

Polio Overview

with an emphasis on

Bulbar Polio

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Rancho Los Amigos Post-Polio Support
Group, March 22, 2014



Poliomyelitis, often called **polio** or **infantile paralysis**, is an acute, viral, infectious disease spread from person to person, primarily via the fecal-oral route.

The term derives from the Ancient Greek *poliós*, meaning "grey", *myelós* "marrow," referring to the grey matter of the spinal cord, and the suffix *-itis* which denotes inflammation., i.e., inflammation of the spinal cord's grey matter.



A severe infection can extend into the brainstem and even into higher brain structures, resulting in polioencephalitis. This can affect breathing, swallowing, and other vital functions.



Although approximately 90% of polio infections cause no apparent symptoms, affected individuals can exhibit a range of symptoms if the virus enters the blood stream. In about 1-2% of cases, the virus enters the central nervous system, infecting and destroying motor neurons. This leads to muscle weakness and paralysis.

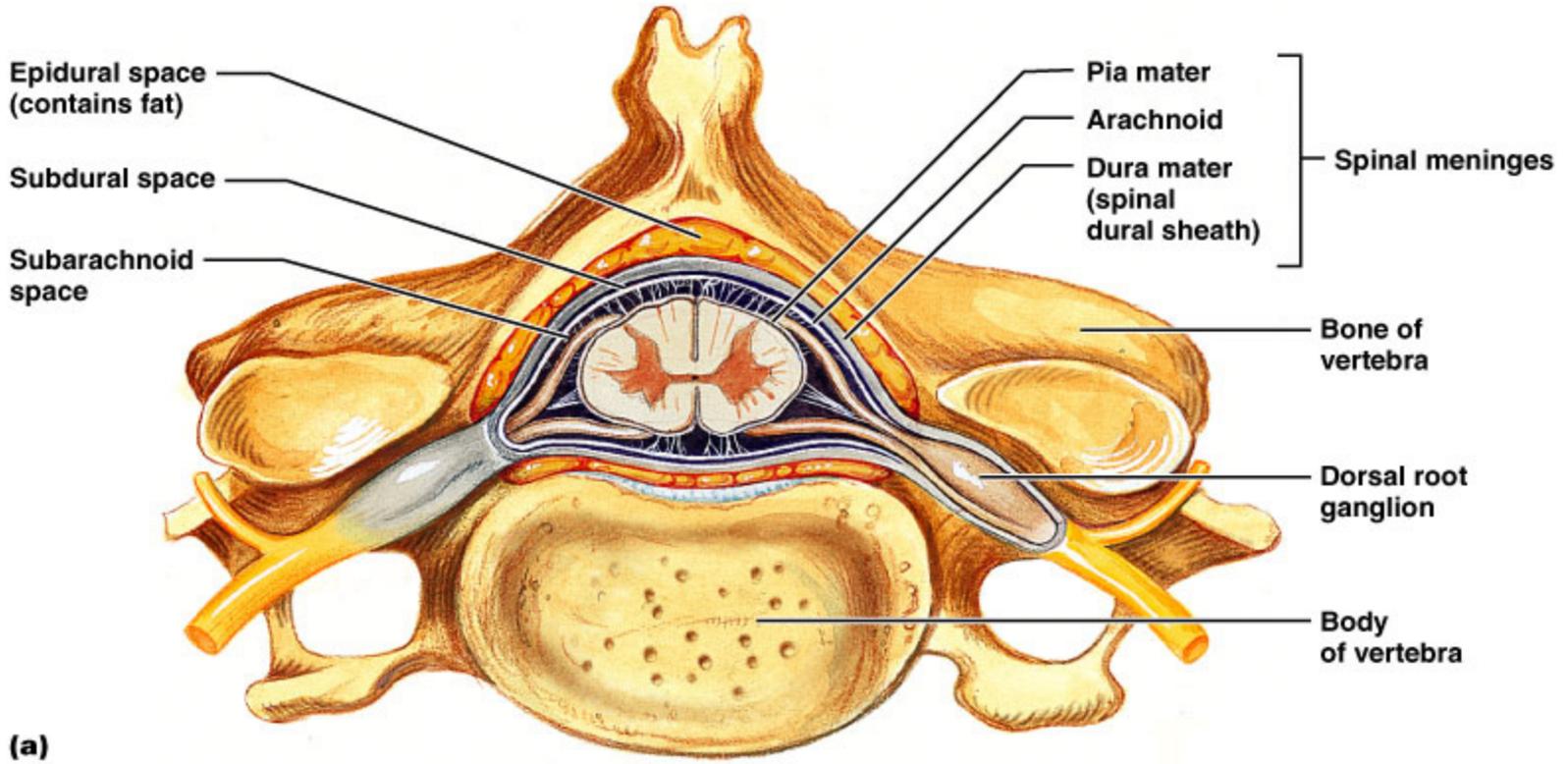
Different types of paralysis may occur, depending on the nerves involved.

