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Corey Gerhard
ADVERTISING MANAGER
Corey.Gerhard@cda.org
916.554.5304

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Andrea LaMattina
PUBLICATIONS SPECIALIST
Andrea.LaMattina@cda.org
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CDA JOURNAL, VOL 42, N°6

Slow to Know or Slow to Show

Kerry K. Carney, DDS, CDE

At a recent conference on interprofessional education, one of the speakers challenged the audience to guess the average length of time between the publication of a therapeutic innovation and its adoption into accepted, everyday practice. The answer was 17 years.[1]

That is an average. Some innovations are rapidly adopted while others can languish for many decades. A recent article by surgeon and journalist Atul Gawande examined what factors may affect the speedy adoption of some ideas and how other "slow ideas" might be accelerated along their road to adoption.[2]

The article began by contrasting the rapid adoption of anesthesia and the slow adoption of Lister's antisepsis techniques.

William T.G. Morton, a Boston dentist, popularized inhalation anesthesia in 1846 after a surgical demonstration of its effectiveness at Massachusetts General Hospital. Though it met some initial resistance, especially from those with religious objections to its use in childbirth, it was rapidly incorporated into surgical procedures around the world.

There were factors that facilitated adoption:

- The potential for financial gain (patent attorneys were gainfully employed defending and disputing claims by Morton and others for years).
- It was heralded as freedom from pain for the patient.
- It made for a less stressful experience for the surgeon (operating on screaming patients can certainly raise one's blood pressure).

Antiseptic techniques of hand washing and disinfection of instruments took much longer to adopt. The financial incentives may not have been as lucrative — most of the cleaning and sterilizing agents were already known and not available to patent. Antisepsis depends on understanding and believing in germ theory, as well as patient follow-up to compare outcomes over time. Anesthesia needed no fundamental understanding of how it worked to appreciate its effectiveness. One could see immediately that it worked.

Trust and congeniality, that was the basis upon which information could not only be communicated but also incorporated into everyday practice.

Gawande discussed how one can effectively shortcut the long and costly delays in adoption and implementation of some important but slow ideas. As his example, he examined the adoption of good, healthy birthing practices and neonatal care through a pilot project in India.

The project revealed that personnel could know what they should be doing, but unless they liked and trusted the training agent, they would not reliably change their practices to include the new techniques. Trust and congeniality, that was the basis upon which information could not only be communicated but also incorporated into everyday practice.

This need to establish a friendly, trusting relationship is not news to good salespeople. Good salespeople try to ingratiate themselves to win the trust of the person responsible for purchasing or prescribing their products.

We know this from our own offices. We are much more likely to try a product offered by a product representative we like. We imbue them with an interest in the welfare of our practice and our patients above their own self-interest. Once we trust they are not going to "steer us wrong," we are much more open to trying their product.

That positive human interaction can be the pivotal factor in behavior change. Educational interactions with health care counselors more predictably achieve patient behavior change than one-way information without the human element. Patients with diabetes who simply watched an instructional video without that human interaction with a counselor were less likely to change their behavior. Health counselors were able to move the behavior change forward by establishing a therapeutic alliance between themselves and the patients.[3]

The pharmaceutical industry has a long history of friendly gifting behaviors to try to speed adoption of new prescribing habits among physicians. Many institutions have restricted gift giving based on its positive influence on prescribing and buying habits. In the last part of the 20th century, the pharmaceutical industry embarked on a new tack to speed up prescribing behavior change.

According to an article in *Pharmacy and Therapeutics*, direct-to-consumer pharmaceutical advertising (DTCPA) can be much more effective than marketing

directly to physicians. Prior to 2005, DTCPA was growing at an estimated 20 percent per year.[4] That is twice as fast as either spending on pharmaceutical direct-to-physician advertising or drug research and development. The growth in DTCPA was based on the estimate that every dollar spent "would increase sales of the advertised drug by an estimated $2.20 to $4.20."[4]

"In 1980, total spending on DTCPA was $12 million, in 1990 it was $47 million and in 1995 it was $340 million, representing a nearly 3,000 percent increase in expenditures over a 15-year period. After the FDA issued revised (more liberal) draft guidelines for broadcast DTCPA in 1997, the budgets for consumer drug advertising more than tripled to $1.2 billion in 1998. Spending on DTCPA nearly quadrupled again during the following decade, topping $5 billion in 2006 and 2007."[4]

"The average American TV viewer watches as many as nine drug ads a day, totaling 16 hours per year, which far exceeds the amount of time the average individual spends with a primary care physician."[4]

In the Indian pilot project that Gawande discussed, there was no demand by the patients for the health care workers to change their practices. It is a very different scenario when the patient is demanding change. In the pharmaceutical context, when patients request that their physicians prescribe a specific drug (for example, one they have seen advertised on TV), there is an increase in the prescribing of that drug.

Patient demand can be a powerful accelerator of change. Though latex gloves had been available for years, their rate of incorporation into general practice in dental offices was slow until patients demanded change. Dentistry's adoption of universal infection control precautions accelerated rapidly when patients began to ask their dentists about antiseptic practices in the wake of deaths attributed to poor infection control and transmission of HIV in the dental office.

The ADA recently collaborated in a study that concluded that chairside screenings in dental offices could save the U.S. health care system millions of dollars.[5] They estimated the one-year savings if patients aged 40 and older were identified during screenings in a dental setting, referred to a physician and started pharmacological treatment. Screenings for diabetes, high blood pressure and high cholesterol in dental offices could save from $42.4 million to $102.6 million over one year.

As dentists, we can play a larger role in combating chronic disease. This may be a slow idea. It may take years for screenings to be incorporated as an essential element in our comprehensive patient examination. It may take the patient asking about screening before it becomes universally adopted. However, adoption of this practice is just one step toward effective, interprofessional, collaborative, patient-centered care. We know it. We just need to show it. ■

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CDA JOURNAL, VOL 42, N°6

Creating Healthy Dialogue

As a practicing dentist, I have had more than 50 years of experience practicing dentistry in California. These were very good years. It is no accident that we call what we do a dental practice. We learn from experience and paying attention to the results we achieve.

I have also seen many changes in organized dentistry over the years. In the past, we were highly protective of our standing in the community as health care professionals. Limits were set on advertising. We worked hard to earn our right to practice dentistry in this state. There was a clearer separation between commercialism and our professional responsibilities to our patients. If there was a conflict between commercial considerations and the well-being of our patients, we understood that the well-being of our patients came first.

I am concerned when I read in the *Journal* that so many people are plagued by dental problems. I am particularly concerned because I know from experience that most dental problems are preventable.

Although much is published in the journals about how to repair damage after it has happened, I have seen nothing about dentists having a discussion with patients about how their teeth got that way. The patient is never asked if he or she would like to avoid that kind of pain and suffering in the future. We seem to take it for granted that dental disease is inevitable. This is a huge waste of time, energy and resources.

Part of the problem lies in our system of dental education. Students are taught procedures and are required to do a certain number of procedures to graduate. This is then carried into practice and the dentists sees themselves as retail marketers of dental procedures. The problem is made worse if the dentist depends on servicing the various dental coverages because they all use lists of procedures that must be followed in order to get reimbursement. This is not about having the patient become healthier.

The *Journal* welcomes feedback in the form of letters to the editor. We rarely see these any more.

I would welcome feedback from the readership. Perhaps we can open a healthy dialogue.

Philip Hordiner, DDS
Los Altos, Calif.

The *Journal* welcomes letters

We reserve the right to edit all communications. Letters should discuss an item published in the Journal *within the past two months or matters of general interest to our readership. Letters must be no more than 500 words and cite no more than five references. No illustrations will be accepted. Letters should be submitted at editorialmanager.com/jcaldentassoc. By sending the letter, the author certifies that neither the letter nor one with substantially similar content under the writer's authorship has been published or is being considered for publication elsewhere, and the author acknowledges and agrees that the letter and all rights with regard to the letter become the property of CDA.*

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CDA JOURNAL, VOL 42, N°6

Disease and Illness

David W. Chambers, EdM, MBA, PhD

The patient has five- and six-millimeter pockets, mobility, through-and-through furcations, bleeding and mild pain on eating.

This is periodontal disease. The etiology and prognosis are known and fully described in PowerPoint slides. But the case may be different for the patient. "Somehow" it just started to hurt occasionally. The dentist seems to be implying that there is blame here. Money and pain and inconvenience are now involved. The patient is experiencing illness.

The facts of disease and illness are identical where they cross like a large X when the patient is in the chair. But the disease path has a different beginning and end from the illness path.

A disease is a prototype abnormality with an established trajectory and minor variations. The CDT code is the same, the textbook description is the same, the optimal treatment is the same, the reimbursement is the same. But each patient has a different and personal illness. The diagnosis may be heartbreaking to the executive who imagines herself the paragon of health. Of course, she will do whatever the dentist recommends and pay in full in cash, but a blow has been dealt to her self-image that extends well beyond the mouth. A down-and-outer who has not been to a dentist in 15 years might take it in stride. "What's the cheapest thing you can do, Doc?" What matters to the patient comes before and after the office visit, and identical visits do not mean identical illnesses.

Dentists are trained and experienced in managing the path of disease. Harvard Business School professor Michael Porter, who is something of an expert on health care policy, thinks that the biggest flaw in our system comes from following the disease path in diagnosis, treatment, financing, design of our offices and patient contact. That has contributed directly to high costs and poor and unevenly distributed health outcomes.

If we decided instead to build our system around health, we would focus on five points on the illness path. First is prevention and patients' willingness to participate in the health care system at all. Second is awareness of need and diagnosis. The third stage — the common one on both paths and often the only one we think of — is intervention in acute disease situations. Recovery and rehabilitation are the fourth phase. The final one is establishing a new "normal," one we hope is sustainable.

The American health care system focuses almost entirely on the cross point in the X. Cost can be read along the disease path and health along the illness path. The intersection of the paths is where providers can make the most money, but it is not where they can do the most good. ■

The nub:

1. Providers who know everything about oral disease may still not know very much about particular patients' experiences.

2. There is always a history and a future for a dental visit, and they are different for the patient and the dentist.

3. Our system is perversely incentivized because it focuses on disease, for a moment.

David W. Chambers, EdM, MBA, PhD, is professor of dental education, Arthur A. Dugoni School of Dentistry, San Francisco, and editor of the *Journal of the American College of Dentists*.

Dentist Shortage Bites California as More Choose to Practice Out of State

A lingering recession, the elimination of Medicaid dental reimbursements and a glut of established dentists in wealthier, populated areas may explain why more new dentists are practicing outside California, according to a new policy brief from the UCLA Center for Health Policy Research.

"Good access to dental care depends on having a robust supply of new dentists in California," said Nadereh Pourat, director of research at the center and

lead author of the study. "We need a new generation of dentists to replace the many dentists who are close to retirement."

While California still saw an increase in the number of dentists and had more licensed dentists — 35,000 plus — than any other state in 2012, the number of those licensed to practice in California who opted to reside or work out of state grew 6 percent between 2008 and 2012.

The migration is especially noticeable among new dentists. In 2012, 86 percent of those licensed within the previous five years practiced in the state, a 10 percent drop from 2008. In addition, new dentists in 2012 made up a smaller share of the state's overall supply. Of all regions, the San Joaquin Valley tallied the highest percentage of new dentists, who composed 15 percent of the local supply.

"There is a lopsided distribution of dentists," Pourat said. "They cluster in areas like San Francisco and Southern California but don't settle in rural and underserved areas. Many areas of the state don't have enough dentists."

Options such as assistance with dental school loan repayment, small business loans and higher Medicaid reimbursement rates to provide incentives should be further developed for better effectiveness, the authors note.

To read the full report, "Trends in the Supply of Dentists in California," go to healthpolicy.ucla.edu/publications/search/pages/detail.aspx?PubID=1275.

Protein Plays Key Role in Infection by Oral Pathogen

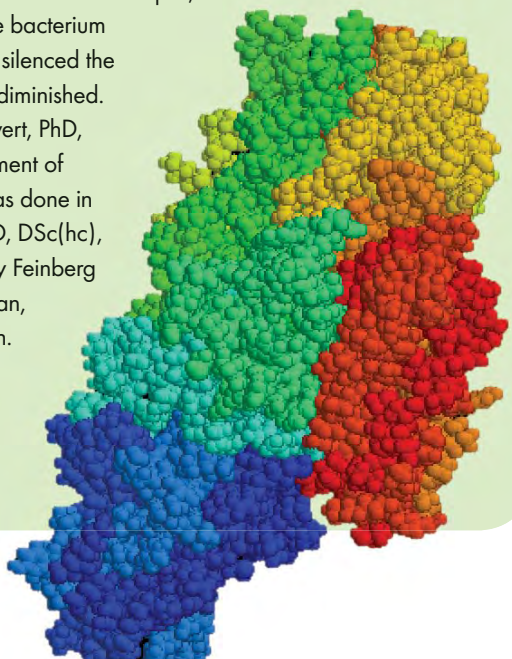
Scientists at the Forsyth Institute, along with a colleague from Northwestern University, have discovered that the protein transglutaminase 2 (TG2) is a key component in the process of gum disease. TG2 is widely distributed inside and outside of human cells. The scientists found that blocking some associations of TG2 prevents the bacteria *Porphyromonas gingivalis* (PG) from adhering to cells. This insight may one day lead to novel therapies that prevent gum disease caused by PG.

Periodontal disease in its more severe forms, such as periodontitis, causes loss of the bone that supports the teeth. Approximately 65 million adults in the U.S. are affected by some form of the disease. PG is the major causative agent of periodontitis, and it may also be involved in the development of systemic diseases such as atherosclerosis and rheumatoid arthritis.

The findings in this study indicate that TG2 is a key mediator in *P. gingivalis* infection. The scientific team examined the critical role that TG2 plays in enabling *P. gingivalis* to adhere to cells. Using confocal microscopes, they found clusters of TG2 where the bacterium was binding to cells. When the team silenced the expression of TG2, *P. gingivalis* was diminished.

This study was led by Heike Boisvert, PhD, assistant member of the staff, department of microbiology at Forsyth. The work was done in collaboration with Laszlo Lorand, PhD, DSc(hc), MD(hc) from Northwestern University Feinberg Medical School and Margaret Duncan, PhD, senior member of staff at Forsyth.

Read the study published ahead of print in the March 24 issue of the *Proceedings of the National Academy of Sciences*.

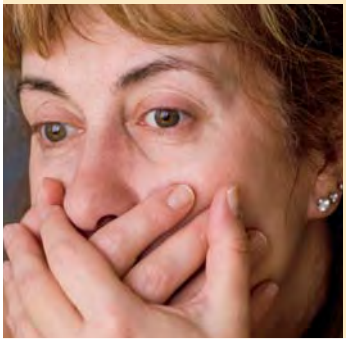


Study Associates Tooth Loss to Depression and Anxiety

Tooth loss from caries and periodontal disease is an outcome of complex, chronic conditions. Several biopsychosocial factors are involved, including accessing care. Individuals reporting dental anxiety may avoid dental care, and individuals with depression may be negligent in self-care. In this study, researchers examined a potential association of tooth loss with depression and anxiety.

The Behavioral Risk Factor Surveillance System (BRFSS) Survey is a complex telephone survey conducted by the Centers for Disease Control and Prevention and state health departments. In this study, the researchers used the BRFSS 2010 data (451,075 respondents). Analysis involved frequency, Chi-square analysis and complex survey logistic regression. Criteria for participants' eligibility included being 19 years or older and having complete data on depression, anxiety and tooth loss.

Among 76,292 eligible participants, 13.4 percent reported anxiety, 16.7 percent reported depression and 5.7 percent reported total tooth loss. Chi-square analysis by tooth loss revealed that participants with depression, anxiety or a combined category of depression or anxiety differed significantly in tooth loss ($p < 0.0001$) from participants without those conditions.



At the conclusion of this national study, the researchers found that depression and anxiety are associated with tooth loss.

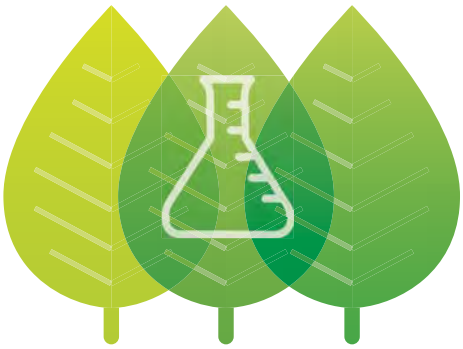
The research study titled "Association of Tooth Loss and Depression and Anxiety," was presented by R. Constance Wiener, PhD, at the 43rd annual meeting and exhibition of the American Association for Dental Research held March 19-22 in Charlotte, N.C.

Inhibition of Oral Biofilm and Cell-cell Communication Using Natural-products Derivatives

The use of plant-inspired cysteine derivatives to inhibit bacterial virulence may serve as a novel tool to improve oral health. The authors of this study proposed that the compounds used in this research may inhibit biofilm formation by interrupting bacterial communication pathways, particularly in AI-2 biosynthetic reactions. Since their library is derived from eukaryotic (plant) origins, this study may provide initial evidence of interkingdom signaling, which has implications for studies of the human microbiome.

