While the usefulness of CT in the pediatric population increases to assess spinal alignment on lateral cervical spine radiographs. Conventional radiography is typically the initial imaging modality of choice; Figure 6 illustrates the 4 lines commonly used in injury. The authors then discuss the Pediatric Emergency Care Applied Research Network (PECARN) data that uses eight clin ical predictors of cervical spine injury, which are summarized in Table 3, and is 98% sensitive for the detection of cervical spine injury, and in distribution within the spine in adults vs children; most children with SCIWORA have a radiographic abnormality or SCIWORA is inversely proportional to the affected patient’s age; most children with SCIWORA have soft-tissue and spinal cord abnormalities as depicted on MRI. The paper proceeds to review the age-related mechanisms of cervical spine injury, then reviews the normal maturational anatomy with a focus on the normal development of C1 and C2 that is essential to distinguish normal developmental anatomy from traumatic injury. The authors then discuss the Pediatric Emergency Care Applied Research Network (PECARN) data that uses eight clinical predictors of cervical spine injury, which are summarized in Table 3, and is 98% sensitive for the detection of cervical spine injury. Conventional radiography is typically the initial imaging modality of choice; Figure 6 illustrates the 4 lines commonly used to assess spinal alignment on lateral cervical spine radiographs. While the usefulness of CT in the pediatric population increases with increasing age, MRI, even though limited by availability and requiring sedation or anesthesia is the most accurate method of assessing acute cervical spine trauma owing to its high soft-tissue contrast and ability to assess the soft tissues, spinal cord, and ligaments. The next section of the article reviews the pitfalls in diagnosis including pseudosubluxation, normal wedge-like vertebral body morphology, the distinction of synchondrosis from fracture, and the effect of cervical collars on spinal alignment and bony spacing. Injury patterns are then reviewed beginning with the craniocervical junction and upper cervical spine distraction injuries. Familiarity with the normal lines and measurements on lateral radiography as depicted in Figures 11 through 14 are key to proper interpretation. The incidence of spinal cord injury without radiographic abnormality or SCIWORA is inversely proportional to the affected patient’s age; most children with SCIWORA have soft-tissue and spinal cord abnormalities as depicted on MRI. Hanging injuries including Hangman’s fracture, clay-shoveler’s fracture, odontoid and Jefferson fractures are illustrated. The craniocervical junction and upper cervical spine distraction injuries. Familiarity with the normal lines and measurements on lateral radiography as depicted in Figures 11 through 14 are key to proper interpretation. The incidence of spinal cord injury without radiographic abnormality or SCIWORA is inversely proportional to the affected patient’s age; most children with SCIWORA have soft-tissue and spinal cord abnormalities as depicted on MRI. Hanging injuries including Hangman’s fracture, clay-shoveler’s fracture, odontoid and Jefferson fractures are illustrated. The final section reviews nonaccidental trauma which is responsible for 19% of cervical spine injuries in children younger than 2 years of age; ligamentous injury is seen in 60% of affected children.

Electronic stimulation devices that are used throughout the body for pain management, to stimulate organs, or to modulate function all have a similar design with a pulse generator, an insulated lead or wire, and an electrode at the end. Providing a head-to-toe review of these devices, this article begins with a review of deep brain stimulators used for management of Parkinson’s disease, essential tremor, and primary dystonia. CT and/or MR are used to direct placement of the electrodes to their targets in the brain. Immediate complications include hemorrhage and infarct; infection may occur and local brain edema develops in approximately 3% of patients but is usually self-limiting. Occipital nerve stimulators for treatment of occipital neuralgia or migraine and trigeminal neurostimulators for neuropathic trigeminal pain are not FDA-approved for these indications and are therefore considered off-label usage; Figures 5 and 6 show examples. Vagal nerve stimulators have been used for approved indications such as refractory epilepsy and treatment-resistant depression and are investigational for a broad spectrum of disorders including heart failure, rheumatoid arthritis, headache, obesity, asthma and movement disorders. Spinal cord stimulation is used to treat a wide variety of chronic pain conditions; those with cylindrical leads can be placed percutaneously while paddle leads, which are less prone to migration and are more effective long term, require a laminectomy or laminotomy for placement. Transvenous pacemakers and implantable cardioverter/defibrillator devices are well known to radiologists and the article focuses on newer devices such as subcutaneous ICDs, leadless pacemakers, and MR conditional de vices. The Medtronic Micra device is a leadless pacemaker seen anchored within the right ventricle by nitinol tines, as seen in Figure 14 of the article. The article proceeds to provide detailed information on MR conditional cardiac implantable electronic devices. For example, Medtronic devices have a wave symbol as seen in Figure 16a indicating they are MRI conditional. Phrenic nerve stimulators for diaphragmatic pacing, gastric stimulators for treatment of gastroparesis, and sacral stimulators are detailed to complete this review of electronic devices from head to sacrum.

