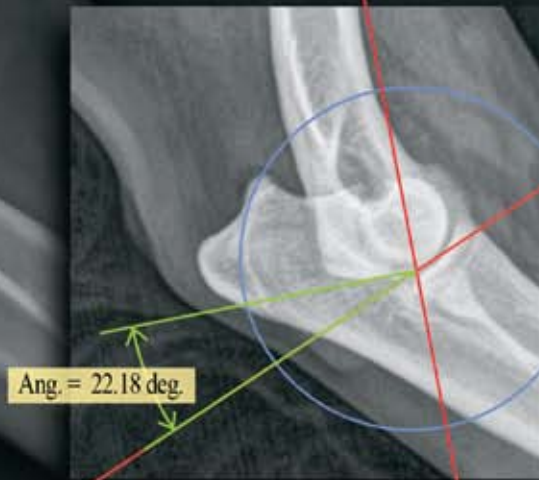




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Understanding the benefits of digital radiology.

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AFP has been focused on providing superior diagnostic imaging systems to the veterinary community for 30 years.

Imaging is our core business—supported by a robust product line for both dental and whole body applications. From a large veterinary hospital to a sole ambulatory practitioner, digital imaging can have a positive impact on a veterinarian’s business.

The key is working with you, the clinician, to determine what digital modality would be the most cost effective and best suited to meet the needs of your practice. Throughout the sales process, we take a consultative approach and help you develop the right plan. Imaging is an important aspect of your business.

As part of our leadership role, we are pleased to partner with leading professionals to bring this valuable resource to the veterinary community.

Best regards,

The team at AFP Imaging

Entering the Digital World

Clear images. Impressive speed. Added functionality.

There's no doubt that digital radiology has evolved into an important diagnostic tool for veterinary practices. The expanded capabilities offered by these systems provide significant advantages over using traditional film-based technology.

When making the commitment to purchase digital equipment, it's important to have a clear picture of how you intend to use it and what you want the system to do.

But, there are big differences between the different digital radiography systems on the market. Purchasing a digital radiography system solely because it obtains a digital image is not enough. That would be like saying "I'm going to buy a refrigerator because I want something to keep my food cold." Refrigerators have many features, sizes, colors and service track records. Keeping your food cold is a basic function that does not differentiate between brands.

When making the commitment to purchase digital equipment, it's important to have a clear picture of how you intend to use it and what you want the system to do.

Then, you need to research what's available and make an informed decision.

There are several types of digital radiography systems on the market today. Each of the different modalities acquires digital images and displays them on

a monitor. However, there are key differences that make some digital systems more suitable for certain practices than others.

CR: Computed Radiography

CR was the first system used in digital radiography. CR sometimes takes a back seat to the newer technology available, but it shouldn't be overlooked. Although the images aren't captured and displayed instantaneously (it can

take between 40 seconds and two minutes), for a lower volume practice it's a great option. There are some excellent CR systems out there that deliver great bang for the buck.

DR: Direct Digital Radiography or Flat Panel

DR delivers the highest quality images instantaneously, but the system generally has a higher price tag. In a high volume practice that requires the speed DR offers, DR is probably the best option.

DR has clear benefits for a veterinarian operating an ambulatory practice, the speed and image quality enabling are critical. The ability to make an on-site diagnosis makes a flat-panel DR system a superior choice in ambulatory equine.

On the dental side, DR makes the most sense because the speed, image quality, ease of use, and ability for fast retakes, coupled with the relatively low cost, makes DR extremely attractive.



DR: Charged-Coupled Device

CCD is a relatively new option available to veterinarians. Priced in the middle between CR and flat panel DR technology, it serves as an entry into DR. Like any new technology, it improves with leaps and bounds every year. Image quality and ease of use varies greatly depending on the manufacturer. CCD technology can be very good and meet a

Matt Wright DVM MS DACV was interviewed for this article.

Dr. Matt Wright received his degree in veterinary medicine from the VA-MD Regional College of Veterinary Medicine. He completed a residency and received his masters degree in radiology at Auburn University. Currently, Dr. Wright works at a radiologist in San Diego and operates the informational Web site on digital radiography at Animal Insides (www.animalinsides.com) and the teleradiology and remote image archival service at DVMinsight (www.dvminsight.com). He has also published scientific articles and lectured on topics such as geriatric radiology, portosystemic shunt imaging, DICOM, and digital radiography purchasing decisions for veterinarians. Currently, he is the chair of the ACVR Digital Imaging Standards Committee and is a member of the DICOM working group for veterinary medicine. Recently, he published a book titled *The Little Book of CT in Veterinary Medicine: A practical Guide to CT Technique for Technicians and Veterinarians*.

veterinarian's needs, but should be researched carefully.

All of these different types of systems can produce diagnostic images. So, you don't always need to buy the most expensive piece of equipment on the market to add digital radiography to your practice. Depending on your budget, the amount of use and

Make sure the company you work with has a history in imaging and some longevity. If the manufacturer isn't going to be around in a year to support the equipment, you may have purchased a \$100,000 paperweight.

what features you need, there is a digital modality that's right for you.