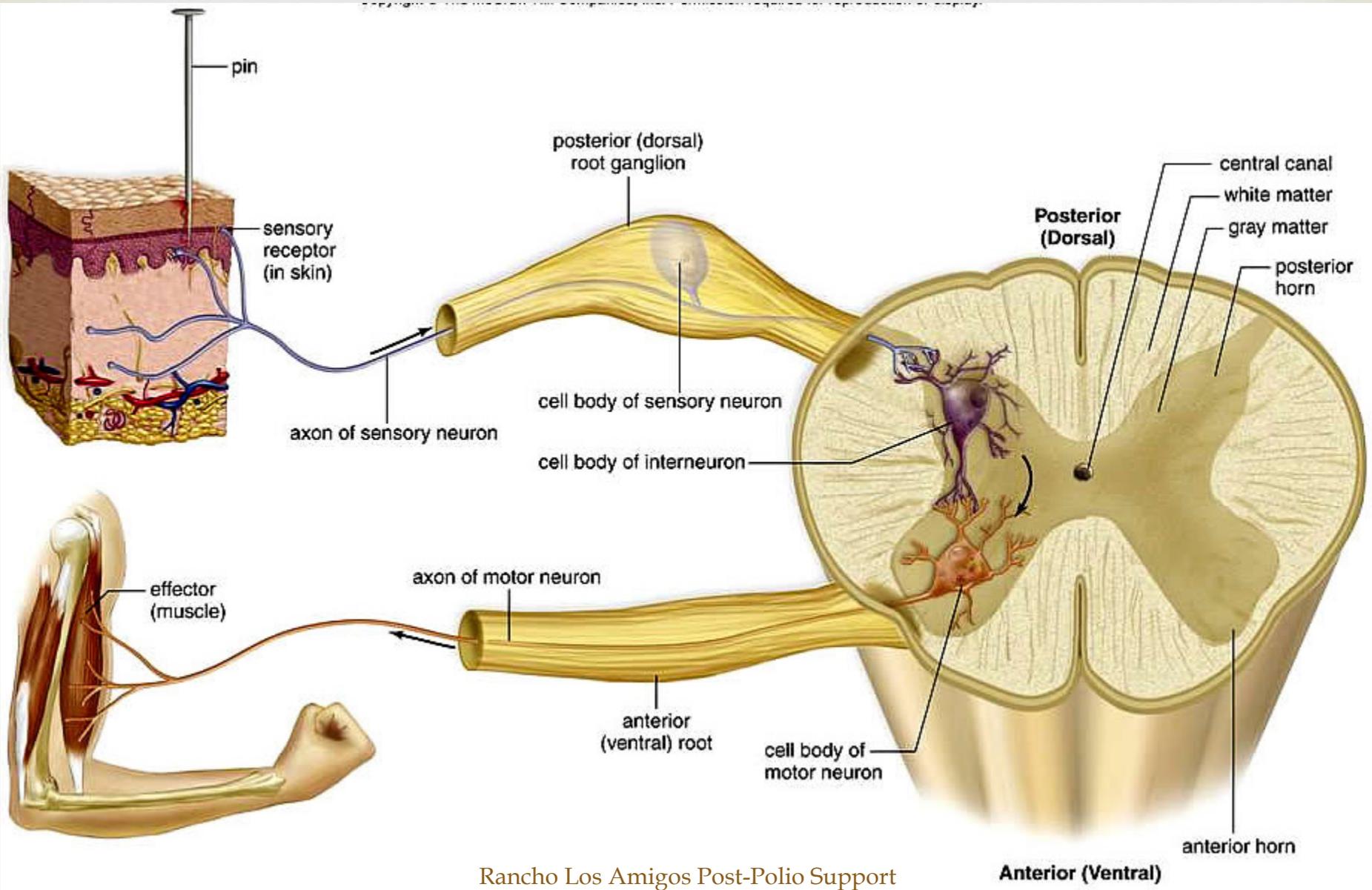
Spinal polio is the most common form.

