

# Digitally Dynamic Dentistry

## Introduction

Scientist Mark Weiser once summed up the essence of technology. He said, "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."<sup>1</sup> The same is true with the digital dental office. The technologies discussed in this article make for more succinct diagnosis, lead to faster treatment, facilitate patient understanding and improve communication with colleagues, patients and third parties. As Weiser so aptly noted, after implementing these technologies, the improvements are so evident that life around the dental office is never the same again.

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1. Schleyer, T (2004) *Why Integration is Key for Dental Office Technology*. JADA Vol. 135: 4S-10S.

## Practice Management Software

by Bill Busch, DMD, MAGD

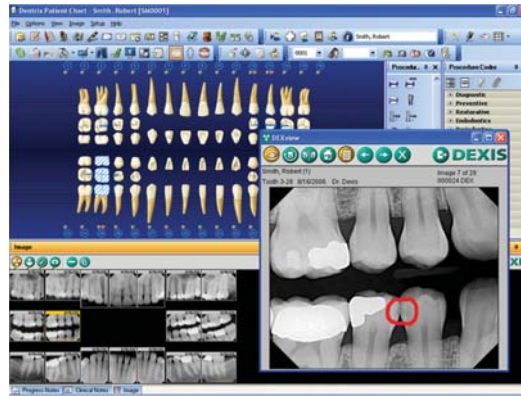
As our economy begins its recovery, efficiencies in office management become more important than ever. Patients checking out a new dental practice or established patients returning for care are looking for a practice that uses technologies that improve all aspects of their visit, whether clinical or clerical. It is important to implement a practice management system that acts as a foundation to connect all the aspects of the digital dental experience.

Of course, the focus of the practice is the dental care of the patient, but a large part of the operation is the flow of information – from the appointment desk, to billing, to the operatories and even to the patient. A practice management system should provide organized and easy access to appointment setting, patient records, insurance, contact information, and even e-mail addresses. With this type of system, patients can see their dental records online, including future treatment, next visit time and date, and they can even pay online.

For a bustling office, scheduling digital appointments works more efficiently than a paper appointment book. Digital scheduling allows the front office staff to search for available times, assign appointments, switch times for cancellations, and track recalls with simplicity.

An efficient practice management system manages all records in one place, so entering payments, filing claims, printing or e-mailing statements and reminders can be accomplished from one screen. What used to be the nightmare maze of insurance has become more organized. With a digital dental office, insurance benefits can be automatically updated and accurately calculated when a treatment plan is entered. Digital X-rays and photographic images can be automatically attached with the patient record and claim form, eliminating the extra work of duplicating X-rays and charts and the frustration of having records lost in the mail. Because all of the information is computerized, costs for extra labor time, physical storage, human error, and processing delays are all eliminated from the budget.<sup>2</sup>

The practice of the patient filling out a form on a clipboard is also being replaced with a more “kiosk-type” of man-



Above: Clinical charting capabilities with digital imaging integration

Above right: Time-saving electronic claims processing and validation

Right: Tracking for practice production to meet financial goals



agement software that allows patients to fill out their information directly on an iPad or in-office computer. This prevents mistakes from the office staff entering the information improperly or because the patient has sloppy handwriting. Charting methods are also accurate and precise, resulting in easy-to-read and easy-to-update information. For added safety, alerts can be triggered for the dentist regarding specific medical needs, such as premedication.

After the office is safely locked up for the night, the practice management system is still hard at work. A mobile capacity allows dentists to review patient records and office schedules on smartphones and mobile computer devices.

The efficiencies gained from practice management software eliminate time-consuming, labor-intensive paperwork, so that the team can concentrate its time and efforts on the real focus of the practice – the patient.

