

What is post-polio syndrome? Post-polio syndrome (PPS) is a condition that affects polio survivors years after recovery from an initial acute attack of the poliomyelitis virus. PPS is mainly characterized by new weakening in muscles that were previously affected by the polio infection and in muscles that seemingly were unaffected. Symptoms include slowly progressive muscle weakness, unaccustomed fatigue (both generalized and muscular), and, at times, muscle atrophy. Pain from joint degeneration and increasing skeletal deformities such as scoliosis are common. Some patients experience only minor symptoms. While less common, others may develop visible muscle atrophy, or wasting. PPS is rarely life-threatening. However, untreated respiratory muscle weakness can result in underventilation, and weakness in swallowing muscles can result in aspiration pneumonia. The severity of residual weakness and disability after acute poliomyelitis tends to predict the development of PPS. Patients who had minimal symptoms from the original illness will most likely experience only mild PPS symptoms. People originally hit hard by the poliovirus and who attained a greater recovery may develop a more severe case of PPS with a greater loss of muscle function and more severe fatigue. It should be noted that many polio survivors were too young to remember the severity of their original illness and that accurate memory fades over time. According to estimates by the National Center for Health Statistics, more than 440,000 polio survivors in the United States may be at risk for PPS. Researchers are unable to establish a firm prevalence rate, but they estimate that the condition affects 25 percent to 50 percent of these survivors, or possibly as many as 60 percent, depending on how the disorder is defined and which study is quoted. Patients diagnosed with PPS sometimes are concerned that they are having polio again and are contagious to others. Studies have shown that this does not happen. What causes PPS? The cause is unknown. However, the new weakness of PPS appears to be related to the degeneration of individual nerve terminals in the motor units that remain after the initial illness. A motor unit is a nerve cell (or neuron) and the muscle fibers it activates. The poliovirus attacks specific neurons in the brainstem and the anterior horn cells of the spinal cord. In an effort to compensate for the loss of these neurons, ones that survive sprout new nerve terminals to the orphaned muscle fibers. The result is some recovery of movement and enlarged motor units. Years of high use of these enlarged motor units adds stress to the neuronal cell body, which then may not be able to maintain the metabolic demands of all the new sprouts, resulting in the slow deterioration of motor units. Restoration of nerve function may occur in some fibers a second time, but eventually nerve terminals malfunction and permanent weakness occurs. This hypothesis is consistent with PPS's slow, stepwise, unpredictable course. Through years of studies, scientists at the National Institute of Neurological Disorders and Stroke and at other institutions have shown that the weakness of PPS is a very slowly progressing condition marked by periods of stability followed by new declines in the ability to carry out usual daily activities. How is PPS diagnosed? Physicians arrive at a diagnosis of PPS by completing a comprehensive medical history and neuromuscular examination and by excluding other disorders that could explain the symptoms. Researchers and physicians typically use the following criteria to establish a diagnosis: Criteria for diagnosis of post-polio syndrome\*<sup>183</sup>; Prior paralytic poliomyelitis with evidence of motor neuron loss, as confirmed by history of the acute paralytic illness, signs of residual weakness and atrophy of muscles on neuromuscular examination, and signs of nerve damage on electromyography (EMG).

Rarely, persons have subclinical paralytic polio, described as a loss of motor neurons during acute polio but with no obvious deficit. That prior polio now needs to be confirmed with an EMG. Also, a reported history of nonparalytic polio may be inaccurate. A period of partial or complete functional recovery after acute paralytic poliomyelitis, followed by an interval (usually 15 years or more) of stable neuromuscular function. Gradual onset of progressive and persistent new muscle weakness or abnormal muscle fatigability (decreased endurance), with or without generalized fatigue, muscle atrophy, or muscle and joint pain. Onset may at times follow trauma, surgery, or a period of inactivity, and can appear to be sudden. Less commonly, symptoms attributed to PPS include new problems with breathing or swallowing. Symptoms that persist for at least a year. Exclusion of other neuromuscular, medical, and orthopedic problems as causes of symptoms. \*Modified from: Post-Polio Syndrome: Identifying Best Practices in Diagnosis & Care. March of Dimes, 2001. PPS may be difficult to diagnose in some people because other medical conditions can complicate the evaluation. Depression, for example, also is associated with fatigue and can be misinterpreted as PPS or vice versa. For this reason, some clinicians use less restrictive diagnostic criteria, while others prefer to categorize new problems as the late effects of polio; for example, shoulder osteoarthritis from walking with crutches, a chronic rotator cuff tear leading to pain and disuse weakness, or breathing insufficiency due to progressive scoliosis. Polio survivors with PPS symptoms need to visit a physician trained in neuromuscular disorders to clearly establish potential causes for declining strength and to assess progression of weakness not explained by other health problems. Physicians may use magnetic resonance imaging (MRI), computed tomography (CT), neuroimaging, and electrophysiological studies as tools to investigate the course of decline in muscle strength. Less commonly, they will conduct a muscle biopsy or a spinal fluid analysis. These tests are also important to exclude other, possibly treatable, conditions that mimic PPS, but the tests do not identify survivors at greatest risk for new progression of muscle weakness. It is important to remember that polio survivors may acquire other illnesses and should always have regular check-ups and preventive diagnostic tests, such as mammograms, pap smears, and colorectal exams. All NINDS-prepared information is in the public domain and may be freely copied. Credit to the NINDS or the NIH is appreciated. For more info on this go to: [http://www.ninds.nih.gov/disorders/post\\_polio/post\\_polio.htm](http://www.ninds.nih.gov/disorders/post_polio/post_polio.htm) Prepared by: Office of Communications and Public Liaison National Institute of Neurological Disorders and Stroke National Institutes of Health Bethesda, MD 20892