

The spinal cord is part of the central nervous system. It serves as the connection between the brain and the spinal nerves that emerge from the spinal cord.

Emerging from the brain, the spinal cord emerges from the brain as the medulla oblongata at the foramen magnum, and from there continues on as the medulla spinalis that is about 45 cm long and has a round-oval cross-section. The spinal cord lies in the spinal canal where it is protected by the vertebral bodies and arches. It grows narrower as it descends and in adults ends in the pointed medullary cone (conus medullaris) at the level of the 2nd lumbar vertebra. Below the tip of the medullary cone at the level of the 2nd lumbar vertebra, the cord continues downward for about 25 cm in a much reduced form called the filum terminale to the 2nd coccygeal vertebra. The nerve fibers emerging from the lower spinal cord continue down the spinal canal below the 2nd lumbar vertebra.

These tightly bundled nerve fibers look like a horse's tail, which is why this segment is known as the cauda equina.

The spinal cord, like the brain, is surrounded by cerebrospinal fluid (liquor cerebrospinalis) and three protective sheaths (meninges):

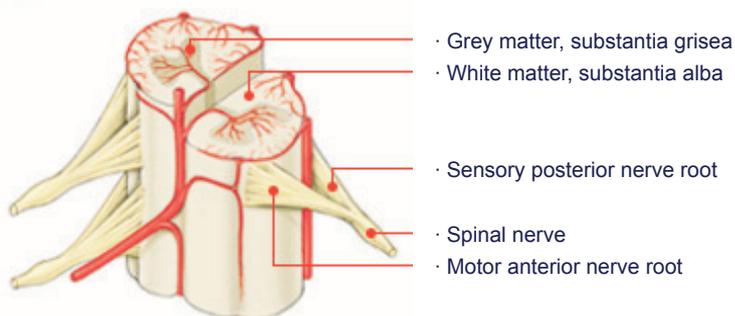
- The "hard" spinal meninx (dura mater spinalis) is the outer sheath that extends from the occipital foramen to the sacral canal
- The middle meninx is formed by connective tissue called the arachnoid membrane (arachnoidea spinalis) with its many blood vessels
- The inner sheath is the "soft" meninx (pia mater spinalis) in direct contact with the spinal cord.

The cross-section of the spinal cord reveals its typical structure.

The grey matter (substantia grisea) at the center is butterfly-shaped in cross-section. It is formed by many nerve cells and runs the entire length of the spinal cord.

The grey matter is enclosed by the white matter (substantia alba) that consists mainly of long nerve fibers.

### • Spinal cord



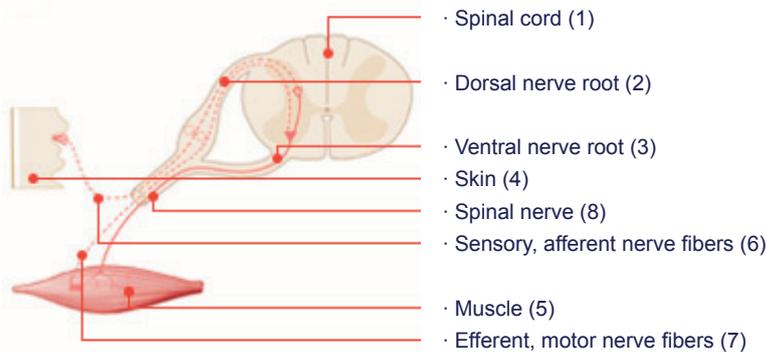
A total of 31 pairs of nerve roots emerge from the spinal cord on both sides along its length. The dorsal nerve root (radix dorsalis) and the ventral nerve root (radix ventralis) merge into a spinal nerve, which then emerges from the intervertebral foramen between the vertebrae.

The dorsal root of the spinal nerve is a sensitive sensory nerve root that receives sensory signals from the body and carries them to the brain. The ventral nerve root carries impulses („commands”) to organs or tissues (e.g. muscles), that instruct them to carry out some action.

The term afferent is used to refer to the "sensory" neural function and the term efferent is used for the "executory" function. The example below explains the various different basic functions of a nerve.

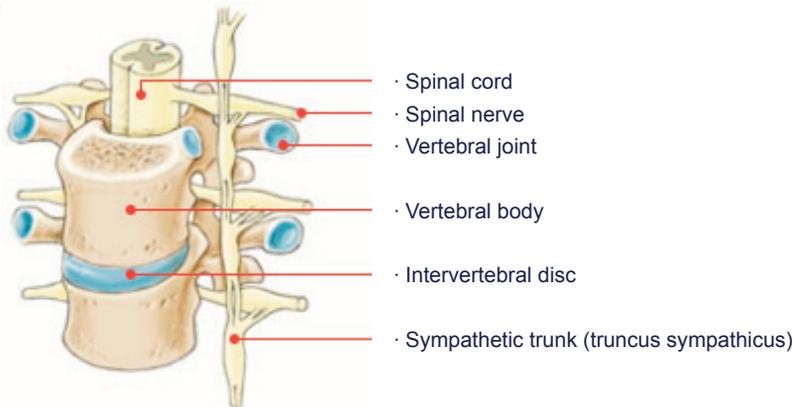
The skin (4) senses cold and reports this to the central nervous system (brain, spinal cord) (1) via the sensory, afferent, nerve paths (6) of the dorsal nerve roots (2). The central nervous system then sends impulses to the ventral spinal nerve root (3) of the muscle (5) via the spinal nerves (8). The muscle receives the impulse to contract repeatedly and this „shivering” produces warmth.

