

# ADMINISTERING EMERGENCY OXYGEN

Emergency oxygen can be given for many breathing and cardiac emergencies. It can help improve hypoxia (insufficient oxygen reaching the cells) and reduce pain and breathing discomfort. Always follow local protocols for using emergency oxygen. Consider administering emergency oxygen for:

- An adult breathing fewer than 12 or more than 20 breaths per minute.
- A child breathing fewer than 15 or more than 30 breaths per minute.
- An infant breathing fewer than 25 or more than 50 breaths per minute.
- A person who is not breathing.

## Emergency Oxygen Delivery Systems

Emergency oxygen delivery systems include the following equipment:



- *An oxygen cylinder.* Oxygen cylinders come in different sizes and have various pressure capacities. Cylinders are labeled “U.S.P.” (United States Pharmacopeia) and marked with a yellow diamond that says “Oxygen,” which indicates the oxygen is medical grade. Oxygen cylinders contain gas under high pressure. If mishandled, cylinders can cause serious damage, injury or death.
- *A pressure regulator with flowmeter.* The pressure regulator controls the pressure coming out of the cylinder and is indicated on the gauge in pounds per square inch (psi). The flowmeter controls how rapidly the oxygen flows from the cylinder to the victim. The flow rate can be set from 1 to 25 liters per minute (LPM).
- *A delivery device.* The equipment a victim breathes through is an oxygen delivery device. Tubing carries the oxygen from the regulator to the delivery device. Delivery devices include nasal cannulas, resuscitation masks, non-rebreather masks and bag-valve-mask resuscitators (BVMs).

Emergency oxygen units are available without prescription for first aid use, provided they contain at least a 15-minute supply of oxygen and are designed to deliver a preset flow rate of at least 6 LPM. The type of system used (variable or fixed flow) impacts the type of delivery devices that can be used and the concentration of oxygen that can be delivered to a victim.

- *Variable-flow-rate oxygen systems* allow the rescuer to vary the flow of oxygen. This type of system must be assembled and the appropriate flow rate selected.
- *Fixed-flow-rate oxygen systems* include a regulator set at a fixed-flow rate, usually 15 LPM, or may have a dual (high/low) flow setting. The cylinder, regulator and delivery device are already connected.

## Oxygen Delivery Devices

Oxygen should be delivered with properly sized equipment for the victim and appropriate flow rates for the delivery device. Various sizes of oxygen delivery devices are available for adults, children and infants.

Delivery Device	Description	Common Flow Rate	Oxygen Concentrations	Suitable Victims
<b>Nasal cannula</b> 	Held in place over the victim's ears; oxygen is delivered at a low level through two small prongs inserted into the nostrils	1–6 LPM	24–44%	<ul style="list-style-type: none"> <li>■ Victims with breathing difficulty</li> <li>■ Victims unable to tolerate mask</li> </ul>
<b>Resuscitation mask with oxygen inlet</b> 	Pliable, dome-shaped breathing device that fits over the mouth and nose	6–15 LPM	35–55%	<ul style="list-style-type: none"> <li>■ Victims with breathing difficulty</li> <li>■ Victims who are not breathing</li> </ul>
<b>Non-rebreather mask</b> 	Face mask with an attached oxygen reservoir bag and one-way valve between the mask and bag; victim inhales oxygen from the bag and exhaled air escapes through flutter valves on the side of the mask	10–15 LPM	Up to 90%	Breathing victims only
<b>BVM</b> 	Hand-held breathing device consisting of a self-inflating bag, a one-way valve and a face mask	15 LPM or higher	90% or more	<ul style="list-style-type: none"> <li>■ Victims with difficulty breathing</li> <li>■ Victims who are not breathing</li> </ul>

For young children and infants who are frightened by a mask being placed on their face, use a “blow-by” technique. To perform this technique, hold the mask about 2 inches from the child’s face, waving it slowly from side-to-side, thus allowing the oxygen to pass over the face and be inhaled.

A conscious, breathing victim can hold the BVM to inhale the oxygen or you can squeeze the bag as the victim inhales to deliver more oxygen. Squeeze the bag between each breath for victims breathing less than 10 times per minute. For a victim breathing more than 30 times per minute, squeeze the bag on every second breath.

## Oxygen Safety Precautions

Use emergency oxygen equipment according to the manufacturer’s instructions, in a manner consistent with federal and local regulations, and according to local protocols. Never attempt to refill an oxygen cylinder; only an appropriately licensed professional should do this.

