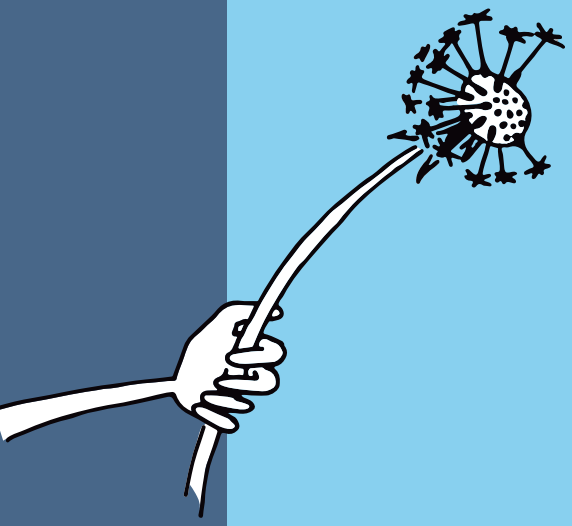
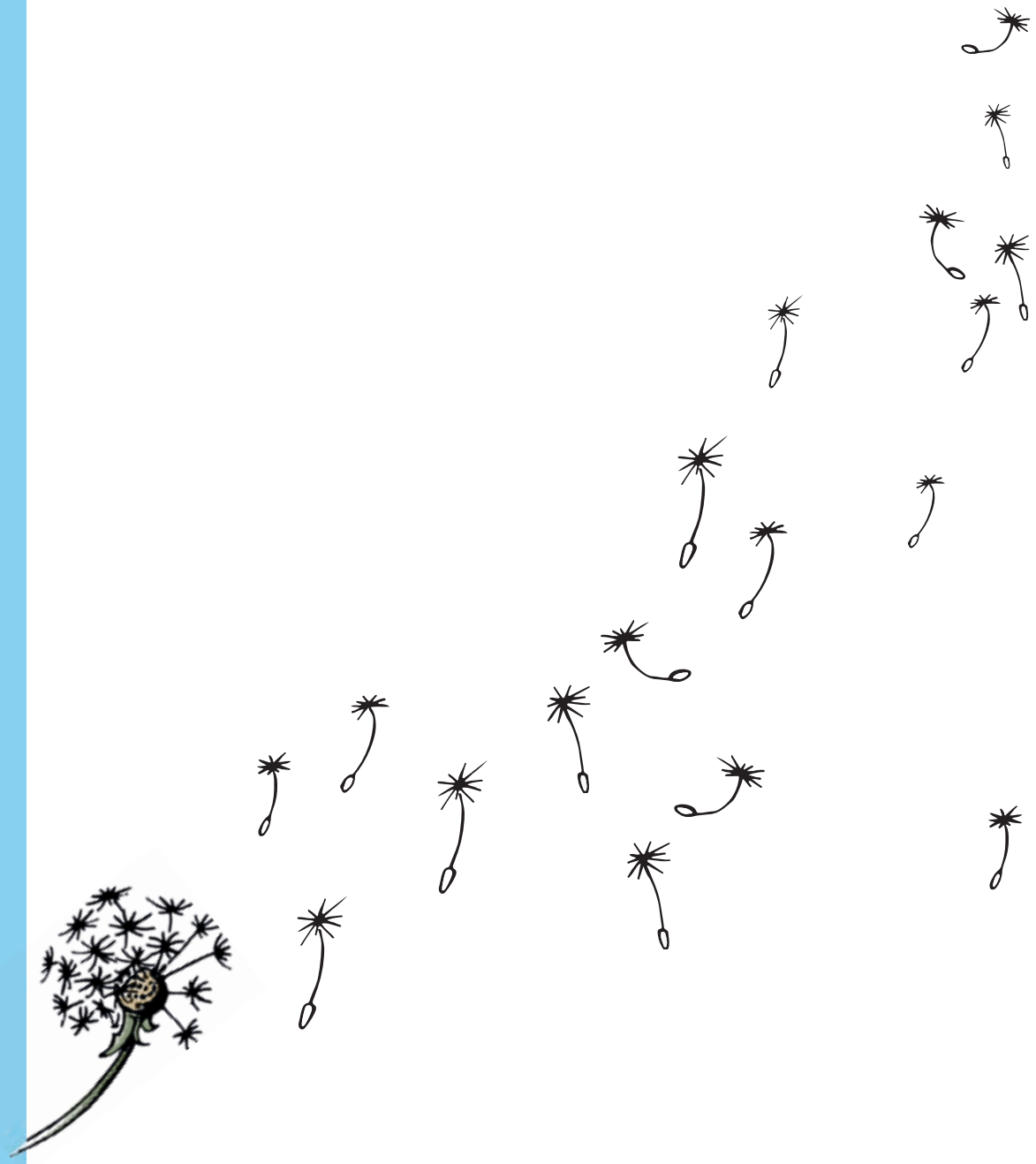
BREATHING IS IMPORTANT TOO