Here's the catch. Not all digital equipment, no matter what format you buy, is created equal in the way it performs, the image quality, the ease of use, the software available and the level of customer support available. That's where you need to do your homework, and it starts with the manufacturer.

Well-Established

There are a lot of smaller companies entering the marketplace and getting on the bandwagon of this emerging technology. Make sure the company you work with has a history in imaging and some longevity. If the manufacturer isn't going to be around in a year to support the equipment, you may have purchased a \$100,000 paperweight.

Another consideration is whether or not the manufacturer offers all modalities. Someone with a full product line is more likely to work with you to determine the best fit for your practice rather than push you into a DR or CR system because that's what they sell.

Make sure you take a hard look at what the manufacturer offers beyond the initial cost of the system or what might be considered the

five-year-cost. Some companies charge a significant annual service fee, software upgrades, off-site backup up, and software and hardware for a Picture Archive and Communication System (PACS) which can be additional costs.

Software is Critical

The software that comes with

the machine is probably the most important component of the digital imaging equipment. It should have the ability to take a raw image and zoom in, adjust the contrast, and perform other basic image manipulations. The ability to manipulate images is one of the main reasons many veterinarians switch to a digital system in the first place.

In reality, those capabilities are almost secondary to the filtering and processing the software performs before the veterinarian actually views the image. The image processing can be thought of as the "special sauce" each vendor applies to their images. The image processing capabilities of the different vendors varies dramatically. Good image processing equates to good image quality and is critical to getting the most out of your digital imaging equipment. Even if you've purchased a high-end, digital machine, poor image quality will result if the software doesn't have the necessary processing algorithms.

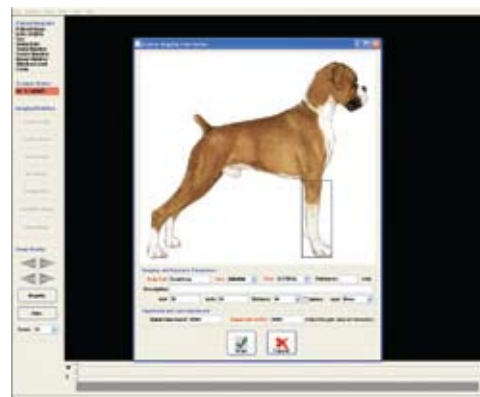
Customer Support

Digital equipment certainly makes it easy to take images, but the common misperception is that these pieces of equipment are "plug-and-play," and that's not the case. As a result, it's important to examine the level of customer support that the manufacturer can provide.

Is it possible for the manufacturer's technical support team to log onto a system and diagnose a particular problem? If it's a user error, are they prepared to ask the appropriate questions and walk the user through an application to resolve an issue? Are seminars or staff training available to customers?

If the manufacturer works through a local distributor, make sure they're well-trained in the digital equipment they're selling, as well as installing that system on your particular computer network. You don't want to be left on an island following your purchase.

Communication



Another key benefit of digital imaging is the ability to quickly send files to another party for a referral or consult. The term DICOM is becoming widely used within the veterinary community when referring to digital radiology. It's a standard that enables one machine to talk to another. DICOM compliance should be a given. DICOM is not an added software feature. Make sure that the software is DICOM compliant.

Another consideration is how quickly you can send the image to the recipient. Does it take four clicks to prepare and send an image or 40? The American College of Veterinary Radiology (ACVR) has developed some guidelines for the veterinary profession with regard to tele-radiology and image transfer.

For more information on these new guidelines, visit www.ACVR.org.

Buyer Beware

Good, solid information can make the selection process a little less daunting of a task and help determine the right piece of digital equipment for your practice. When making the final decision, it's important to test the

equipment out and make sure that it does what you want it to do.

If you're viewing a demonstration at an industry tradeshow, make sure those results can be reproduced in your clinic with that exact same machine and software.

Peer feedback is valuable, but what might work for one veterinarian may not work for another. Keep in mind no one is going to say they made a \$100,000 mistake, so take outside input for what it's worth.

Watch out for the "quick return" calculators, and don't be fooled by the theory if I spend \$100,000, I'm going to save money. Wrong you've still spent \$100,000. (For a way to accurately calculate a return turn to page 12.)

The Annual Digital Radiography SHOWDOWN and DICOM validation is a great place to look for objective information on different digital radiography systems. At the SHOWDOWN, vendors put their imaging devices to the test in a public forum. The results are available for free at www.animal-insides.com.

Remember, when shopping for a system, there's no timeline. If you're feeling pressured to "act now," or this deal will only be available for a limited time, walk away. The sales process is on your time.

Purchasing digital imaging equipment is not an impulse buy. It requires careful consideration and obtaining and sifting through a lot of information. It's not easy, but if you've made the commit-

Digital Imaging Training and Continuing Education Increase Comfort Level, Equipment Usage within Veterinary Practices

Digital imaging equipment is an important piece of equipment for a veterinary practice.