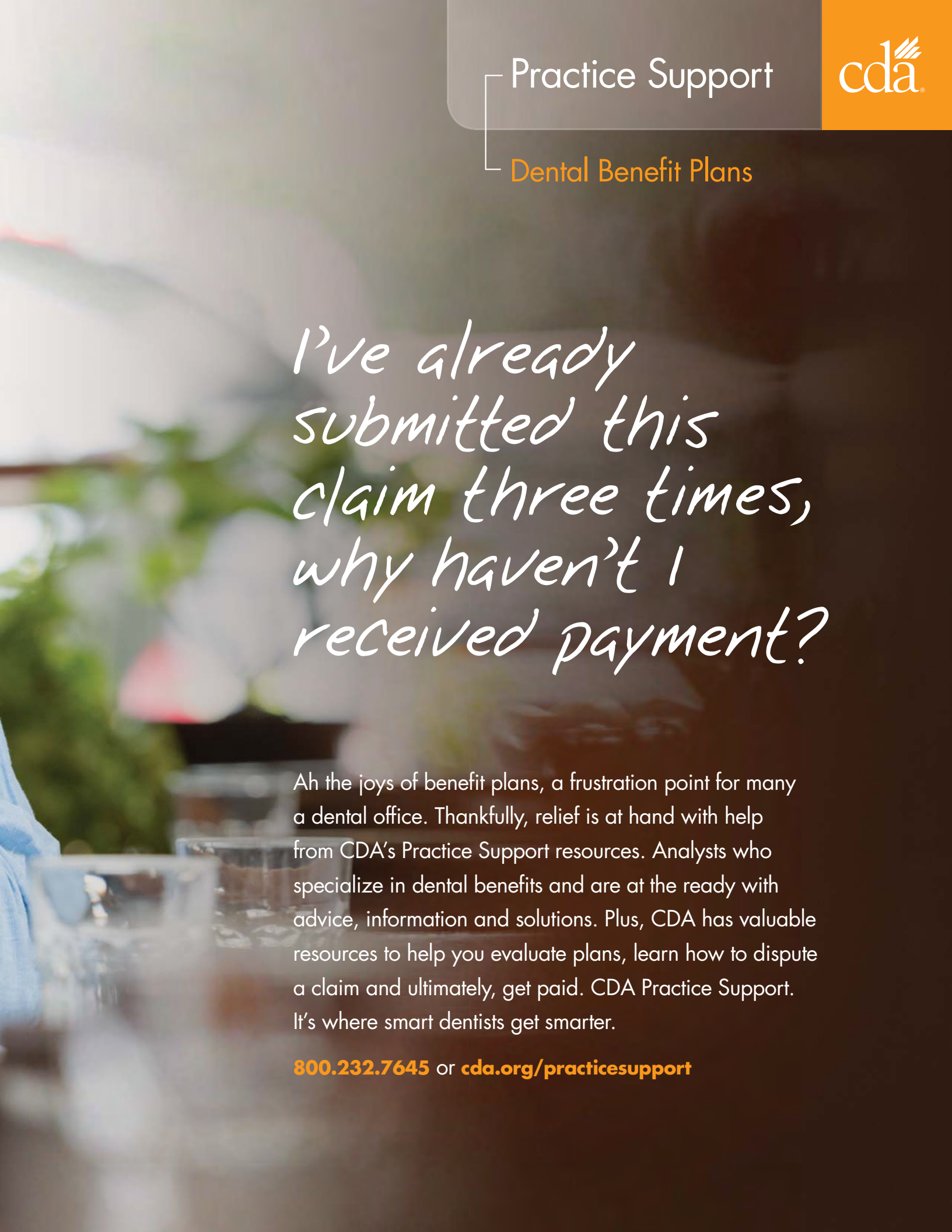
Many plant metabolites and structurally similar derivatives have been identified as inhibitors of bacterial biofilm formation and quorum sensing (QS). Previously, these researchers demonstrated biofilm and QS inhibition using modified cysteines, similar to those produced by the tropical plant Petiveria alliacea. In this study the researchers expanded their compound library to examine structure-activity relationships for biofilm and QS inhibition.

Using a microplate-based screening approach, they observed the biofilm formation by three indigenous oral



Gram-positive bacteria: *Streptococcus mutans* UA159, *Streptococcus sanguis* 10556, and *Actinomyces oris* MG1. Bacteria were grown in the presence of inhibitory compounds and analyzed using fluorescent staining for biomass and via confocal microscopy. Compounds were also tested in a Vibrio harveyi QS reporter, which responds to autoinducer-2 (AI-2) signaling (interspecies) but not acyl-homoserine lactone signaling (intraspecies). Reverse transcriptase real-time PCR and global RNA sequencing (RNAseq) were used to study modified genetic expression in *S. mutans* UA159 in the presence of select compounds from the researchers' library.

"Inhibition of Oral Biofilm and Cell-cell Communication Using Natural-products Derivatives" was presented by Steve Kasper, a senior at the State University of New York College of Nanoscale Science and Engineering, at the 43rd annual meeting and exhibition of the American Association for Dental Research held March 19-22 in Charlotte, N.C.



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Device Saves Teeth, Jaws Damaged by Cancer

Artificial scaffolding developed and patented at the Faculty of Dentistry at the University of Oslo, Norway, helps the body generate new bone that is as strong as the original. The new material can aid patients with loose teeth caused by periodontitis and mandibular bone damaged by cancer, infections and accidents.

If there is too wide a gap between the two bone fragments, or if parts of the bone have been damaged, the body does not always succeed in repairing the damage by itself, as can happen when some of the bone has been removed during cancer surgery or when the bone has been damaged by radiotherapy.

Image courtesy of University of Oslo.

"This is where our invention comes in," says Ståle Petter Lyngstadaas, research dean at the Institute of Biomaterials, Faculty of Dentistry. Along with Professor Jan Eirik Ellingsen, Associate Professor Håvard Jostein Haugen and others, Lyngstadaas has created a foam rubber scaffolding that helps the body repair such critical damage.

Manufacturing the material is a simple matter. A mixture of water and ceramic powder is poured through ultrapure foam rubber designed to look like trabecular bone. When the mixture has solidified, it is heated to a temperature that causes the foam rubber to dissolve into water vapor and carbon dioxide and the nanoparticles to ligate into one solid structure. The result is a mirror image of the foam rubber structure.

The Norwegian dentists have tested the new method successfully on rabbits, pigs and dogs. They have begun clinical studies on patients with periodontitis and damage to the mandibular bone. To establish what method works best, they say it is particularly advantageous to perform tests on patients with periodontitis.

For more information, see the article in the March 18 issue of *Apollon*.

Resin Infiltration Effects in a Caries-Active Environment

Researchers studying resin infiltration effects in a caries-active environment found that infiltration successfully stabilized early non-cavitated lesions in a small population with high caries activity. Continuing follow-up may further confirm its efficacy.

The objective of the study was to compare carious lesion changes after resin infiltration of approximal noncavitated lesions in a high caries risk population after two years. Resin infiltration (I=Icon, DMG-Germany) was compared to mock infiltration (C=Control) in a split-mouth RCT. Lesion progression was monitored at two levels (lesion depth rating [E2/D1/D2] and lesion depth changes within ratings) in caries-active subjects (mean DMFT=7.4+2.0, age=14-36 yrs), receiving standard-of-care preventive measures including F-supplementation.

After two years, 15 tooth pairs (68 percent recall) in 10 patients were available for analysis. Lesion depth rating and depth increase (within ratings) were visually determined from digital radiographs by two independent examiners (intra-/inter-evaluator agreement: k>0.70). Depth increase was confirmed by digital subtraction radiography (DSR). Ratings were statistically analyzed by logistic regression. Discrete time survival analysis (logistic regression and generalized estimating equation [GEE] modeling) was used to examine effects of treatment on probability of lesion increase over time, controlling for baseline severity.

This pilot study identified important promising trends between the plaque and salivary metabolomes from caries-active and caries-free children, despite a relatively low number of subjects. The research was supported in part by DMG Germany and the University of Michigan.

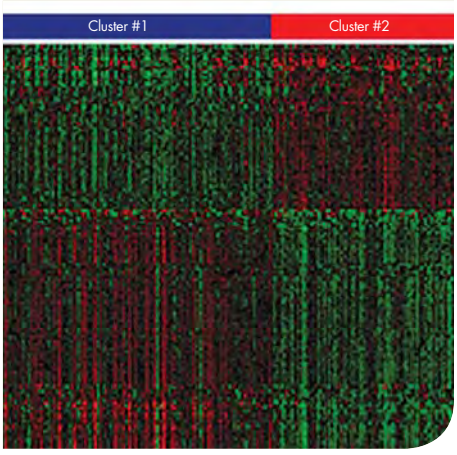
The study was presented at the 43rd annual meeting and exhibition of the American Association for Dental Research held March 19-22 in Charlotte, N.C.

Gene Expression Signature Reveals New Way to Classify Gum Disease

Researchers at Columbia University Medical Center (CUMC) have devised a new system for classifying periodontal disease based on the genetic signature of affected tissue, rather than on clinical signs and symptoms. The new classification system, the first of its kind, may allow for earlier detection and more individualized treatment of severe periodontitis. The findings were published recently in the online edition of the *Journal of Dental Research*.

Currently, periodontal disease is classified as either "chronic" or "aggressive," based on clinical signs and symptoms such as severity of gum swelling and extent of bone loss. "However, there is much overlap between the two classes," said study leader Panos N. Papapanou, DDS, PhD, professor and chair of oral and diagnostic sciences at the College of Dental Medicine at CUMC.

Looking for a better way to classify periodontitis, Dr. Papapanou turned to cancer as a model. In recent years, cancer biologists have found that, in some cancers, clues to a tumor's aggressiveness and responsiveness to treatment can be found in its genetic signature. To determine whether similar patterns could be found in periodontal disease, the CUMC team performed genome-wide expression analyses of diseased gingival tissue taken from 120 patients with either chronic or aggressive periodontitis.



More severe cases of periodontitis are represented under the red bar, less severe cases under the blue bar. Credit: Panos N. Papapanou, DDS, PhD/Columbia University College of Dental Medicine.

The researchers found that, based on their gene expression signatures, the patients fell into two distinct clusters. "The clusters did not align with the currently accepted periodontitis classification," said Dr. Papapanou. However, the two clusters did differ with respect to the extent and severity of periodontitis, with significantly more serious disease in Cluster 2.

The new system could offer huge advantages for classifying people with different types of periodontitis.

For more detail, read the article "Gingival Tissue Transcriptomes Identify Distinct Periodontitis Phenotypes" published in the March 19 issue of the *Journal of Dental Research*.

Bone Loss in Leukocyte Adhesion Deficiency Reversed

Patients with leukocyte adhesion deficiency, or LAD, suffer from frequent bacterial infections, including periodontitis. These patients often lose their teeth early in life.

New research by University of Pennsylvania School of Dental Medicine researchers, teaming with investigators from the National Institutes of Health, has demonstrated a method of reversing this bone loss and inflammation.

The work was led by Penn Dental Medicine's George Hajishengallis, DDS, PhD, professor in the Department of Microbiology, in collaboration with Niki Moutsopoulos, DDS, PhD, of the National Institute of Dental and Craniofacial Research. It was published in the journal *Science Translational Medicine*.

Leukocyte adhesion deficiency is a rare but life-threatening disease. Patients can succumb to bacterial infections because their immune systems lack a molecule required by immune cells, specifically neutrophils, to travel to the site of infection.

"This is a very different form of periodontitis than we see in otherwise healthy people, in which the neutrophils can cause disease by being too active or present at high numbers in the gums," Dr. Hajishengallis said.

To understand what was unique about the LAD patients' disease, the researchers examined their immune system-related genes and proteins. Compared to people with periodontitis or gingivitis who were otherwise healthy, one molecule in particular stood out: people with LAD had very high levels of IL-17 mRNA and IL-17-expressing cells in their gum tissue.

Not only can IL-17 encourage inflammation, it can also encourage the development of osteoclasts, which are cells that break down bone; in this case, teeth.

For more information, read the study published in the March 26 issue of *Science Translational Medicine*.

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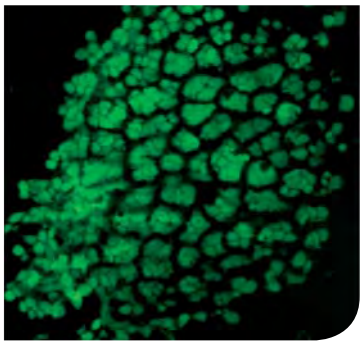

Image courtesy of Basma Hashmi, Harvard SEAS.

Bioinspired Gel Encourages Tooth Formation

A bit of pressure from a new shrinking sponge-like gel is all it takes to turn transplanted unspecialized cells into cells that lay down minerals and begin to form teeth.

The bioinspired gel material could one day help repair or replace damaged teeth and bone, and possibly other organs as well, scientists from the Wyss Institute for Biologically Inspired Engineering at Harvard University, Harvard School of Engineering and Applied Sciences (SEAS) and Boston Children's Hospital reported recently in *Advanced Materials*.

"Tissue engineers have long raised the idea of using synthetic materials to mimic the inductive power of the embryo," said Don Ingber, MD, PhD, founding director of the Wyss Institute and senior author of the study. "We're excited about this work because it shows that it really is possible."

By examining tissues isolated from the jaws of embryonic mice, Ingber and his colleagues showed that when compressed, mesenchymal cells turn on genes that stimulate them to generate whole teeth composed of mineralized tissues, including dentin and enamel.

The team chemically modified a special gel-forming polymer called PNIPAAm that scientists have used to deliver drugs to the body's tissues. PNIPAAm gels have an unusual property: they contract abruptly when they warm. Ultimately, they developed a polymer that forms a tissue-friendly gel with two key properties: cells stick to it, and it compresses abruptly when warmed to body temperature.

To see if the shrinking gel would also work in the body, the team loaded mesenchymal cells into the gel, then implanted the gel beneath the mouse kidney capsule, tissue that is well supplied with blood and often used for transplantation experiments.

The implanted cells not only expressed tooth-development genes, but they also laid down calcium and minerals, just as mesenchymal cells do in the body as they begin to form teeth.

For more information, read the full report in the February 18 issue of *Advanced Materials*.

Salivary Biomarkers of Gingivitis

Salivary biomarkers have been studied to help determine the presence, risk and progression of periodontal disease. However, clinical translation of salivary biomarkers from bench to chairside requires studies that identify biomarkers associated with the continuum of phases between health and periodontal disease. The objective of this study was to identify salivary biomarkers associated with gingivitis.

Forty gingivitis subjects and 40 persons with gingival health who had more than 20 teeth were studied. Unstimulated saliva was collected from all subjects at baseline and seven to 30 days later, and an additional sample was collected from gingivitis subjects seven to 30 days post-dental prophylaxis. Clinical parameters of periodontal disease were recorded at baseline and the final visit. Salivary concentrations were measured using Luminex.

Gingivitis subjects had significantly higher bleeding on probing (BOP), plaque index and gingival index than healthy subjects ($p<0.002$). All gingivitis subjects showed a significant drop in BOP post-treatment, with 90 percent of subjects falling below 12 percent affected sites.

These findings indicate that salivary PGE2 has the potential for discriminating gingivitis from healthy tissue. Also, patients who return to health clinically after dental prophylaxis appear to continue to produce inflammatory mediators for weeks. These findings have potentially important implications for the decision-making process in the emerging field of personalized oral health care.

The presentation "Salivary Biomarkers of Gingivitis: Information Important for Personalized Decision-making" was given by Craig Miller, DMD, MS, at the 43rd annual meeting and exhibition of the American Association for Dental Research held March 19-22 in Charlotte, N.C.

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CDA JOURNAL, VOL 42, N°6

Disasters and the Dental Office

Anthony R. Cardoza, DDS

GUEST EDITOR

Anthony R. Cardoza, DDS, has performed numerous postmortem dental examinations, comparisons and identifications. He is a diplomate of the American Board of Forensic Odontology. Dr. Cardoza maintains a general dental practice in El Cajon, Calif.
Conflict of Interest Disclosure: None reported.

Pick up the newspaper or check out the headlines online and it's becoming all too common to read about the latest disaster occurring somewhere in our country. Whether it's hurricanes in the South or East, flooding in the Midwest, tornados in the central U.S. or wildfires or earthquakes in the West, disasters of these magnitudes are no longer rare and unusual but have sadly become commonplace. In 2003, the largest wildfire in California's history broke out on a Saturday night in eastern San Diego County. By the following Sunday night, the fire had spread and was threatening my neighborhood. I was forced to evacuate my family and all the personal belongings I could pack into two cars and a trailer for what became a very long night. Fortunately, the firefighters were able to make a stand and stop the fire from advancing beyond the borders of my neighborhood, and no homes in my immediate area were lost. Sadly, that was not the case for more than 2,800 structures in San Diego County. This disaster then became personal when I was asked to complete the 15 postmortem examinations on the victims of this wildfire.

How would you respond if the next wildfire spread beyond the surrounding hills and into a commercial district, destroying your office? What if the epicenter of the next earthquake happens to be in your town, causing a destructive force that levels an entire area including your office? Consider the number of sinks in a typical dental office. It's highly possible that a water valve or hose in the wall could burst overnight or on a weekend, leaving you with a flooded office come the next morning. Loss of computer data from theft or loss of the network server could have a devastating effect on your office. Are you, as a practicing dentist and a small business owner, prepared to repair or rebuild in the aftermath of such an event? What if there was a large-scale bioterrorism event? Would you be willing to utilize your clinical knowledge and skills for the Department of Public Health and volunteer in a mass inoculation clinic?

