In this presentation we discuss how pathology and symptoms progress as Parkinson’s disease develops. We will also introduce the Hoehn and Yahr staging system.

This graph represents the loss of dopamine producing cells in the brain correlated with the development of non-motor and then motor symptoms. It is not until about 50 percent of dopamine cells are lost that motor symptoms may begin to occur. In this graph one can see that the disease may be divided into three phases: a presymptomatic phase, a phase in which non-motor symptoms are predominantly present, and then a phase in which motor symptoms become increasingly evident. In the presymptomatic phase, loss of cells in the brain gradually occurs and no symptoms are detectable by the patient. This phase may last perhaps up to 10 years. As cell loss begins to accumulate, non-motor symptoms begin to occur such as constipation, loss of smell, changes in mood, and sleep disorders such as REM sleep behavior.
disorder. Eventually there is progression of dopamine cell loss such that the typical motor symptoms of tremor, bradykinesia or slowness, and rigidity or stiffness are detectable.

In initial phases of the disease, cell loss typically begins in the lower part of the brain stem and gradually spreads upward until there is involvement of the mid brain and substantia nigra which contains the dopamine-producing cells. Thereafter, cell begins to affect the surface or cortical areas of the brain. Over time the areas that were previously affected become more severely affected.
Parkinson’s disease is a slowly progressive disorder with a significant amount of variation in progression of symptoms and disability from person to person. As a result, it is difficult to predict the rate of progression for any specific patient. However, there are some prognostic features. Individuals who develop symptoms at a later age of onset typically develop more rapid progression of disability. The development of cognitive impairment or dementia is a poor prognostic feature and is associated with high risk of nursing home placement and death. Measurements of uric acid levels, a byproduct of protein metabolism, have been negatively associated with rate of progression. In other words, higher uric acid levels are associated with slower rate of progression. Patients in whom tremor is the predominant symptom have a slower rate of progression of disability. This is because bradykinesia and gait disorders, which contribute to disability more than tremor, develop slowly in these patients.
The Hoehn and Yahr staging system is an older but commonly used method of rating the progression of Parkinson’s disease. It was first developed even before the discovery of levodopa. Stage 1 disease is characterized by mild symptoms typically affecting only one side of the body without significant disability or impairment of balance.

Stage 2 disease is characterized by symptoms on both sides of the body. There is some degree of disability and gait and posture may be affected, but balance is preserved.
Stage 3 is characterized by the milestone of balance impairment. Clinically this is detectable by the development of spontaneous falls or inability to maintain balance without falling after a pull test. Symptoms occur on both sides of the body and typically mild to moderate disability is present.

Patients in stage 4 of the Hoehn and Yahr systems are generally severely disabled but are still able to walk and stand without assistance. They are usually unable to live alone and are at high risk of falling. They require assistance with day-to-day activities and may experience cognitive impairment.

Patients in stage 5 are completely dependent and are wheelchair or bed bound. Most of these patients have significant cognitive impairment or dementia. During this stage of the disease, patients are typically unable to live alone, are dependent on others for help with activities of daily living, and tend to have a high risk for falls if walking.
Although we do not have a cure or any proven therapy which has been shown to slow the progression of Parkinson’s disease, we have many effective treatments. Once some degree of impairment or disability occurs, treatment of symptoms with a variety of anti-Parkinson medications can markedly improve disability and quality of life. As a result, many patients can continue to work and function independently for many years after a diagnosis.

Treatment of Parkinson’s disease with medication should typically begin when there is impairment in day-to-day activities, social function, or ability to perform one’s occupation. Although motor symptoms are a substantial source of disability, in advanced Parkinson’s disease non-motor symptoms become the predominant difficulties. Unfortunately, dementia becomes increasingly common as the disease progresses and is, in fact, the greatest source of nursing home placement. Patients develop increasing difficulty with control of the autonomic system and especially trouble with bladder control or lightheadedness when arising from a chair or bed. Balance progressively becomes worse and in advanced Parkinson’s disease tends not to respond to levodopa, resulting in frequent falls, which may cause injury.
Parkinson’s disease results in slight reduction of life expectancy, but this varies substantially from patient to patient. Life expectancy is longer in patients who do not have cognitive impairment and, of course, in younger patients. Levodopa has also been shown to significantly reduce mortality.

Although Parkinson’s disease itself does not cause death, complications of immobility can cause hospitalization and death. The most common causes of death are trouble with swallowing resulting in aspiration pneumonia, poor bladder control resulting in urinary infections, and development of blood clots in the leg which can go up to the lungs (pulmonary embolism). Poor balance causes falls and resulting complications from fractures are common.