Image quality and enhancements lead to improved diagnostics and patient care. It can be portable for ambulatory or emergency practices improving productivity. If used properly, the equipment can pay for itself by generating a strong return on investment.

It also provides the ability to take faster retakes without worrying about the costs associated with film or processing fluid. That means everyone in a veterinary practice has a greater opportunity to learn as they go, increase their comfort level taking images and enter the digital world in some way, shape or form.

First of all, digital imaging decreases the dental radiology learning curve exponentially through efficient staff teaching including proper tube head/sensor positioning. Digital imaging makes this possible through instantaneous results without time-consuming film processing. It greatly reduces frustration and increases comfort allowing staff members to take part in digital dental radiography.

As part of the veterinary community's ongoing educational efforts, AFP Imaging has participated in wet labs across the country to further promote dental radiology as way to enhance patient care and broaden a practice's scope of services. These wet labs are held at a variety of venues ranging from the annual Veterinary Dental Forum to various industry trade-shows to distributor-sponsored labs to courses taught at the Animal Dental Training Center in Maryland.

Educational opportunities will vary from learning general dental radiography to advanced classes on oral surgery, endodontics and more. Most of these wet labs provide an opportunity to gain a familiarity with AFP's radiography equipment.

In addition, AFP is in the process of developing a variety of classes on digital imaging and software applications. These courses will be offered throughout the country and led by veterinary experts to further enhance the experience of individuals using digital imaging equipment.



John Craig

Just Like Magic

No Hocus Pocus—Digital Imaging Software Critical to Delivering High Quality Images, Adding Functionality

A veterinarian pushes a button and within a few seconds a high-quality image pops up on a computer monitor – no chemicals or processing involved. What happens in that short timeframe isn't magic, but it's close.

Digital imaging software is the critical component that takes an image captured by the hardware's detector plate and prepares it for viewing. Whether using CR, DR or CCD technology, software is critical to image quality and the ability to make enhancements to the image post-processing – one of the main reasons many veterinarians make the switch to digital in the first place.

The process begins with the digital hardware producing an image that contains 10-16 bits per pixel. This ratio correlates directly with image quality. In comparison, a standard digital camera produces images that are 8 bits per pixel. Although these images contain a lot of bits, they aren't ready for human viewing. They require special filtering or image processing algorithms within the software to bring out all of the detail and resolution.

It's important to realize that the image processing capabilities of vendors differs dramatically. Even in a high-end, digital machine, poor image quality will result if the software doesn't have those all-important processing algorithms. By the same token, even the lowest quality raw data can be vastly improved if the right software is installed.

When selecting a manufacturer, it's important to make sure the software used in the equipment has the most up-to-date filtering techniques or algorithms, and can be easily updated when enhancements are made to the software package. By using an older version, image quality might be compromised, but the veterinarian also may not be able to reap the full benefits of digital imaging.

Post-Processing

Quickly generating a crystal-clear image that a veterinarian can use for an accurate diagnosis is the primary reason for using digital imaging equipment. However, the software also gives veterinarians a chance to manipulate the image further enhancing the

diagnostic possibilities through post-processing.

With a few mouse clicks, veterinarians can enlarge, adjust the brightness and contrast, invert the black-white polarity, annotate and perform other capabilities once the image is displayed on the screen. The initial image will be high quality, but every veterinarian is different. The added functionality of the software should be easy enough to use, so any veterinarian can tailor an image to meet their specific viewing requirements.

Measurements – Traditional film radiography or digital, the sheer physics of the process means that the resulting image is always magnified. The software should have the ability to calibrate the images for accurate measurements, when doing pre-surgical planning, a dental root canal and more.

Reporting – Another nice feature for clients is the ability to take multiple radiographs and assemble them in a report complete with captions. This report is also a valuable too when sending information to another veterinarian or a radiologist for consult.

Exporting – Images can be exported to referring or primary care practitioners, or passed along to clients. They can be burned to CD using a simple viewer software application or sent electronically. The digital nature of images allows identical copies to be generated quickly and easily.

John Craig, who has a doctorate in engineering from Stanford University, is co-founder of EponaTech, the developer of Metron, an image-based software system designed specifically for veterinary use.

His experience includes software development and the implementation of world-class image filtering techniques, calibration and measurement schemes, and the DICOM standard. He is the author of "Introduction to Robotics: Mechanics & Control," a leading university textbook for the engineering field of robotics, as well as several papers related to robotics and equine biomechanics.

Craig has chaired conference sessions on biomechanics and the connection between machines and the biomechanics of animals. He is also co-founder of EponaShoe, Inc., which produces polyurethane horseshoes.

Display – The quality of the display used for diagnosis is just as important as the raw image data and the pre-processing filters. Software that can prepare images to be shown on any kind of monitor is critical for proper viewing. Whether purchased at a local computer store or a high-end video retailer, superior image data generated by the software and displayed on a low quality monitor will result in a poor image for viewing.