This month's *Journal* is not about disasters *in* the dental office but disasters *and* the dental office. The authors include not only well-respected forensic odontologists but also experts in the field of insurance who have dealt with dentists who have experienced these types of losses.

James D. Wood, DDS, is a forensic dental consultant for Lake, Marin, Mendocino, Napa and Sonoma counties. He was instrumental in the formation of the California Dental Identification Team (CalDIT) and was its first director. He is the current lead forensic odontologist for region 9 Disaster Mortuary Operational Response Team (DMORT) who deployed to New York City in September 2001 as well as New Orleans in 2005. His article discusses how forensic dentists interact in mass fatality incidents.

Joyce M. Galligan, RN, DDS, who is on the faculty of the Ostrow School of Dentistry of USC, is one of the leaders in dental health care's involvement in bioterrorism events. Her article explores the potential role dental health care professionals can play in a bioterrorist attack.

Sheila Davis is the assistant vice president, claims and risk management, for The Dentists Insurance Company, TDIC. Her article details dental property emergencies and prevention strategies, as well as how to respond in the event of an emergency.

Gary Mitchell has been insuring dental offices for more than 25 years as a licensed insurance broker. Mr. Mitchell has assisted dentists who have suffered losses in their offices because of disasters such as fires, earthquakes, theft and water damage. His article discusses the steps to take to ensure accurate and timely recovery of digital records.

Finally, Duane E. Spencer, DDS, one of California's most experienced forensic odontologists and forensic dental consultant to Alameda, Contra Costa, San Mateo and Solano counties and the California Department of Justice, writes about new advancements in forensic dental identification.

Due to the subject matter of this issue, I do not expect the reader to enjoy or apply any of the subjects directly to his or her day-to-day practice, nor do I hope that the reader will experience any type of disaster. Nevertheless, in the words of Benjamin Franklin, "By failing to prepare, you are preparing to fail." By understanding where your exposure risk level lies and being prepared to deal with these types of events, your office will be back up and running sooner rather than later. ■

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Forensic Dental Identification in Mass Disasters: The Current Status

James D. Wood, DDS

ABSTRACT Dentists continue to play a valuable role in the identification of victims in a mass disaster. Individuals and multidisciplinary teams are available to assist authorities in the process. Training, experience and advances in technology continue to improve the efficiency of the identification process.

AUTHOR

James D. Wood, DDS, is a forensic dental consultant to five Northern California counties and the California Department of Justice, Missing/ Unidentified Persons Unit. He is a member of Disaster Mortuary Operational Response Teams, DMORT.

Conflict of Interest Disclosure: None reported.

Dentists have responded in various organized groups to assist in the identification of victims in mass fatality incidents since the 1960s. Since Congress passed the Disaster Relief Act of 1974, the evolution of responses to mass disasters has continued, often spurred by lessons learned in the most recent actions. Organization and sophistication varies from state to state. Even today, many states have no organized dental response team.

For families of victims, an important component of the grieving process is identification of the deceased and return of the remains for final disposition. In addition, a positive identification is critical in settling insurance claims, estates and even the right of a spouse to remarry in the future. For dentists responding to these disasters, there is a fine balancing act between working as quickly as possible and maintaining meticulous records to ensure that no mistakes are made.

California is fortunate to have a large number of highly skilled and experienced forensic odontologists. There are more active diplomates of the American Board of Forensic Odontology in California than in any other state.

Organization of these resources to account for the diversity of the state's population and geographical features is a critical component of disaster response readiness. California counties consult with forensic odontologists on individual cases. Multiple fatalities related to an individual event often result in dentists from neighboring jurisdictions collaborating for expediency and accuracy.

In early 2002, the California Dental Identification Team (CalDIT) was founded in the aftermath of the terrorist attacks of 9/11. Team members have

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TABLE 1

DMORT Missions and Responsibilities

2005–2006: Hurricanes Katrina and Rita
2008: Hurricane Ike
2009: South Dakota floods
2009: Continental Airlines Flight 3407, Buffalo, N.Y.
2009: American Samoa tsunami
2010: Haiti earthquake

Responsibilities include:

- Temporary morgue facilities
- Victim identification
- Forensic dental pathology
- Processing
- Preparation
- Disposition of remains

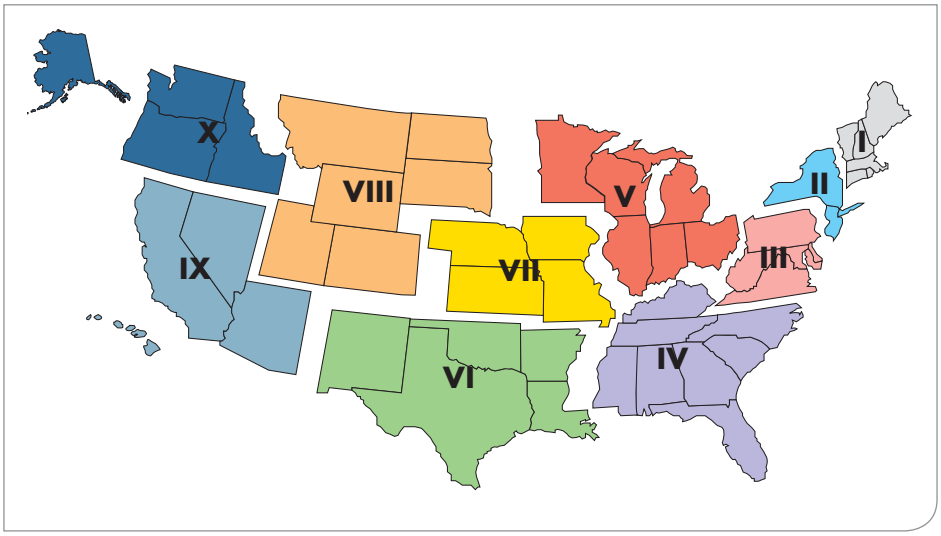

FIGURE 1. DMORT regions in the United States.

an active affiliation with a local law enforcement agency, their local coroner or medical examiner. CalDIT is an official component of the California Governor's Office of Emergency Services under the Coroner's Mutual Aid Program.[1] It is organized in several regions based upon population centers and can be activated through a request from an individual county for assistance. CalDIT is ideally suited to respond to disasters involving 50 or fewer victims.

In the early 1980s, members of the National Funeral Directors Association established a nonprofit committee and brought together the components for a portable morgue and supplies that would be available for easy deployment. It was open to all types of forensic personnel. After the passage of the Family Assistance Act of 1996, U.S. air carriers were required to have a plan in place to assist the families of victims after an incident. Around the same time, the federal government joined with the National Funeral Directors Association, and the Disaster Mortuary Operational Response Team (DMORT) was developed.[2]

DMORT was established to assist authorities when local and state resources are insufficient to handle victim identification and to provide mortuary services in a large-scale loss of life. DMORTs are composed of private citizens who have a particular expertise. They work with the local authorities to help identify deceased victims and return them to their families.

Large-scale mass disasters involving large numbers of victims would likely require the deployment of DMORT. Ideally, in recognition of the expertise available in California, DMORT would coordinate and work with CalDIT. Ultimately, the local jurisdiction — medical examiner, sheriff-coroner or coroner — maintains control and oversight of the operation.

Evolution

DMORT has evolved significantly over the last 17 years and has responded to six major disasters since 2005 (**TABLE 1**). DMORT is a component of the National Disaster Medical System (NDMS) as a part of the support mechanism for the Department of Health and Human Services to provide victim identification and mortuary services.[3]

DMORT is organized into 10 regions (**FIGURE 1**) with a distinct team structure for each region. California is part of Region 9, which also includes Arizona, Nevada and Hawaii and currently consists of 100 members. Nationwide, there are 1,077 team members, including a specialized team to respond to weapons of mass destruction (WMDs). No single regional team has the same composition, and as assets are needed, team members from regions unaffected by a disaster could be deployed to assist in the identification efforts. The smallest regional team is composed of 67 people and the largest has 125 (**TABLE 2**).

Should a major disaster involving a large number of fatalities occur in California, a DMORT advance assessment team of three prearranged team members would be deployed within eight to 12 hours for an initial evaluation of the size and scope of the incident. Based upon the initial assessment, a plan would be formulated for a possible team deployment. This ensures that assets are deployed in the best way to maximize efficiencies at appropriate times during the incident response. In the past, deployments of personnel did not always match the need at a given time. Because dentists

TABLE 2

DMORT Team Composition

- Medical examiners/coroners
- Forensic anthropologists
- Forensic odontologists
- Dental hygienists/assistants
- Photographic specialists
- Mental health specialists
- Computer specialists
- Administrative support staff
- Medico-legal death investigators
- Forensic pathologists
- Fingerprint specialists
- Funeral directors/embalmers
- X-ray technicians
- Heavy equipment operators
- DNA specialists
- Medical records technicians
- Security personnel
- Evidence specialists[4]

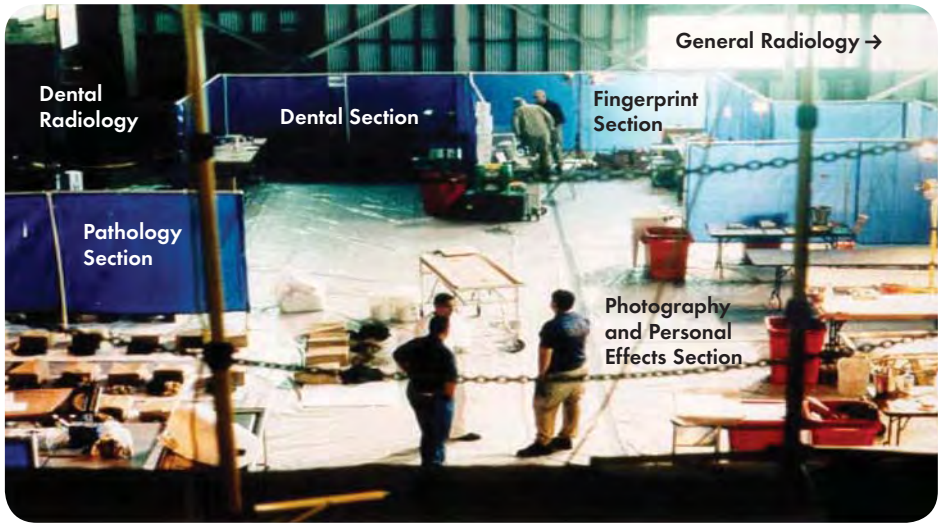

FIGURE 2. DMORT morgue used after the crash of Alaska Airlines 261. *(Photo courtesy of Ray Johansen, DMD.)*

involved in DMORT are private citizens, it is critical they are deployed when they can be of greatest value. A typical deployment for a DMORT member is 14 days, with work shifts up to 12 hours and living conditions that can be primitive.

Critical to the mission of DMORT are three disaster portable morgue units (DPMUs). These can be deployed immediately and are staged at locations on the East and West Coasts. The DPMUs contain prepackaged supplies and equipment needed to set up a fully operational morgue with workstations. Special teams of individuals are responsible for the assembly, operation and repackaging of the DPMU.

DMORT — Today and Tomorrow

There is a specific procedural flow of human remains through a DMORT morgue.

1. *Decontamination*. First instituted after Hurricane Katrina and subject to the discretion of authorities in charge, WMD teams decontaminate human remains before they actually enter the portable morgue. This removes surface contaminants that might be harmful to morgue personnel.

2. *Registration*. Proper cataloging and tagging with a unique identifier of the remains and any personal effects is performed here. Also, an escort is assigned who then accompanies the remains through the entire examination process, ensuring that the body is examined at every station and not left alone or unattended. This provides a proper chain of custody.

3. *Fingerprints*. Typically staffed by law enforcement, often the FBI. Recent trends toward digital fingerprinting have greatly increased the speed with which an identification can be made.

4. *Radiography*. The standard protocol is for full-body digital radiographs. This allows for an overview of the injuries sustained by the victim and for easy identification of artificial joint replacements or other implanted medical devices. Serial numbers can be traced to the manufacturer or medical facility where they were placed, providing a valuable lead in the identification process. At the discretion of the medical examiner, the radiography station might be positioned at any point in the process, depending on the nature of the remains.

5. *Pathology*. This is the station where a typical autopsy might take place, with the collection of tissue specimens and fluids for toxicology.

6. *Anthropology*. This station is extremely important in examining skeletal remains and is valuable in early classification of age, sex, stature and race. After the collapse of the World Trade Center, anthropologists were valuable in determining whether remains were actually human. This was important as there were many restaurants in the buildings serving a variety of meat products.

7. *Dental*. This section is divided into two distinct teams, a postmortem section and an antemortem/comparison section. The postmortem section examines and documents the dental remains. The antemortem/comparison section, which is typically housed in a clean remote area, performs the antemortem dental data entry and makes comparisons for identification.

8. *DNA*. Tissue samples are retained for DNA analysis. This is typically performed by law enforcement personnel who have specific training in collection and analysis.[5]

FIGURE 3. DMORT morgue postmortem dental section.

FIGURE 4. Antemortem dental records damaged by water and mold. *(Photo courtesy of David Senn, DDS.)*

FIGURE 5. Antemortem dental record – charting of missing teeth, filled surfaces. *(Photo courtesy of Ray Johansen, DMD.)*

FIGURE 6. Antemortem dental record compared to postmortem dental record in WinID3. *(Photo courtesy of Ray Johansen, DMD.)*

DMORT Dental Identification

In the evolution of dental identifications in a mass disaster, the move to a completely digital environment has greatly improved the efficiency and accuracy of the examination process and the comparison process for identification (**FIGURE 2**).

Postmortem. A digital record of the dental remains is made. Digital photographs of the remains, a full series of digital radiographs and digital charting of the dental findings are performed. DMORT uses the Airibex Nomad as a hand-held portable X-ray device, as the images are captured in a DEXIS digital X-ray system. The photographs and X-ray images can be imported into WinID3, a computer-assisted dental identification program developed by James McGivney, DMD, and available free as a digital download on the Internet.[6]

Individuals working cases in the postmortem section work in teams of three or more. The photographer sometimes acts as a rover and can be available for multiple workstations. A team of two dentists performs the dental autopsy and makes the dental X-ray images. A computer operator ensures that the images are of diagnostic quality and records the charting in the WinID3 program. All work is verified as a team before moving to the next case (**FIGURE 3**).

Antemortem. In large-scale disasters, this may actually be a separate section, but can later be blended with the group of dentists making comparisons. Creating the antemortem dental record is of critical importance and a strict protocol is followed. Interpreting written dental records can be a daunting task and is performed in teams of two or three to provide consistency and accuracy. Sometimes antemortem dental records can be badly damaged

FIGURE 7. Comparison of dental X-rays – antemortem to postmortem. *(Photo courtesy of Ray Johansen, DMD.)*

due to environmental conditions such as those encountered after Hurricane Katrina in 2005 (**FIGURE 4**). The WinID3 program searches on specific criteria — missing teeth and filled surfaces of teeth. All other features, while they may ultimately be important in the final comparison for identification, are considered secondary in the search algorithm. Dental X-rays are scanned and entered into the system (**FIGURE 5**).

Comparison. Once the dental record is complete, comparisons can be made. Ideally, a comparison team is made up of three dentists from the antemortem and postmortem sections working together. The WinID3 program can search based on either a postmortem or an antemortem record (**FIGURE 6**). Once a search is completed, a ranking of possible matches is listed. Because multiple windows can be opened, it is possible to make comparisons on the computer screen. This is a very significant improvement in the speed and efficiency of the identification process. In the past, one would perform a search, manually compile the records and then perform a comparison. The final identification is made by a direct comparison of the actual antemortem records to the postmortem records and verified through the chain of command to the medical examiner (**FIGURE 7**).

Conclusion

Mass-scale disasters involving large numbers of victims often require local agencies to request federal assistance. DMORT has emerged as an organization with the resources to assist in the identification and mortuary services necessary in these incidents. Significant advances in digital technology have made it possible to perform the identification in a near paperless environment with accuracy and efficiency. Trained and experienced dental personnel in a dental identification team or a larger organization such as DMORT are a valuable resource in the identification process. The identification of individuals is a critical component of our society, as everyone deserves the dignity of his or her identity in death as well as in life. ■

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THE AUTHOR, James D. Wood, DDS, can be reached at jwooddds@comcast.net.

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- Safe, predictable, and efficient use of NiTi rotary file systems
- Warm vertical and single cone obturation techniques
- Trouble shooting common problems in endodontic treatment
- Restoration of endodontically treated teeth, with or without posts
- Canal anatomy and morphology




Instructors:
Mo K. Kang, DDS, PhD, MS; Shane White, BDS, PhD, MS, MA; Nadia Chugal, DDS, MPH, MS, MA; and guest lecture by L. Stephen Buchanan, DDS, FACD, FICD

Periodontal Surgery Workshop:
Pocket Reduction and Crown Lengthening

July 26, 2014 | CDE Credits: 9 | Course Fee: $750

Periodontal flap surgery combined with osseous recontouring is a predictable technique to treat patients with moderate periodontitis and those who need elongation of clinical crowns to enhance restorative dentistry in non-esthetic areas. This hands-on workshop uses a pig jaw model where participants will be able to practice full and split thickness flap preparation, respective osseous surgery and suturing.