## Digital Radiography

by Brad Durham, DMD

In today's dental practice, no other technology has the same effect on the dentist, the patient and the office staff than digital imaging, and this definitely includes digital radiography! A report by the American Dental Association Council on Scientific Affairs noted, “Advantages of digital radiography include a decrease in radiation exposure for intra-oral radiographs, speed in obtaining the image, ease of digital storage, electronic transmission of the image and discontinued need for darkroom equipment.”<sup>3</sup> That being said, the positive

2. Wellwood S. (2009) EDI-based claims processing systems reduce costs, improve efficiency. *Dental Economics* (99)3, <http://www.dentaleconomics.com/index/display/article-display/357562/articles/dental-economics-volume-99/issue-3/departments/viewpoint/edi45based-claims-processing-systems-reduce-costs-improve-efficiency.html> (accessed January 2, 2012).

3. American Dental Association Council on Scientific Affairs (2006) *The use of dental radiographs: Update and recommendations*. JADA, Vol. 137: 1304-1312. <http://jada.ada.org> (accessed Jan 3, 2012).

impact on the patient's understanding is substantial.

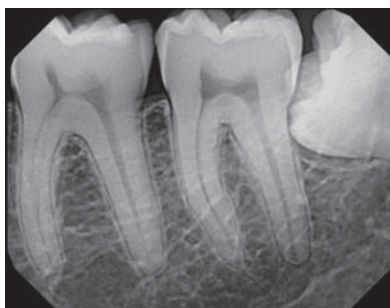
Those who have implemented this technology understand that digital X-ray has increased diagnostic capabilities over traditional film. Digital radiography offers images that can be enhanced and enlarged. The image is constructed using pixels that range in shades of gray depending on the exposure, and are arranged in grids and rows on the sensor.<sup>4</sup>

Basically, the number of gray levels and the pixels determine the resolution. My particular digital X-ray sensor generates 16,000 shades of gray for excellent contrast, and at 2.2 megapixels, can be enlarged to fill the screen, without pixelation. We use 42-inch monitors to maximize the technology. With this kind of clarity, I become a better diagnostician.

Patient education is another asset to digital radiography. Since most patients are not schooled in reading X-rays, it's beneficial that the size and clarity of digital images clearly show the smallest of dental issues. The dentist can change contrast, highlight or annotate the area of interest on these images to facilitate patient understanding. Digital radiographs and even intra-oral photographs can easily be sent electronically to referring dentists and specialists and to the patient who can then share with others. The patient's own digital radiographs and intra-oral photographs can be integrated into presentation software together with treatment explanations of the condition or even video, for an even more in-depth explanation. It doesn't take a peer-reviewed study to tell you that better education leads to quicker case acceptance and treatment.

Just as the radiographs and intra-oral photographs can be quickly e-mailed to patients, front-office staff can use this technology to submit insurance claims. Digital images can be e-mailed along with office notes and clinical records directly to the insurance provider, eliminating the costs of postage and labor for duplicating film, and most importantly, ensuring that all of this personal documentation is not "lost in the mail." Electronic submissions result in fewer mistakes and quicker reimbursement.

Last, but certainly not least, digital X-ray is friendly to the environment and easier on the budget. Traditional film X-ray needs chemicals to be processed, and chemicals to clean the processor. These hazardous substances need to be properly



*Left: Enlarged, enhanced images facilitate better diagnosis and greater patient understanding*



*Right: Digital images can be easily shared with patients, colleagues and insurance*

stored and disposed of, in some states, by approved disposal companies. Time spent developing film and mounting them, duplicating film X-rays and maintaining the equipment could be better spent with the patient. In fact, a digital FMX can take up to 25 minutes less to capture than traditional X-rays. Since digital X-rays and intra-oral photographs are stored on the computer, the dentist saves money on film, chemicals, mounts and the time it takes to file and access traditional film.

From clinical to clerical, digital radiography has a widespread impact on the dental practice. We "went digital" over 10 years ago. For a forward-looking practice, the question should not be *if* it is time to implement a digital system, but *when* to implement. The answer is a resounding "as soon as possible."

## Laser Caries Detection

by Mark Hyman, DDS, MAGD

Methods of caries detection vary among dentists. Reading an X-ray or using an explorer are the traditional choices, but are not always the most definitive, or the most technologically advanced ways of determining the presence of decay. In this age of digital dentistry, laser caries detection offers a less invasive approach to diagnosis, and equally as important, might build patient confidence and increase treatment acceptance.