Spinal Cord Unit
Prague

Content



Introduction

Breathing is a basic vital function, which is to a certain extent automatic and to a certain extent under voluntary control. This control is partially or completely lost, when patients after spinal cord injury become tetraplegic. Respiratory muscles may also be affected like other muscles below spinal cord injury levels. How much their function will be limited depends on the height and extent of the injury.

For the respiratory muscles the same rules as for the muscles of the extremities apply. It is important to keep them in the appropriate fitness so they are able to perform well in potential stress situations. This can be achieved by regular exercise as targeted breathing, training with breathing aids, playing a musical instrument or singing.

On the next few pages we would like to introduce various breathing exercises and prevention measures.

Why exercise regularly?

The main breathing muscle is the diaphragm.

If the diaphragm's function remains at least partially preserved, the person is able to breathe independently.

Other respiratory muscles are accessory

They have a supportive function during demanding breathing activities, such as singing, speaking, sneezing or exercise. Accessory muscles of respiration of tetraplegic patients are always limited in function.

Tetraplegic patients may experience shortness of breath in more demanding situations.

It is important to stay in good respiratory condition.

1. How to exercise regularly?

In this section, we would like to show you how to perform exercises ideally and give you good tips for making coughing easier.

POSITIONS DURING BREATHING EXERCISES

In the supine position

- lie on the back
- put the pillow under the head
- keep upper extremities loosely at the sides
- lower extremities can be supported under the knees

In the side position

- lie on the side
- put pillow under the head
- keep upper arm loosely laid in front the body
- lower extremities are bent at the hips and knees, with a pillow between the knees for better postural stability

In the prone position

- lie on the belly
- head is turned to the side
- one upper extremity is bent in front of the face, the other one loosely laid along the body
- chest can be supported by a pillow
- lower extremities are straight, or one extremity can be bent

SOFT TISSUE TECHNIQUES FOR RELEASING CHEST

Chest tissues have to stay in the best condition. Soft tissue techniques are used to keep the chest tissues elastic, stretched and fit. This care ensures indirectly the maximum possible lung volumes.

Stretching of the soft chest tissues in the diagonal direction

- assistant stands next to the patient's bed near the patient's chest
- one palm is placed on the patient's right shoulder
- the other palm is placed on the ribs on the left side

Assistant works with patient's breathing. Assistant stretches palms away from each other in the diagonal direction during inhalation and palms stay in the stretched position during exhalation.

Neck muscles stretching

- assistant stands behind the patient's head
- assistant puts his palms on the patient's shoulders
- fingers are pointing toward the patient's feet

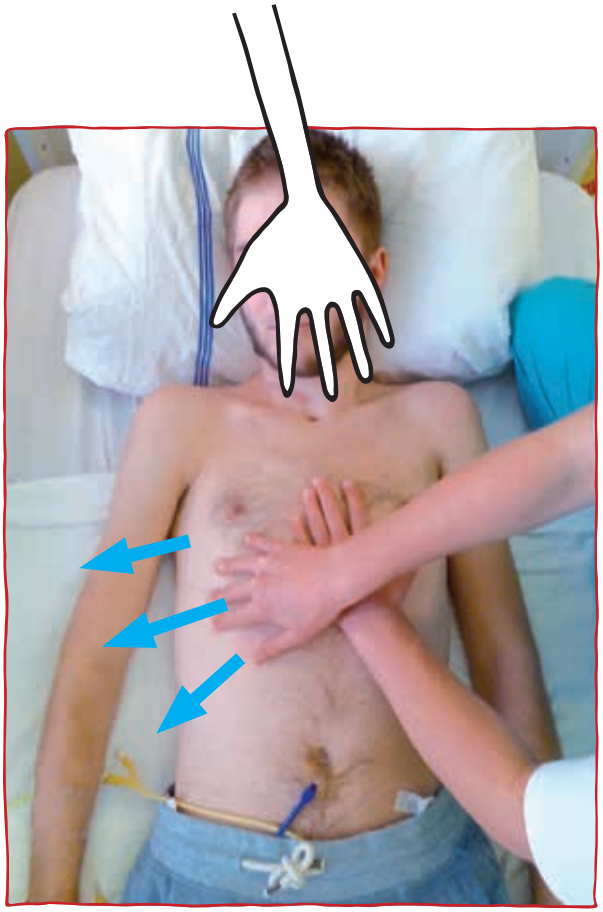
Assistant works with patient's breathing. Assistant is pushing the patient's shoulders down in the direction from the ears toward the toes while the patient is exhaling. The assistant is trying to „print" the patient's shoulder blades into the bed.