Learning Objectives:
- Indications, rationale and techniques for periodontal surgery
- Flap design, preparation and suturing techniques
- Osseous resective surgery
- Clinical crown lengthening: indications and surgical technique
- Anesthesia, pain management, and post-op care

Workshop Exercises (exercises will be performed on pig-jaws):
- Full thickness flap preparation
- Distal wedge
- Osseous recontouring
- Continuos sling sutures and periosteal sutures
- Split thickness flap preparation
- Osseous reduction for elongation of clinical crown


Instructors:
Paulo M. Camargo, DDS, MS, MBA, FACD;
Phillip Melnick, DMD

Immediate Implant Placement & Provisionalization in the Esthetic Zone

July 12-13, 2014 | CDE Credits: 14 | Course Fee $1800

A technique course emphasizing the successful prosthetic and surgical management of immediate implant placement for the Esthetic Zone. This course will provide scientific and clinical applications of fabricating an immediately loaded provisional implant restoration. Emphasis will be placed on the prosthetic interface, “platform shifting,” emergence profiles, bone remodeling, and soft tissue healing. Discussions of immediate loading protocols and techniques will be covered in depth. The hands-on portion on the 2nd day of the course will be spent on ideal implant placement in the Esthetic Zone on plastic models and constructing the provisional restoration.

Learning Objectives:
- Biological conditions for success with immediately placed implants
- Ideal emergence profiles of abutments and how to create it
- When, where and how to use “platform shifting”
- Rationaland techniques for creating screw retained implant provisionals
- The science and controversies behind immediate loading implants
- Soft tissue management around immediately placed implants.
- Management of the perio-restorative interface and creation of a scalloped architecture

Workshop Exercises:
- Placement of implant in the Esthetic Zone using plastic models
- Placement of graft materials for “gap bridging”
- Fabrication of a screw retained implant provisional restoration


Instructors:
Peter Moy, DMD;
Alessandro Pozzi, DDS, PhD

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The Role Dental Professionals May Play in a Mass Disaster

Joyce M. Galligan, RN, DDS

AUTHOR

Joyce M. Galligan, RN, DDS, is an associate professor of Clinical Dentistry at the Ostrow School of Dentistry of USC and a member of the Los Angeles Medical Reserve Corps.
Conflict of Interest Disclosure: None reported.

Disasters, natural or man-made, may occur at any time. Large-in-scope disasters can quickly overload a community's response. Volunteers are needed to assist in their own or neighboring communities when disasters strike. Each disaster affords numerous volunteer opportunities through various local and state organizations.

Many of California's dental health care professionals are eager and willing to volunteer in the event of a disaster. During the time of a mass crisis, local public health departments are dependent upon health professional volunteers to help meet the increased demand for services. Local public health departments and emergency response officials, however, acting on the short notice of an emergency situation, are not necessarily able to take advantage of potential volunteers' capabilities, as they cannot instantaneously classify the volunteers' skills. Immediately after the attacks on September 11, 2001, tens of thousands of people traveled to New York City's Ground Zero to volunteer and provide medical assistance. Authorities, however, could not make use of all the volunteers because there was no process in place to determine their qualifications and/or skills.[1]

The significant problems associated with registering and verifying the credentials of volunteer health care professionals immediately following major disasters or emergencies continues today, especially for local emergency response teams. To address this issue, former California Governor Arnold Schwarzenegger designated California Volunteers as the lead state agency responsible for coordinating volunteers in times of disaster. California Volunteers also administers California's Citizen Corps programs, which include volunteers in police, fire corps, neighborhood watch, medical reserve corps (MRC) and community emergency response teams (CERT).[2]

To coordinate emergency medical response, each state and many local governments established MRCs. An MRC is a national network of local groups of volunteers committed to improving the public health, emergency response and resiliency of their communities. Not all MRC participants are licensed professionals; however, all volunteers

must go through a credentialing process prior to being accepted into an MRC.[3]

In conjunction with the MRC, state and local communities may also have a CERT. Its purpose is to educate people about disaster preparedness, particularly hazards that may impact their area, and to train them in basic disaster response skills, such as fire safety, earthquake preparedness, light search and rescue, hazardous material awareness, team organization and disaster medical operations. A CERT is not concerned with health-related issues, aside from basic first aid administered by nonmedical volunteers. A dental professional could volunteer for both an MRC and a CERT unit, but the services he or she provides to each entity would be quite different. In order to join a CERT, a potential volunteer must complete 21 hours of Federal Emergency Management Agency (FEMA) training in the classroom and in simulated emergency exercises. Once trained, volunteers can join their local CERT team and assist others in their neighborhood or workplace following an event when professional responders are not immediately available. CERT members are also encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their communities. No license of any kind is required to join this group — just the completion of the 21 hours of instruction.[2]

Medical Reserve Corps

MRC units in California provide the established public health infrastructure with teams of trained and experienced dentists, dental hygienists, dental assistants, medical personnel, mental health and other skilled volunteers to assist in responding rapidly to public health emergencies. The types of support volunteers might provide include assistance in a mass inoculation/vaccination of citizens or a mass medication dispersal notification as requested by a public health department.

Many of California's local MRCs hold training sessions to educate their members in the proper administration of inoculations and immunizations against various agents and diseases. Training sessions are scheduled regularly for new members joining the MRC and as refresher courses for current members to keep their skills sharp.

A dental professional could volunteer for both an MRC and a CERT unit, but the services he or she provides to each entity would be quite different.

In order to join an MRC, a licensed volunteer must have a current, valid, unrestricted license and must register on the state's volunteer website at healthcarevolunteers.ca.gov. Alternatively, an individual may contact his or her local MRC unit. To locate your local unit, visit medicalreservecorps.gov.

Since their establishment in July 2002, California's MRC units have credentialed more than 10,000 volunteers. Of that total, 61 are dental professionals.[3] For comparison's sake, there are currently 37,508 licensed dentists, 34,084 registered dental assistants, 1,277 registered dental assistants in extended function,[4] 18,548 registered dental hygienists, 31 registered dental hygienists in extended function and 445 registered dental hygienists in alternate practice in the state of California.[5] Obviously, there are numerous dental professionals who may not be aware of the volunteer opportunities available to them.

Volunteer Opportunities in the MRC for Dental Professionals

During a public health emergency, volunteers will be needed to help staff a point of distribution (POD) clinic for mass dispensing of antibiotics or administration of vaccines. The Public Health Department has strategic secret POD locations in place for these purposes. In order to avoid possible destruction by terrorists or theft of the drugs or medications, the locations are kept secret until the clinics are needed.[3]

In the event a mass inoculation or vaccination is required, a large number of patients will need to be seen and volunteers will have to perform many different functions. These could include vaccinating or dispensing pharmaceuticals, screening for medical/health history, distributing patient education materials regarding the vaccine or pharmaceuticals dispensed and managing potential allergic reactions to a vaccine. A dental health care provider has many of the skills necessary to carry out mass inoculations or vaccinations, and the MCR will match those skills and interests with the services required.

As discussed in an August 2004 article in this journal entitled "Dentists Can Contribute Expertise in a Major Public Health Disaster," many of the skills dental professionals possess are in fact transferrable to emergency response teams. For example, a medical screener at a vaccination clinic would assess clients for contraindications to vaccinations and refer those with contraindications to an on-site physician for a physical exam. A medical screener should also have good interviewing skills and be

knowledgeable about exposure risks, contraindications to the vaccination, risks of vaccination and risk-benefit analysis. Medical screening personnel would ensure that potential recipients understood and signed any necessary consent forms. All these skills are within the purview of dental professionals, as exhibited in their daily practices, so the amount of training required should be negligible.

Certain volunteer positions could be filled by any member of the dental team. For example, a vaccination assistant would help the vaccine administrator with all aspects of pre- and post-vaccination, such as ensuring that vaccination stations are adequately maintained with supplies, helping prepare and clean vaccination sites, applying dressings and explaining aftercare. Vaccination assistants would be responsible for entering the vaccine and diluent lot numbers on the patient's consent form and clinic record and providing the vaccine recipient with a card that documents when and where the vaccine was administered.[6]

Other volunteer responsibilities would be limited to certain licensees, including the actual administration of a vaccine, which would require a valid dental license. A vaccinator would oversee the vaccination process, reconstitute the vaccine, give vaccinations, sign the clinic record and watch for immediate reactions or complications. Vaccinators would be familiar with diluent, vaccination techniques, methods to prevent contamination of the vaccine, exposure risks, medical conditions that constitute contraindications, the risks of vaccination, preparation of the vaccine site, normal and abnormal post-vaccination responses and follow-up care of the vaccination site. Vaccinators would also respond to medical emergencies that may occur in the clinic.[6]

If you volunteer, your skills will be utilized on a per-need basis and will depend on your background and expertise. The MRC will do its best to ensure that the role a dental health care provider is assigned will make the best use of the individual's abilities and area of expertise, but the MRC does ask that volunteers be flexible. Remember, you are participating in an emergency situation, which generally is much more fluid than what you may be accustomed to dealing with on a day-to-day basis. If you are not able to be flexible, this type of volunteer position may not be one you are best suited to handle.[3]

Disaster service workers are covered by workers' compensation and cannot be held liable for their actions during a disaster while acting within the scope of their responsibilities.[3]

If you volunteer, you will be required to devote a minimum of one day, or one 12-hour shift, during the course of the emergency. You can volunteer additional hours if you are able and willing.[3]

Limited Liability for Volunteer Services

A worry often voiced by volunteers is the potential liability they will face in the event someone is injured or dies due to their efforts. An amendment to California Business and Professions Code Section 1627.5 addresses this concern. Under Sec. 1627.5, specified immunity is provided to a licensee who voluntarily and without compensation or expectation of compensation provides emergency medical care consistent with his or her dental education and emergency training during a declared state of emergency, for any personal injury, wrongful death or property damage caused by the licensee's good faith but negligent act or omission. The code does not provide immunity for gross negligence or willful misconduct.

B&P Section 1627.5 also provides the Dental Board authorization to suspend compliance with any provision of the Dental Practice Act that would adversely affect a licensee's ability to provide emergency services. This suspension of the Dental Practice Act allows licensees to administer vaccines and inoculations during a state of emergency. If the Dental Practice Act were not suspended, dental licensees would not be able to administer vaccines, etc., as those acts are outside the scope of practice.

Volunteers working for public health during an emergency will be sworn in and subscribe to the oath or affirmation set forth in the California Constitution that declares them to be disaster service workers (DSWs) in time of need. DSWs are covered by workers' compensation and cannot be held liable for their actions during a disaster while acting within the scope of their responsibilities.[3]

On a national level, the American Dental Association (ADA) lobbied heavily for several years for passage of the Pandemic and All-hazards Preparedness Reauthorization Act of 2013. The act, which was signed into law on March 19, 2013,[7] makes dental entities eligible to conduct certain educational and training activities pertaining to public health emergencies. States, at their option, may include dentists and dental facilities, including dental schools, in their public health emergency plans without mandating participation by dentists.

The White House press secretary, Jay Carney, said the law "revises authorities for activities to improve public health and bioterrorism emergency planning, preparedness and response; streamlines authorities within the Department of Health and Human Services to improve coordination and eliminate inefficiencies; and strengthens the role of the Food and Drug Administration to bring prevention treatment products, known as 'countermeasures,' to market for emergency use."[7]

Preparedness and response activities "may include dental health facilities" and "dental health assets" under the law, and the medical surge capacity authority is amended by striking "public health or medical" and inserting "public health, medical or dental" language.[7]

Under current federal and state laws, dental professionals are authorized to provide volunteer services in certain emergency situations without subjecting themselves to civil liability. This removes the largest hurdle preventing volunteerism and should allay the fears of most licensees, thus encouraging volunteerism during a natural disaster or other emergency.

What Is Required of a Volunteer?

Once an individual has qualified to be a volunteer, the MRC anticipates that volunteer will need to attend training or volunteer meetings once or twice a year. Continuing education credit may be provided.[3]

Volunteers do not need to receive any vaccinations prior to their service. However, in the event of pandemic flu, a smallpox outbreak or other public health emergency involving a vaccine-preventable infectious agent, all staff, including volunteers, will be vaccinated prior to being deployed to assist the public.[3]

If volunteers need to be activated due to an emergency, they will be notified either by email, direct telephone contact from Disaster Healthcare Volunteers or the MRC, or through the media, such as public broadcast announcements on radio or television. They will be directed to report to a mobilization center or staging area. If a volunteer is unavailable to assist and the reason is acceptable, he or she will not be removed from the MRC unit.[3]

Volunteers who are employed in the private sector must obtain permission from their employers before volunteering. There currently are no laws that protect a volunteer's employment status during a state of emergency.[3]

Conclusion

It is difficult to carve out time in our busy schedules for activities that take us away from our families, friends and businesses. But hopefully, you will recognize the importance your volunteer efforts can make to your community and decide that the benefits you will be able to provide in a time of need far outweigh the minimal time commitment required.

The fact that volunteer efforts are now organized to ensure that volunteers' skills will be properly utilized and their efforts will not expose them to additional liability should remove any roadblocks to dental professionals becoming members of volunteer organizations such as a CERT or MRC.

Please consider volunteering your time for the benefit of your community. Hopefully, your skills will never be required in a time of emergency. If, however, a state of emergency is declared, you can contribute to ameliorating the chaos and confusion that are sure to follow. ■

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THE AUTHOR, Joyce M. Galligan, RN, DDS, can be reached at galligan@usc.edu.

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Dental Property Emergency Preparation and Response

Sheila Davis

AUTHOR

Sheila Davis is the assistant vice president, claims and risk management, for The Dentists Insurance Company, TDIC. She started her career in organized dentistry in 1985 and transitioned to TDIC in 1988. She currently manages the day-to-day operations of claims and risk management. Her experience ranges from single practitioner professional liability matters to complex multidiscipline cases involving both dental and medical treatment and outcomes. She has presented claims and risk management philosophies nationally on behalf of TDIC.

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It was a typical afternoon in a Northern California periodontal practice. Patients were checking in and the two dentists in the office had treatments underway. Then the Subaru wagon came crashing through the office wall and into the waiting room.

"It was very surprising," said Ellery Strunk, the office's marketing coordinator. "It was loud and startling and there was debris everywhere." The counter in the first operatory was pushed three feet into one dentist, who tumbled onto the patient's legs. "We were all in a state of shock," Strunk said. "We had to move quickly to get things under control. The dentists stopped working to analyze the situation, but they had to get back to the procedures in process. Our entire staff — front and back office — stepped up to handle the situation."

While this car-crash scenario is not typical of property emergencies that occur in dental offices, it reminds us that unexpected things do happen. The Dentists Insurance Company received 808 property claims in 2012, according to claims supervisor Reggie Green. Green said the number of property claims stays fairly consistent year to year, with the most common emergencies being water-related damage from leaky toilets, faucets and water lines, sewage backup and electrical fires.

The causes of property emergencies vary, but there are a number of simple and effective things dentists and staff can do to help prevent them and to prepare for an efficient response in the event of an unexpected situation.

In any property emergency, a dentist's main concern, after assuring the safety of staff and patients, is getting back to practicing dentistry. A well-prepared office will be able to get up and running quickly. Setting up a property emergency plan, scheduling an annual office evaluation, conducting equipment inspections and backing up computers are essential steps in preparedness.

Preparation and Prevention

A property emergency plan can be established in a few hours and is worth its weight in gold if an emergency occurs. The plan should include telephone numbers for local fire and police departments (calling 911 is always an option), property insurance carrier, key staff members, building maintenance, utility services and dental equipment technicians and supply vendors. Keep a list of these numbers, even if the dentist and staff have them programmed into their phones, and update them on a regular basis. Place the emergency plan in a binder and situate it in a central location in the

TABLE 1

Property Emergency Plan Checklist

Establish a property emergency plan and include:

- Telephone number for your property insurance carrier.
- Insurance policy number.
- Police and fire department phone numbers.
- Property management and building maintenance phone numbers.
- Location of and instructions to access your computer backup systems.
- Telephone numbers for staff.
- Telephone numbers for utility services.
- Contact information for office supply vendors.
- Contact information for the alarm company.
- Phone numbers for local plumbers.

TABLE 2

Annual Office Evaluation Checklist

Conduct a yearly evaluation of your office. For each piece of equipment, furniture, computer and other property in your office, list the following information:

- The name and brief description of the item.
- Make, model and serial number.
- Date of purchase.
- Original cost of item.
- Replacement value of item.
- Location of item.
- Receipts and manuals for all equipment, computers and software.

TABLE 3

Preventive Action Checklist

- Install alarm system for fire alert and theft prevention.
- Keep smoke alarms functional and test them once a month.
- Replace smoke alarm batteries once a year.
- Conduct a yearly fire drill to reinforce protocol.
- Test computer backup system routinely.
- Inspect fire sprinklers, water heater and plumbing systems regularly. Check compression and water lines for fatigue or leaks.
- Watch for frayed electrical cords, overloaded circuits and power strips.

office. Keep two copies of the plan off site, one at the dentist's home and the other with a key staff member.

