Choosing a Digital Radiography System

by Dr. Lorne Lavine

Educational objectives

Upon completion of this course, participants should be able to achieve the following:

• Understand the role that software plays in choosing a digital X-ray system.
• Evaluate the main differences between hard sensor and phosphor plate systems.
• Understand and choose proper computer infrastructure required to run digital radiography systems.
• List the factors that affect image quality for digital X-rays.
• Develop a solid backup and data protection protocol for their offices.

The look and feel of the modern dental practice has changed dramatically over the past 10 years. Systems that were once paper-based have now moved into the digital realm. In many dental advances over the past few years, there’s no doubt that the technology has been the driving force in this process. This is as true in other fields as it has been in dentistry. In the early 1990s, intraoral cameras were all the rage. In the late 90s, it was digital cameras. And, at present, no other topic seems to generate greater interest than digital radiography. While entire books can be written on the subject, the goal of this article is to focus on how digital radiography can improve the profitability of the practice, particularly by improving case acceptance.

Having worked with hundreds of offices who have installed digital radiography, the biggest hurdle to adopting this technology is financial. Not only is the cost of the sensors and software very high, but there is the need to add operatory workstations, expand the capacity of the server, mount monitors, improve the data backup, and keep up with the ongoing costs of support and maintenance. While these initial costs are high, there is little doubt that using digital radiography can definitely help the bottom line of the practice by increasing patients’ willingness to come to the practice and accept treatment. There are a number of key areas where digital radiography makes sense:

1. There is no doubt that in order to increase case acceptance, we have to improve our ability to diagnose disease, and the vast majority of dental practices find digital radiography to be superior to film. In a recent survey in Dentaltown Magazine, more than 73 percent of the respondents claimed that they found digital radiography to be more diagnostic than film. There are a few reasons for this. First, there’s a big difference between seeing a

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life-size image, which is around one-inch vs. an image magnified to fill up a typical 17- or 19-inch screen. A good monitor with a high contrast ratio (greater than 700:1) will bring out all the subtle shades of grey that are important when trying to diagnose caries. Secondly, and just as importantly, all digital radiography software gives us incredible tools to improve diagnostics. The most popular of these is the capability to alter the brightness and contrast of the image. Other tools that many offices will use include sharpening, smoothing, equalization, inverting, gamma and noise removal. All software also has magnification tools, permitting you to zoom in on key areas of the image. There are a few programs that really simplify this process. For example, XDR, a smaller company from the Los Angeles area, offers a “caries” icon and a “perio” icon. One click of the icons will apply numerous filters and enhancements to bring out the diagnostic features of the image with minimal muss and fuss.

2. A practice that is efficient and saves time will be very attractive to your patient base, many who are busy and would prefer to minimize the time spent in the office. The time savings with digital radiography are quite significant. However, it’s important to understand that the time savings are limited to the hard sensors. Phosphor plates systems, while an excellent option for many offices, do not provide any time savings over traditional film. Offices also need to know that the process of digitizing film through use of a film scanner will also slow down the process. When using sensors, most offices will see the image on the screen within five to six seconds. Another big time saving is that once the full series is complete, there is no more work to be done. The images don’t need to be processed in the developer, there is no mounting of the film, and no clean up or mess of the chemicals. Many offices can start and finish a full mouth series of radiographs in well under 10 minutes, allowing patients to get in and out of the office quicker.

3. Another key feature of digital radiography is the fact that you can reduce the exposure time of the radiographs. This can be a big selling point for current and future patients. One thing to be cautious of is that many vendors still claim unrealistic amounts of exposure reduction. When digital radiography was first introduced, film was much slower and their claims of 80-90 percent reduction in exposure were accurate. However, over the past 15 years, the speed of film has greatly increased, and many offices are now using E speed film. While offices using digital radiography should still expect a reduction, it’s closer to 30-50 percent over film. In any event, this can be a big marketing advantage for the practice. Even though many

of us know that the exposure even with film is minimal, patients want to know that they are being exposed to the least amount of radiation possible.

4. Speaking of marketing, another reason for offices to consider digital radiography is how having these technologies improves the image of the practice. For many years, dentists who purchased digital radiography systems were considered to be very progressive. Many offices saw a large influx in new patients that were referred by existing patients who were impressed that the office was so technologically advanced. While that is still true today, many offices are now considering digital radiography not to stay ahead of the curve, but to catch up. Recent surveys in various journals have shown that the market penetration of digital radiography is around 30-40 percent, far more than was originally thought. Just as importantly, at least 15-20 percent of offices plan on adding digital radiography in the next 12-18 months. So, it’s no longer a matter of being on the bleeding edge but rather, to keep up with your competitors.