SOFT TISSUE TECHNIQUES FOR RELEASING CHEST

Releasing intercostals spaces

- assistant stands next to the patient's bed near the patient's chest
- assistant puts his palm on the patient's sternum
- fingertips of the other hand are placed in the intercostal spaces near the sternum

Assistant's palm holds sternum, fingertips are appropriately pushing into the intercostals spaces to the side. Releasing may be done in all intercostals spaces.



Stretching the upper extremity together with stretching the soft tissues of the chest

- assistant stands next to the patient's bed near the patient's shoulders
- assistant puts one palm on the patient's ribs
- the other hand holds the patient's arm near at the elbow

Assistant stretches the upper extremity and holds the ribs. Ideal angle between the arm and chest is approximately 100 degrees. Assistant stretches chest in the direction of the patient's legs during exhalation and palm stays in the stretched position during inhalation.

SOFT TISSUE TECHNIQUES FOR RELEASING CHEST

Stretching of soft tissues around the chest

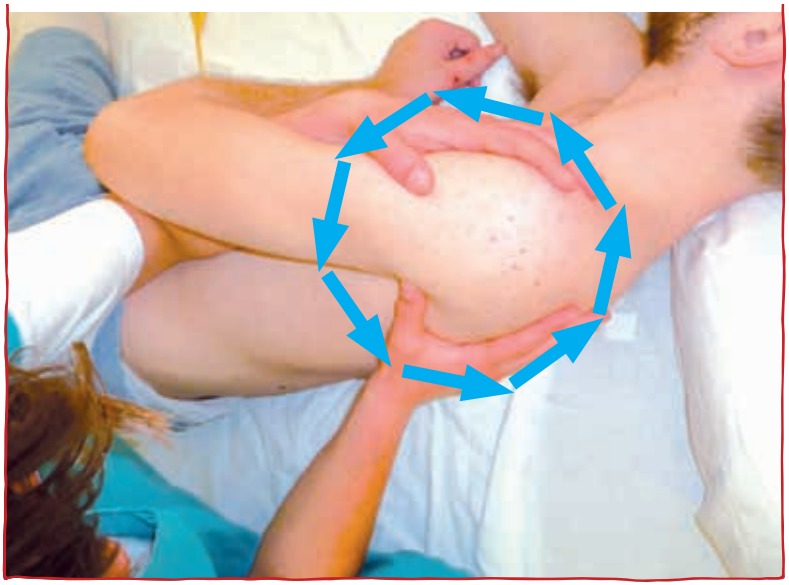
- assistant stands next to the patient's bed behind his back
- assistant puts both palms on the side of lower part of the chest
- fingers are pointing to the bed

Assistant stretches the chest during exhalation. Palms stay in stretched position during inhalation.

Scapula release

- assistant stands next to the patient's bed behind his back facing the patient's head
- assistant puts his palm firmly on the patient's shoulder blade
- he puts the other hand on shoulder from the front side

Assistant does circular motion with the whole shoulder girdle. His hands work together as one unit.