Meet with employees twice a year to review the emergency plan, making sure everyone knows whom to call and what to do in case of an emergency. As illustrated in the car-crash incident, staff members may be the ones stepping up to manage an emergency (**TABLE 1**).

In addition to creating a property emergency plan, schedule a complete inventory of your dental office each year. Both you and your staff members should walk through the entire office. Go through every room and operatory and list each piece of equipment. This includes furniture, computers, inventory, supplies and any other miscellaneous property.

During the annual office inventory, take photos or videos to document location and condition of items. Keep this documentation off site along with receipts for all equipment, computers and software purchases. These receipts will help streamline the claims process in case of a property emergency (**TABLE 2**).

The annual evaluation is also a good time to inspect equipment and schedule any necessary cleaning and service. Test your computer backup system to ensure it is working and saving uncorrupted and usable data. Check water lines for fatigue or leaks, test fire alarms, replace batteries and inspect fire extinguishers (**TABLE 3**).

Insurance Insights

Whether it's fire, water damage or theft, a property emergency in the dental office can be an unnerving experience. Having and following an emergency plan helps dentists and staff respond efficiently and reduces downtime. Insurance companies can also provide assistance. Insurance carriers offering building and personal property coverage have experienced claims representatives trained to handle emergencies. After contacting the police or fire department, call your insurance carrier immediately. Have your policy number ready and be prepared to describe what happened and the exact location of the damage or loss. After the initial call, the insurance company may request additional documents, depending on the type of loss. These might include a copy of the current lease if you do not own the building, production documents, photographs and receipts for stolen or damaged equipment. A proof of loss form is often required, which the insurance company will send to the dentist for signature and notarization (**TABLE 4**).

If an emergency occurs after the close of business or over the weekend, insurance companies have an emergency line. For instance, TDIC has a claims emergency hotline that connects policyholders to a live operator who will put them in immediate contact with an on-call claims supervisor. Depending on the severity and location of the loss, the on-call claims supervisor will either travel to the loss site or send a claims adjusting professional to meet with the policyholder.

In the car-crash situation, the TDIC claims representative was at the dental office within 30 minutes of the incident, according to the office staff. "TDIC stepped up immediately and had someone there to board up our office and get the cleanup process underway," Strunk said. The accident happened on a Tuesday and TDIC immediately arranged for the accident site to be blocked off with plastic sheeting and cleaned top to bottom the following day. "We were back up and running on Thursday, just without a waiting room," he said. "Patients came in through the back entrance, and we had to move some appointments around, but we got back to work."

When it comes to the adjustment of a property loss, a claims representative can assist in a variety of ways. Green explained that TDIC hires licensed estimators and claims professionals to prepare an estimate for construction repairs such as carpet, tile, drywall and painting. "The estimate will help the claims representative establish the amount owed to the policyholder for construction repairs," Green said.

Insurance companies can also hire a dental equipment technician to inspect

TABLE 4

Essential Information Needed in a Property Emergency

If a property emergency occurs, there are a few basic pieces of information dentists will need when calling their insurance company. According to TDIC, these essentials include:

- Policy number.
- Exact location of loss.
- An explanation of the loss (approximate time of occurrence, location, description of what happened).
- Are other tenants affected by the loss?
- Office phone, email and fax number.
- The police department to which the crime loss was reported and the report number.

After the initial call reporting the property loss, dentists may need to send additional documents to the insurance company, depending on the emergency, including:

- A copy of the current lease.
- Photographs – photos taken with smartphones are acceptable and easy to send to the claims representative.
- Production documents.
- Original receipts for stolen or damaged equipment.
- A signed and notarized proof of loss form (provided by insurance company).

TABLE 5

Fire Damage

Due to the potential impact of a fire, the insurance claims representative will make a professional restoration service available. Fire and electrical professionals will also conduct an independent investigation. The claims representative will schedule these investigators and coordinate the restoration services. In the event of a dental office fire, remember:

- Contact the fire department to extinguish all fires.
- Use professionals to clean and restore damage.
- Circulate the air by opening windows and doors.
- Do not wipe walls or fabrics, as the soot and smell will saturate them.
- Do not use electric equipment.
- Photograph damaged equipment and areas.
- Separate salvageable items.
- Have an authorized service technician check equipment prior to operating it.
- Inventory all damaged equipment and salvageable equipment separately.
- Collect valuable documents such as insurance, tax, employee records and patient information and move to a clean area.
- Move any dental equipment that you can to a dry, clean area.
- Replace essential equipment as soon as possible.

equipment. The results of that inspection will help the claims representative determine whether the equipment needs to be repaired or replaced. Additional assistance can include the adjustment of business income loss by hiring a forensic accountant to review and analyze the dentist's financial records, including production, collections and expenses. The forensic accountant will produce a report reflecting a daily or monthly business income amount, which the claims representative can use as a basis for payment to the policyholder.

It's a Process

Claims professionals emphasize the importance of letting the insurance process work in the event of a property emergency. "One thing dentists may not understand is that recovering from a property emergency is a process," said TDIC claims supervisor Kyle Broadhead. "They can minimize in their own minds what needs to be done." For instance, he said, dentists may call in their own cleaning crew instead of using professional restoration companies recommended by TDIC to properly remove water or clean up after a fire.

Broadhead pointed out that professional restoration companies take moisture readings and eliminate water in subfloors and walls to prevent mold from growing after water damage to an office. In the event of fire, restoration companies are trained to use ozone generators to remove odors instead of masking them. "We want the job completed properly," he said. Broadhead acknowledged that time is an issue and dentists want to get back to work, but said it's important to trust your insurance company. "If the cleanup isn't handled in the right way, it will take more time and expense down the road if water damage turns into a mold issue or if smoke smells linger for months."

Responding to a Property Emergency

While insurance companies respond quickly, there are a number of things dentists and staff can do to mitigate damages from a property emergency. TDIC makes the following recommendations.

Fire Emergency: Make sure professional firefighters extinguish the fire. Enter the building only after the fire department has declared that it is secure. Once you are able to enter the structure, walk through and assess the damage. Do not turn on lights or other electric equipment. Be careful not to disturb anything in the immediate area where the fire appears to have originated. A forensic professional may use this evidence to determine the cause and origin of the fire. Make sure the gas main and electricity are shut off. Open the windows to let in fresh air and do not breathe the smoke for extended periods.

Move any dental equipment that you can to a dry, clean area. Be sure to leave the equipment near the office and not off site. Items moved away from the incident create the risk of contaminating the second location and transferring health-related problems. Plan to replace essential dental and office equipment as soon as possible to reduce the potential for additional loss. Established vendors may be able to provide quick replacement of items.

Smoke, soot and water problems are associated with even minor fires. Your claims representative will assist in finding a restoration company (**TABLE 5**).

Water Damage: Shut off the main water valve. If you are in a complex with other offices, contact building maintenance.

TABLE 6

Water Damage

Trust a professional restoration company to thoroughly dry your office to avoid mold problems. Your insurance claims representative will assist in finding needed resources. In the event of water damage, remember:

- Shut off the main water valve or contact building maintenance.
- Avoid shock – do not step into flooded areas or touch any electric equipment.
- Move valuable equipment and papers away from flooded area.
- Have an authorized service technician check salvaged equipment prior to operating it.
- Direct the water to drains or out of your office.
- Open cabinets and areas concealing moisture to allow circulation if possible.
- Separate and air dry colored items that might bleed in a clean location.
- Replace essential items as soon as possible.

TABLE 7

Computer Loss

Prevention plays a big part in minimizing downtime in the event of a computer loss. Be sure to:

- Back up your data daily.
- Test backup system regularly.
- Make sure backup system is storing uncorrupted data and that data is retrievable.
- Store backup data off site in a secure location.
- Review contracts with service providers to ensure you are covered in the event of a loss of your computer or computer data.
- Use surge protectors and uninterruptible battery power supplies.
- Keep copies of CDs and software licenses off site.
- Train all staff in proper computer use.
- Quit programs and shut computers down completely at the end of every day.
- Utilize antivirus protection software.
- Be prepared to notify patients of data theft.

TABLE 8

Theft and Vandalism

If there is any evidence of theft or vandalism, contact the police to search the building and make sure it is safe to enter. Remember to:

- Get the police report number.
- Protect areas of disturbance to ensure safety.
- Photograph any evidence of forced entry, damaged equipment and areas where equipment is missing.
- Replace essential items as soon as possible.
- Inventory all damaged and stolen equipment.

To avoid shock, do not step into flooded areas or touch any electric equipment. If the water came from above, there may be debris falling from the ceiling. Make sure it is safe for you and your staff to enter the building. Once the water is off, notify your insurance company. Have your policy information available and be prepared to summarize the facts of your loss (**TABLE 6**).

Computer Loss: The loss of office computers may seem like a devastating prospect, but a few precautions can ensure a practice quickly gets back to practicing dentistry. Having a backup system for storing information on office computers is critical. If dentists have a backup that is current, they can resume work the same day or the following day after a computer loss. If computer backup is not regularly performed and checked, it could take a week or two to get back to business, especially if the office keeps electronic records.

Consequences of not backing up office data include loss of accounts receivable, accounts payable, check registers, cash receipts, financial statements, patient records and appointment schedules. Without a backup drive, the data on the computer system may be lost. Regular testing of a backup system is essential to ensure it is working and saving uncorrupted and usable data. The best plan for backup data is to store it off site in a secure location.

TDIC recommends that dentists keep records of computer and software purchases, including receipts and user manuals. These receipts help the claims process move quickly and assure that replacement computers are compatible with other office equipment.

Review service provider contracts to confirm that you are covered in the event of a loss of your computer or computer data, and have those providers sign a confidentiality agreement.

If your office computers are stolen, there is the potential for unauthorized parties to access private patient information such as Social Security numbers, birth dates and credit card numbers. You are obligated to protect the private health information of your patients. To ensure that information is protected, encrypt all practice computers and laptops. Typically, if stolen data from an unencrypted computer contains private information, such as a name and date of birth or a name and a Social Security number, dentists are required to notify affected individuals of the data theft. TDIC has a form letter for dentists to use in this situation, and it includes specific recommendations for individuals to secure their credit and prevent identity theft (**TABLE 7**).

Theft and Vandalism

If you arrive at your office and find signs of forced entry or an open door, do not enter. Contact the police to search the building and make sure the intruders are gone. The responding officer will provide a corresponding police report number. Once immediate danger has passed, notify your insurance company. Have your policy information available and be prepared to summarize the facts of your loss. Have the police report available for reference.

To mitigate damages, protect the areas of disturbance and begin an inventory list of damaged property and stolen equipment. Items that are typically stolen but not immediately noticed include petty cash and blank checks from the middle or back of the business checkbook. Be prepared to replace essential items quickly, including broken windows, doors and office equipment. Vendors you have relationships with may provide quick replacement of needed items and possibly even loaner units. Make a reasonable effort to continue production through the loss (**TABLE 8**).

For more information or if you have questions regarding this topic, contact the TDIC Risk Management Advice Line at 800.733.0634. ■

THE AUTHOR, Sheila Davis, can be reached at sheila.davis@cda.org

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Business Continuation Planning: How to Recover if Disaster Strikes

Gary Mitchell

AUTHOR

Gary Mitchell has been with Mitchell and Mitchell Insurance Agency Inc. since December 1986, president since January 1994 and an owner since November 1995. He received a bachelor's degree in physics and engineering from Pacific Lutheran University in Tacoma, Wash. He currently holds insurance licenses in California, Oregon, Washington, Nevada, Colorado and Arizona. *Conflict of Interest Disclosure: None reported.*

On the morning of Oct. 12, 2012, a fire started in a restaurant called Squat and Gobble on West Portola Avenue in San Francisco. The building next door housed the orthodontics practice of Fred Warren, DDS, MSD. The fire was reported at 4:40 a.m. and when the San Francisco Fire Department arrived, both buildings were burning. By 7:30 a.m., both were destroyed.

When Dr. Warren got to his office, the fire was still raging. When firefighters arrived, they felt it was unsafe to enter the building or access the roof. They took a defensive position and sprayed water on both buildings from the outside. When the firefighters' operation ended, they advised Dr. Warren that his building would be condemned. He was prohibited from entering it to retrieve anything. Not knowing how to respond, he simply stood there as his practice smoldered in the morning light.

If an emergency occurred at 3:00 in the morning, what would you do? Do you have a plan for when the worst happens? Dr. Warren spent most of that tragic day assessing the damage with the fire department and speaking with his insurance carrier (**FIGURES 1A–B**). He called his staff. He called his IT person to find out how to access his digital computer records, including his appointment calendar. Dr. Warren's off-site computer backup worked. His staff knew which patients to call immediately and were able to send out letters to all patients letting them know what had happened. The insurance adjustor was on site the next business day to assess the damage (**FIGURES 2A–B**). Within a very short time period, Dr. Warren, the adjuster and a dental supply recovery company had put together a plan to relocate his practice temporarily.

On Dec. 18, 2012, Dr. Warren secured a lease three blocks down on West Portola Avenue. The office began treating patients at its new temporary location 45 days later (it could have been ready within 35 days with more cooperation from city inspectors). With dental chairs, X-ray units, phones, computers and waiting room furniture in place, the staff had everything they needed to become operational (**FIGURES 3A–C**). Once they were ready, the office sent out another letter letting patients and vendors know the temporary address,

FIGURE 1A. The operatory in Dr. Warren's office before the fire.

FIGURE 1B. The operatory in Dr. Warren's office after the fire.

and the staff started scheduling patients.

The only items Dr. Warren could not retrieve from the fire were his study models. The patients' charts and X-rays were available in their new location because Dr. Warren's office had been digital for several years.

Is your office that well prepared? In addition to creating a disaster plan, you should create a business continuation plan. The goal is to get your office back up and running as quickly as possible for patients, your staff and your practice's financial health. The business continuation plan should cover all possible types of disasters, not just fire.

Begin by dividing your office assets into two categories. First, there are tangible assets that include equipment, furniture, tenant improvements, computers and phones — all the physical items you need to run a dental office. Second are the intellectual assets, your charts (physical or digital) and all digital information stored in your office.

The first line of defense is an insurance policy. Be sure you know what your policy covers. In California, office insurance policies (or business owners' policies) exclude damage from floods and earthquakes, but you can obtain separate flood and earthquake coverages. Those policies do include verbiage that is not as cut and dried as a fire policy. You should check with your insurance agent/company as to what additional coverage might be advisable.

How much coverage do you need? Contact your local dental equipment company representative and ask him or her to determine the replacement value of all your office equipment and cabinets as well as the cost to rebuild the office infrastructure. Be sure to include all furniture (waiting room, front desk and your office), computers and phones. Remember the first rule of insurance: The more responsibility you are willing to take, the less you have to pay someone else to take that responsibility; i.e., the higher your deductible, the lower your premium.

What can you do to reduce the risk of your office burning down? According to Battalion Chief Bill Tyler of the Novato Fire Department, firefighters look to three things initially — saving lives, extinguishing the fire and salvaging property.

Battalion Chief Tyler confirmed what is seen in many dental office fires. Salvaging can occur before the fire is out. If firefighters get to a medical/dental office fire in time, they will try to put fire blankets over charts to protect them. Firefighters recognize the value of those assets. In Dr. Warren's office, the building was too engulfed to allow access inside. Most dental offices keep their charts in metal file cabinets, which are tightly packed. This is a good thing because the tighter the files are packed, the higher the temperature needed for them to catch fire. Make sure cabinets and drawers are closed at night. However, this is not a reason to breathe easily. Dr. Warren's charts would not have survived had they not been digital.

Offices with sprinkler systems are much better protected than those without, but there is more risk of water damage. Either way, get an early detection system. Many offices have a burglar alarm but no fire alarm. Ask your alarm service what it would charge to monitor for fire as well. Install a working fire extinguisher in the office and have it checked annually. Prepare a written business continuation plan and review it with your staff. Most fire department websites have a checklist that can guide you as to what needs to

FIGURE 2A. Dr. Warren's treatment coordinator room before the fire.

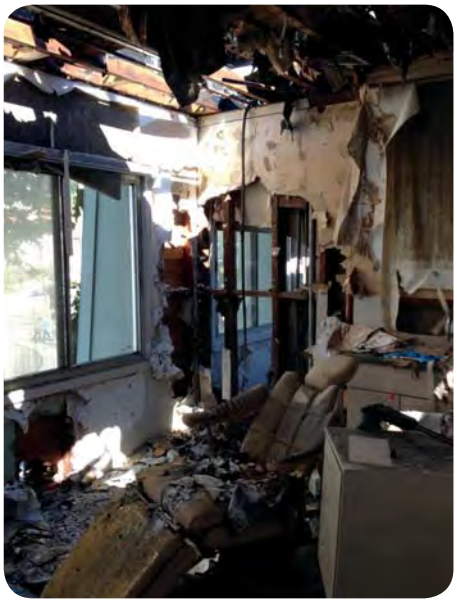

FIGURE 2B. The aftermath exposing the extensive damage caused by the fire to Dr. Warren's treatment coordinator room.

be included in the plan. Another option is to consult sba.gov/content/disaster-planning. Make a video of your office and take it home, along with a list of all equipment and contents of your office. The Federal Emergency Management Agency (FEMA) has published a book entitled *After the Fire: Returning to Normal* that is another good resource.

