Anatomy and Physiology
of the Spine and Nervous System

It is essential for a great Chiropractic Assistant to have a basic understanding of the anatomy and physiology of the spine and nerve system. Patients will often discuss with the Assistant what the doctor has told them, or ask questions about it. An Assistant well versed in this area can be a valuable support to both the patient and the doctor.

This module is designed to offer a concise and easy to understand explanation about the anatomy and physiology of the spine and nerve system, as well as some basics about how the body works.

We’ll start with some basics about the structure of the spine and nerve system and then discuss how they function. Then we’ll discuss different stages of degeneration, and finally, we’ll define some anatomical terms for your understanding.
I. Anatomy of the Spinal Column and Nerve System

The spinal column is made up of 24 movable bones called vertebrae. They are divided into 3 types: cervical (neck), thoracic (chest) and lumbar (low back). The occiput, or base of the skull, is a bone that connects with the spinal column on top. The sacrum, a triangular shaped bone, connects on the bottom, and the coccyx, or tailbone, attaches to the lowest part of the sacrum. A joint is the junction between bones; most joints allow for movement.

In addition to the above mentioned bones, there are many soft tissues that are part of the spine. Attaching to all of the bones are tendons, which are fibrous structures that connect the muscles to the bone. The muscles in turn function to move the bones.
In between the vertebrae are intervertebral discs, which act as cushions or shock absorbers. There are two parts of an intervertebral disc. The inner portion, which is gel-like in nature, is called the nucleus pulposus. The outer portion, called the annular fibrosus, is made up of fibrous rings. Lastly, ligaments are fibrous tissues that act as straps to connect bone to bone.

The spinal column is divided into four regions. The cervical spine, or neck, is made up of seven bones, sitting on top of each other forming a forward c-shaped curvature called a lordosis. The first cervical vertebra, or C1, is called the atlas. The second, C2, is called the axis. The last cervical vertebra, C7, is known as vertebral prominens. The thoracic, or dorsal, spine makes up the mid-back region. It is comprised of twelve vertebrae and forms a concave curvature called a kyphosis. The lumbar spine, or low back, is made up of five vertebrae and like the cervical spine, forms a lordosis. Finally, the sacroiliac is comprised of four bones, the right ilium, the left ilium, the sacrum and the coccyx.

The nervous system is the master control system of the entire body. It is made up of the brain, the spinal cord and the nerves. The brain is housed within the skull and the spinal cord sits within the spinal column. Branching off of the spinal cord are spinal nerves, which exit the spine between the vertebrae. They in turn continue to branch, supplying nerve impulses to all of the organs, tissues and cells of the body.
II. Physiology of the Spine

Vertebrae move in six different directions, or ranges of motion. The first is flexion, or forward bending. Next is extension, or back bending. Right and left lateral flexion are side bending, and right and left rotation are twisting.

There is a normal amount of movement that can be expected within each of the different ranges of motion. When a vertebra moves beyond that range it is called hypermobility, and when a vertebra is stuck, fixated or moves less than that range it is called hypomobility.
III. Physiology of the Nervous System

The nervous system functions very much like an electrical system, supplying power to the body for it to function. When the brain needs to direct a function in the body, it sends the signal as an impulse that travels down the spinal cord and out to the body via the spinal nerves, which as mentioned above, branch numerous times before arriving at their destination. The junction of two nerves is called a synapse, and the nerve impulse travels across the synapse en route to the next nerve.

A vertebral subluxation is when a vertebrae is misaligned in relation to the vertebrae above and below, and is restricted in motion, resulting in interference to the spinal nerve at that level or others connected to it. Over time, a subluxation will lead to decreased function of the cells, tissue and organs supplied by that nerve, a state called dis-ease, which can ultimately lead to disease.

When a subluxation is present, proper nerve flow is disrupted, resulting in less than optimum performance of that nerve. This can obviously affect the function of the tissue that was to receive the message. In other words, structure determines function.
IV. Stages of Degeneration

Over time, any joint that is not moving within its ranges of motion properly will begin to degenerate. As a result of vertebral subluxation, there are three stages of spinal degeneration:

**Stage 1** – loss of normal spinal curve and disc height may begin to decrease

**Stage 2** – narrowing of the disc space (yellow arrows), bone deformation (blue arrows), early joint fusion, and impairment of motion and nerve function

**Stage 3** – joint fusion (yellow arrows), degenerated discs (blue arrows) and nerve roots, and permanent loss of function
Appendix I – Terminology

The following diagnostic, anatomic and physiological terms are commonly used within healthcare professions, including chiropractic:

- **Distal**: away from the trunk or point of origin
- **Proximal**: closest to the trunk or point of origin
- **Superior**: toward the head
- **Inferior**: toward the feet
- **Anterior**: nearer to the front of the body
- **Posterior**: nearer to the back of the body
- **Medial**: near the median plane of the body
- **Lateral**: farther away from the median plane of the body
- **Superficial**: near to the surface
- **Deep**: farther from the surface
- **Cephalic**: toward the head of the body
- **Caudal**: toward the feet or lower part of the body
- **Myo**: prefix referring to muscle
- **Osteo**: prefix referring to bone
- **Neuro**: prefix referring to nerve
- **-itis**: suffix meaning inflammation
- **-osis**: suffix meaning abnormal or diseased process or condition
- **-algia**: suffix meaning pain
- **Hypo**: decreased
- **Hyper**: increased
- **Inter**: between
- **Intra**: within
- **Supine**: face up
- **Prone**: face down