5. Probably the biggest selling point of digital radiography for case acceptance is the concept of co-diagnosis. In the past, patients had to rely on their trust of the practice and the dentist to proceed with dental treatment. In many cases, their conditions were not apparent to them, did not have any associated pain, and patients often were unaware of their dental problems. While we often tried to show patients the X-rays on a viewbox, this is really not ideal for most patients as they have trouble seeing the problems. Digital radiography changes all of that. Now, dental problems that show up in a radiograph can be viewed on a 17- or 19-inch screen, and the patients, for the first time, can see exactly what we as dental professionals can see. Once they see and understand their condition, they will be far more accepting of our treatment plans, as there will be no doubt in their mind about the status of their condition. This is the core of thinking behind co-diagnosis. In the previously mentioned Dentaltown survey, a whopping 94 percent of practices found that digital radiography had improved their profitability, and increased case acceptance is a big part of that.

Digital Radiography Positives

1. Improves ability to diagnose disease.
2. Saves time.
3. Reduces exposure to radiation.
4. Improves the image/perception of the office.
5. Allows for co-diagnosis and increases case acceptance.
Infrastructure

In my conversations with dentists, there are a number of reasons why offices have not taken the plunge with digital radiography. Some are worried that the image quality is not on par with film. Others are concerned about comfort issues. Still others worry about the myriad of options and simply find it overwhelming. However, the number one reason given for hesitation is the cost.

Most offices, when they first start exploring digital radiography, are surprised to learn about the cost of not just the systems, but the entire infrastructure that’s required. In most cases, the cost of the infrastructure is more than the cost of the digital systems themselves. This infrastructure extends to many different systems, including:

### Infrastructure Costs to be Considered

1. The computer server. Digital X-ray images take up far more hard drive storage than practice management data, so many offices will need to upgrade their servers accordingly.
2. Computers in the operatories. A good half of all offices still do not have computers in the ops, so there is the expense and challenge of adding a computer, one to two monitors, mounts, and wireless keyboards and mice.
3. Monitors. To view digital images, it’s ideal to use a monitor that has a high-contrast ratio, so many offices will need to replace their older monitors.
4. Printers. Laser printers are not a good option for printing images, so offices will need either an inkjet or color laser printer.
5. Data backup. Now that the office is digital, having a good backup protocol is critical, and often, more expensive and extensive systems are needed.

While all of these systems must be considered in a perfect world, it’s important for dentists to understand that many options exist. For the practice that wants to get into digital radiography but has a limited budget, an excellent option already exists: laptops. Many offices already use laptops but aren’t aware that these same laptops can be used for digital radiography. Although laptops give up some resolution and contrast ratio, they add lower cost and mobility as an option. Many of the newer sensors are USB and don’t even require an interface box, so it’s very easy to move a laptop and sensor at the same time from one operatory to another.

In this scenario, most offices can get into digital radiography for under $16,000. Sure, it’s not cheap, but far less than the $40,000-$50,000 that it costs to do a full overhaul of the technology systems. What’s also nice about this approach is that once the office can move forward with upgrading of the infrastructure, the laptop can still be utilized in the office, either in a clinical or administrative setting.

Using a laptop is a great option for offices that want to get into digital radiography now. You can still have the same functionality as you’d have with a desktop system, and it’s a solid investment since that same laptop can be used in a more advanced network configuration should the office decide to go that route down the road.

### Backup

For offices that are considering digital X-rays, the most overlooked yet critical component of this is that a solid backup and business continuity system be implemented. I’ve just developed a complete paradigm shift in how I approach data backup and protection. Let’s look at a typical scenario.

An office has a dedicated server and perhaps eight to 10 computers throughout. The office backs up nightly to an external hard drive or tape and that device is removed from the office every evening and taken offsite. So, if anything ever happens to the office server, you’re protected, right? As I’ve found out over the past few years, the answer is usually “no.” The problem isn’t that your data is offsite and protected… you’ve got that covered. The problem is how long it takes to recover from a disaster. If someone accidentally deletes a file or your practice management data becomes corrupted, that’s easy… just restore the missing or corrupted file from your backup. You’re still able to run the practice with no downtime. But, what if something happens to your server or main computer to make it non-operational? Motherboards can get destroyed by power surges. Servers can be stolen or ruined by fire or flood. If you don’t have a server that is running, what do you do with the backup? That’s the real problem that had me worried for a long time: how long would it take for a support technician to get an office back up and running if the server was gone?