Insurance can replace your tangible assets but it does little to address your intellectual property. The only way to guarantee that those assets are protected is to store multiple copies in different locations. No dental office I have seen has a complete set of duplicate charts. It is strongly suggested that you take your office "paperless." Make your charts, X-rays, images, appointment book and anything else you can think of digital.

Once your office is digital, either partially or fully, getting multiple copies of backups is key. The only thing that matters with backups is whether or not you can restore them. If you do not verify at least monthly that you can restore your backups, you will never know if the backup is working and there is a reasonable chance the backup process will not work when needed.

Remember, when running most backups you are only getting the data from your programs; you are not backing up all the mission-critical software on your computer. Make sure you have an off-site computer with all mission-critical software installed, including but not limited to the dental software program you use, Microsoft Office or accounting/billing software, imaging software, etc. The off-site computer must mirror your office computer. At the very least, keep copies of the latest versions of the software programs off site.

Most dental offices use one of the following forms of backup.

Manual Backup. A team member runs a backup at the end of each day onto an external hard drive, laptop or thumb drive (some offices run the backup in the middle of the night). Then a staff member takes the laptop or drive home. The simple way of looking at this method is "read from the office, write from home." This is the most common form of backup, and you should have multiple off-site backups.

The pros to this form of backup are low cost and simplicity. The are more cons, however. The moment you don't run the backup or someone forgets to take the drive home is most likely when a disaster will occur. Who is testing to make sure the backup can be restored? What happens when the tester is sick or on vacation? When done in the middle of the night, you are always one day behind and the computer is on the premises. You also need to be concerned about compliance. This form of backup is compliant under the Health Insurance Portability and Accountability Act (HIPAA), but only as long as the data is not lost or stolen.

Cloud-based Storage. Many companies provide cloud-based storage options, including Ashtel Dental at ashteldental.com, Intronis at intronis.com and IBackup at ibackup.com. Make sure the vendor is HIPAA-compliant. Get references and be sure you can restore all of your data in the event of a disaster. Ask how long it would take to download all your data. Remember when you run backups, only changes are updated. When you download, you need 100 percent of the data. Find out how often the vendor runs backups.

The pros here are that there is no effort for you or your staff and backups are performed automatically and stored off site. You will still need to store mission-critical software off site.

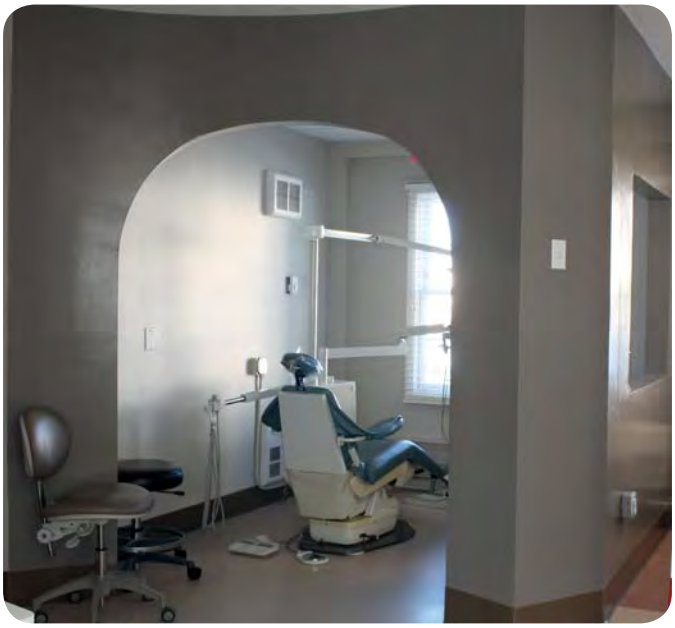

FIGURE 3A.

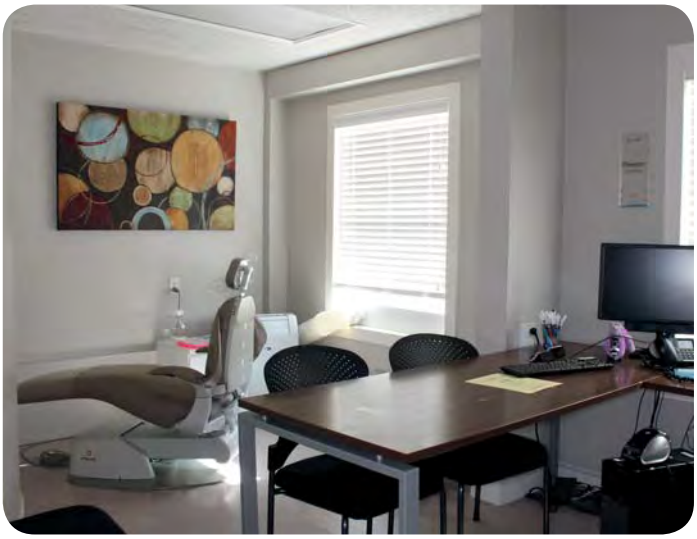

FIGURE 3B.

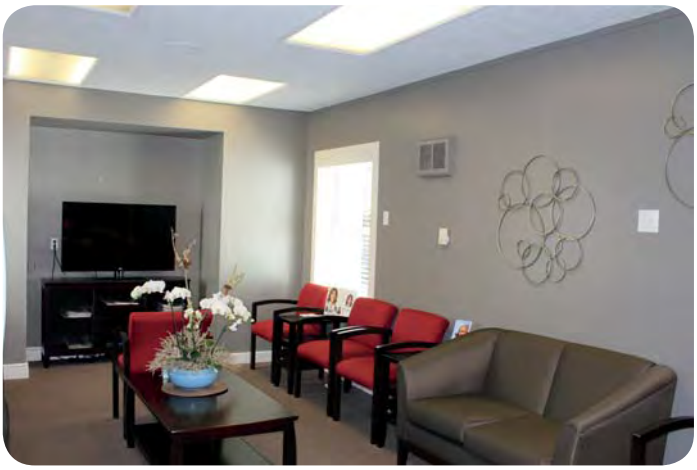

FIGURE 3C.

FIGURES 3A–C. The temporary, operational office with new operatory, treatment coordinator room and patient waiting room. Dr. Warren and his staff started seeing patients again 45 days after the temporary lease was signed.

A downside could be provider stability and security. What would you do if the company went out of business? What if you forget to update your credit card and your service is not renewed?

Virtual Private Network. Charlie Kleiman, owner of Dental Computer Systems Integration (dcsiDental.com), prefers to run a virtual private network (VPN) like the one Dr. Warren was using. Simply stated, you have an off-site computer running the same mission-critical software as the computer at the office. As with the cloud, the off-site computer "calls" the office computer (no, this is not computer dating) and backs up the data every night. If your office is destroyed, you have a complete backup off site. Software programs are available to encrypt the data so you remain HIPAA-compliant during the data transfer. Just remember that the only data being updated are the changes made that day, not the complete data.

If you have a VPN, make sure that when your IT person updates the office computer, the off-site computer is also updated. If you update one but not the other, information sometimes cannot be transferred.

When creating a business continuity plan you should answer the questions, "How can we keep the business running if there is a disaster?" and "How quickly can we get back up and running?" The fewer days you are down, the less impact it will have on you financially. A continuity plan is not a plan unless it is in writing. If possible, have a walk-through with your staff periodically and make sure to go over the plan with new staff members. Offices that are really ahead of the curve do a real drill. Most important, the only real test is whether you can restore your data. ■

THE AUTHOR, Gary Mitchell, can be reached at gmitchell@mitchellandmitchell.com.

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Forensic Odontology: An Overview

Duane E. Spencer, DDS

ABSTRACT This article is an overview of the field of forensic odontology, highlighting historical cases, with an emphasis on California cases, and briefly discussing some of the current techniques and issues in the field. As with all fields of dentistry, forensic odontology is adapting to new methodologies, changes in techniques, research findings and legal issues. Today's dentist who works in the forensic arena must face and understand these changes and advancements.

AUTHOR

Duane E. Spencer, DDS, practices pediatric dentistry in Walnut Creek, Calif. He is a forensic dental consultant to Alameda, Contra Costa, San Mateo and Solano Counties and the California Department of Justice.
Conflict of Interest Disclosure: None reported.

"Forensic odontology is the branch of odontology which deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings in the interest of justice." — Pederson[1]

There is no indication in the Old Testament that a forensic dentist was available to verify whether it was Adam who bit the apple. Therefore forensic dentistry might be dated back to A.D. 49, when Agrippina the Younger identified Lollia Paulina by her teeth.[2] Other cases of historical forensic dental interest include the identification of Gen. Joseph Warren, a Boston physician. Gen. Warren was shot and killed at the Battle of Bunker Hill in June 1775. Nine months later, his body was exhumed and his friend and dentist, Paul Revere, identified the body by a false tooth and wire that he had made for Gen. Warren. The positive identification of John Wilkes Booth was made by his dentist 13 days after Lincoln's assassination. The dentist recognized two gold fillings he had placed a week prior to the assassination. Four years later Booth's body was moved to a family plot, at which time his brother confirmed the identity of the remains by a "peculiarly plugged tooth."

In 1897, a tragic fire broke out at an annual charity event in Paris, and 126 attendees perished. Dental comparisons were used to identify many of the victims. Oscar Amoedo, a dentist often referred to as the "father of forensic odontology," published the first textbook on forensic odontology in 1898 following this disaster. The first "modern" text in the field is considered to be *Forensic*

TABLE 1

Forensic Organizations in the U.S.

Organization	Description
American Academy of Forensic Sciences (AAFS) aafs.org	Founded in 1948 and covers all forensic science disciplines. Meets annually in February.
American Society of Forensic Odontology (ASFO) asfo.org	Founded in 1970 and is an entry-level organization for those interested in forensic dentistry. Not limited to dentists. Meets annually in February with the AAFS.
American Board of Forensic Odontology (ABFO) abfo.org	Founded in 1976 and is the credentialing organization for forensic odontologists. Meets annually in February with the AAFS.
California Society of Forensic Dentistry Inc. (CSFD)	Founded in 1984, members are forensic dentists currently affiliated with county medical examiners, coroners or law enforcement. Several members are consultants to California DOJ (MUPS).
Joint POW/MIA Accounting Command (JPAC)	Founded in 2003, formerly the Central Identification Laboratory, Hawaii, CILHI. Headquarters are in Hawaii. Joint military services, about 400 personnel. Its mission statement is "Achieve fullest possible accounting of all Americans missing from nation's past conflicts."

Odontology, published in 1966 by Swedish dentist Gosta Gustafson. The first American text on the subject, *Handbook for Dental Identification: Techniques in Forensic Dentistry*, was published in 1973 by Lester L. Luntz, DDS, and his wife, Phyllys Luntz.

The first course in forensic odontology may have been given in 1903 by Sadanori Mita, MD, in Japan.[3] This course was said to have included the examination, evaluation and classification of bite marks. The first American postgraduate course in forensic odontology took place in 1963 at the Armed Forces Institute of Pathology in Washington, D.C. (**TABLE 1**)

Adolph Hitler and Eva Braun committed suicide in 1945 and their bodies were burned. The Soviets were able to identify them based on extensive dental work they had had. In 1972, Reidar Sognnaes, DDS, MS, PhD, the founding dean of the University of California, Los Angeles, School of Dentistry, and Ferdinand Strom, DDS, published a paper that reviewed and confirmed the identifications.

In the 1970s, there were some who believed it was actually a Russian who had assassinated President Kennedy, not Lee Harvey Oswald. The remains of the assassin were exhumed and positively identified as Lee Harvey Oswald by comparison to his military dental records.

Forensic dental identifications have been utilized in numerous other cases and disasters in more recent years. Dental identification procedures were used after the 1978 Jonestown tragedy, the 1993 Waco, Texas, siege, the 1995 bombing of the Murrah Federal Building in Oklahoma City, the 9/11 terrorist attacks in New York City, Shanksville, Penn. and at the Pentagon, the 2004 tsunami in southeast Asia, Hurricane Katrina in 2005 and the 2010 Haiti earthquake.

California dental identification cases that many remember include the 1974 Symbionese Liberation Army (SLA) shoot-out and fire in Los Angeles. The six victims were identified by the late

FIGURE 1. April 1990 *CDA Journal* cover article.

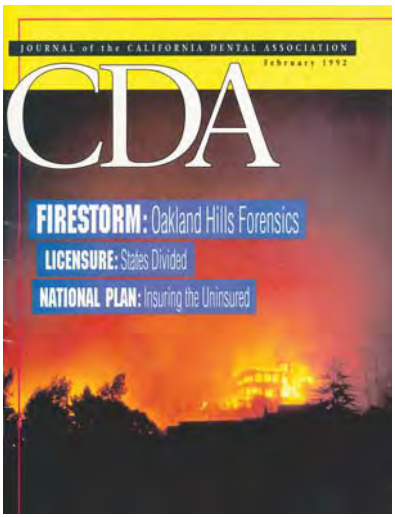

FIGURE 2. February 1992 *CDA Journal* cover article.

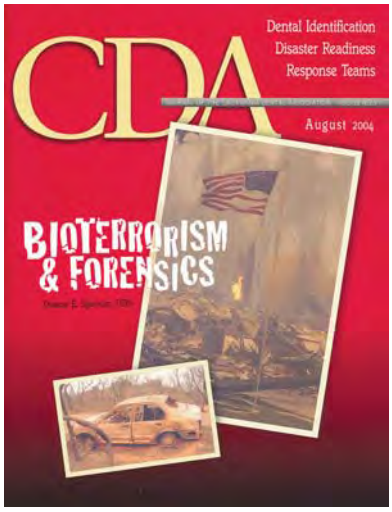

FIGURE 3. August 2004 *CDA Journal* cover article.

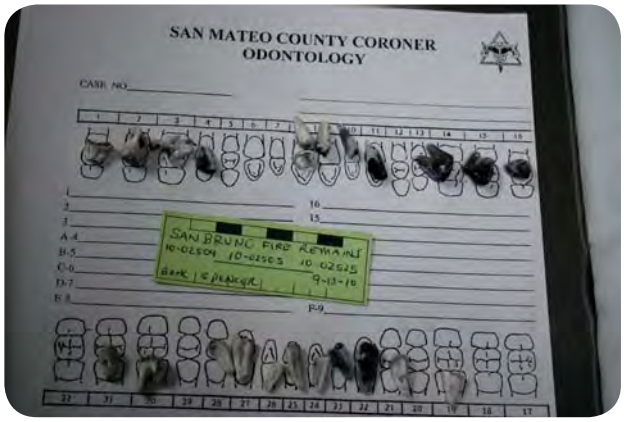

FIGURE 4. Roots of teeth were found in the ashes of a burned home. Dental evidence was sufficient to make a positive identification.

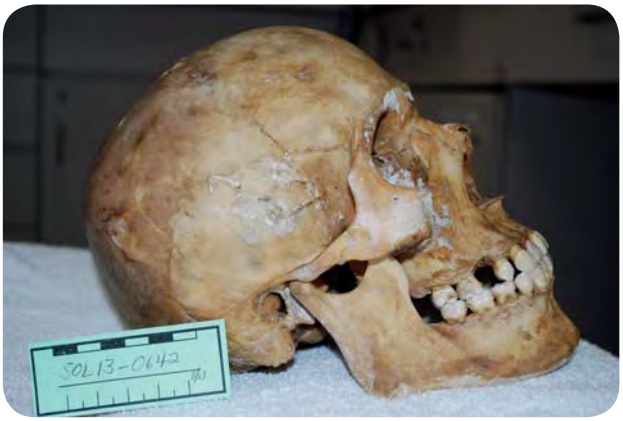

FIGURE 5. Skull of a Solano County "John Doe," one of the approximately 3,200 unidentified cases in the California Department of Justice's database.

Gerald Vale, DDS, and his team. Among Dr. Vale's extensive list of forensic cases was that of Richard Ramirez, the Hillside Strangler (**FIGURE 1**). The dental identifications of murdered California girls include Polly Klaas in Sonoma County, Christina Williams in Monterey County, Juli Sund and Silvina Pelosso in Yosemite, Xiana Fairchild in Santa Clara County, Danielle Van Dam in San Diego County, Yesenia Nungaray, who was initially a Jane Doe, in Alameda County, Sandra Cantu in San Joaquin County, Amber Dubois in San Diego County and Michelle Le in Alameda County. These cases all received intense media attention.

Numerous California disasters and accidents have required dental identifications over the years, including the 1978 Pacific Southwest Airlines (PSA) 182 airliner collision with a private Cessna over San Diego that caused 144 deaths, the 1982 Caldecott Tunnel fire that resulted in seven deaths, the 1986 Cerritos Aeromexico flight 498 midair collision with 82 deaths, the 1987 PSA 1771 crash in San Luis Obispo County with 43 deaths, the 1989 Loma Prieta 6.9 earthquake with 63 deaths (42 on the collapsed Cypress Freeway in Oakland), the 1991 East Bay firestorm with 25 deaths (**FIGURE 2**), the 2000 Alaska Airlines 261 crash into the ocean off Ventura County with 88 deaths, the 2000 van crash in Alameda County that killed a mother and six children, the 2003 Cedar Fire with 15 deaths (**FIGURE 3**), the 2008 helicopter crash in Trinity County where nine firefighters perished, the 2010 San Bruno Pacific Gas and Electric pipeline explosion and fire with eight deaths and the 2013 limousine fire on the San Mateo Bridge with five deaths. These are some of the more widely publicized cases in California in the past 35 years.