Specific attention should be given to the following areas concerning oxygen cylinders:

- Check for cylinder leaks, abnormal bulging, or defective or inoperative valves or safety devices.
- Check for the physical presence of rust or corrosion on a cylinder or cylinder neck, and any foreign substances or residues, such as adhesive tape, around the cylinder neck, oxygen valve or regulator assembly. These substances can hamper oxygen delivery and in some cases may have the potential to cause a fire or explosion.

Also, follow these guidelines:

- Do not stand oxygen cylinders upright unless they are well secured. If the cylinder falls, the regulator or valve could become damaged or cause injury due to the intense pressure in the tank.
- Do not use oxygen around flames or sparks, including smoking materials such as cigarettes, cigars and pipes. Oxygen causes fire to burn more rapidly and intensely.
- If defibrillating, make sure that no one is touching or is in contact with the victim or the resuscitation equipment. Do not defibrillate someone when around flammable materials, such as free-flowing oxygen or gasoline.
- Do not use grease, oil or petroleum products to lubricate or clean the regulator. This could cause an explosion.
- Do not drag or roll cylinders.
- Do not carry a cylinder by the valve or regulator.
- Do not hold on to protective valve caps or guards when moving or lifting cylinders.
- Do not deface, alter or remove any labeling or markings on the oxygen cylinder.
- Do not attempt to mix gases in an oxygen cylinder or transfer oxygen from one cylinder to another.

## Monitoring Oxygen Saturation

Pulse oximetry, using a pulse oximeter, is used to measure the percentage of oxygen saturation in the blood and appears as a percentage of hemoglobin saturated with oxygen (Figure). Pulse oximetry readings are recorded using the percentage and then SpO<sub>2</sub> (e.g., 95 to 99 percent SpO<sub>2</sub>).

Pulse oximetry should be used as an added tool for victim care, as it is possible for victims to show a normal reading but have difficulty breathing or to have a low reading but appear to be breathing normally. When treating the victim, all symptoms should be assessed, along with the data provided by the device.



The pulse oximeter reading never should be used to withhold oxygen from a victim who appears to be in respiratory distress or when it is the standard of care to apply oxygen despite good pulse oximetry readings, such as in a victim with chest pain.

Range	Percent Oxygen Saturation Level	Delivery Device
Normal	95–100% SPO <sub>2</sub>	None
Mild hypoxia	91–94% SPO <sub>2</sub>	Nasal cannula or resuscitation mask
Moderate hypoxia	86–90% SPO <sub>2</sub>	Non-rebreather mask or BVM
Severe hypoxia	≤85% SPO <sub>2</sub>	Non-rebreather mask or BVM

To use a pulse oximeter, apply the probe to the victim’s finger or any other measuring site, such as the earlobe or foot, according to the manufacturer’s recommendation. Let the machine register the oxygen saturation level and verify the victim’s pulse rate on the oximeter with the actual pulse of the victim. Monitor and record the victim’s saturation levels while administering emergency oxygen. If the oxygen level reaches 100 percent and local protocols allow, you may decrease the flow rate of oxygen and change to a lower-flowing delivery device.

## Limitations

Some factors may reduce the reliability of the pulse oximetry reading, including:

- Hypoperfusion, poor perfusion (shock).
- Cardiac arrest (absent perfusion to fingers).
- Excessive motion of the victim during the reading.
- Fingernail polish (remove it using an acetone wipe).
- Carbon monoxide poisoning (carbon monoxide saturates hemoglobin).
- Hypothermia or other cold-related illness.
- Sickle cell disease or anemia.
- Cigarette smokers (due to carbon monoxide).
- Edema (swelling).
- Time lag in detection of respiratory insufficiency. (The pulse oximeter could warn too late of a decrease in respiratory function based on the amount of oxygen in circulation.)

# USING A RESUSCITATION MASK

**Note:** Always follow standard precautions when providing care. Always select the properly sized mask for the victim.

## 1 ASSEMBLE THE RESUSCITATION MASK

- Attach the one-way valve to the resuscitation mask, if necessary.

## 2 POSITION THE MASK

- Kneel to the side of or above the victim's head and place the rim of the mask between the victim's lower lip and chin.
- Lower the resuscitation mask until it covers the victim's mouth and nose.