Laser caries detection often provides the dentist with an accurate assessment of how to proceed clinically, and might help dispel patients' doubts about diagnoses and treatment proposals. The laser caries detection results serve as an automatic second opinion, providing the possibility of caries, even for "difficult to diagnose" patients. Other pathological changes that can remain undiagnosed by conventional examination methods include initial lesions, questionably stained grooves, demineralization, changes in the enamel and fissure caries.

4. Brennan J. (2002) An introduction to digital radiography in dentistry. *Journal of Orthodontics (British Orthodontic Society)* 29(1): 66-69.



Digital quantitative results for sound diagnosis



Less-invasive and highly accurate caries detection

Many scenarios can result in an unreliable diagnosis of caries or no diagnosis at all. For example, fluoridation has resulted in harder tooth enamel. As a result, incipient caries lesions have now migrated below the surface. Laser detection devices might allow the dentist to “see” into occlusal pits and fissures and get to the bottom of possible sub-surface caries lesions.

The laser caries unit measures caries fluorescence within the tooth. When the laser is shined onto the tooth’s surfaces, the reflected light is analyzed by the system, which determines the presence and amount of decay. At a specific wavelength, clean, healthy tooth structure exhibits little or no fluorescence, resulting in low indication from the unit. On the other hand, carious tooth structure will exhibit fluorescence proportionate to the degree of caries and result in a higher indication from the device.

Depending on the type of unit, the results are displayed as audible sounds, lights, and/or numbers on an LCD screen. In the case of sound-emitting units, the sound increases in intensity depending on the size of the carious lesion. In the case of quantifiable numbers, the dentist can decide whether the tooth should be monitored or treated. Research has determined that under both wet and dry conditions, the reproducibility of the laser caries detection method was excellent, and the diagnostic accuracy of the unit was significantly better than that of radiographs.<sup>5</sup>

Besides adding to the dentist’s certainty of the presence of caries, a laser caries detection unit might add to the patients’ confidence in the results and their comfort during the consultation. The probe of the unit does not scratch any tissue, so the evaluation is simple, fast and painless. In cases

where doubt exists, results are reproducible, permit re-checking, stabilization and actual documentation of caries. This excellent reproducibility allows monitoring of lesions over time to facilitate preventive-based management of dental decay.<sup>6</sup>

A quote by Dale Carnegie sums up the key benefit of the laser caries detection unit quite well. He said, “Evidence defeats doubt.” In the age of digital dentistry, we are able to utilize

the digital X-ray and intra-oral photographs displayed on the monitor, and the laser caries detection, to help the patient reach the conclusion to completely accept our recommended treatment plan before the caries becomes more serious, and subsequent treatment more complex, and possibly, painful.

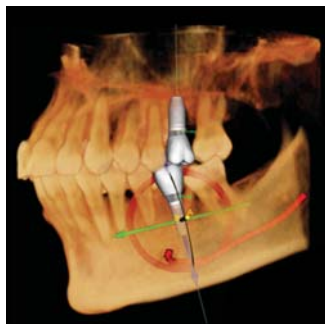
## Cone Beam Imaging

by Justin Moody, DDS

Imaging technologies give dentists the tools to improve the quality of the dental visit as well as quality of life after the visit. Some dental options, such as implants, require precise information for more predictable outcomes. To obtain the detailed data necessary to safely and confidently carry out these procedures, cone beam computerized tomography (CBCT) imaging provides a three-dimensional view of the anatomy. While two-dimensional radiography has its place in each dental office, these 3D views are typically unattainable with standard 2D imaging methods.

For implants, CBCT makes results more predictable. A

CBCT scan provides the information needed to assess bone height, width, quality, pathology, root locations and proximity to adjacent teeth and location of the nerves. Panoramic radiographs cannot offer the precise data that CBCT provides for placement of implants.<sup>7</sup> The view of the dentition on a 3D scan can be rotated, zoomed in on from any angle and viewed in 360 degrees. This information provides a “surgical view” of the implant site without actually performing surgery, and helps the practitioner to determine the implant’s



Implant and restoration planning with 360-degree views of the anatomy

5. Shi X-Q, Welander U, Angmar-Månsson B (2000) Occlusal Caries Detection with KaVo DIAGNOdent and Radiography: An in vitro Comparison. *Caries Res* 34:151-158.

