

Basic Coding: Technical Aspects of Imaging Modalities

With the opening of the ACR's Radiology Coding Source as a free publication, it is expected that there will be a group of readers who are not as sophisticated or experienced with radiographic procedures and coding as past paid subscribers to the Source. This article presents a base of information about the technical aspects of radiographic modalities, magnetic resonance imaging, computed tomography, ultrasound, nuclear medicine, and radiation oncology. Radiology coders without a background in imaging technology will increase their coding skills by taking the time to learn how these imaging modalities are used daily by radiologists. Managers and experienced coders should find this information helpful in training others within their organizations.

RADIOGRAPHY

Radiography is the process of creating images by exposing an image receptor to X-rays. The resulting picture details the internal structure of the area penetrated by the X-rays. X-rays are especially useful for examination of the skeletal system, but have limited use for diagnosis of disease processes in the soft tissues.

Contrast technique can be used with X-rays. A contrast agent is an internally administered substance that has opacity and looks different from soft tissues on an X-ray. An example is a barium study such as an upper gastrointestinal (GI) series. This type of X-ray study uses fluoroscopy, which produces real-time images that are directly visible to the radiologist during the X-ray examination. Fluoroscopic equipment is complicated and expensive, and generally only a radiologist can perform fluoroscopy. X-rays can also be used with the addition of fluoroscopy in other real-time procedures, such as angiography.

A "C-arm" for spot filming is a portable fluoroscopy unit used for the most part in a surgical suite to provide imaging during a surgical procedure. This fluoroscopic unit can also create permanent images called "spot films." Often, spot films from a hospital operating room (OR) will be sent to the radiologist, who is asked to issue a report concerning what is seen on these images. In that case, coding for interpretation of the OR spot films is done by selecting the CPT[®] code corresponding to plain radiograph(s) of the body area imaged. Code 76000, *fluoroscopy (separate procedure) up to one hour physician time, other than 71023 or 71034*, can only be reported when the radiologist is in the room, supervising the fluoroscopy as it is performed.¹

CT, CTA, and CT RECONSTRUCTIONS

Computed axial tomography (CT) produces cross-sectional images of the inside of the body by combining X-rays and computers. In this imaging modality, the X-

¹ ACR Radiology Coding Source, July-August 2003, "Coding Q & A."

rays are rotated around a specific area of the body, and pictures are taken of the internal anatomy from different angles. A computer program then forms the readable image. The resulting image is like a “slice” of the imaged body area. Compared to conventional radiography, CT offers a better way to differentiate soft tissue structures.

CT studies acquire imaging data in the axial plane, and the technology is then capable of reconstructing the images in sagittal, coronal, and oblique planes. Axial data reconstructed in one other plane is called a two-dimensional (2-D) image. This type of two-dimensional reconstruction is defined as part of the basic CT study, and is not coded separately in addition to the base CT procedural code.² Three-dimensional (3-D) reconstruction techniques use texture, shading, and perspective that have an illusion of depth. Shaded surface rendering and volumetric rendering are complex methods of data acquisition that can be performed on the CT scanner itself or on an independent workstation. Two CPT[®] codes identify the work of 3-D reconstructions in conjunction with a base CT examination: *76376, 3D rendering with interpretation and reporting of computed tomography, magnetic resonance imaging, ultrasound, or other tomographic modality; not requiring imaging postprocessing on an independent workstation,* and *76377, 3D rendering with interpretation and reporting of computed tomography, magnetic resonance imaging, ultrasound, or other tomographic modality; not requiring imaging postprocessing requiring image postprocessing on an independent workstation.*

CT studies can be performed without a contrast medium, with a contrast medium, or without contrast followed by the use of contrast material. Contrast is a radiopaque substance used to enhance visualization of the internal structures to be studied. Only contrast that is injected intra-arterially, intra-articularly, or intrathecally qualifies a CT study to be coded as a with-contrast study. The administration of oral and/or rectal contrast is not sufficient to assign a with-contrast CPT[®] code.³ No separate code is applicable for the injection of the contrast, as the injection is included with the work valued in the CT exam code. Coders should look for documentation in the report about the type and amount of contrast used when coding with-contrast studies. This is important to satisfy documentation requirements for the reporting of a with-contrast CPT[®] code, as well as important for assigning an additional Level II Healthcare Common Procedure Coding System (HCPCS) code for the contrast medium on the technical side. When coding procedures without contrast followed by with contrast material, the coder should look for documentation in the report of imaging being performed both pre- and post-contrast administration.