SOFT TISSUE TECHNIQUES FOR RELEASING CHEST

Stretch of soft tissues of back

- assistant stands next to the patient's bed facing the patient's legs
- assistant puts his palm on the shoulder blade on the back
- the other palm is on the upper part of pelvis on the same side

SOFT TISSUE TECHNIQUES FOR RELEASING CHEST

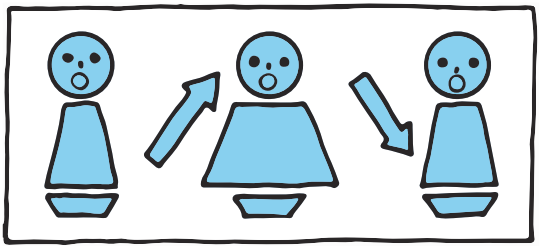
The palm on the shoulder blade stays still, the other palm pushes toward the patient legs during inhalation. Palms stay in stretched position during exhalation.

ACTIVE CYCLE OF BREATHING TECHNIQUE

Active breathing exercises are used to strengthen the breathing muscles, to maintain flexibility of the rib cage and the joint connections. Active breathing exercises help to train proper respiratory stereotype, which can help to cough in crisis situations. Patients can do these exercises in the supine position, in the prone position, in the side position or sitting up.

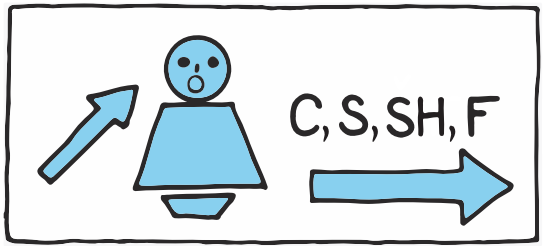
Exercises to increase chest flexibility

Inhalation is done very slowly through the nose or mouth to a maximum. Exhalation is short without power through open mouth. Patient is trying to expand the rib cage in all directions as much as possible.



Forced exhalation

Training forced exhalation can be done with respiratory trainers or shaping mouth and lips. Inhalation is deep and slow through the nose or mouth. Exhalation is controlled with sound of letter Ccc, Sss, SHhh or Fff.



ACTIVE CYCLE OF BREATHING TECHNIQUE

Huffing

This technique of forced exhalation is an ideal helper for successful cough. Huffing effectively removes sputum from the upper respiratory tract. It is not as exhausting as a fit of coughing. When huffing, the inhalation is slow through the nose and exhalation is fast and active through the open mouth. Upper respiratory tract and vocal cords are relaxed.

Controlled breathing

Controlled breathing is relaxed breath without forced exhalation. This kind of breathing is good for resting and gaining some energy before other exercise or coughing.

RESPIRATORY TRAINERS

Respiratory trainers are aids specially designed for training inhalation and exhalation. They use resistance or feedback. Some of them create vibrations in the airways, which help loosen sputum and allow easier coughing.

Flutter – this respiratory aid works during exhalation with slight overpressure and vibrations in the airways.

Acapella – this respiratory aid works during exhalation with slight overpressure and vibrations in the airways.

Triflo – this respiratory aid used during inhalation provides simple feedback to regulate the power and speed of breath.

Training with these respiratory aids is very effective for improving the respiratory function and easy coughing.
Please consult with a physiotherapist for proper use.

2. Exercise during an infection

Each respiratory infection increases the demand on breath. It produces more sputum and irritating cough. Effective coughing of sputum requires cooperation between the diaphragm and abdominal muscles, which are not working in tetraplegic patient. This is the reason why coughing is so strenuous for tetraplegic patient and it may exhaust whole organism. If patient insufficiently coughs there is a risk that sputum stays in airways and the course of infection will be worse. Active and passive techniques of breathing exercises and respiratory aids may facilitate the release of sputum and coughing. For effective coughing patient can use the manual assistance of someone from relatives.

It is important to exercise regularly and on time even with low respiratory problems.

