an overdose. Some mainly

slow the heart, while others can also affect electrical conduction in the heart, breathing, blood sugar, or the brain.

The most important effects are a dangerously slow heart rate and low blood pressure. Together, these can prevent the brain and other organs from receiving enough blood and oxygen. Some overdoses also cause abnormal heart rhythms, seizures, or loss of consciousness.

A suspected beta-blocker overdose needs prompt expert advice even when there are no symptoms. In the United States, call Poison Help at 1-800-222-1222 . The poison center can advise whether emergency evaluation or monitored observation is needed. Outside the United States, contact the local poison center or emergency medical service.

If the person collapses, has a seizure, has trouble breathing, or cannot be awakened, call emergency services immediately. Do not make the person vomit or give food, drinks, or home remedies unless a poison specialist or clinician instructs you to do so.

Symptoms

Symptoms may begin within a few hours, but timing depends on the medicine. Extended-release products are designed to release medicine slowly and may cause later or longer-lasting effects. A person who initially feels well may still need observation.

Possible symptoms include:

Very low blood pressure may cause shock , meaning the organs are not receiving enough blood. Signs can include severe weakness, confusion, cool skin, very little urine, or unresponsiveness.

Some beta-blockers have additional effects. Propranolol can enter the brain readily and may cause seizures or changes in the heart's electrical conduction. Sotalol can lengthen the time the heart needs to reset between beats, increasing the risk of a dangerous rhythm called torsades de pointes.

Low blood sugar can occur, particularly in infants and young children. Its signs may include sweating, unusual behavior, drowsiness, or seizures. Beta-blockers can also hide typical warning signs of low blood sugar, such as a racing heartbeat.

Not every overdose causes a very slow pulse. The heart rate may appear normal early on, and some beta-blockers have properties that can produce different patterns. A normal pulse does not make a suspected overdose safe to monitor without professional advice.

- A slow, weak, or irregular pulse

- Low blood pressure
- Dizziness, weakness, or fainting
- Unusual tiredness or difficulty staying awake
- Confusion or agitation
- Nausea or vomiting
- Shortness of breath or wheezing
- Cold, pale, or clammy skin
- Blurred vision
- Seizures
- Loss of consciousness

Causes and risk factors

Overdose may result from taking several tablets at once, repeating a dose because the first dose was forgotten, or confusing medications that look alike. Problems can also occur when a child or another household member gains access to a prescription.

Intentional ingestion is another cause. Anyone who may have taken medicine to harm themselves needs immediate medical and mental health support. Do not leave the person alone while arranging help if it is safe for you to remain with them.

Factors that may increase the risk or severity of poisoning include:

Kidney function matters for medicines such as atenolol, nadolol, and sotalol because the kidneys help remove them from the body. Reduced kidney function may allow their effects to last longer.

The dose printed on a tablet does not predict severity by itself. Different beta-blockers vary in strength and toxic effects. Clinicians and poison specialists also consider the person's weight, symptoms, time of ingestion, formulation, and other substances involved.

- Taking an extended-release beta-blocker
- Taking more than one heart or blood pressure medicine
- Combining the medicine with alcohol, sedatives, or other drugs
- Existing heart, lung, kidney, or liver disease
- Being very young, older, or medically frail

- Taking a beta-blocker with another substance that slows the heart or lowers blood pressure
- Delayed access to medical care

Diagnosis

Diagnosis begins with the circumstances and the person's symptoms. Emergency clinicians may ask for the medicine's name, strength, formulation, estimated number of tablets, and the time they were taken. They will also ask about prescription medicines, nonprescription products, alcohol, and recreational substances.

Bring the pill bottle, blister pack, medication list, or a photograph of the label if this can be done safely. Do not delay emergency care while searching for packaging.

The medical team will repeatedly check the heart rate, blood pressure, breathing, oxygen level, temperature, and mental alertness. An electrocardiogram, or ECG, records the heart's electrical activity. It can identify a slow rhythm, delayed electrical conduction, or other rhythm problems.

Blood tests may be used to check:

A beta-blocker blood level is usually not needed to guide immediate treatment. Treatment is based mainly on symptoms, vital signs, ECG findings, and the suspected medicine.

Because some effects are delayed, clinicians may continue heart monitoring and repeat examinations or tests. The observation period depends on the specific beta-blocker, whether it is immediate-release or extended-release, the amount involved, and the person's clinical course.