This review article from 3 midwestern institutions reviews the imaging of pediatric cervical spine trauma, which the authors point out differs in incidence and in mechanisms and patterns of injury and in distribution within the spine in adults vs children; Table 1 highlights these differing features. While cervical spine injury is much less common in children than adults, an important difference is that the fulcrum of injury in children tends to be higher in the C-spine, specifically the C2-C3 level, owing to the larger mass of the head relative to the body in children. The paper proceeds to review the age-related mechanisms of cervical spine injury, then reviews the normal maturational anatomy with a focus on the normal development of C1 and C2 that is essential to distinguish normal developmental anatomy from traumatic injury. The authors then discuss the Pediatric Emergency Care Applied Research Network (PECARN) data that uses eight clinical predictors of cervical spine injury, which are summarized in Table 3, and is 98% sensitive for the detection of cervical spine injury. Conventional radiography is typically the initial imaging modality of choice; Figure 6 illustrates the 4 lines commonly used to assess spinal alignment on lateral cervical spine radiographs. While the usefulness of CT in the pediatric population increases...
As automated breast ultrasound becomes integrated into routine breast imaging practice, familiarity with common artifacts becomes increasingly important. In this article from the Department of Breast Imaging at Northwestern Memorial Hospital in Chicago, Illinois, Dr. Ingolf Karst and colleagues begin by reviewing the basics of image acquisition, stressing the importance of appropriate patient positioning, transducer placement, and scanning technique to obtain the three standard scans of each breast. Movie 1 demonstrates these scans. The article then proceeds to show how the transverse scans are reconstructed by software into sagittal and coronal planes; correlating the US images to the breast anatomy is detailed. After correlating the US echogenicity of the breast to the four designated BIRADS breast composition patterns, the authors review the importance of the coronal plane reconstructed images. The next section provides a review of common artifacts, beginning with the influence of scanning technique on image quality including inadequate patient positioning, lack of transducer contact, and poor transducer placement; Figure 8 illustrates these three artifacts. Software artifacts include nipple artifact and silhouette artifact, the latter from an algorithm used to suppress image information that is outside the scanned tissue. Artifacts arising from physiologic conditions include cardiac artifacts from tachycardia and motion artifacts; both are readily recognized and do not typically interfere with scan interpretation. Breast lesion artifacts can result from firm masses and from posterior acoustic enhancement posterior to cysts which on coronal images can be mistaken for a hyperechoic mass. Apparent architectural distortion around a surgical scar can be challenging to recognize on coronal images but is usually readily evident on axial scans. Shadowing can have multiple causes and is likely the most challenging finding to interpret on automated breast US. The article provides methods to help analyze shadowing including use of a second view to resolve shadowing seen on a single projection, evaluation of additional planes, and use of the rotation software tool integrated into the PACS workstation; Figures 21 and 22 and Movie 3 illustrate the use of this tool for problem-solving. The final section describes the use of software-reconstructed planes beyond the other standard two planes to differentiate masses from artifacts. Table 2 at the end of the article summarizes the methodological approach to manage automated breast US shadowing.

Radiologists play an important role in the diagnosis and management of renal cell carcinoma. From the Departments of Radiology, Pathology, and Internal Medicine at UT Southwestern Medical Center, Dr. Alberto Diaz de Leon and colleagues begin their article by discussing the three main subtypes of renal cell carcinoma, detailing their relative frequency and imaging characteristics. The article then briefly reviews the tumor biology of clear cell renal cell carcinoma, elucidated by the discovery of the von Hippel-Lindau gene. While the authors state that there is no universally accepted imaging surveillance strategy to identify recurrent disease in patients who have undergone surgical resection, most guidelines suggest imaging of the chest and abdomen, given that these represent the most common sites of disease recurrence. An important point is that with CT, dual-phase imaging of the liver and pancreas is particularly important as up to 1/3 of hepatic metastases from renal cell carcinoma are detected only on arterial phase scanning. The article proceeds to review unusual locations for renal cell carcinoma metastases; examples of thyroid and small bowel metastases are provided. While as with most malignancies the greatest risk for recurrence of renal cell carcinoma is within the first several years after treatment, late recurrence more than 10 years after surgery is known to occur. The pancreas is one such site of metastatic disease, with clear cell subtype of renal cell carcinoma one of the most common primary tumors to metastasize to the pancreas; Figure 5 illustrates such a case. Osseous metastases are found in up to 30% of patients with metastatic disease and are most often osteolytic; the authors suggest that whole body MRI has a sensitivity superior to that of Tc-99m methylene diphosphonate bone scintigraphy and CT in detecting bone metastases. The ability to assess the response to therapy in patients with metastatic renal cell carcinoma can be challenging; the article describes the concept of oligoprogression, which is defined as one or a few sites of disease progression despite overall stable or responsive disease. Using size-based criteria such as RECIST 1.1 to assess tumor response can be misleading and the use of Choi MASS (morphology, attenuation, size, and structure), and iRECIST or immune-related response criteria in the setting of immune modulation therapy are attempts to overcome this limitation. The article concludes with a section devoted to imaging findings associated with treatment-related toxic effects including enteritis and colitis associated with various agents and pulmonary toxicity in the form of cryptogenic organizing pneumonia, nonspecific interstitial pneumonia, and hypersensitivity pneumonitis.