For Veterinarians Only

Many of the digital radiograph systems available originated from human radiography and the software is designed specifically to function in that type of environment. But hospitals may have six or more trained personnel on staff just to run the software and manipulate the images to get them just right for the doctors to read them.

In a veterinary practice, it's unlikely they will have that level of support, so it's important for a veterinarian to consider software that is configured to meet their unique needs.

Some of the systems available to the veterinarian are simply human machines with a slight makeover. For example, when shooting the foot of a horse, the software is calling it an ankle, but in the equine veterinary world it's actually a fetlock. This would also be imprinted in the corner of the image as an annotation. There are places to put the age and breed of the animal, or whether or not the animal has been neutered. This is very important for documentation.

Communication

Another consideration for veterinarians that has its roots in the human realm is an image standard format called DICOM. Legally mandated on the human side, it is gaining acceptance in the veterinary market. Any software solution

a veterinarian considers must be able to support the DICOM format, but this does not mean you need to purchase an expensive DICOM system.

Look for a software solution that can speak the DICOM language, whether or not the images are stored internally in DICOM format. Many software systems can convert the file to a DICOM format for electronic distribution and can open files and save files in a DICOM format without the DICOM price tag. Systems which are DICOM through and through are generally from human medical and bring along the big price tag and sometimes unneeded complexity.

PACS (Picture Archiving and Communications System) –are computers or networks dedicated to the acquisition, storage, retrieval, distribution and presentation of medical images. The overwhelming majority of PACS use the DICOM standards. PACS are most useful when medical image data is generated from multiple sources (x-ray, ultrasound, CT, MRI, etc.) and accessed and used by multiple clinicians. This is particularly beneficial when those using the images are physically separated, perhaps on different floors of a large building, when using a referral practice or when practices are in different cities.

PACS grew out of the needs of radiology departments in large hospitals. As a result, these systems frequently have large initial and continuing costs. For example, many systems assume that a full time IT staff is available in-house for support. The imaging needs of a typical veterinary practice tend to be less complex than at a large hospital with a full staff of technicians, radiologists, specialists and primary care physicians who are all generating and accessing large volumes of medical image data at all times.

A type of PACS called miniPACS has evolved to fill the core needs of image handling at the small to medium volume range with correspondingly lower costs. Your veterinary digital imaging software should be able to communicate with the preferred PACS system of your practice.



Ease of Use

Taking a digital image is easy to do, but in order to use the full functionality of the equipment, the software should have a well-designed user interface.

Most veterinarians don't have time to read a manual about the software, nor do they have the time to hunt and search for the capabilities on-screen. The system needs to be fairly self-intuitive for the veterinarian to see the options available and how to execute the commands.

Make sure the manufacturer has an excellent track record for customer service. They should have the ability to log onto a system from a remote location and diagnose a problem, or walk a veterinarian or staff member through a step-by-step process to resolve an error message.

From start to finish, the entire process of using digital radiology equipment should make things easier for a veterinarian, but that's not magic. It's software.



Dr. Jan Bellows

Digital Radiology Essential to Quality Dental Therapy, Patient Care

It's true that teeth can be cleaned and polished without seeing radiographic images but intra-oral radiographs are essential to help veterinarians provide the highest quality dentistry. Simply stated, radiology is essential to performing dental procedures and elevating the level of care they provide their patients.

Unfortunately, skull films to evaluate dental structures are not appropriate because of superimposition and lack of detail. Intra-oral radiographs can be obtained using a standard veterinary whole body system or a dedicated dental unit

In many ways digital is easier, economic, and can be more diagnostic compared to the "analog" film methodology.

and processed either manually using hand tanks or an automatic film processor.

The use of dental digital imaging equipment enables images to be

captured and viewed directly on a computer screen almost instantaneously. The ability to alter images on the spot reduces the need for re-takes and aids in overall image quality. In many ways digital is easier, economic, and can be more diagnostic compared to the "analog" film methodology.

As a result, veterinarians should be able to use digital radiography to their advantage and bring the highest quality dentistry to their practice.

Why Digital Radiology?

Saving Time – With a finite amount of time in each day, veterinarians and their staff members strive to perform tasks as efficiently as possible. Frequently, once a practice has decided to adopt intra-oral radiology, frustration can occur when trying to figure out how to expose and process films. Because of instantaneous results, staff can efficiently learn proper

techniques for tube head/digital sensor positioning. Digital radiology exponentially decreases the dental radiology learning curve.



In the clinical setting, staff will see a major time savings in the use of anesthesia. A full mouth oral survey from exposure to image examination takes about 10 minutes digitally compared to at least 45 minutes using analog film. The time saved and ability for quick retakes enables veterinarians to view possible dental lesions from different angles. This alone makes digital imaging indispensable to the veterinary dentist.

Cost Savings – Film-based technology is less expensive initially compared to digital because of the cost of the equipment. However, an article published in *Dental Economics* (February 2005), shares that the real cost for each analog processed film is \$1.18 (complete full oral survey take 6-14 films). With digital imaging there are virtually no additional expenses, as film, chemistry and processing equipment maintenance costs are eliminated.