6. Hibst R, Paulus R, Lussi A (2001) Detection of Occlusal Caries by Laser Fluorescence: Basic and Clinical Investigations, *Medical Laser Application*, 16(3): 205-213.

7. Laster WS, Ludlow JB, Bailey LJ and Garland H (2005) Accuracy of measurements of mandibular anatomy and prediction of asymmetry in panoramic radiographic images. *Dentomaxillofac Radiol* 34(6): 343-349.



Orthodontic planning is enhanced with full knowledge of teeth positions

proper inclination, length and diameter.<sup>8</sup> Compatibility with implant-positioning software programs that allow for restoration planning at the onset and that are used to create surgical guides additionally facilitate the implant process and increase the probability of a positive outcome.

For orthodontic patients, cone beam imaging is useful in determining precise root position, location of impacted, supernumerary and ectopically erupting teeth, TMJ evaluation, screening for head and neck pathology and discerning and measuring airway volumes.<sup>9</sup>

When a case warrants a CBCT scan, the practitioner can decide on what settings to use for the specific patients' needs, based on their clinical expertise and As Low As Reasonably Achievable (ALARA) principles. To achieve ALARA, dentists can reduce radiation exposure through collimation and shorter scan times. The fields of view on the CBCT scanner should be flexible, with larger fields of view for orthodontics or maxillofacial and oral surgery, and medium field of view for implants. For example, some systems can be collimated to capture just the maxilla or mandible areas, both arches with temporomandibular joints or cephalometric views.

Besides delivering the precise information needed to perform surgery, move teeth or place implants, cone beam radiography also increases communication between the dentist and patient. The 3D representation of the dentition boosts patients' understanding of their dental condition and the issues that require special attention. Plus, the data captured from the CBCT can easily be transmitted electronically to referring specialists or restorative dentists so that treatment can be planned using a team approach.

Cone beam imaging gives dentists the confidence to embark on cases without the surprises during treatment that can impede success. It literally adds a dimension to dental diagnosis and planning that is unattainable with traditional 2D methods and gives dentists more opportunities to provide new and innovative dental treatments. ■

8. Guttenberg SA, CBCT and implants: a career-altering experience. *Dental Tribune* <http://www.dentaltribune.com/articles/content/id/2981/scopes/specialties/section/implantology> (Posted September 28, 2010).

9. Way, D. (2006) Utilization of CBCT in an Orthodontic Practice. *AADMRT Newsletter*, [http://laadmrt.com/currents/way\\_summer\\_06\\_print.htm](http://laadmrt.com/currents/way_summer_06_print.htm) (accessed January 3, 2012).

## Author Bios



**Dr. Busch** is a member of the American Dental Association, Missouri Dental Association, Academy of General Dentistry, Academy of Sports Dentistry, Academy of Cosmetic Dentistry, and the Greater Kansas City Dental Society. He has received the Mastership Award from the Academy of General Dentistry (MAGD). As well as maintaining a private practice in Kansas City, in 2006, Dr. Busch founded TeamSmile. With the help of the Kansas City Chiefs, UMKC School of Dentistry, the local dental community, organized dentistry – including the ADA, and a handful of manufacturers, this dental outreach program provides dental care to the local underserved children in the Kansas City area.



**Dr. Durham** has practiced for 25 years with an emphasis on head, neck and facial pain treatment, dental cosmetics and complex dental reconstruction. His practice combines art, science and technology with personalized care. Dr. Durham is a clinical and featured instructor at The Las Vegas Institute and was the first in the world to earn the LVI Mastership award for aesthetic reconstruction. He teaches a series of courses entitled "The Niche Practice" at LVI and his home in Savannah, Georgia. He can be reached at [drd@braddurhamdmd.com](mailto:drd@braddurhamdmd.com) and [www.nichepractice.com](http://www.nichepractice.com).