- Blood sugar
- Potassium and other electrolytes
- Kidney and liver function
- Acid levels and signs of poor circulation
- Possible additional poisons when relevant

Treatment and management

Treatment takes place under poison-center guidance or in an emergency department. People with significant symptoms may need care in an intensive care unit.

Initial care focuses on breathing, circulation, and heart rhythm. Oxygen or breathing support may be provided when needed. Intravenous fluids can help support blood pressure, although fluids alone may not correct severe poisoning.

Activated charcoal may reduce absorption when an ingestion was recent. It is not appropriate for every patient and can enter the lungs if someone is very drowsy, vomiting, or unable to protect their airway. It should not be taken at home unless a poison specialist specifically recommends it.

Several treatments may be used for a slow heart rate or low blood pressure:

Treatment is adjusted to the beta-blocker's specific effects. Sodium bicarbonate may be used when certain medicines, particularly propranolol, cause dangerous widening of the ECG's QRS complex. Magnesium and other rhythm-focused care may be needed for sotalol-related rhythm problems.

Lipid emulsion therapy may be considered in selected severe poisonings involving medicines that dissolve readily in fat. Evidence for this approach is limited, so toxicology specialists weigh its possible benefits and risks.

When shock continues despite standard treatment, advanced heart and circulation support may be considered. This can include extracorporeal membrane oxygenation, or ECMO, which temporarily pumps and oxygenates blood outside the body. Hemodialysis may help remove certain beta-blockers, particularly some medicines that stay mainly in the bloodstream and are cleared through the kidneys. These treatments are reserved for specific, severe situations.

Care also includes treatment of seizures, low blood sugar, breathing problems, and other substances taken at the same time. There is no single treatment plan that fits every beta-blocker overdose.

- Atropine may be tried to increase the heart rate, although its effect can be limited in severe poisoning.
- Glucagon can help the heart beat more strongly through a pathway that does not depend on beta receptors. It may cause nausea or vomiting.
- High-dose insulin therapy helps heart muscle use energy and can improve its pumping action. This treatment requires close monitoring of blood sugar and potassium, with glucose supplied as needed.
- Vasopressors are intravenous medicines that tighten blood vessels or support the heart to raise blood pressure.

Complications

Severe poisoning can cause prolonged low blood pressure, abnormal heart rhythms, or cardiac arrest. If circulation remains poor, the brain, kidneys, liver, and other organs may be injured from a lack of blood and oxygen.

Vomiting while very drowsy may allow stomach contents to enter the lungs. This is called aspiration and can lead to breathing problems or pneumonia. Seizures may cause injury and further reduce oxygen delivery.

Other possible complications include:

The outlook depends on the beta-blocker, amount taken, release formulation, other substances involved, underlying health, and how quickly effective care begins. Prompt poison-center advice and supportive treatment can make a major difference.

- Acute kidney injury
- Brain injury after prolonged shock or cardiac arrest
- Lung injury or the need for mechanical ventilation
- Dangerous changes in blood sugar or electrolytes
- Recurrent rhythm problems during delayed absorption
- Complications related to other medicines or substances taken

Follow up

After an uncomplicated evaluation, follow the discharge instructions about activity, medicines, and warning signs. Do not restart, stop, or change a prescribed beta-blocker unless the treating clinician explains when and how to do so. Suddenly stopping some beta-blockers can worsen chest pain, blood pressure, or heart rhythm problems.

Seek emergency care after discharge for fainting, severe dizziness, trouble breathing, a seizure, new confusion, inability to stay awake, chest pain, or a very slow or irregular pulse. Call the care team promptly for milder symptoms that are new, persistent, or worsening.

Routine follow-up may include a medication review with a doctor or pharmacist. This can identify duplicate prescriptions, confusing labels, kidney-related dose concerns, or drug combinations that may need closer monitoring.

To reduce future medication errors:

When an overdose was related to self-harm, follow-up should include a mental health assessment and a practical safety plan. This may involve limiting access to large amounts of medicine, involving a trusted support person, and arranging timely behavioral health care.

Immediate help is appropriate if thoughts of self-harm return.

- Keep medicines in clearly labeled, child-resistant containers.
- Store them out of sight and reach of children.
- Use a medication list or pill organizer carefully.
- Ask a pharmacist what to do after a missed dose.
- Never take an extra dose unless a clinician has told you to.
- Dispose of unused medicines through a pharmacy or community take-back program.

Sources

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