Unfortunately, I found out the hard way with a few of our clients that the answer is: too long. The fastest we were able to get an office up and running was 24 hours and that was because they were able to go out and purchase a brand new server locally. The other offices averaged 48-72 hours and a few were longer than that. That’s the real problem that has been overlooked by many dental offices when they come to their backup system: not if the data is protected, but how much downtime will the practice suffer if something goes wrong.

Consider that if your server is down, you are down. You cannot schedule patients, cannot take digital X-rays, cannot create treatment plans and cannot access patient data. You’re dead in the water.

But, what if there was a system available that could guard against this? What if there was a way to be back up and run...

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ning within 30-60 minutes even if your server was destroyed? What if you could combine this system with automatic backup to an offsite location that required no input from you or your staff? Wouldn’t a system like this be valuable for any dental practice?

Systems like this have been available for a few years for large corporations as they really couldn’t recover from a disaster without it. The concept is called “business continuity” and that seems to be a proper description: being able to continue to run your business even in the face of a disaster to your technology systems. The main deterrent for a dental practice to incorporate something like this was cost, but the costs have now dropped enough to make it a very viable option for dental offices. For most practices, they are looking at a startup cost of around $1,500 and then monthly fee to back up the data of around $50-100.

We’ve been installing these types of systems for a few months now and have been very pleased with the results. The system has two components: a device that sits in the office with a copy of the data, and online backup to secure servers that are spread around the country. The unique aspect of the in-office device is its ability to provide “virtualization”: if your server goes down, you can tell the device to act as a virtual server. As far as your computers are concerned, the real server is still up and running. Even if the entire office burned down, within a short period of time, you could access your data from a home computer or laptop and function normally. This is the concept behind business continuity, that no matter what happens, the office will be able to function normally with little to no downtime.

In a down economy, every practice worries about their spending, and that’s no different when it comes to technology purchases like backup and business continuity. The question to ask, though, is what would it cost to the practice to not have business continuity, and what is it worth to be able to sleep well at night knowing your office will recover from a disaster?

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**Author’s Bio**

**Dr. Lorne Lavine**, founder and president of Dental Technology Consultants, has more than 23 years invested in the dental and dental technology fields. A graduate of USC, he earned his DMD from Boston University and completed his residency at the Eastman Dental Center in Rochester, New York. He received his specialty training at the University of Washington and went into private practice in Vermont until moving to California in 2002 to establish DTC, a company which focuses on the specialized technological needs of the dental community.

Dr. Lavine has vast experience with dental technology systems. He is a CompTia Certified A+ Computer Repair Technician, CompTia Network+ certified and will soon be a Microsoft Certified Systems Administrator. As a consultant and integrator, he has extensive hands-on experience with most practice management software, image management software, digital cameras, intraoral cameras, computers, networks, and digital radiography systems. Dr. Lavine writes for many well-known industry publications and lectures across the country.

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| 1. A video monitor used for viewing digital X-rays should have the following minimum contrast ratio: | A) 1:1  
B) 700:1  
C) 10,000:1 |
| 2. Which system offers the greatest time savings over film?               | A) Hard sensors  
B) Phosphor plates  
C) Neither…they offer equal time savings. |
| 3. An office incorporating digital X-rays should expect the following average reduction in exposure times vs. film: | A) 80-90 percent  
B) 10 percent  
C) 30-50 percent |
| 4. The biggest selling point for digital radiography is:                  | A) Cost savings over film  
B) Co-diagnosis  
C) Increased patient comfort |
| 5. The most costly component of a digital X-ray system is usually:        | A) The sensors  
B) The software  
C) The computer infrastructure |
| 6. What is the best printer for printing digital X-ray images:            | A) Inkjet or color laser  
B) Black and white laser |
| 7. Laptops are not ideal for viewing digital X-rays due to:               | A) Smaller screen  
B) Lower contrast ratio  
C) Lower resolution  
D) All of the above |
| 8. When a server crashes, it typically requires at least the following amount of time to get the office back up and running: | A) Two hours  
B) 24 hours  
C) 48-72 hours |
| 9. The number one reason given by dentists for not adding digital X-rays to their practice is: | A) Cost  
B) Comfort  
C) Too confusing |
| 10. True or False? The best system to ensure business continuity is virtualization. | A) True  
B) False |

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