Autogenic drainage

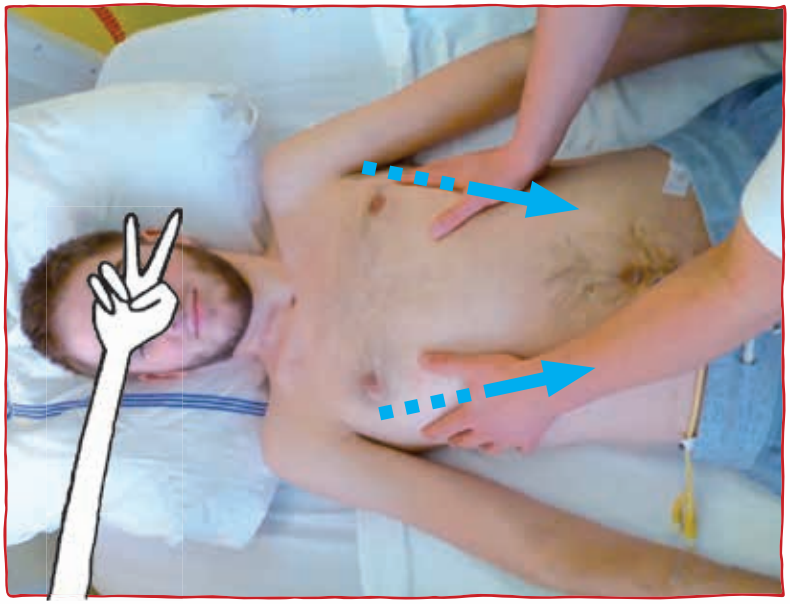
It is respiratory self-drainage technique that utilizes controlled airflow to mobilise and move sputum from the peripheral to central airways toward the mouth.

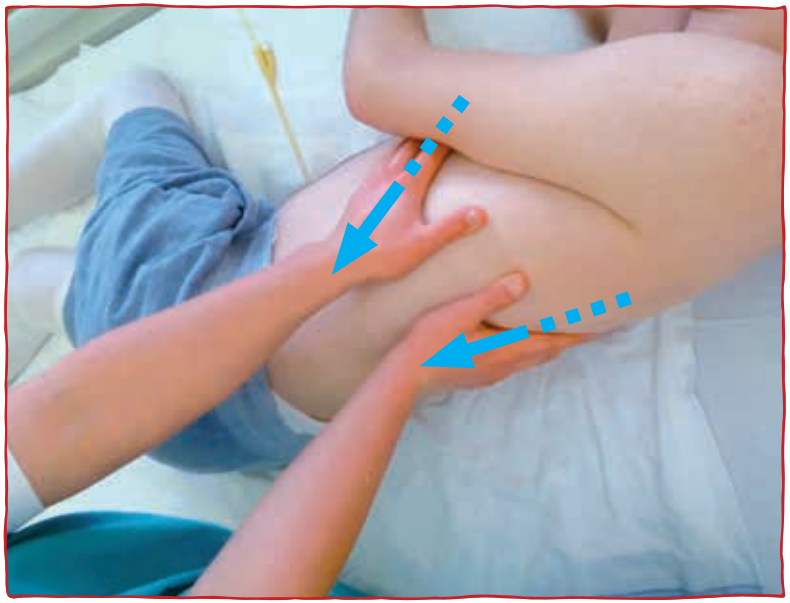
- first take a large breath in through the nose and hold it inside for a moment
- take a breath out through the slightly open mouth
- finally take a breath out at a fast rate, more forcefully and follow with a gentle huff

Assistant can help with autogenic drainage. He can use **contact breathing**, especially pressure and vibrations at the end of exhalation. It is important to mobilise sputum in lungs. This may be enough to clear sputum or a little cough may be needed.

We can do this cycle in all following positions.

Keep doing the cycle until your chest is clear or until you are tired.





3. Contact breathing for stimulation chest movements

- assistant puts his palms to specific area of patient's chest
- during the inhalation, assistant maintains palm on patient's chest and resists chest movement
- during the exhalation, assistant helps ribs move with flat pressure of his palms
- assistant can use flat pressure, springing or deep vibration during the exhalation

Both-sided upper chest breathing

- assistant stands next to the bed near patient's chest
- he puts his palms below the collar bones

Both-sided lower chest breathing

- assistant stands next to the bed near patient's chest
- he puts his palms on lower ribs

CONTACT BREATHING FOR STIMULATION CHEST MOVEMENTS

One-sided upper chest breathing

- assistant stands next to bed behind the patient's back
- he puts one palm below collar bone and the second palm on shoulder blade and thoracic spine

CONTACT BREATHING FOR STIMULATION CHEST MOVEMENTS

One-sided lower chest breathing

- assistant stands next to bed behind the patient 's back
- he puts his palms to lower ribs – the first palm is on front side of chest and the second palm is on back side
- the fingers point to the ground

CONTACT BREATHING FOR STIMULATION CHEST MOVEMENTS

Back chest breathing

- assistant stands next to the bed near patient's chest
- he puts his palms to lower part of chest on both-sides

4. Resting positions

These positions are used to soothe the patient, to decrease the stuffiness and to relax breathing muscles.