A person will usually have asymmetric paralysis that most often involves the legs.

Bulbar polio leads to weakness of muscles innervated by cranial nerves.

Bulbospinal polio is a combination of bulbar and spinal paralysis.





The nervous system comprises the brain and various types of nerves, including **sensory** nerves, which carry impulses from all parts of the body to the brain and **motor** nerves, which carry impulses away from the brain and to the muscles and all of the organs of the body.

The somatic part of the nervous system has both sensory components which convey sensations from the eyes, the nose, and other sensory organs to the brain where most of the impulses reach our awareness, and motor components which transmit impulses to the skeletal muscles in the limbs and trunk, allowing voluntary control of movements.

The **autonomic nervous system (ANS)** regulates the functions of our internal organs, such as the heart, stomach and intestines. We are often unaware of the ANS because its functions are involuntary or by reflex.

For example, we do not notice when blood vessels change size, or when our heart beats faster, or your intestinal tract is working.

What happens when you contract polio?

The virus enters your mouth.

It travels to your intestines.

The virus multiplies.

If you're lucky, it is excreted in your feces and you aren't even aware of it.

Or, you might have flu-like symptoms.

If you are unlucky, the virus enters your blood and travels to your central nervous system.



Once the virus is in the central nervous system, it can damage nerves in the spinal cord. This damage can occur along the entire length of the spinal cord, from the tail bone to the brain stem.

Autopsy results done in the 1940s by Bodian indicate that at least 50% of motor nerves must be damaged before this damage is apparent.

As noted before, the virus does not damage sensory (afferent) nerves. (note)

In 1875, a polio case was presented to the Society of Biology in Paris. A nineteen-year-old patient had had polio when he was six months old. It paralyzed his left side. The young man had recovered partial use of his left arm and leg and became a tanner, which required him to use his arms to pull heavy, wet hides out of vats of acid. By the time he was seventeen, this French patient reported fatigue and a feeling of heaviness in his right arm, the arm that had apparently not been affected by the polio. His right arm and leg both became weaker and smaller. Known as "the French patient," this appears to be the earliest case of post-polio syndrome studied.

From 1875 to 1900, twenty-four articles appeared in European medical journals describing 30 additional polio survivors experiencing new weakness and sometimes atrophy.

Two things that are important to remember:

1. Every polio survivor is different.
2. Every polio survivor is different.

Oops! You think I've made a mistake.

No! I wrote this statement twice to emphasize this point. If anyone says to you, or you read an article that says, "All polio survivors ..." or "No polio survivors ..." it is wrong!