Following graduation from Auburn University College of Veterinary Medicine in 1975, Dr. Bellows completed an internship at the Animal Medical Center in New York City. In 1986, he became certified as a Diplomate of the American Board of Veterinary Practitioners (canine and feline-recertified in 1996 and 2006). In 1988, he became a Fellow of the Academy of Veterinary Dentistry, and in 1990, a Diplomate of the American Veterinary Dental College.

Dr. Bellows has lectured extensively in the United States as well as Europe. He has authored many articles on veterinary dentistry as well as two books, *The Practice of Veterinary Dentistry* a team effort, and *Small Animal Dental Equipment Materials and Techniques*. Dr. Bellows practices veterinary medicine and dentistry at Hometown Animal Hospital and Dental Clinic in Weston, Florida.

If only two oral surveys (6-14 films) are taken per practice each day the digital system will be paid off within 18 months. This does not take into account the additional income received through therapy performed based on radiographic findings. (See Digital Imaging ROI on page 12.)



Immediate Results – Viewing enlarged images within seconds on a monitor as compared to waiting at least five minutes to observe a small film on a light box provides an immediate reward. In addition, electronic processing and enhancement allows more diagnostic information to be extracted from the image compared to film.

Storage and Distribution – Digital images can be easily saved in a variety of formats for insertion into the client file, to send to another veterinarian for a consult, or for sharing with the client. Archive image storage on the computer's hard drive is automatic and takes up no physical space. Compared to drying and storing wet films, digital is a blessing. It also allows fast access and heightened security for record keeping at a lower cost and with less physical space.

Digital Formats

The digital technologies available for dental use fall into two basic categories- photo sensitive phosphor (PSP) plates and digital imaging sensors.

PSP technology uses an x-ray-sensitive plate that replaces film.

It is exposed by the x-ray unit, placed into a scanning device, which records the latent image and converts it to a digital file in a computer within 45 seconds. While the plate is relatively rugged with less size restrictions, the equipment is bulky and the plates must be handled in light-safe conditions similar to film. The plates need replacing after 50-500 exposures depending on the manufacturer at a cost of about \$25 US.

Digital imaging sensors communicate with the computer and are either hardwired to or use some form of wireless technology. The image can be viewed onscreen within seconds without additional handling

or processing. The original sensors used a charge-coupled device (CCD) combined with a scintillator to produce an instant image. The process was termed Radio-VisioGraphy (RVG). RVG was designed for "operative radiology" in human dentistry rather than to replace the full mouth series of film images.

Over the past two decades, there have been five additional versions of RVG – the most recent is based on a complementary metal oxide semiconductor (CMOS). With CMOS, high-efficiency, low-noise images are produced, which are then digitized and transmitted to a computer via a standard USB port.

Getting Started

A dental x-ray unit is required to expose the sensor. Since the amount of radiation necessary to produce digital images are less than traditional film (up to 80% less x-ray dosage), old dental x-ray units may need to be replaced.

A desktop, tablet, or laptop computer in the treatment area captures and displays the images. The sensor is portable between treatment tables, but must be

When considering intra-oral digital sensors, it's important to keep the following terms in mind.

Active Area This is the available area of a sensor to which data (x-rays) can be actively measured. This is measured as the horizontal dimension in millimeters (mm). The active area is limited by the size of the pixel.

Dynamic Range The dynamic range represents the largest output of the device divided by the smallest output, measured in decibels (dB). The dynamic range indicates what output the system is capable of producing. The larger the dB number, the better the image.

Film Size Equivalent The size of the sensor and resulting image in relation to traditional film x-ray systems available to the dentistry profession.

Pixel Matrix Measured as the number of pixel elements in the horizontal and the number of pixel elements in the vertical. These are multiplied and the result is the total number of pixels displayed.

Pixel Size The relative size of the pixel to be displayed as measured in microns.

Readout Time The amount of time from which the sensor receives the input (x-ray) to the time it has completed transmission of the data to the computer processor. This is measured in seconds.

Resolution A measurement description noted in Line Pairs (lp) that measures the system's ability to capture detail. Electronics industry accepted methodology and protocols utilize the direct calculation of the known spacing of the pixel elements shown by the manufacturers' documents and production criteria.

Sensor Dimensions The external dimension measurement of the various sensor sizes measured in millimeters.

Signal to Noise Ratio Measures the ratio of signal coming out of a sensor with no image present (noise), versus the maximum signal coming out of a sensor without saturation (the most intense image).

able to attach to a USB port easily unless a wireless system is used. If needed, USB powered hubs with six-foot wires allow the USB outlet to be placed in a more accessible location.

The digital sensor replaces film in the patient's mouth. Sensors are available in three sizes similar to film numbers 0, 1, 2. Parallel and bisecting angle technique is used to position the sensor properly. The operator chooses the tooth or quadrant to be exposed from software downloaded into the computer. Images will appear on the screen within seconds.