They have positive influence on tension of muscles and relaxation of patient. They contribute to easier breathing and to psychological well-being.

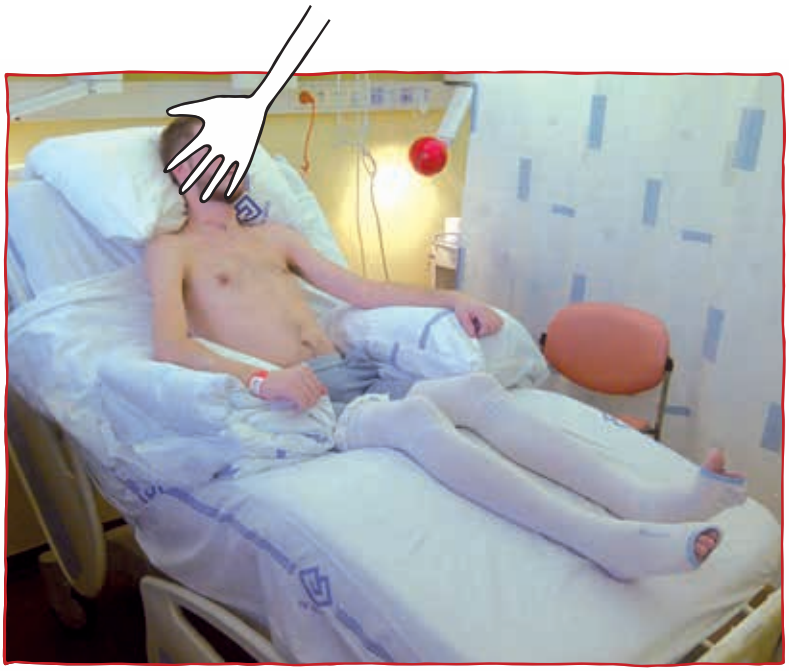
The goal is the facilitation of breathing and decrease (reduction) of respiratory discomfort.

In the side position

- patient is lying on the side
- lower extremities are slightly bent at the hips and knees
- upper leg is in front of patient's body and his back is supported with a pillow

Half-sitting position

- patient is lying on his back in half-sitting position (about 45 degrees)
- lower extremities are bent at the hips and knees, assistant puts a pillow under the head and knees
- upper extremities are along the body



In the prone position

- lower and upper extremity on the same side is bent
- upper extremity is bent in front of his face
- lower extremity is bent at hip (about 45 degrees)

Sitting with backward bend in wheelchair

- if you want to rest during the attack of cough, you can lean the wheelchair back on the bed and put the pillow under the head
- **assistant has to help with this position!**

5. Sleep apnea

Sleep apnea is common sleeping disorder of spinal cord injury patients. It is characterised by pauses in breathing during the sleep, sometimes hundreds of times. There are two types of sleep apnea: obstructive and central. The obstructive sleep apnea is caused by a blockage of the airway, usually when soft tissues of larynx collapse during sleep. Negative pressure causes collapse of soft tissues of throat during inhalation.

The central apnea is caused by a problem with control of breathing in the brain. Mixed sleep apnea is a combination of central and obstructive sleep apnea.

As breathing stops or slows down, the oxygen level drops significantly lower and the carbon dioxide level increases. It leads to activation of the muscles of breathing to take a breath. There are signals to the brain and body wakes up with loud inhalation.

Breathing frequency and blood pressure increase too much. Sleep apnea is associated with numerous risks for cardiovascular system.

Sleep apnea can also be associated with dreaded long-term complications if not diagnosed and treated properly. Common symptoms of sleep apnea include: daytime fatigue and sleepiness, insomnia, headache, poor concentration and poor attention. Another symptom is loud snoring.

If sleep apnea is not treated, people are also at increased risk of additional problems, such as memory problems, poor decision – making, microsleeps and risk of cardiovascular disease.

If you have these problems, contact your doctor!

The team of physiotherapists of Spinal Cord Unit at University Hospital Motol prepared this brochure for your needs.

