Diagnostic imaging has seen a huge technology shift in the last 10 years. Modalities that were not accessible to the small animal patient, such as magnetic resonance imaging, are now considered the modality of choice for neurologic examinations. This technology shift has caused a lot of confusion as well as questions about what modalities are used for which diseases and why. The purpose of this article is to explain the different modalities including conventional radiography, ultrasound, nuclear medicine, computed tomography and magnetic resonance imaging, their uses and the pros and cons of each.

Radiography is the oldest and widest used diagnostic imaging modality available. Since its discovery by Wilhelm Conrad Roentgen on November 8, 1895, several changes have been made. These changes include the use of screens to minimize patient dose while increasing the efficiency of information transfer from the x-rays to film. In addition, automatic processors were invented to speed the development of the film to generate an image. Computed radiography (CR) and digital radiography (DX) have been created to optimize contrast resolution and create a virtual image that can be stored in a computer, rather than on a shelf by creating a digital image. These modalities can be further divided into direct and indirect imaging. Direct imaging occurs when the x-ray photon directly strikes a detector to create an image. This will provide the greatest spatial resolution for digital images, but it is still less than screen-film combinations. Indirect imaging is when the x-ray photon interacts with a phosphor in the screen to transform the x-ray photon into light. The light can then expose the imaging plate with greater efficiency and minimal loss of resolution.

The choice of which system to buy will be guided by your needs as a practitioner. Digital, indirect radiography such as a charged coupling device, is inexpensive but provides a rapid digital image. This system generally comes with an x-ray table and a large device that works similar to a digital camera. Other forms of indirect and direct digital radiographic systems may have an imaging plate but are considerably more expensive. In exchange, for the added expense more detail and better imaging quality is obtained. Computed radiography is an indirect cassette based system much like conventional
radiographs. When the cassette is exposed it is placed in a reader to generate the image. This can take around 45–60 seconds, but is mildly less expensive (depending on the number of cassettes required) and more versatile than most DX systems.

The main thing to avoid is the high-pressure salesperson talking of resolution. People will use the terms megapixels, pixel depth, and even line pairs per millimeter. The thing to remember is that all digital systems (with the exception of digital mammography) will have less spatial resolution than most film screen combinations. That said, it is not the spatial resolution we care about. Spatial resolution, the ability to see to objects of similar opacity next to each other, is not as importance as contrast resolution. Contrast resolution is the ability to see two structures of slightly different opacities next to each other. This is where digital imaging (direct and indirect) is superior. Because it is possible to adjust the grey scale on the images after exposure, the ability to identify small fragments, areas of mineralization or nodules within the lungs, is far greater with digital imaging modalities compared to conventional film. The choice of which vendor and technology is right for your clinic is difficult and it is recommended that you seek help from a board certified radiologist or advice from colleagues who have the system you are interested in, to guide your purchase choice.

The main benefit of digital is the change from the fee per image that we have grown accustom. Since there is no inherent charge for the images and since cost for storage of digital images is minimal, a three view radiographic study can become the norm rather than the exception. With the fee per image that we use to perform, the main problem is our diagnoses were limited by the client’s ability to pay. A single lateral projection was all we could perform on a vomiting dog if the owner had cost constraints. Now, we can take 3 radiographs or even 9 radiographs with the digital radiographic system in the same time it took us to run 1 normal film through a processor. Also, gone are the days of repeat radiographs due to technique. This is eliminated using digital or computed radiography.

Radiography is the method of choice for rapid evaluation of the skeletal system and the thorax. Pulmonary edema can only be evaluated with radiography (be it computed tomography, digital radiography or conventional) and fractures, though seen with ultrasound and nuclear medicine, can best be evaluated with some form of radiographic technique. In addition, radiography can be used to give an overview of the abdomen. Unlike ultrasound, which will be discussed next, radiographs can help look at large gas filled structures that are not easily evaluated with ultrasound. Examples include gastric dilation with volvulus and mechanical obstructions. It is possible to identify these with ultrasound as well, but radiography remains faster and easier to make the diagnosis.
The idea of changing over to digital imaging is a daunting one, but much like when we switched to e-mail from regular mail, it is a necessary transition. No one uses a pen and paper much and tablets, iPads, smartphones and laptops are the norm in most hospitals. Computed or digital radiography provides innumerable benefits compared to conventional imaging, the best of which is access to specialists 24 hours a day for advice and guidance. Switching to digital means you will never be alone!