Image quality is equivalent to traditional dental films. The software allows a variety of options for enhancing and manipulating the image for greater diagnostic value. The tools used most often include enlargement, auto contrast, grayscale resolution, spotlight features, inversion of colors, and measurement rulers.

Film First?

At one time, the general recommendation was to get acclimated

to taking x-rays by using hand-processed film systems, then purchasing an automatic film processor when the dental practice was busy enough to support one and ultimately, converting to digital if warranted. Now, when looking to build a dental practice it might make more sense to eliminate the extra steps and move straight to a digital application.

For those already using film-based systems, there might be initial resistance when converting to digital. However, staff members will soon realize the ease of not having to use separate film packs on each quadrant, taking the film packs into the processing room and dealing with cumbersome developing and mounting procedures all of which make digital an ideal choice for dental applications.

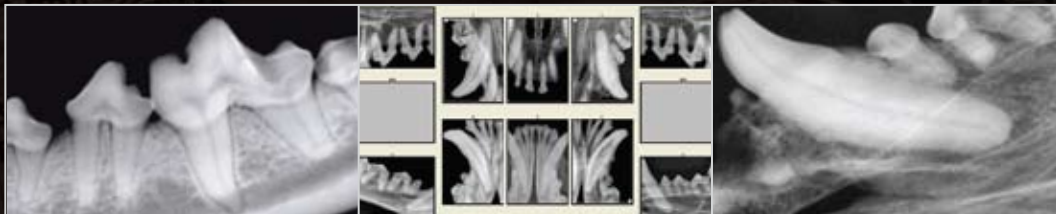
There are numerous dental digital vendors in the industry. One criteria common to all systems is the achieved resolution based upon line pair discrimination (lp/mm). Differences in lp/mm affect image quality as the image size is increased. The human eye

views ten line pairs per millimeter. Other parameters to consider are sensor size, numbers of pixels in the sensor, pixel size, active image area, and readout time.

It's important to select a product that best meets the needs of the practice, and to make sure the company has a proven track record in the industry as well as a history of excellent customer service and support.

The decision to use digital for dental has many considerations. In the end, it's the right thing to do, not only for the continued evolution of a veterinary practice, but more importantly, for the highest quality patient care.

AFP. Good dental health means better animal health.



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Dr. Joe Stricklin

Digital Radiography Hits the Road as Key Component of a Successful Ambulatory Equine Practice

Dr. Joe Stricklin uses a rugged, highly portable system to provide fast and accurate care for his patients

I've been around horses in some capacity all of my life. In my youth, I helped raise and care for horses, riding for pleasure. When I decided to become a veterinarian, it was my intent to dedicate my career to these wonderful animals.

For 18 years following my graduation from Texas A&M in 1980, I operated an ambulatory practice with a focus on equine. Wanting to share my knowledge of equine care with others, I accepted a teaching position at Colorado State University in 1999.

I spent nearly eight years at the university, but couldn't resist the opportunity to hit the road once again. My passion for horses hasn't changed. It's what led me back to private practice in rural Colorado. But, I can say the technology available to treat them has certainly evolved since I began my career.

My experience in the academic setting was especially rewarding because it afforded me the opportunity to work with some of the latest technology available. When establishing my ambulatory/surgical practice for a second

time, one of the first pieces of equipment I purchased was a portable digital radiography system.

Entering the Digital Era

When I started my practice, the first x-ray machine I used was an army surplus unit, made sometime between 1935 and 1945. The films weren't very good and the process was slow and cumbersome.

I felt like I took a big step when I bought an automatic processor to develop my film. That took away some of the guess work when it came to reading radiographs. Gradually, I upgraded my film/screen combinations and using my experience with taking images was able to achieve some good results.

But the digital technology that's available now compared to what I was using in my practice back then is like night and day. The image quality, speed, portability makes my job easier.

I'm not saying that there's anything wrong with film-based radiographs. There are some very good systems out there, but for an ambulatory

practice digital radiography makes a lot of sense.

Logistics

Like many veterinarians that operate an ambulatory practice, I cover a pretty wide territory with a radius of about 150 miles. As a



result, the process of taking images and heading back to my office to develop x-rays and analyze the results isn't an option.

In many cases, these horses are heading to competitions and have training regimens that must continue. The treatment of an injury must begin immediately. I can't wait a week until my schedule takes me back into the area. Also, making multiple trips back and forth to treat one horse will take up an entire day. The cost of gas alone makes it an unrealistic option, but for obvious reasons treating just one horse a day is not good for business.

Although the number varies due to the severity of the injuries, I may

Dr. Joe Stricklin, DVM received his degree in veterinary medicine from Texas A&M in 1980 and has been working with horses ever since. Currently, he operates an equine ambulatory practice in Greeley, Colorado with an emphasis on lameness, dentistry, alternative therapy and minor surgical procedures. From 1999 through 2006, Dr. Stricklin held the position of assistant professor at Colorado State University where he taught courses such as Equine Field Service and Perspectives in Equine Practice among others. In 2006, he was named the SCAAEP Teacher of the Year and in 2005, Equine Teacher of Year by the senior class CSU CVM. Dr. Stricklin was named Texas Equine Practitioner of the Year in 1995.

see five patients in a day or it could go as high as 20 if I'm calling on a large stable. Either way, I use my digital radiography equipment every day. In a typical 5-day work week, I probably average between 10-15 shots per day. If I had to make an immediate diagnosis on any of those horses using film-based technology, that schedule wouldn't be possible.