Dental Identifications

It is well known that the teeth are the hardest structures of the human body. They withstand the elements, especially heat, quite well. In cases of fire, the posterior teeth are often protected by the tongue and buccal musculature, whereas the anterior teeth may be burned or charred. In intense and prolonged burning, sometimes all the odontologist has to work with is teeth or roots of teeth. In the case of the 2010 San Bruno Pipeline explosion, a 17-year-old boy was identified by only the roots of his teeth. They were the only human remains recovered from the very intense and prolonged fire that burned the residence where the young man, his father and his grandmother lived and perished (**FIGURE 4**).

In California, medical examiners and coroners are tasked with identifying their deceased cases. When the more common and traditional methods of identification (visual, fingerprints, etc.) fail, the forensic odontologist is called in. Some dental consultants serve more than one county in California. The majority of cases these odontologists examine result in positive identifications. The coroner usually has an idea of the identification, but due to the condition of the remains (e.g., burning, decomposition, skeletonization, trauma, fragmentation) his or her staff cannot positively make an identification. The coroner's office locates the dentist of the presumed deceased, dental records are obtained, a postmortem dental exam is performed, antemortem and postmortem records or radiographs are compared and a positive identification can usually be made.

In cases where a positive dental identification is not possible (e.g., no presumptive identification of the deceased, no antemortem dental records available) the case may become a Jane or John Doe (**FIGURE 5**). California law requires the coroner to retain the maxilla and mandible for at least one year after a positive identification is made. All postmortem dental information (charting, photographs and radiographs) are submitted via the medical examiner or coroner's office to the California Department of Justice (DOJ) Missing and Unidentified Persons Unit (MUPS) in Sacramento. Here all

information concerning the unidentified deceased is entered into a computer database that can be searched against similar information on missing persons. Currently there are approximately 3,200 active unidentified cases in the California database at MUPS. MUPS also enters the same information into a national database, the National Crime Information Center (NCIC). A number of other organizations also actively work to identify the unknown deceased and locate the missing. One, developed by the National Institute of Justice (NIJ) in 2007, is the National Missing and Unidentified Persons System (NamUs, namus.gov). Its database can be searched not only by medical examiners, coroners and law enforcement, but also by the general public. Both California DOJ MUPS and NCIC use a computer-assisted dental identification system called WinID3, developed by James McGivney, DMD, an experienced forensic odontologist. It is a Windows-based system that can switch among a number of languages. It is used throughout the forensic science community and in law enforcement and criminal justice systems to aid in identifying the unknown. It was used successfully at the World Trade Center site and after Hurricane Katrina.

DNA Analysis

The California DOJ requires a postmortem dental exam of all unknown deceased prior to submitting DNA to the state DNA laboratory in Richmond, Calif. Obviously, if the unknown deceased can be identified via the MUPS dental database, it will save the time and expense of obtaining and analyzing DNA. For the past two decades, DNA analysis has gained prominence in forensic science. Although highly reliable, the analysis takes time, is expensive and requires a specialized and fixed facility. DNA is available throughout the body, although the femur is a desirable source from decomposed and skeletonized remains. Seven-year-old Xiana Fairchild was identified by dental comparison and DNA analysis. She went missing one day from her home in Vallejo, Calif. About a year later, a skull with no mandible was found on a remote road in Santa Clara County. Only the four primary molars remained in the skull and had no restorations. Tooth #J was removed and sent to the county crime lab where DNA was extracted. The forensic odontologist made a challenging positive dental identification, supported by a positive DNA match using Xiana's toothbrush, which had been placed in evidence after her disappearance.

The California DOJ requires a postmortem dental exam of all unknown deceased prior to submitting DNA to the state DNA laboratory in Richmond, Calif.

DNA analysis is also valuable in identification efforts following mass disasters where fragmentation of the remains is present, such as the 9/11 attacks.

Technological Advances

As in general dentistry and all dental specialties today, the field of forensic dentistry has benefited from technological advancements. The first published use of dental radiography for human identification occurred in 1943.[4] In the not too distant past forensic dentists obtained dental radiographs using a medical X-ray machine. Dental X-ray films were placed on the horizontal X-ray table, with a tooth or teeth on each film, and the X-ray was taken. This produced one large film with numerous images of the teeth. Some coroners' offices were eventually able to obtain donated second-hand dental X-ray machines. These were definitely more "user-friendly" for the forensic dentist but required that the dentist take the exposed films back to his or her office for developing. If there was a problem with the developed X-rays, it meant a return trip to the morgue for retakes. Fortunately, digital radiography came of age. Post 9/11, some California medical examiners and coroners wrote grant proposals to the federal government and obtained digital dental radiographic equipment. Several of the busier California agencies were able to obtain the Dexis system utilizing a laptop computer, an Aribex Nomad hand-held X-ray machine or a traditional wall-mounted machine and a scanner capable of scanning not only paper reports but also the traditional antemortem X-rays received from dental offices. With this technology, the forensic dentist can obtain a positive identification while still at the coroner's office, and the family of the deceased can be notified. In select dental identification cases (e.g., skeletonized unknowns), a panoral X-ray may be taken. Dental cone beam computed tomography (CBCT) became available in 2001, and identifications should one day be possible using antemortem and postmortem CBCT scans.[5] There are exciting possibilities for CBCT technology in the forensic future.

Today, reports, charts, dental radiographs and photographs can be transferred digitally to other offices. It is common for a dentist to send digital

records if he or she is contacted by a coroner. If the dentist has taken digital X-rays, some problems that forensic dentists formerly had to deal with are eliminated. The digital X-rays will be properly "mounted" with dates, etc. When the dental office sends copies of its traditional X-rays, the forensic dentist has to interpret whether the dot is up or down. It may also happen that the office's registered dental assistant records the date as the day the X-rays were copied, not the date they were taken. And all practicing dentists have seen X-rays that were not properly exposed, developed or fixed. Over- or under-exposed or improperly fixed X-rays are of little use for comparisons. Digital X-rays remedy all these problems and do not get lost as traditional X-rays can.

Restorations

Although dental restorations are but one part of the dental identification equation, they can be an important and defining part. Dental amalgam was typically the restorative material of choice through most of the 20th century. There was gold, plastic, silicate, porcelain and eventually composite materials. The metal materials, being radio-opaque, are valuable when comparing antemortem and postmortem X-rays. Today, dentists use tooth-colored composite materials to a great extent, and it can be a challenge for the forensic dentist to determine the presence of some of the fine, esthetic restorations that dentists now place using microdentistry and flowable composites. Some are not readily seen on dental X-rays and can be radiolucent. They may mimic dental caries on a radiograph. In addition, they are not always easily detected during a postmortem examination on decomposed remains. Conditions in a morgue are sometimes less optimal than in a dental operatory (poor lighting, etc.). In

TABLE 2

Forensic Dental References

- *Digital Analysis of Bitemark Evidence Using Adobe Photoshop Forensic Imaging Services*
  R. Johansen and C. M. Bowers; Forensic Imaging Services, Santa Barbara, Calif., 2000.
- *Forensic Dental Evidence, an Investigator's Handbook*
  C. Michael Bowers. Elsevier Academic Press, 2004.
- *Bioterrorism and Forensics*
  Journal of the California Dental Association vol. 32, no. 8, August 2004.
- *Dental Autopsy*
  William Silver and Richard Souviron. CRC Press, 2009.
- *Forensic Dentistry*
  David Senn and Paul Stimson. 2nd ed. CRC Press, 2010.
- *Bitemark Evidence, A Color Atlas and Text*
  Robert B.J. Dorion. 2nd ed. CRC Press, 2011.
- *Manual of Forensic Odontology*
  David Senn and Richard Weems. 5th ed. CRC Press, 2013.

many cases it is quite helpful when the forensic dentist can resect the maxilla and mandible in order to conduct an adequate examination. The use of an ultraviolet light helps detect composite restorations and dental sealants.

With the dental software being used in dental offices today, it is simple to record not only what tooth and which surfaces were restored, but which specific material was used, including the brand-name of the composite. This is also the case for root canal filling materials. Research at State University of New York Dental School in Buffalo, N.Y., is being done to aid in detection of both resin-type materials and root canal filling materials. Using X-ray fluorescence (XRF) the researchers have been able to locate and identify resin brands in dentition.[6] Different manufacturers have their own formulations for dental resins, which differ in filler particle size and elemental composition. These materials survive even after cremation. Using scanning electron microscopy/energy dispersive X-ray spectroscopy (SEM/EDS) the investigators have succeeded in assessing the elemental composition of root canal filling materials even after high temperature incineration.[7] Dentists are encouraged to include material brand names in their computers to further document their procedures on patients.

With the above-mentioned changes and advances in dentistry, as well as changes in dental computer hardware and software, intraoral photography and videography, intraoral laser technology, advances in dental bonding, dental implants and the availability of newer esthetic resins, odontologists will have many new options to consider when working with identifications in the future.

As dentists, we should all endeavor to maintain complete records, to chart accurately and to obtain the best radiographs possible. However, being human, we can make mistakes. Dr. McGivney has characterized common charting errors as "flips, flops and slides." A "flip" occurs when the treatment is erroneously charted to the contralateral tooth, the tooth on the opposite side of the arch, e.g., No. 19 to No. 30 or No. 4 to No. 13. A "flop" results when a restored surface is transposed, e.g., MO instead of DO or OF instead of OL. "Slides" can occur when a tooth is missing and the distal tooth drifts into its place, e.g., No. 14 is missing and No. 15 drifts mesially and is charted as No. 14. Forensic odontologists are challenged by these errors.

Mass Disasters

Airline crashes, fires, earthquakes, tsunamis, terrorists' attacks, floods and transportation accidents that result in great loss of life are referred to as multiple fatality incidents (MFI). What will the next mass disaster be? When? Where? It will happen. We know that California will have more earthquakes. The Hayward Fault in Northern California is overdue for a large-magnitude shaker. Some experts believe that if the 1989 Loma Prieta earthquake had occurred slightly farther north on the Hayward Fault, it would have shaken Oakland 12 times harder. It has been estimated that such a quake on the Hayward Fault could result in several thousand deaths. And if the crash of Asiana Airlines Flight 214 at San Francisco International Airport on July 6, 2013, had occurred only a split second sooner, the death toll would not have been three, but probably scores.

Forensic dentistry is just one of the forensic specialties that must continually plan to be ready. How can you prepare for a mass disaster when you do not know what it will involve, how large it will be, where it will occur (on land, air or sea) and what other conditions might occur simultaneously? Most forensic odontologists in California know dentists with some forensic training whom they can call for assistance when necessary. In May 2013, forensic odontologist John Berk, DDS, received assistance from five dentists, on short notice, to help him identify the victims of the San Mateo Bridge limo fire.

Post 9/11, two forensic odontologists, Anthony "Rick" Cardoza, DDS, and James Wood, DDS, and the California Society of Forensic Dentistry (CSFD) formed the California Dental Identification Team (CalDIT). This group, which is under the auspices of the California Emergency Management Agency (CalEMA), is composed of more than 30 odontologists who currently consult with California's medical examiners and coroners.

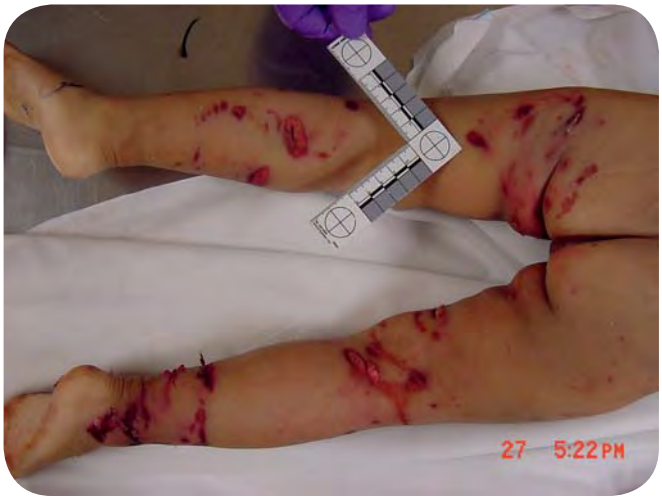

FIGURE 6. Legs of 2-year-old who was fatally mauled by his family's pit bulls. Bites and claw marks were present all over the child's body. The most intense destruction in such fatal animal attacks is usually around the head and neck.

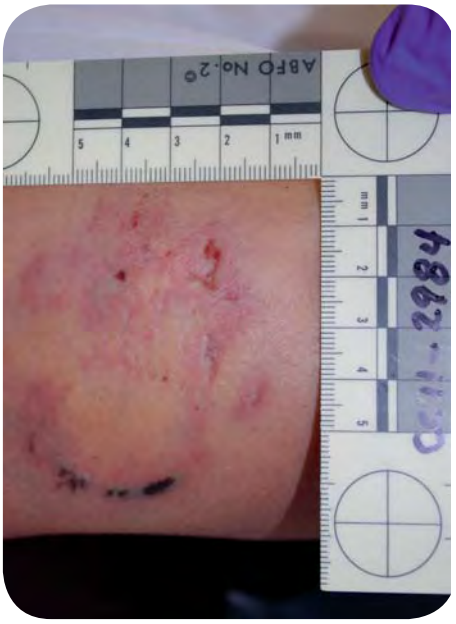

FIGURE 7. Human bite mark on a crime victim's arm.

Team members stand ready to assist in moderate-sized disasters.

If a mass disaster should overwhelm the local county or counties, a federal disaster response team may be summoned. The 10 federal Disaster Mortuary Operational Response Teams (DMORT) stand ready. A number of California forensic odontologists are members of the DMORT Region 9 team. See *Forensic Dental Identification in Mass Disasters: The Current Status* on page 379.

Dental Age Estimation

In Roman times a young man was considered ready for military service if his second permanent molars had erupted.[8] Today there are other reasons to estimate certain individuals' age.

When performing a forensic dental examination on unknown remains, the odontologist is faced with estimating the deceased's age at time of death. Also, in certain disasters, it might be advantageous to segregate the remains by age to aid in the identification process. At times, the odontologist may be called on to estimate the age of a living individual. The legal system may need to know whether an immigrant arrested for criminal activity is an adult or a juvenile (i.e., older or younger than 18) and should be held in a juvenile or an adult detention facility.

If the deceased is a child or adolescent, an odontologist experienced in pediatric dentistry or orthodontics can usually make a good dental age estimation. By visual and radiographic examination, one can assess the development, eruption and emergence of the teeth. Once an adolescent approaches adulthood, he or she also reaches the end of dental and skeletal development. Biochemical techniques such as aspartic acid racemization and carbon-14 dating may then be necessary. These require a laboratory and are time-consuming and costly. Continuing research is taking place to aid with the scientific dental assessment of age.

For the past two decades, there has been an emphasis on the evaluation of third molar development to assist in estimating whether an individual is older or younger than 18. In 1993 Harry Mincer, DDS, of the University of Tennessee School of Dentistry authored an article on the use of third molars as an estimator of chronological age.[9] Since that date numerous other articles have been published concerning third molar development of various ethnic and foreign populations.[10-13]

Bite-mark Evidence

Humans have probably been biting each other forever. Biting activity takes place playfully with parents and their infants and in lovemaking, but also during episodes of violence and criminal activity. Victims of physical child abuse are often bitten on many parts of their bodies. Likewise, victims of violence are commonly bitten. The author has seen human bites on every part of the body.

The first bite mark may have occurred in the Garden of Eden. Throughout history, there have been numerous recorded bite-mark cases. An early case occurred in 1906 in England, when a piece of bitten cheese was found at a burglary scene. Dental impressions were made of two suspects and the models of one man were said to "fit" the bite mark in the cheese. The man was convicted of the crime. In Quebec in 1930 a murdered infant had multiple bite marks. Robert B.J. Dorion, author of a book on the subject, believes that

this may be the first North American case of human bite marks on skin documented by archival photography.[14]

The first reported bite-mark case in the U.S. took place in Texas in 1954. Again, it involved a piece of bitten cheese found at a burglary scene. Doyle, the suspect, voluntarily bit into another piece of cheese that was then compared to the crime scene cheese. Doyle was convicted following the testimony of a firearms examiner and a dentist.

The first California bite-mark case was recorded in 1974. Walter Marx was the suspect in the sexual assault and murder of an elderly woman. At autopsy, a bite mark was noted on the victim's nose but no bite-mark evidence was collected. Eventually, dental impressions were taken from Marx. The victim's embalmed body was exhumed and photographs and impressions of the nose were taken. Three dentists, Gerald Felando, DDS, and Drs. Sognnaes and Vale, used overlays, 3-D comparisons and scanning electron microscopy on the case and testified at trial. Marx was convicted of involuntary manslaughter.

A well-known bite-mark case followed the murders of two female Florida State University students in 1978. Theodore "Ted" Bundy, serial killer of as many as 40 young women across the U.S., was eventually convicted of the crimes, with bite-mark evidence from the hip of one young woman proving very important at trial. The 1986 movie *Deliberate Stranger* starring Mark Harmon and several true crime books covered this case. Bundy was executed in 1989. For an excellent history of bite-mark evidence, the reader is referred to Dorion's *Bitemark Evidence, A Color Atlas and Text* (**TABLE 2**).