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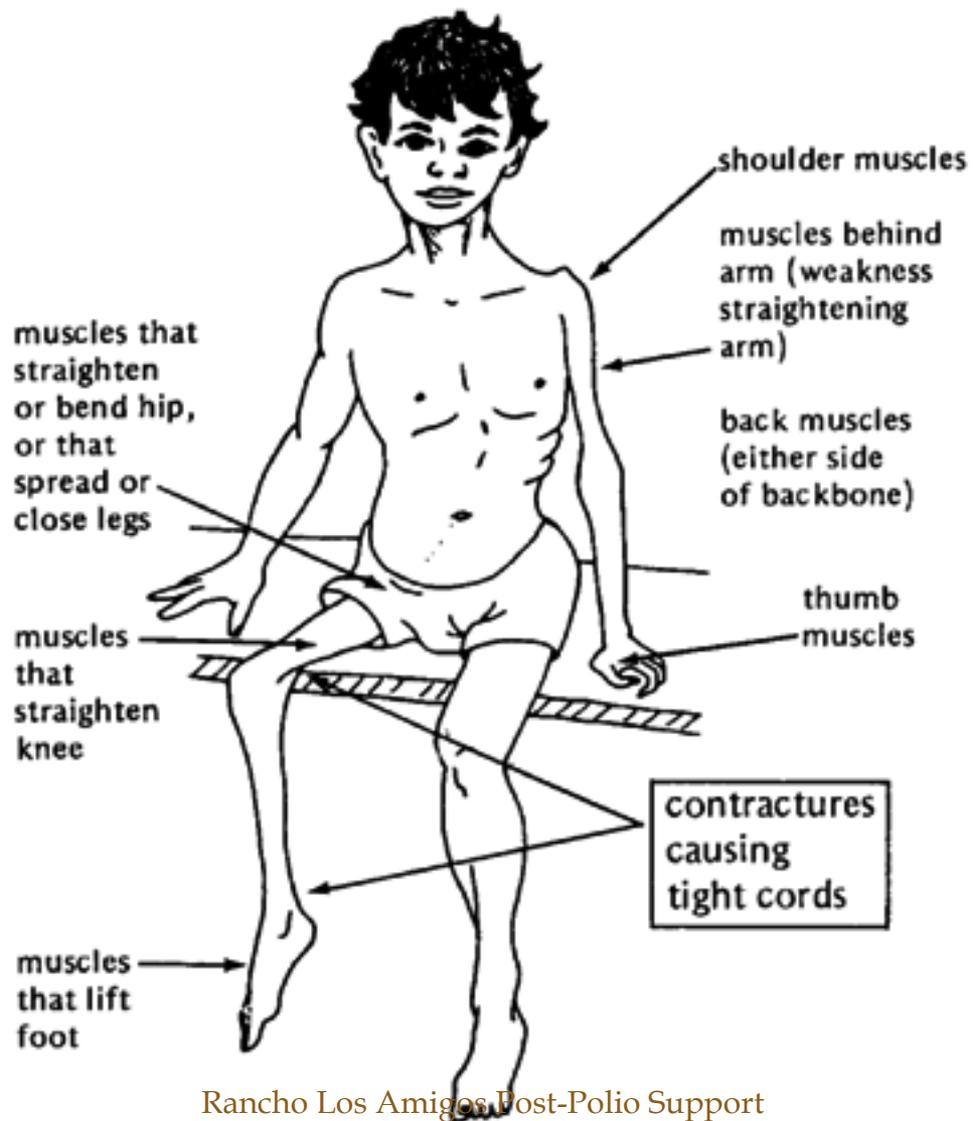
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MUSCLES COMMONLY WEAKENED BY POLIO



Bulbar Polio

Bulbar polio occurs when the virus invades and destroys nerves within the bulbar region of the brain stem. The bulbar region is a white matter pathway that connects the cerebral cortex to the brain stem. The destruction of these nerves weakens the muscles supplied by the cranial nerves, producing symptoms of encephalitis, and causes difficulty breathing, speaking, and swallowing. Critical nerves affected are the glossopharyngeal nerve, the vagus nerve, and the facial nerve. Other nerves may also be affected.

Autonomic Nerves

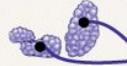
PARASYMPATHETIC NERVES "Rest and digest"

SYMPATHETIC NERVES "Fight or flight"