Diagnostics and Treatment

When a horse is showing signs of lameness, there's no time to waste. Is it a bone injury or soft tissue? To help identify the source of the pain and begin treatment, it's absolutely necessary that I see what's happening with that animal right then and there.

The speed and clarity of digital imaging allows me to make an immediate diagnosis and determine the proper course of action. Whether its injections into the joints, acupuncture, chiropractic manipulations or other forms of therapy, having access to that information instantaneously enables me to be more proactive when it comes to treatment.

Accuracy

But speed does not compromise accuracy. The clarity of a digital image provides a true picture of what's going on. Along the same lines, if the animal moved or

a better angle is needed, those determinations can be made on the spot and the person can take as many images as necessary until satisfied with the result.

I've seen way too many rash diagnoses made using very poor quality images. In this day and age, you're just asking for trouble and risking potential lawsuits. Some of the horses I work on cost \$2 million dollars or more. But, if a case is misdiagnosed and owners are given the wrong information, it becomes a huge problem no matter how much the horse costs.

In some cases, I send digital images using the Internet to facilitate consultations with other practitioners or radiologists if a second opinion is required.

Selecting Your Equipment

Although there are numerous benefits, digital imaging technology is an investment, so it's important to do your homework when considering making the move to digital.

Portability and ruggedness –

Make sure the machine can be easily moved from one location to another. It should be able to handle the daily grind of traveling around in a truck or withstanding different temperature extremes. I've worked in temperatures as low as 15 degrees and as high as 105 degrees. Can the cable withstand getting stepped on by a 1,200 lb. horse? Does it come with a hard shell carrying case?

Visual images – Different people have different visual requirements. It's important to make sure that the hardware can deliver images that look good to you, or can be manipulated using software to your personal needs. I suggest 14 bits per pixel for the best results. If you can't use the images to their fullest advantage, you can't help your patients.



Software – Consider using equipment with software designed specifically for veterinary use. I come into contact with a lot of lameness issues so I'm looking at feet and hoof angles. Not only do I get excellent images, but the software I use shows both bone and soft tissue on the same radiograph. I can also zoom in and out, adjust the contrast and color and measure distance and angles images for a thorough analysis of the animal's hoof.

Research the company – Find out who makes the hardware and the software, how long has the company been in business, what type of customer support do they provide, are they able to assist in storing the images. These are all important factors when considering digital imaging equipment.

If you are running an ambulatory practice, especially an equine practice, and working on high-dollar performance horses, I don't believe you can operate effectively without having digital radiography equipment.

My passion is horses. I need the best diagnostic tools possible to ensure that I'm doing all I can to quickly, safely and effectively treat my patients.





Dan Zalta

Digital Imaging Equipment Can Show a Strong Return on Investment

Accurate Fees and a Change in Mindset Turns a Capital Expense into a Revenue Stream

In addition to crystal clear images, veterinarians can see new profitability and a strong return on investment by using digital imaging equipment.

The advent of the Internet and chain pet supply stores has left some veterinarians on the outside looking in when it comes to traditional sources of revenue such as pet food and prescriptions. Today's pet owner is extremely savvy, and consumers are shopping outside the veterinary office when it comes to non-service items because it can be purchased cheaper elsewhere.

But, a veterinarian doesn't need to look very far for alternative ways to generate revenue. The ability to leverage equipment that might already exist within the practice starts by building an accurate fee structure, while realizing that capital equipment can actually become a profit center.

On the surface, there is a significant difference in the purchase price of digital imaging equipment versus traditional film-based x-ray equipment. If it's only viewed as a capital expense that depreciates over time, that's certainly true. But, when factoring in the amount of labor involved using film-based radiography equipment and

outside costs such as processing chemicals and film, the initial investment actually becomes a secondary cost.

However, that's only if the veterinarian that purchases a piece of digital imaging equipment charges clients their fair share for its use. To determine the most accurate fee possible for a piece of equipment, the first step is to determine the true break even point. This

piece of equipment. Supplies and maintenance for the machine cost \$500 each year. The veterinarian estimates that piece of equipment will be used 1,000 times over the course of the year. If the client is charged \$2.50 for each use, the upkeep of the machine is paid for, and in five years, so is the replacement.