Nearly half of adults in the United States are hypertensive; secondary causes account for 10% of cases and this condition is termed secondary hypertension. Table 1 provides a list of causes, which can be divided into endocrine and non-endocrine causes. Imaging plays an important role in identifying common causes of secondary hypertension and in the detection of its complications. Primary hyperaldosteronism or Conn syndrome is the most common cause of secondary hypertension, with aldosterone-producing adrenal adenomas and adrenal gland hyperplasia the most common causes of Conn syndrome; the article provides examples of these conditions as seen on CT and MRI. Cushing syndrome is an uncommon cause of secondary hypertension; causes include an ACTH-producing pituitary tumor (Cushing disease) and a variety of adrenal and non-adrenal tumors associated with a paraneoplastic syndrome. Pheochromocytomas and paragangliomas as rare causes of secondary hypertension, seen in fewer than 5% of affected patients; typical imaging features are illustrated. Hypertension is seen in up to 50% of patients with hyperparathyroidism with parathyroid adenomas the most common underlying etiology, while 1/3 of patients with hyperparathyroidism have systolic hypertension. Nonendocrine causes of secondary hypertension include aortic coarctation with characteristic imaging findings on thoracic CT angiography. Renovascular hypertension is seen in 1-2% of all hypertensive patients and is due to atherosclerosis or fibromuscular dysplasia in most cases. Page kidney resulting from renal parenchymal compression by a subcapsular hematoma produces hypertension by activation of the renin-angiotensin-aldosterone axis, while patients with renal parenchymal disease due to autosomal dominant polycystic kidney disease, acute glomerulonephritis, diabetic nephropathy or chronic kidney disease all have a high incidence of secondary hypertension. The latter section of the paper reviews the complications of hypertension, divided into cardiovascular and central nervous system complications. Aortic aneurysms and the spectrum of acute aortic syndromes including aneurysm rupture, intramural hematoma and dissection are all seen with increased frequency in hypertensive patients. Cardiac effects include left ventricular hypertrophy, myocardial infarction, and coronary artery atherosclerosis. Finally, CNS manifestations include intracerebral hemorrhage, subarachnoid hemorrhage, and posterior reversible encephalopathy syndrome; the latter is characterized by vasogenic edema in the parietal and occipital subcortical white matter as depicted on T2-weighted and FLAIR MR sequences.

In this extensive review of the imaging of prosthetic cardiac valves, Dr. Prabhakar Rajiah and colleagues from UT Southwestern and UT Health Science Center in San Antonio, Texas begin with illustrations of the most common mechanical and bioprosthetic valves encountered in practice. After a discussion of the spectrum of imaging modalities and their relative role in evaluating valvular disease, the article describes the key features to be assessed in a comprehensive cardiac valve evaluation, with several movies illustrating the normal function of the various valves. First, the article focuses on the hemodynamic and pathophysiologic consequences of stenosis, regurgitation, and a stuck or frozen leaflet using static images and video evaluation of retrospectively-gated cardiac CT to illustrate the pertinent findings. Structural abnormalities include prosthesis-patient mismatch and structural failure which refers to intrinsic damage of the prosthetic components impairing valve function. The authors point out that bioprosthetic valves are more prone to structural failure than are mechanical valves, with failure rates of 30% for heterografts within 10-15 years. Valve calcification is the most common cause of sterile valvular degeneration in a bioprosthetic valve and is an important contributor to the decreased longevity of these valves; CT is the most sensitive technique to detect commissural and basal calcifications. Valve dehiscence reflects a separation of the prosthetic valve from its annulus due to breakdown of the suture line, as demonstrated in an affected patient in Figure 9. Paravalvular leak reflects abnormal flow through a channel between the prosthesis and valve annulus due to inadequate sealing and is a complication of both mechanical and bioprosthetic valves. The most common cause of a paravalvular leak is endocarditis-induced dehiscence; the article provides several case examples as seen on echocardiography and CT and details the transcatheter management of this complication using a variety of closure devices that are illustrated in Figure 11. Infective endocarditis and vegetation are assessed with echocardiography, while CT is used when echo is indeterminate or is used to assess for paravalvular complications. Similarly, paravalvular and aortic root abscesses are assessed on echocardiography although CT and MR can demonstrate associated findings. Paravalvular pseuadoaneurysm is most common after aortic root graft placement; CT has 100% accuracy in the diagnosis of this complication. Abnormal connections between two neighboring cavities such as a Gerbode defect between the left ventricle and right atrium and thrombus formation particularly on a mechanical valve are additional complications illustrated in the article. Pannus formation is a subacute or chronic complication most often seen on mitral valve prostheses and can be difficult to distinguish from thrombus; Table 2 provides distinguishing features of these two complications. Finally, aortic dissection can occur in prosthetic aortic valves as can other miscellaneous complications; the general imaging approach to the evaluation of prosthetic heart valves is summarized in Table E2.
Thank you for listening, I hope you found these summaries helpful. Please subscribe to our podcasts and rate us on iTunes. This helps your colleagues find us much more easily. We greatly appreciate it.