Constrict pupils



Stimulate saliva



Slow heartbeat



Constrict airways



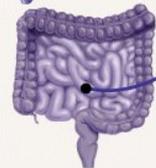
Stimulate activity of stomach



Inhibit release of glucose; stimulate gallbladder



Stimulate activity of intestines



Contract bladder



Promote erection of genitals



Dilate pupils



Inhibit salivation



Increase heartbeat



Relax airways



Inhibit activity of stomach



Stimulate release of glucose; inhibit gallbladder



Inhibit activity of intestines



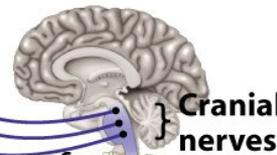
Secrete epinephrine and norepinephrine



Relax bladder



Promote ejaculation and vaginal contraction



Cranial nerves

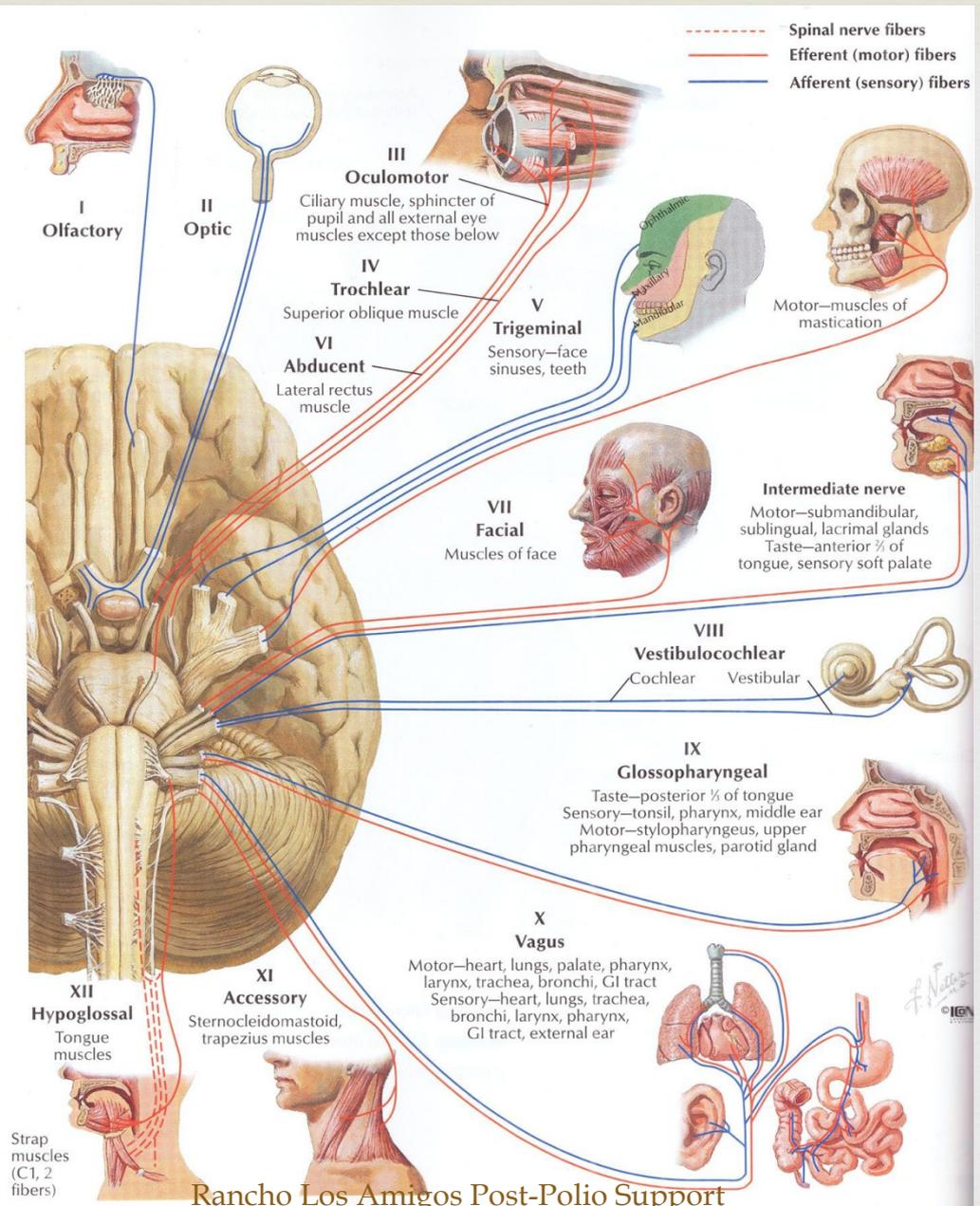
Cervical nerves

Thoracic nerves

Lumbar nerves

Sacral nerves

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Just as in **Spinal Polio**,
Bulbar Polio can vary in severity.