CT or fluoroscopic technologies can also be combined to provide guidance for many surgical procedures, which then can be performed in a minimally invasive

² *CPT Assistant*, Dec. 2005, p. 7.

³ *CPT 2008 Radiology Guidelines*, p. 300.

manner rather than as open surgical procedures. Fluid drainages, biopsies, and pain therapies are common examples.

Computed tomographic angiography (CTA) is a technique used to study blood vessels, and is a less invasive alternative to conventional angiography (CA). CPT[®] codes for CTA do not differentiate between the study of arteries (arteriography) and veins (venography). This means that only one CTA code is reported, even if both arteries and veins are studied. In CTA, the patient receives a very rapid injection of contrast to enhance the vessels, and a complete axial set of data is obtained. Following this, 2-D and 3-D reformatted (reconstructed) images can be created and interpreted. The entire process of acquiring image data is included under the description of each of the codes for CTA in CPT. The one requirement of the study, which must be documented to be coded as a CTA study, is that post-processing (after axial source data is obtained) reconstructions be performed. Without post-processing reconstructions, it is not a CTA study.⁴ In CPT 2008, CTA code descriptors were changed to clarify that noncontrast imaging, if performed, is included in CTA studies but is not a requirement. From a coding perspective, it is important to understand that the 3-D rendering codes are never to be reported in conjunction with CTA, magnetic resonance angiography (MRA), nuclear medicine, positron emission tomography (PET), CT colonography, or cardiac CT and coronary CTA studies, because all of these CPT[®] codes are valued to include 3-D.

MAGNETIC RESONANCE IMAGING

This imaging modality analyzes the amount of energy released from tissues exposed to a strong magnetic field. The scanner picks up this energy as a radiofrequency. Magnetic resonance imaging (MRI) does not expose the patient to radiation. A computer translates the reaction of the tissues to the magnetic field into a 2-D image. As with CT, studies may be performed without contrast, with contrast, or without contrast followed by use of contrast. An MR study is contrast-enhanced with an injection of gadolinium—a non-ionic element that affects the way tissues respond to magnetization. The supply of gadolinium can be assigned a Level II HCPCS code and reported along with the technical component. Cross-sectional images of organs such as the brain and internal body structures such as joint spaces are obtained with this imaging procedure. MR technology is also used to perform MR angiography (MRA), a study used to evaluate disorders of arterial and venous structures. Like CTA codes, MRA CPT[®] codes include the study of both arteries and veins. MRA can be performed either with or without contrast. “Time-of-flight” MRA involves imaging the hydrogen protons in a phase of MRI without the use of contrast. The post-processing of source images to create maximum intensity projections (MIPs) is included in the MRA codes, and the separate reconstruction codes should not be reported with MRA studies.

⁴ *CPT Assistant*, January 2007, p. 31.

ULTRASOUND

Ultrasound is a diagnostic imaging modality that exposes parts of the body to high-frequency sound waves to produce images of muscles, tendons, and internal organs. This modality allows for evaluation of size, structure, and pathological lesions with real-time images. It is also used to visualize a fetus during prenatal care. Like MRI, ultrasound does not expose the patient to radiation. Images are displayed as thin sections of the body area studied. Current technology includes 3-D ultrasound and even four-dimensional ultrasound, which is 3-D ultrasound in motion. Like CT and fluoroscopy, ultrasound can be used to provide guidance for invasive procedures.