Still using this example, here's where the veterinarian can turn

ROI Advantages of Digital Imaging*

	Film-Based Imaging	Digital Imaging	Difference
Required Labor Time	45 minutes per procedure	10 minutes per procedure	- 35 minutes per procedure
Labor Cost: \$2/minute	\$90 Total Cost	\$20 Total Cost	- \$70 per procedure
Client Charge for Whole Body Study	\$100	\$100	
Profit per Procedure	\$10	\$80	+ \$70
Number of Studies per Year	200	200	
Total Annual Profit	\$2,000	\$16,000	+ \$14,000

*This hypothetical example is meant to illustrate the potential savings and profit advantages of digital imaging equipment. Each practice should carefully evaluate its own unique business situation to determine if digital imaging is right for their practice.

is calculated using the purchase price, the expected lifespan of the equipment, the number of uses and the costs associated with keeping it operational.

For example, a veterinarian has a piece of equipment that was purchased for \$10,000 with an expected lifespan of five years. It is costing the veterinarian \$2,000 each year to own that

any piece of equipment into a profit center by factoring in a return on the investment into the client's fair usage. Perhaps this veterinarian feels a 10 percent return on the \$10,000 purchase price is fair. That comes to \$1,000 over the course of the five-year-lifespan or \$200 each year. When divided by the 1,000 uses, that \$200 is another \$.20 each time the piece of equipment is used.

Dan Zalta is the president and founder of Fee Technology. The company provides veterinarians with pricing solutions to accurately establish fees and greatly enhance their bottom line. Visit Fee Technology on the Web at www.feetech.net.

A small amount for the eventual replacement of the machine, a small amount for maintenance costs and a small amount for a return on investment should be incorporated as part of the fee for any service.

Once the break even and return points are determined, the next part of the equation to address is the labor involved with the procedure. This is where digital imaging equipment can generate an unbelievable return.

Using digital imaging equipment for diagnostic purposes takes less time to operate and the results appear faster for quicker analysis.

The benefits of using digital imaging equipment for diagnostics are clear. Digital is quicker, offers sharper images and saves time for employees. But, that's only part of the picture.

Because the image can be adjusted on the computer, there is also a reduced need for re-takes. In addition, digital equipment eliminates the need for film or processing chemicals, so the costs associated with operating the machine are gone.

Obviously, it will vary from clinic to clinic, but let's say that labor goes from 45 minutes and 2 assistants, using film-based equipment down to 10 minutes



for 2 assistants using digital equipment. Using an estimate of \$2 per minute the true cost of the procedure in labor is reduced from \$90 to \$20 for a labor savings of \$70.

That being said, a veterinarian is not going to lower the price of their regular x-ray because that's what clients are used to paying. Because it costs so much less to operate the machine, that \$70 will go directly to the bottom line in profit. In addition, the veterinarian's technicians now have 35 minutes available to perform other procedures that generate additional revenue.

The benefits of using digital imaging equipment for diagnostics are clear. Digital is quicker, offers sharper images and saves

time for employees. But, that's only part of the picture. Do those benefits outweigh the cost of the equipment?

The only way a veterinarian can accurately answer that question is by gaining a clear understanding of the true cost of labor when taking an x-ray and attaching a dollar amount to the savings achieved by using digital.

In addition, the veterinarian must have the ability to accurately pass along the cost of the equipment and maintenance along with a small return on the investment onto the client as part of the overall fee. When this happens, the veterinarian will see how digital imaging equipment can go from an expense that depreciates to a profit center that generates revenue.

Dental Imaging Leads to Strong ROI

by Dr. Jan Bellows

The use of radiography in dental applications is underutilized, not only as a diagnostic tool, but as a means to increase practice revenue.

When using digital equipment, images are delivered so quickly that practices using digital equipment are more likely to recommend a full mouth series on every animal that comes in for an Oral ATP (Assessment, Treatment and Prevention). This benefits the patient, but the practice too.

Typically, a dental radiograph will be performed by a veterinary technician or an assistant. So, when considering the true labor costs of a practice, dental applications are a great way to keep a veterinarian's employees productive and generating revenue. The ease of use opens up additional opportunities to take dental x-rays as a regular part of the teeth cleaning process

It takes an average of 45 minutes to properly expose, process, dry, and store a traditional full mouth oral survey. A full mouth series using digital imaging equipment should take 10 minutes at most—a savings of 35 minutes per case.

With two cases/day @ \$20/hour for tech time and about the same for anesthesia time, not using digital costs the practice at least \$100/ day with most practices operating 320 days per year the difference is over \$30,000.00 per year saved with digital dental radiology compared to film-based equipment.

The cost of dental digital imaging equipment ranges from \$6,000-18,000, which is significantly lower than whole body equipment. This return on investment is recouped in some practices within months of installation.

Every veterinarian ought to have a digital dental unit not only because it's important for patient care, but the return can be huge when compared to a regular dental x-ray machine, and that return can happen very quickly.

AFP. The Veterinary Imaging Experts. We've Got Your Needs Covered.

For 30 years AFP Imaging has been providing unrivaled imaging solutions.

We design, manufacture, service and support our products. We understand your equipment needs and will find the right solutions for your clinic or in the field.

And that's just the beginning. We'll provide you with training tools to get you up and running. In the event that you require assistance, our team will guide you through any technical difficulties.

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