- Simplified example of the different conductive qualities of a nerve



A total of 31 pairs of nerve roots emerge from the spinal cord on both sides along its length, resulting in the 31 spinal segments. Each spinal segment takes care of information transmission for a precisely defined area.

- Angled front view of a section of the thoracic spine showing two spinal cord segments. The spinal nerves emerging from the spinal cord come through the intervertebral foramen on the way to their areas of distribution.



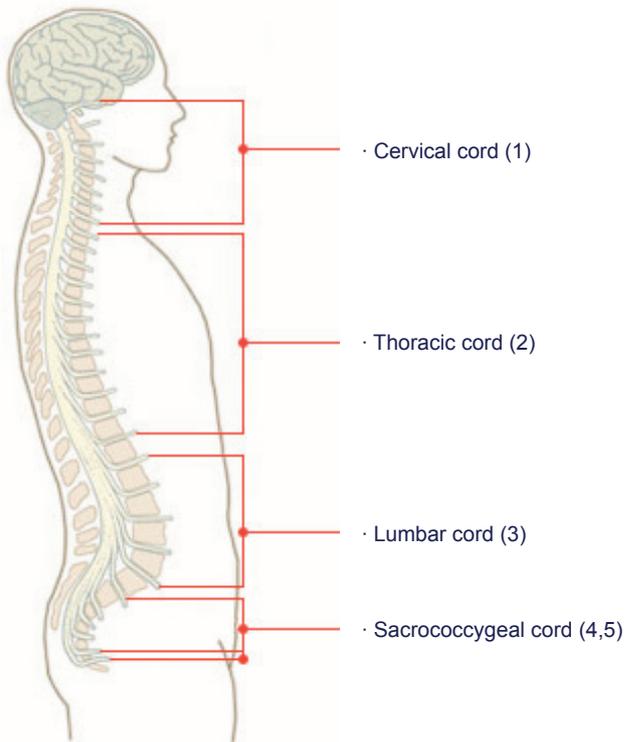
The allocation of the spinal cord segments always refers to the area where the spinal nerves emerge from the spinal cord through the intervertebral foramen between two adjacent vertebra on the way to their respective area of distribution.

Up to the Th1 thoracic segment, the segments are named for the vertebra directly below. Beginning at Th1, each spinal segment bears the name of the vertebra directly above.

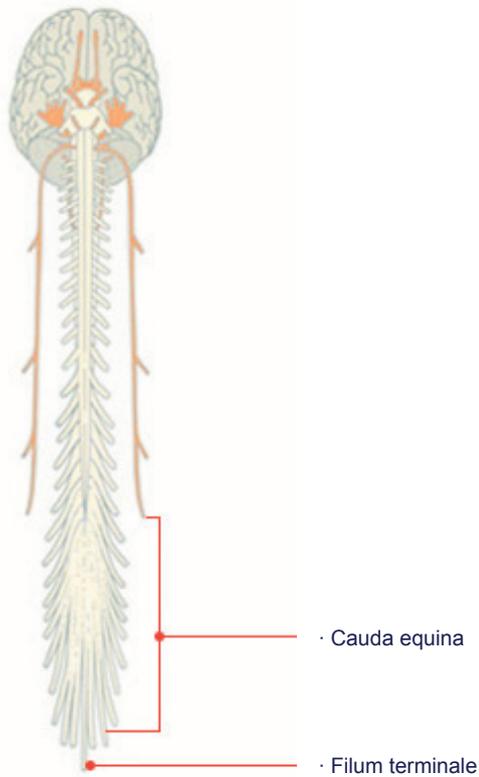
The spinal segments are defined as follows:

	<b>Spinal cord segments</b>	<b>Level of segment as projected on the spinal column</b>
<b>Cervical cord (1)</b>	C1-C8	C1-C7
<b>Thoracic cord (2)</b>	Th1-Th12	Th1-Th 9
<b>Lumbar cord (3)</b>	L1-L5	Th 10-Th12
<b>Sacrococcygeal cord (4,5)</b>	S1-S5 and Co1	L1-L2

• Spinal cord segments, side view



- Spinal cord and emerging spinal nerves, front view



Each spinal cord segment innervates a specific area of skin via the sensitive fibers of the dorsal roots of the spinal nerves. These skin areas are known as dermatomes. Nerve fibers from adjacent spinal cord segments also radiate into each dermatome, so that assignment to a single nerve root is not always entirely clear-cut.

The first spinal nerve, C1, has no dermatome. This means that the skin has 30 dermatomes corresponding to the 30 remaining spinal nerves.

When pressure is applied to one of these nerve roots, as the result of a slipped or prolapsed disc, for example, symptoms may include neurosensory failure in the corresponding skin area. This phenomenon is referred to as radicular (nerve root-based) pain.

- Distribution of the dermatomes