Doppler ultrasound uses sound waves to evaluate blood as it flows through a vessel. Duplex ultrasound combines conventional ultrasound with Doppler, allowing an evaluation of the structure of the blood vessel as well as how the blood is flowing through the vessel. A computer program that converts sound information into color graphics will produce a picture of the blood vessel. Spectral Doppler provides graphic hemodynamic information to identify any stenosis or plaque in the blood vessels.

Coding for ultrasound studies requires careful attention to the information provided in the diagnostic ultrasound and obstetrical ultrasound sections of the CPT[®] codebook. These sections include information for documentation requirements and the elements that constitute a complete or a limited study, which must be included in order to report the correct codes. In addition, radiology coders must consult the National Correct Coding Initiative* in order to correctly report certain ultrasound studies together at the same encounter.

*The Centers for Medicare and Medicaid Services (CMS) developed the National Correct Coding Initiative (NCCI) to promote national correct coding methodologies and to control improper coding that may lead to inappropriate payment in Part B claims.⁵

NUCLEAR MEDICINE

Nuclear medicine, also called radionuclide imaging or nuclear scintigraphy, involves imaging that uses small amounts of radioactive material to diagnose many types of cancers, heart disease, and other abnormalities within the body. The radioactive materials may be injected, swallowed, or inhaled as a gaseous substance. The radiopharmaceutical accumulates in the body area being studied and gives off energy that can be detected by a gamma camera or by positron emission tomography (PET). A computer then produces images that can provide information about the structure and function of organs and tissues, as well as information about areas of chemical activity, called “hot spots.” Single photon

⁵ For more information, see the CMS Web site at <http://www.cms.hhs.gov/NationalCorrectCodInitEd/>.

emission computer tomography (SPECT) adds functional 3-D imaging to a nuclear medicine study.

In some cases, nuclear medicine images can be superimposed with CT or MRI, allowing information from two different studies to be fused and interpreted as one image. PET/CT technology can perform both studies at the same time. A PET scan can measure body functions, such as sugar metabolism, to help determine how well organs are functioning. Nuclear medicine also includes some radiopharmaceutical therapies that can treat hyperthyroidism and certain forms of cancer, and can also be used to provide pain relief.

As of January 1, 2008, the cost of diagnostic radiopharmaceuticals is considered to be included in the base procedure for Medicare under the Hospital Outpatient Prospective Payment System. Although Medicare bundles the procedure and the radiopharmaceutical into one payment, the radiopharmaceutical coding should be reported so that the technical component can continue to be valued correctly.

RADIATION THERAPY

Radiation therapy is the use of high-energy radiation to treat cancer. Many techniques are used, including 3-D imaging, computerized treatment planning, and high-energy X-ray machines. Therapy can be delivered by internal or external means. Internal radiation therapy, also called brachytherapy, involves implantation of radioactive material. External therapy delivery techniques include conventional external beam radiation therapy, 3-D conformal radiation therapy, intensity-modulated radiation therapy (IMRT), proton beam therapy, neutron beam therapy, stereotactic radiosurgery (SRS), and stereotactic body radiation therapy (SBRT). External radiation therapy is similar to radiography in that the machine that produces and delivers the radiation is external to the patient's body.

In both internal and external radiation therapy, the total radiation that the patient will receive is calculated and can be delivered in one dose or over many sessions. A course of radiation therapy is typically divided into six phases of care: (1) consultation; (2) preparation for treatment; (3) medical radiation physics, dosimetry, treatment devices, and special services; (4) radiation treatment delivery; (5) radiation treatment management; and (6) follow-up care management.⁶ Many of these phases contain further divisions, identified with CPT[®] coding according to the level of effort and complexity of the specific procedure in that phase. The first and last phases of radiation therapy are represented in CPT[®] by the Evaluation & Management code section, as the radiation oncologist will provide a consultation (first phase), and follow-up care management (last phase). Owing to the need for integration of all phases of care, all CPT[®] codes that describe the physician work components require direct or personal physician supervision.⁷

⁶ *The ASTRO/ACR Guide to Radiation Oncology Coding 2007*, p. 33.

⁷ *The ASTRO/ACR Guide to Radiation Oncology Coding 2007*, p. 169.