Spinal Cord Injury
Respiratory Care

The Respiratory System
- The respiratory system is the part of the body used to breathe air.
- Air contains oxygen and enters through your mouth or nose, down your windpipe and into your lungs.
- Your lungs send the oxygen through your blood to all of your body parts.
- You breathe out carbon dioxide, which your body doesn’t need.
- The muscle groups used to breathe in air are the neck muscles, intercostal muscles (muscles between your ribs), diaphragm (muscle that separates the abdomen and chest) and the abdominal muscles (help you breathe more deeply and cough).

What does the Spinal Cord have to do with Breathing?
The brain sends messages through the nerves in the spinal cord to the muscle groups that are used in breathing. Normally people breathe without even thinking about it. If someone has a spinal cord injury breathing problems can occur when the signals that the brain sends cannot get to the respiratory muscles due to injury. Typically injuries below thoracic level 12 (T12) do not cause breathing problems. Breathing problems do not usually occur in patients who experience injuries in the lumbar or sacral areas (lower areas) of the spinal cord. The higher the level of spinal cord injury, then the greater the loss of respiratory muscle function.

Level of Spinal Cord Injury and Respiratory Function
- Usually complete injuries in the thoracic or cervical regions result in permanent loss of respiratory muscle function below the level of the injury.
- If the injury is incomplete, it is impossible to know for sure right away if any function will come back.
- Injuries in the thoracic area (T1-T12) affect the intercostals (ribs) and abdominal muscles. The lower the injury in the thoracic area the less muscle control that is lost. A high thoracic injury will result in a loss of most of the intercostal and abdominal muscle control.
- Complete injuries in the cervical area usually result in a total loss of intercostal and abdominal muscle control and a high injury will cause a loss of more muscles, such as the neck muscles and diaphragm. In this situation, a ventilator would be needed to help a person breathe.
Ventilator Assistance:
- A ventilator forces air into the lungs so that the body can get the oxygen it needs.
- Many people with an injury at C5 (cervical) level and some with a C4 injury can eventually breathe without the ventilator or only use it part of the time. The cervical levels C3, C4 and C5 send messages to nerves that control breathing.
- Patients with injuries above cervical level 3 (C3) need a ventilator all the time.

Respiratory Complications
- The loss of function in the respiratory muscles weakens the respiratory system and can result in fluid to gather in the lung or lung congestion.
- If you have a spinal cord injury at cervical level 1-5 (C 1-5) you are at risk for respiratory failure because of gather fluid and because you are unable to breathe and cough without ventilator assistance.
- Atelectasis is a condition where the lungs partially collapse because they aren’t getting enough air into them or there is a lot of fluid.
- Any level of spinal cord injury puts a patient at risk for a blood clot. Blood clots could form or move to the lungs and this is called Pulmonary Embolism.
- Pneumonia is another serious respiratory complication for people with spinal cord injury.
- Sleep apnea occurs when you stop breathing for periods of time when you sleep. If you experience symptoms like below then speak to your provider for advice:
  - Irregular breathing or snoring
  - Sleepiness in the daytime
  - Problems with memory or concentration
  - Waking up frequently during the night
  - Waking up tired or with a headaches

How can Respiratory Complications be Prevented?
- Tell your health care provider if you have any of these: shortness of breath, pale skin, fever, and feeling of a heavy chest, coughing, increase in congestion.
- You should receive the (pneumococcal) pneumonia vaccine and the flu vaccine (every year) unless your health care provider advises you not to.
- Avoid the buildup of lung secretions by using a cough assist machine if available.
- Suction frequently if you have a tracheostomy and are on a ventilator.
- Deep breathe and cough regularly even if not on a ventilator.
- Sit up straight in your wheelchair and turn regularly while in bed to prevent congestion.
- Wear an abdominal binder to help support your intercostal and abdominal muscles
• Maintain a normal weight. Being underweight or overweight can lead to respiratory complications.
• Drink plenty of water to keep congestion or mucous thin and easier to cough up.
• Don’t smoke as smoking decreases the amount of oxygen in the blood, increases congestion in your chest and increases the risk for pneumonia and bronchitis.
• Avoid contact with others who have a cold or flu and avoid areas with dust, smog and other pollutants in the air.
• Learn about exercises that you can do to help keep the respiratory system clear and opened.

**Breathing Exercises**
Do these at least two times a day:
1. Take a deep breath, hold for a few seconds and breathe it out.
2. Take a deep breath, breathing in as much air as quickly as you can and then breathe it out as quickly as you can.
3. Take a deep breath and hold it, take another one and hold it, take one more and then slowly breathe out.
4. Take a deep breath in and then breathe out slowly counting for as long as you can.
5. If you have an incentive spirometer, use it to do your breathing exercises and keep track of your progress.