

## ORGANIZATION NEWS

### Information/Education Page

### Respiratory Health and Spinal Cord Injury



#### What does the respiratory system do?

Your respiratory system (or pulmonary system) is responsible for breathing. This system enables you to inhale oxygen into your blood and exhale carbon dioxide.

#### How does the respiratory system work?

Breathing is a process that involves the coordination of your brain and respiratory muscles that include the diaphragm, abdominal muscles, intercostal muscles, and at times, other muscles.

- Your brain sends signals down your spinal cord to contract the diaphragm.
- Your diaphragm is the primary muscle used for inhaling.
- As you breathe in, the diaphragm moves down (contracts) and your lungs, rib cage, and abdomen (belly) expand as air is drawn into (inhaling) your lungs through your nose and mouth.
- Air travels through the main airway (trachea) and smaller airways to air sacs in the lungs. The air sacs transfer oxygen to your blood.
- Your diaphragm relaxes after inhalation. Your lungs, rib cage, and abdomen get smaller, pushing carbon dioxide out (exhaling).
- More muscle strength is necessary to help with breathing when exercising or coughing. To exhale forcefully during a cough, the brain sends signals down the spinal cord to direct your abdominal muscles and intercostal muscles (between the ribs). The muscles responsible for most of the force are the abdominal muscles.
- Coughing is important because coughing helps to remove mucus and prevent mucus buildup in lungs that blocks the airways leading to the air sacs that absorb the oxygen from the air.

#### How does spinal cord injury impact the respiratory system?

Signals sent from your brain cannot pass beyond the damage to the spinal cord, disrupting the inhaling and exhaling process. Muscle control loss depends on the level of injury and if there is complete or incomplete spinal cord damage.

- Complete high cervical injury that involves the spinal cord at or above the C3-5 spinal nerves may have a loss of or weakness in

diaphragm function depending on the extent of damage. A tracheostomy (an opening through the neck into the trachea, the main airway to help a person breathe) or ventilator (a machine that helps a person breathe by pushing air into the lungs) may be necessary.

- In complete lower cervical injury that does not involve the C3-5 spinal nerves, diaphragm function remains and usually a ventilator is not needed. In high and low complete cervical injury you will have a loss of control of the abdominal muscles (over your belly) and intercostal muscles (between the ribs).
- In incomplete cervical injuries, the degree of diaphragm weakness or loss of other muscle control depends on the extent of damage.
- At the thoracic level of injury, you can lose some or all control of the abdominal muscles (over your belly) and intercostal muscles (between the ribs). The amount of loss depends on the location and extent of spinal cord damage.
- In lumbar or sacral injury levels, abdominal and intercostal muscles are not affected.
- If you require a ventilator to breathe because of loss of diaphragm function, a pacing system to stimulate the diaphragm may be an option.

#### How does loss of muscle function affect my health?

The muscles that are still functioning have to work harder to get oxygen into your blood and to get rid of the carbon dioxide. You may also have trouble coughing with enough force to get rid of mucus in your lungs.

- Both a higher injury level and whether a person has complete or incomplete injury contribute to the risk of respiratory problems.
- Persons with a higher and more complete injury (eg, complete cervical) are at higher risk for respiratory problems than persons with a lower and incomplete injury.

#### What health problems are common?

Although people with cervical or thoracic injury are at the highest risk for having complications, others at high risk are those who

- Smoke
- Have chronic obstructive pulmonary disease

- Have a tracheostomy
- Use a ventilator

Other common health problems include the following:

- Atelectasis (a collapse of all or a portion of the lung)
- Bronchitis (an infection in the tubes that lead to the air sacs in the lungs)
- Pneumonia (an infection in the air sacs)
- Obstructive sleep apnea (OSA)

OSA occurs when a loss of muscle tone during sleep in the tongue, soft palate, or other soft tissues of the throat allows the airway to collapse and obstructs the flow of air when you try to breathe in. This typically leads to a drop in blood oxygen level and a rise in blood carbon dioxide level. The brain responds with a brief arousal to jump-start breathing. This disruption of sleep repeats throughout the night.

OSA is also associated with medical problems such as

- Depression
- Diabetes
- Heart attacks, heart failure, and irregular heartbeat
- High blood pressure
- Stroke
- Death

Those at highest risk for OSA are those who

- Snore
- Are men or postmenopausal women
- Are overweight or obese
- Drink alcohol
- Take muscle-relaxant medication
- Have a small jaw, enlarged tonsils, or difficulty breathing through the nose

## What can I do for my respiratory health?

### Prevention: do whatever you can to prevent respiratory health problems

- Do not smoke and stay away from secondhand smoke!
- Avoid the buildup of secretions in the lungs.
  - Get a cough assist machine if you have difficulty coughing and clearing secretions.
  - You may require a suction tube to keep your lungs clear if you have a tracheostomy with or without a ventilator.
  - An attendant or family member can manually assist with coughing if required.
- Drink plenty of water, especially if you have an infection, unless your doctor tells you something different.
- Keep a healthy weight! Ask your health care providers to recommend a diet if you are overweight and an exercise program to help maintain fitness.
- Stay away from people who may have a cold or flu.
- Get a flu shot every year.
- Ask your doctor about a pneumonia shot.

### Watch: the sooner you can identify any problems, the better

Signs and symptoms of a lung infection (bronchitis or pneumonia) may include the following:

- Fever and chills
- Cough or feeling the need to cough with thick, sticky mucus
- Change in the color of mucus from clear to green or yellow
- Tightness in the chest
- Shortness of breath

### Some signs and symptoms of OSA include

- Other people tell you that you stop breathing at night
- Loud snoring
- Restless sleep (especially if you awaken choking or gasping for air)
- Waking up with a sore and/or dry throat
- Waking with a headache
- Daytime fatigue, sleepiness, or not feeling rested after sleeping

### Visit your health care provider: annual check-ups to screen for the health problems common for your age and type of injury

- ALWAYS go see your provider if you have signs of a respiratory infection.
- ALWAYS go see your provider if you think you have sleep apnea.
- Ask your provider if you should get a lung function test to see how well your lungs function, especially if you have ever smoked, have chronic obstructive pulmonary disease, have asthma, or have problems breathing.

## Authorship

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## Source

Our health information content is based on research evidence and/or professional consensus and has been reviewed and approved by an editorial team of experts from the Spinal Cord Injury Model Systems.

## Disclaimer

This information is not meant to replace the advice of a medical professional. You should consult your health care provider regarding specific medical concerns or treatment.

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