A Buzzing Head: CT scans and syncope
Rebecca Burk, MD
3/28/14

A Story from the Front Lines
“Code blue, 1-Echo waiting room. Code blue, 1-echo waiting room.” We ran down the stairs to the waiting room to find Mr. X slumped back in a chair. He had a heart rate of 50, a systolic blood pressure in the 80s. The monitor showed sinus bradycardia. No one in the area knew him or anything about his medical problems. We loaded him onto a stretcher, wheeled him over to the ED and transferred care to the emergency providers. His mental status was already improving and his neurologic exam was completely normal, other than being sleepy and slowed. His blood pressure and heart rate improved without intervention. An hour later he was called to our team to be admitted. His vitals were normal, his labs were normal, his CT head was normal. I surfed through his electronic chart and found that these episodes happened every few months. They were thought to be autonomic insufficiency from his diabetes. No medicines were obvious offenders. His last discharge summary described the exact scenario we had encountered, in exactly the same location. During each of these episodes, Mr X had had a CT scan of his head. He had a total of 9 CT scans of his head in the prior 2 years. All were for the same indication. All were normal.

Teachable moment
CT scanning is a useful tool that can lead to prompt diagnosis and treatment of life threatening conditions. However, it is sometimes overused.

While this presentation was not completely consistent with syncope, as the patient didn’t immediately regain consciousness, the initial presentation seemed most consistent with a cardiogenic or neurocardiogenic source of altered mental status given his bradycardia and hypotension. CT scanning in the evaluation of syncope has been shown to be low yield. In a 2001 study, 44% of patients evaluated for syncope at academic hospitals had a CT scan of the head. Only 2% of these studies had diagnostic yield. In all the cases that CT did have diagnostic yield, stroke or seizure were suspected as the leading diagnosis. The AHA/ACCF consensus guidelines for the evaluation of syncope recommend neuroimaging only if a neurologic cause of loss of consciousness is suspected. In this patient who had had multiple CT scans of his head for the same indication, this may have been a low yield study.

Ionizing radiation is known to increase cancer risk and medical radiation accounts for 79% of man-made (e.g. non-environmental radiation) ionizing radiation. Cancer risk is thought to be a linear response to the cumulative dose of radiation, so there is no safe minimum dose. The Biological Effects of Ionizing Radiation VII report is the accepted standard resource quantifying the cancer risk associated with ionizing radiation. They estimate that 1 in 100 people will develop a cancer (solid or liquid tumor) from a dose of 10mSv. A CT scan of the head is a dose of approximately 2mSv, so our patient had an 18mSv exposure with his 8 head CT scans. Thus 1.8/100 people would develop a cancer
from his exposure. As a comparison, the average environmental exposure to ionizing radiation for the average person is 3mSv over 1 year.

The CT head that our patient received was a low-yield study that carried a risk. Each individual study only minimally increases his cancer risk. However, due to recurrent syncopal episodes, he is at risk for repeated imaging and an increased cumulative risk of cancer due to ionizing radiation. In our patient’s scenario, the risk of ionizing radiation could have outweighed the diagnostic benefit of a CT head in the setting of what was thought to be an autonomic dysregulation. The repeat study could have been avoided with a more careful review of the medical record.