One person might have trouble forming words.
Another person cannot swallow.
A third person seems to sleep all the time.

The nerves that originate in the brain stem (bulb) control:

Breathing

Heart rate

Chewing

Swallowing

Sleeping

Arousal or concentration

and many other functions.

Some polio survivors might have few if any visibly apparent symptoms. But, remember, about 50% of neurons must be damaged before there is any visibly apparent weakness.

Also note, many polio survivors were infants. They might not remember if they had bulbar involvement.

OK. We've reviewed polio. We know that polio can change our body in many different ways.

We've learned that bulbar polio can do things to our body that are not always outwardly evident.

Without being obsessed, what are some of the late effects we should pay attention to.



Breathing:

Do you wake often during the night?

Do you feel tired, even if you think you slept well?

Do you experience:

Frequent yawning?

Talking tires you?

You sleep better with your head elevated?

Morning headaches?

Poor concentration?

Breathing:

Do you use accessory muscles to take a breath?

Neck muscles?

Elevate your shoulders?

Is your cough weak?

Have you had a pulmonary function test?

A sleep study?



Swallowing:

The nerves that lead to the swallowing muscles originate in the bulbar region.

Research indicates that swallowing problems can occur even if there was no apparent swallowing problem at onset.

Swallowing problems can be aggravated by breathing problems.

Swallowing:

Swallowing problems can be aggravated by fatigue.

When you are eating you should be eating.

Not talking.

Not laughing.

Not ... not ... not!

Chewing and swallowing are separate activities, and different (but related) nerves are used.

Internal Organs:

The vagus nerve originates in the bulbar region.

Vagus means “wanderer,” because it wanders throughout your upper body and viscera.

The vagus nerve is part of autonomic nervous system. Acting in concert with other parts of the autonomic nervous system it performs multiple and essential functions!

Internal Organs:

The autonomic nervous system is divided into three parts:

The sympathetic nervous system

The parasympathetic nervous system

The enteric nervous system

Together, they perform part of the “fight or flight” functions.

Internal Organs:

When something goes wrong in this system it can cause serious problems, including:

Blood pressure problems

Heart problems

Trouble with breathing and swallowing

Sluggish or overactive bowels

Post-Polio Fatigue:

Post-polio fatigue can be divided into three areas:

Muscle fatigue – where your muscles feel very tired and heavy, particularly after physical activity

General fatigue – where you feel an overwhelming sense of physical exhaustion, as if you have not slept for days

Mental fatigue – where you find it increasingly difficult to concentrate, have problems remembering things, and make mistakes that you would not usually make

Post-Polio Fatigue:

For our purposes today we will concentrate on mental fatigue.

The reticular activating system is also located in bulbar region of the spinal cord, at the base of the brain.

The reticular activating system controls the transition from sleep to wakefulness, and the ability to focus attention on something.

Post-Polio Fatigue:

The reticular activating system acts as a gate keeper, dampening down the effect of unwanted stimuli such as loud noises, helping to prevent the senses from being overloaded.

To some extent it also regulates response to the stimuli received from outside and helps to pin point a specific fact through detailed thought.

Coordination of actions related to eating, walking, and urinary functions are also carried out by the reticular activating system.

Post-Polio

Remember. Post-polio is only part of the equation.

Most of us are getting older. Some of us have other medical issues, or the after-effects of injuries and other life altering situations.

Something else to remember:

Just because you had polio, this does not make you immune to other diseases or conditions!

Don't assume the pain in your side, or the ache in your leg is polio related.

Don't neglect the headache, the tingling in your arm, or the tightness in your chest.

AND, don't let any doctor scoff or belittle your symptoms by telling you, "I know it hurts but, after all, you did have polio."

Thank you for your attention.

If you have questions I'll try to answer them. But remember, I am not a physician.

I'm just an incredibly curious person, and if I don't know the answer to something I will search until I find it, or my reticular activating system gives out.