**Dr. Hyman** is a graduate of the University of North Carolina at Chapel Hill and the University of North Carolina School of Dentistry, where he serves as adjunct associate professor. He has taught at the Pankey Institute. Dr. Hyman holds a Mastership Award granted by the Academy of General Dentistry. He has served on the surgical staff of Cone Health System in Greensboro, North Carolina, for more than two decades. An internationally recognized and highly regarded speaker, he has been in private practice in cosmetic and family dentistry in Greensboro for 26 years.



**Dr. Moody** graduated from the University of Oklahoma, College of Dentistry. As a supporter of organized dentistry and continuing education, he maintains membership with the American Dental Association, American Academy of Implant Dentistry and Academy of Osseointegration, as well as state and local societies. Additionally, Dr. Moody is a diplomate with both the International Congress of Oral Implantologists and the American Board of Oral Implantology/Implant Dentistry, and an associate fellow with the American Academy of Implant Dentistry. He also holds mastership and fellow status at the Misch International Implant Institute. Dr. Moody has been in private practice in Crawford, Nebraska, since 1997.

# Post-test

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1. \_\_\_\_\_ should provide organized and easy access to appointment setting, patient records, insurance, contact information and even e-mail addresses.
  - a. A practice management system
  - b. A paper appointment book
  - c. A filing cabinet
  - d. A professional office manager
2. Digital scheduling allows the front office staff to \_\_\_\_\_ by clicking and dragging the information into the time slot.
  - a. search for available times
  - b. assign appointments
  - c. switch times for cancellations and track recalls
  - d. all of the above
3. The image in digital radiography is constructed using \_\_\_\_\_ that range in shades of gray depending on the exposure, and are arranged in grids and rows on the sensor.
  - a. voxels
  - b. pixels
  - c. spectrum units
  - d. emulsions
4. A digital FMX can take up to \_\_\_\_\_ to capture than traditional X-rays, and that is not even including the time for developing the film.
  - a. 10 minutes longer
  - b. 25 minutes shorter
  - c. 5 minutes shorter
  - d. 20 minutes longer
5. True or False: CBCT is short for cone beam computerized tomography
  - a. True
  - b. False
6. The laser caries unit measures \_\_\_\_\_ within the tooth.
  - a. plaque formation
  - b. bacteria
  - c. dental pulp
  - d. caries fluorescence
7. Research has determined that under both wet and dry conditions, the reproducibility of the laser caries detection method was excellent and the diagnostic accuracy of the unit was \_\_\_\_\_ than that of radiographs.
  - a. significantly better
  - b. minimally better
  - c. worse
  - d. no different
8. \_\_\_\_\_ provides the information needed to assess bone height, width, quality, pathology, root locations and proximity to adjacent teeth and location of the nerves.
  - a. A CBCT scan
  - b. A traditional film X-ray
  - c. A 2D panoramic radiograph
  - d. An intra-oral photograph
9. The 3D view of the dentition on a 3D scan can be \_\_\_\_\_.
  - a. rotated
  - b. zoomed in on from any angle
  - c. viewed in 360 degrees
  - d. all of the above
10. To achieve ALARA, dentists can reduce radiation exposure through \_\_\_\_\_.
  - a. patient positioning
  - b. collimation
  - c. shorter scan times
  - d. both b and c

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## Digitally Dynamic Dentistry by Drs. Busch, Durham, Hyman and Moody

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| 2. Course material was up-to-date, well-organized and presented in sufficient depth | 3 | 2 | 1 |
| 3. Instructor demonstrated a comprehensive knowledge of the subject                 | 3 | 2 | 1 |
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| 5. Overall, I would rate this instructor  | 3 | 2 | 1 |

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Please circle your answers.

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| 2.  | a | b | c | d |
| 3.  | a | b | c | d |
| 4.  | a | b | c | d |
| 5.  | a | b |   |   |
| 6.  | a | b | c | d |
| 7.  | a | b | c | d |
| 8.  | a | b | c | d |
| 9.  | a | b | c | d |
| 10. | a | b | c | d |

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