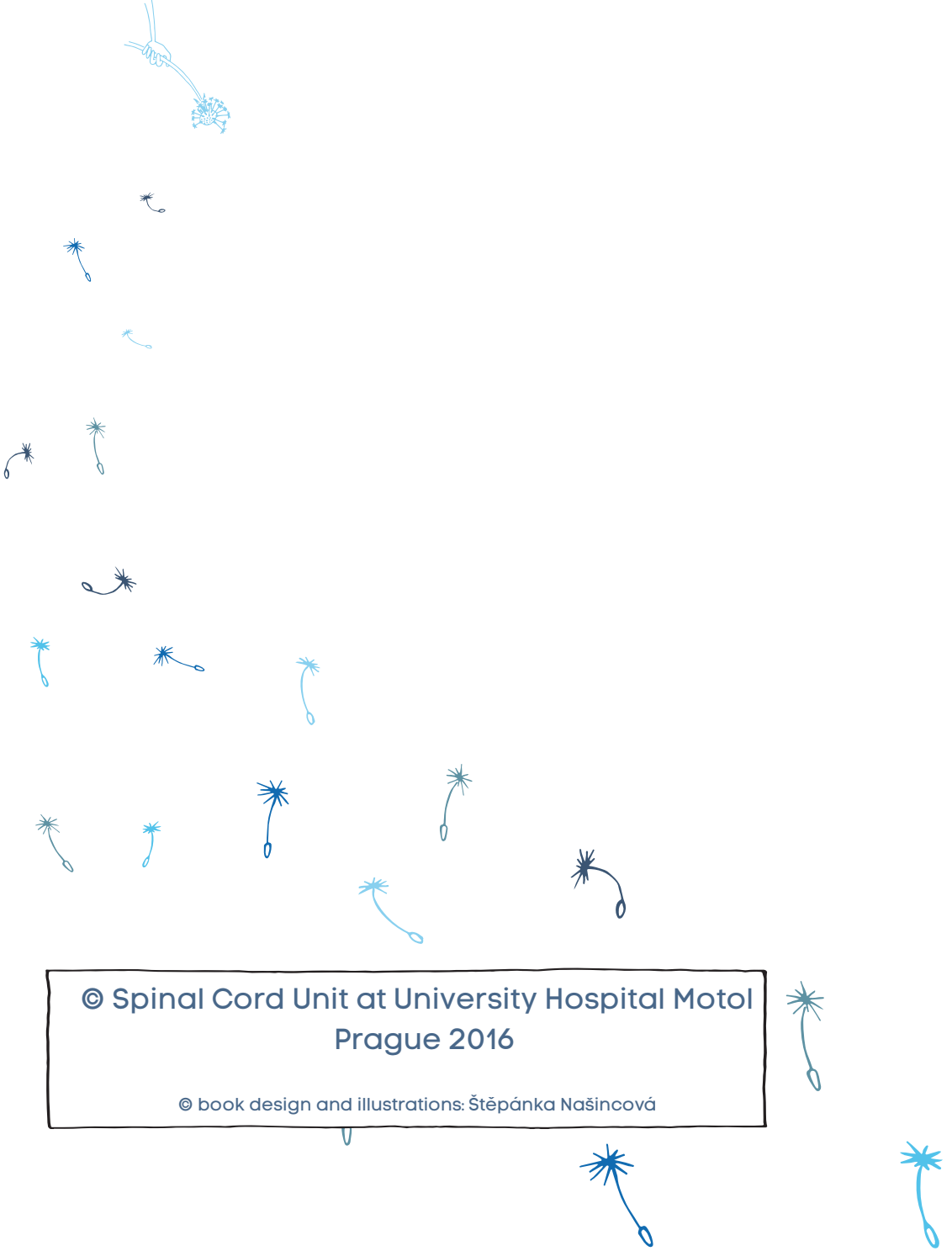
Spinal Cord Unit
Prague

FN MOTOL

This brochure in printed form was created with the support of Movement without help Foundation

Pohyb bez pomoci
Nadace

Thanks to all colleagues and lets fight against all infection! :)
We hope this brochure will be helpful.



ACUTE SPUTUM EXPECTORATION :

1. Stretch soft tissues of the chest
2. Exhalation with vibrations
3. Exhalation with (C,S,SH,F)
4. Exhalation with open mouth
5. Huffing
6. Cough
7. Relax