The long-term consequences of stroke on the individual, their family, community and society cannot be understated. Over the past several years much has been learned about the treatment of stroke in the acute setting. We have also learned how to care for a patient who has suffered a stroke and that better care after a stroke translates into a better functional outcome. Despite the availability of many promising treatments the best treatment by far is to prevent a stroke from occurring in the first place.

One area in medicine, which aids in both prevention and potentially treatment of stroke, is sleep. Fully one third of our lives are spent asleep and what occurs at night has profound effects on our ability to function in the day and visa versa. Recently the information and understanding of sleep has grown tremendously as had its effect on both the cardiovascular and cerebrovascular systems.

In order to better understand the connection between sleep and stroke we must first understand normal sleep.

Sleep for most of our human history was always considered simply as the absence of wakefulness, a very passive state. In fact it is quite the opposite. Each of us undergoes a dramatic change from wakefulness to sleep. This transformation is a highly coordinated process, which has to get the brain to a different state altogether without sacrificing the control it has on the rest of the body.

When we go to sleep at night our brains will fluctuate between two different states, non-rapid eye movement sleep (NREM) and rapid eye movement (REM) sleep. Although outwardly these two states appear to be the same they are in fact polar opposites. The transition from one to the other is very organized. When we first fall asleep we enter Stage I sleep. Stage I is the introduction of sleep. We can easily be awakened from it and it is probably one of the few times that we are aware of sleeping. During this time a “sensory curtain” separates us from the rest of the world but we can still be aroused from loud stimuli from around us.

This stage normally is brief followed by stage II sleep. This stage takes up the majority of our sleep time.
Sleep Apnea and Stroke

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shows a significant increase in metabolic activity yet outwardly the differences are obvious. A hallmark of REM is atonia. This amounts to loss of muscle function everywhere in the body except the diaphragm and the eye muscles. Fluctuations in heart rate and blood pressure are common. Importantly breathing rate changes and in certain situations can become very compromised.

This whole cycle will take approximately 90 min. and throughout the night we will cycle these stages 4-5 times. As the night progresses then a higher percentage of each cycle is made up of REM.

Control of breathing during sleep is different than when we are awake. As we drift to sleep we no longer have a conscious control of our breathing. During sleep our breathing becomes shallow and regular. If oxygen levels decrease significantly or if carbon dioxide increases significantly then the patient will wake up. During NREM sleep our heart rate and blood pressure are fairly stable however when we enter REM sleep there are significant variability of both heart rate and blood pressure.

Although the above changes can be dramatic it causes little concern in the healthy person. However if there are concomitant health problems then serious consequences can occur. One such problem is sleep disordered breathing or sleep apnea.

Sleep apnea for many years has been under diagnosed. In general the prevalence of sleep-disordered breathing is 4-8% in all men and 2-4% in all women. This equates to about 12 million people. Unfortunately the majority of people with sleep apnea have never been diagnosed. An apnea is defined as an attempt to breath but with complete lack of airflow for 10 seconds or more. A hypopnea occurs when the breathing gets so shallow that the oxygen levels decreases. Both of these will disrupt sleep and decrease the oxygen levels. The number of episode in one hour is called the apnea hypopnea index (AHI). This gives a sense of the severity of the sleep apnea. A score of less than 5 is normal. AHI <15 is mild, AHI 15-30 is moderate and AHI >30 is severe.

The heart and brain effects of sleep apnea are significant. Twenty percent of heart attacks and 15% of sudden deaths occur from midnight to 6am. Patients with sleep apnea are more likely to die during the night that all the other hours of the day combined. This was recently seen in a study in The New England Journal of Medicine. Commonly these patients will have hypertension. Roughly 80% of patients with OSA will suffer from high blood pressure. There are tremendous fluctuations in blood pressure during each apnea as a result of the decreasing oxygen levels. Sleep apnea also plays a role in the development of congestive heart failure, coronary artery disease, pulmonary hypertension and abnormal heart rates. REM sleep which occurs in the early morning hours are a dangerous time for patients with sleep apnea because the heart is the most unstable in this stage of sleep. If fact sometimes patients will never have REM sleep because the brain won’t let it happen.

May is stroke awareness month. Stroke affects over 700,000 people every year here in the United States. It is the third leading cause of death and the leading cause of disability. Fully 50% of patients who have a stroke never return to their previous level of function. Although there are effective treatments to treat a stroke the most effective treatment is prevention. Controlling the risk factors can make a difference. The risk factors include high blood pressure, elevated cholesterol, smoking, diabetes, obesity and a previous stroke or heart attack. Interestingly sleep apnea can be caused by several of these factors or result in them. We have found now that sleep apnea by itself also raises the risk of stroke.

A relationship between sleep and stroke has always been observed. It has already been established that OSA and cardiac problems coexist. Several of the risk factors for coronary artery disease are also known risk factors for stroke. There is also a high frequency of stroke and sleep apnea in the same age groups. A similar relationship between early morning hours and myocardial infarction has been seen with both ischemic and hemorrhagic stroke. There is also a strong connection between sleep apnea and stroke. A high percentage of patients will develop sleep apnea after they have a stroke. In addition, patients with a stroke who snore are less likely to be alive one year after they have their stroke compared to patients without snoring. Finally patients who have sleep apnea have upwards of a 3x increased risk for stroke.

The recognition of the risk factors for stroke and treatment of these problems are vital to prevent a stroke. In fact of the top 3 causes of death stroke is the most preventable. In addition to knowing the risk factors it is important to know the symptoms of stroke. Sudden onset of numbness or weakness on one side of the body, sudden intense headache, sudden vision changes, sudden language or speech difficulty or sudden walking problems should prompt a call to 911.

Stroke is a serious problem that many time can be avoided if care is taken to recognize and treat the risk factors. Sleep apnea is one such disorder that is frequently over look but if treated could change your life.