## 3 SEAL THE MASK

- From a position either on the side of or above the victim's head, apply even, downward pressure to seal the top and bottom of the mask.
- If you suspect a head, neck or spinal injury, without moving the victim's head, apply even, downward pressure with your thumbs to seal the mask.



## 4 OPEN THE AIRWAY

- From the side of the victim's head, tilt the head back and lift the chin.
- From above the victim's head, tilt the head back and lift the jaw.
- If you suspect a head, neck or spinal injury, without tilting the head back, push or thrust the lower jaw up with your fingers along the jawbone.

## 5 BLOW INTO THE MASK

- Each ventilation should last about 1 second and make the victim's chest clearly rise.
- The chest should fall before the next ventilation is given.



# USING A BVM—TWO RESCUERS

**Note:** Always follow standard precautions when providing care. Always select the properly sized BVM for the victim.

## 1 ASSEMBLE THE BVM

## 2 RESCUER 1 POSITIONS THE MASK OVER THE VICTIM'S MOUTH AND NOSE

- Kneel behind the victim's head.

## 3 RESCUER 1 SEALS THE MASK

## 4 RESCUER 1 OPENS THE AIRWAY

- Place the thumbs along each side of the mask, using the elbows for support.
- Slide the fingers behind the angles of the victim's jawbone.
- Push down on the mask with the thumbs, lift the jaw and tilt the head back.

## 5 RESCUER 2 GIVES VENTILATIONS

- Squeeze the bag slowly with both hands.
- Each ventilation should last about 1 second and make the chest clearly rise. The chest should fall before the next ventilation is given.



# ASSEMBLING THE OXYGEN SYSTEM

*Note: Always follow standard precautions when providing care.*

## 1 CHECK THE CYLINDER

- Make sure the oxygen cylinder is labeled “U.S.P.” (United States Pharmacopeia) and marked with a yellow diamond that says “Oxygen.”

## 2 CLEAR THE VALVE

- Remove the protective covering.
- Remove and save the O-ring gasket, if necessary.
- Turn the cylinder away from you and others before opening for 1 second to clear the valve of any debris.

## 3 ATTACH THE REGULATOR

- Put the O-ring gasket into the valve on top of the cylinder, if necessary.
- Make sure that it is marked “Oxygen Regulator.”
- Check to see that the pin index corresponds to an oxygen cylinder.
- Secure the regulator on the cylinder by placing the two metal prongs into the valve.
- Hand tighten the screw until the regulator is snug.



## 4 OPEN THE CYLINDER AND CHECK PRESSURE

- Open counterclockwise one full turn and check the pressure gauge.
- Determine that the cylinder has enough pressure (more than 200 psi). If the pressure is lower than 200 psi, **DO NOT** use.



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## **5** ATTACH THE DELIVERY DEVICE

- Attach the plastic tubing between the flowmeter and the delivery device.



**Note:** *When breaking down the oxygen equipment, be sure to bleed the pressure regulator by turning on the flowmeter after the cylinder has been turned off.*



# ADMINISTERING EMERGENCY OXYGEN

## Notes:

- Always follow standard precautions when providing care. Follow local protocols for using emergency oxygen.
- Check the cylinder to make sure the oxygen cylinder is labeled “U.S.P.” and marked with a yellow diamond that says “Oxygen.”
- Determine that the cylinder has enough pressure (more than **200 psi**). If the pressure is lower than **200 psi**, **DO NOT** use.
- Assemble the cylinder, regulator and delivery device prior to delivery, if necessary.

## 1 TURN THE UNIT ON AND ADJUST THE FLOW AS NECESSARY

- For a variable-flow-rate oxygen system, turn the flowmeter to the desired flow rate.
  - Nasal cannula: **1 to 6 LPM**
  - Resuscitation mask: **6 to 15 LPM**
  - Non-rebreather mask: **10 to 15 LPM**
    - Inflate the oxygen reservoir bag to two-thirds full by placing your thumb over the one-way valve until the bag is sufficiently inflated.
  - BVM: **15 LPM or more**



## 2 VERIFY THE OXYGEN FLOW

- Listen for a hissing sound and feel for oxygen flow through the delivery device.



## 3 PLACE THE DELIVERY DEVICE ON THE VICTIM AND PROVIDE CARE AS NEEDED



**Note:** When monitoring a conscious victim's oxygen saturation levels using a pulse oximeter, you may reduce the flow of oxygen and change to a lower-flowing delivery device if the oxygen level of the victim reaches **100 percent**.