Forensic odontologists are sometimes asked to evaluate bites caused by various animals. These cases often involve fatalities. Examples in the U.S. range from insect bites and crayfish bites, which can resemble other types of patterned injuries, to bites by alligators,[15] sharks,[16] bears, tigers and mountain lions.[17] In the U.S., dogs cause most of the fatal animal attacks on humans (**FIGURE 6**). The most highly publicized dog fatality case in California in recent years was the 2001 case of the St. Mary's College lacrosse coach, Diane Whipple, who was mauled to death by two Presa Canario dogs in San Francisco. Another animal fatality that gained much media attention was the 1994 mauling of a jogger in the Sierra foothills of El Dorado County. A mountain lion left an imprint of its maxillary anterior teeth on the victim's chin. The responsible female mountain lion was identified by its teeth/bite mark and later by DNA analysis. The victim's DNA was found at the bed of the mountain lion's claws.

Theodore "Ted" Bundy, serial killer of as many as 40 young women across the U.S., was eventually convicted of the crimes with bite-mark evidence.

Although it is not known how many criminal cases with bite-mark evidence have been evaluated by forensic odontologists in the U.S. in the past 40 years, hundreds have gone to trial. Although the bite-mark information may not be the primary evidence in a case, it can be very persuasive for a jury. The first recorded trial that included evidence of a bite mark in skin in the U.S. (People versus Johnson, 1972, Illinois) dates back only 42 years. How much bite-mark experience had many of the odontologists had prior to testifying in those early cases? Most evaluated the evidence as they had learned to do, paying attention to detail and testifying in a proper manner as to their opinion of the evidence. As we have learned in recent years, a few odontologists testified to patterned evidence that was incorrect, not scientifically supported and which may have convinced juries to wrongly convict the accused.[18] There have been a number of exonerations of men serving lengthy prison sentences, some on death row, who were convicted, to various degrees, on bite-mark evidence. These exonerations were made possible by the use of DNA analysis. In some cases, the DNA analysis identified the individual who was actually responsible for the crime.

The American Board of Forensic Odontology (ABFO) has established guidelines for bite-mark evidence, which have been amended over the years as cases and experience have increased. Advances and improvements have also been made in the way bite-mark evidence is handled. The ABFO No. 2 scale, developed by Hyzer and Krauss, is used today by multiple forensic science disciplines. The important use of photography has benefited from the development of digital photography, alternate light source (ALS) photography, infrared (IR) and reflective ultraviolet (UVA) photography.[19] While hand-traced acetate overlays of suspects' teeth are still used, computer-generated overlays have become the gold standard.[20,21] Swabbing the bite-mark site for possible ABH blood group classification and DNA evidence is extremely important today.[22] If the bite-mark victim is deceased, the bite mark is sometimes resected for

evaluation under transillumination.[23] Although most bite-mark evidence in criminal activity is associated with bites on human skin, many cases have involved bites into foods (cheese, apples, chewing gum) and other objects (belts, pencils, bullet casings, duct tape).[24]

Research is being conducted in various aspects of bite-mark evidence.[25-31] How accurate is human skin in recording bite-mark evidence (**FIGURE 7**)? Is the human dentition unique? What were the positions of the biter and the person being bitten? Was there movement? Was there clothing between the teeth and the skin? Is the odontologist's conclusion in a bite-mark case subjective or objective? Are his or her findings scientifically based? The National Academy of Sciences (NAS) issued a report in 2009 called *Strengthening Forensic Science in the United States: A Path Forward*,[32] which addressed forensic odontology along with several other forensic disciplines. The report considered the value and appropriate use of bite-mark analysis and comparisons. Considerable further research is needed in the field. Forensic odontologists who choose to work with bite-mark evidence must be willing to follow the ABFO guidelines, to properly collect, evaluate and compare the evidence, to seek additional opinions and to support and understand the related research under way. Currently, many forensic odontologists believe that a recognized human bite mark should be used only to exclude a suspect. ■

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THE AUTHOR, Duane E. Spencer, DDS, can be reached at snoopydds@aol.com.

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Strategic Continuing Education Planning

Michael Perry, DDS

For most dentists, lifelong learning is a tenet of their professional life. Many combine a need to keep up with the latest in materials and techniques with a passion for learning.

Decades ago, continuing education (C.E.) for dentists was in large measure driven by dental schools and organized dentistry. Many of the most credible educators were affiliated with one or both of those entities and, compared to today, the cost of many training programs was relatively low.

Clinical C.E. as a Business

Like other segments of the dental marketplace, C.E. for dentists has evolved. C.E. providers now compete for dentists' attention with a variety of courses designed to help them better care for patients and increase practice profits. Dental schools and organized dentistry have been joined by both private and corporate C.E. providers in a competition for doctors' attention and dollars. Marketing to dentists for dental C.E. has also become more sophisticated.

As with all market-based offerings, customers purchase C.E. based upon perceived value. Doctors value C.E. that they feel will help make them more effective as clinicians and more profitable.

Return on Investment (ROI)

Every prudent dentist should have a business plan. A business plan answers the question "How am I going to spend money in order to make money?" Such a plan should have a timeline of three to five years and be updated annually. It should include capital improvements such as leasehold enhancements and

equipment, marketing expenses and continuing education. Any prospective equipment purchases should be subjected to an ROI analysis that answers the questions "How long until I break even on this purchase?" and "How much will this purchase increase my net profit?"

C.E. training programs should also undergo ROI analyses, including calculations of doctor and staff training time, course tuition and costs of travel, equipment and material.

Reaching Capacity

Some dentists who are practice owners or associates do not operate at capacity. They may not be able to fill their patient-care schedules. For some of these doctors, it could be more cost-effective to increase the variety of services offered in their practices, as opposed to advertising for increased numbers of new patients or contracting with additional dental benefits companies. Every doctor operating below capacity should therefore have a strategic C.E. plan as a component of his or her business plan. This helps narrow the search for the type of C.E. investment a doctor wants to make to specific training categories. Options within these categories can then be subjected to ROI analyses to help the doctor best choose where to invest.

Experts with CDA Practice Support are available to assist doctors in business planning, capacity calculations, ROI analyses and strategic C.E. planning. ■

Michael Perry, DDS, is the director of Practice Management for CDA. Dr. Perry consults with member dentists on leadership, dental benefits and practice management issues.

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Considering Dating a Patient? Refer First

TDIC Risk Management Staff

There is considerable information about the ethical implications and risks of dentists dating a patient of record, but the fact remains that dentists encounter a variety of people in daily practice and may find themselves attracted to a patient. Conversely, a dentist may discover a patient is attracted to him or her.

In California, Business and Professions Code 726 which applies to all licensed dental professionals states in part, "The commission of any act of sexual abuse, misconduct or relations with a patient, client or customer constitutes unprofessional conduct and grounds for disciplinary action …" A dental professional who has a sexual relationship with a patient is in violation of the Dental Practice Act.

"The commission of any act of sexual abuse, misconduct or relations with a patient, client or customer constitutes unprofessional conduct and grounds for disciplinary action ..."

If an attraction develops, consider ahead of time how this could become an awkward situation in the future. The Dentists Insurance Company strongly advises you not to act on that unless you first refer the patient to another dentist for dental care before beginning a personal relationship.

"Romantic chemistry happens," said a TDIC analyst who fields calls for the Risk Management Advice Line. "But there are consequences involved with dating a patient." These range from violating the Dental Practice Act to damaging your professional reputation.

For these and other reasons, TDIC recommends a written office policy against dating patients. "The policy should be applied universally," said analyst Taiba Solaiman. "The doctor sets the example for the office." If a doctor dates a patient, it sends a message to the rest of the staff that it is acceptable behavior.

A dentist who is serious about dating a patient should refer the patient to another dental provider. If a staff member wishes to date a patient, the best practice is the same: the patient must seek dental care from another office. This can prevent a number of potential problems. There could be concerns surrounding forgiving a balance or unauthorized credit placed on a patient's account. If the relationship does not work out, the patient may voice

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LOS ANGELES: General Dentistry. 5 Ops in a prof. bldg downtown. 2013 GR $225K. #CA141

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NORTH OF SACRAMENTO: General Dentistry & Building. 4 Ops, 5 available. ~1500 active patients. EZ Dental, Pan. 2012 GR $515K on 32 hrs/wk. #CA558

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PITTSBURG: General Dentistry. 5 Ops. 1400 SF. Pano, Fiber optics. Low rent. 3-year avg. GR $236K w/60% overhead. #CA133

POWAY: General Dentistry. 4 Ops. 1100 SF. Dentrix, Digital X-rays, Intraoral camera. 2013 GR $720K w/Adj. Net $241K. #CA139 – In Escrow

RIDGECREST: General Dentistry Practice & Building. 4 Ops. 1500+ SF. Small practice. 2012 GR ~$175K. #CA523

RIVERSIDE: General Dentistry Practice & Building w/Emphasis on Implants. 5 Ops. 2012 GR $500K+. #CA120 – In Escrow

S. LAKE TAHOE: General Dentistry. 5 Ops, 1 Add'l avail. 1450 SF. Avg. GR $733K over last 3 years. #CA134

S. ORANGE COUNTY: General Dentistry. 4 Ops. 1350 SF. Coastal location. Dentrix. #CA119 – In Escrow

SAN BERNARDINO: General Dentistry. 4 Ops. Avg GR $265K over last 3 years. Dr retiring. #CA150

SAN CLEMENTE: General Dentistry. 3 Ops, 2 Add'l plumbed. PracticeWorks, Digital X-rays, Pano. #CA129

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SHERMAN OAKS: General Dentistry. 4 Ops in Prof. bldg near freeways. SoftDent. 2012 GR $740K w/Adj. Net $220K. #CA135 – In Escrow

SOUTH COUNTY SAN DIEGO: General Dentistry Practice & Building. 4 Ops. 1200 SF. Main street location. 2013 GR $310K on 150 Days worked. #CA148

THOUSAND OAKS—FACILITY ONLY! 4 Ops. 1325 SF. Move-in ready. Modern design. Dentrix, Equipped business office, sterilization area. Great start-up location/ satellite office. #CA137

TUSTIN: General Dentistry. 3 Ops. CEREC 3D Machine. GR $300K w/Adj. Net $103K. #CA131 – In Escrow

VICTORVILLE: General Dentistry. 3 Ops, 3 Add'l plumbed. 2150 SF. SoftDent. 2013 GR $313K w/Adj. Net $147K. #CA149

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WEST LOS ANGELES: General Dentistry. 4 Ops, 1 Add'l plumbed. Great location on West side. GR $342K on 2 Drs days/wk. #CA117

YORBA LINDA—NEW LISTING! General Dentistry. 4 Ops, 1 Add'l plumbed. Prof. bldg. 4 Days hygiene. EagleSoft, Digital, Paperless. 2013 GR $914K w/Adj. Net $301K. #CA146

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concerns about unauthorized access to his or her private health information.

The ethical considerations of personal relationships with patients are addressed in the ADA *Principles of Ethics and Code of Professional Conduct*, which states, "Dentists should avoid interpersonal relationships that could impair their professional judgment or risk the possibility of exploiting the confidence placed in them by a patient." This section is under the Principle of Nonmaleficence ("do no harm").

Patients ideally trust and respect their dentist and reveal confidential information with the expectation that it will be used only in their best interest. This dynamic creates a delicate balance between dentists and patients that must not be exploited.

Combining professional and personal relationships is never without complications. Protect your role as a health care professional. TDIC advises a simple, "Thank you, no" to safeguard your practice and professional reputation. ■

The Dentists Insurance Company offers policyholders a free advice line at 800.733.0634 for assistance with questions or concerns about potential liability. TDIC risk management analysts will work with policyholders to develop a solution.

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CN-262 PETALUMA: HMO Practice in very desirable area. 1,200 sf w/ 3 ops **$450k**

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DG-232 SANTA CRUZ: Large, well-established Medical/Dental Prof complex! 1,063 sf w/ 3 ops **REDUCED ! $330k**

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NORTHERN CALIFORNIA

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GN-249 YUBA CITY: This FFS practice sets the bar for all dentists! With an opportunity to own your building. 1,750 sf w/ 5 ops **$465k /Real Estate $TBD**

GG-273 WILLIAMS: Live & Practice in this wonderful close-knit community! 1,800 sf w/ 2 op + 2 add'l **$195k**

GN-275 GREATER SACRAMENTO AREA: Beautiful "Spa Like" Practice! 1,596 sf w/ 4 ops **$525k**

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HN-213 NORTH EAST CA: Close to the Oregon Border, this FFS practice is 2,200 sf w/ 3op +1 **add'l $145k**

HN-197 EAST LODI FOOTHILLS: Two practices for one great price! Call today for details! **$595k**

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HN-268 CALAVERAS COUNTY: "Main Street" charm & picturesque views of Central Sierra Foothills. 2,000 sf w/4 ops + 2 add'l **$250k**

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SALES

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JG-278 GREATER VISALIA: Runs like a well-oiled machine! 1,500 sf w/ 4 ops **$320k (Real Estate Also Available)**

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EN-203 SACRAMENTO Oral Surgery: Highly efficient office. 3,000 sf w/ 4 ops **$325k**

GN-284 CHICO Ortho: Warm, caring and well established! 900 sf w/ 2 ops + 1 add'l. **$75k**

BC-230 CENTRAL CONTRA COSTA Perio: Loyal patients @ 2 locations! **$650k**

EG-225 SACRAMENTO Ortho: Well-maintained, single-story Medical/Dental complex. 1,200 sf w/ 4 chairs **$95k**

DN-229 EAST BAY Endo: Strong referral & patient base. Attractive tree-lined street, mature landscaping and curb appeal. High foot traffic. 975 sf w/ 2 ops **$245k**

DG-264 SAN JOSE Ortho: $300-400k in build-outs alone! 1800 sf w/ 5 chairs. **ONLY $270k**

ASK THE BROKER

Recent articles have indicated that the graduating dentists will be looking for group practices since they have a large debt load, more female graduates, and a decreasing annual production in our offices. How are we solo practitioners going to sell our solo practices? Should we try to form group practices by linking up with other solo practices in an attempt to make ourselves look more desirable in their eyes or should we just stay the same and try our best to sell a solo practice?

The short answer is just try your best to sell your solo practice. The only additional advice here is that smaller practices doing less than $400K might need to consider setting themselves up for a merger upon retirement. They need to consider this because the average dental student graduates with more than $350,000 in dental school debt and the smaller practices won't generate enough cash flow to pay for all their debt! The owner of a smaller practice should then consider going to a month-to-month lease when they are getting ready to retire in order to facilitate a possible merger. The retiring dentist may be asked to work back as an Associate up to a year to help facilitate the merger. Keep in mind that the average take-home salary after the sale of your practice is approximately 1.5 to 2x your normal income, so taking costly and perhaps uncomfortable steps to try and form group practices prior to retirement may not make long-term financial sense. Group practice set-ups, contracts and exit strategies are often more complicated and will also present an entire myriad of problems since most lenders have difficulty lending on fractional sales. I believe that we will see more mergers in the future as the return on investment from a successful merger is much higher than a traditional transition.

The millennial mindset may not be geared toward being solo practitioners as much as the baby-boomer mindset was. A percentage of female dentists may prefer employment that is more conducive to raising a family. This factors into the equation since 50% of most dental school students are female, as compared with 10% during the baby boomers' generation. While this may seem to indicate that fewer new dentists are looking for solo practice opportunities, my experience is that once the young dentists get comfortable with their skills, they realize that the best way to get out of their massive debt is to work for themselves. The good news is that California has no shortage of dental schools as several new schools have recently been established in California and adjacent states. There is no question that group practices and corporate dentistry are on the rise. However, I believe that there will always be a greater proportion of dentists who choose to own their own practices.

Timothy G. Giroux, DDS is currently the Owner & Broker at **Western Practice Sales** and a member of the nationally recognized dental organization, ADS Transitions.
You may contact ***Dr Giroux at*: wps@succeed.net or 800.641.4179**

HIPAA Security Risk Analysis

CDA Practice Support

Health Insurance Portability and Accountability Act (HIPAA) covered entities are required to perform a risk analysis of their systems that store or transmit electronic protected health information (ePHI). This analysis is considered a necessary tool in achieving compliance with HIPAA Security Rule standards and implementation specifications. In addition to the risk analysis, a covered entity must also document what practices it has implemented to mitigate identified risks and vulnerabilities.

What is a risk analysis?

It is an accurate and thorough assessment of the potential risks and vulnerabilities to the confidentiality, integrity and availability of ePHI held by the covered entity. For purposes of this discussion, "vulnerability" is a flaw or weakness in system security procedures, design, implementation or internal controls that could be exercised (accidentally or intentionally) and result in a security breach or violation of security policy.

How do we conduct a risk analysis?

According to the Department of Health and Human Services (HHS), there is no single method or "best practice" that guarantees compliance with the Security Rule. The agency points to a publication from the National Institute of Standards and Technology (NIST) that provides examples of steps that may be applied to a risk analysis process. *The Guide for Conducting Risk Assessment* (NIST SP 800-30) is available online at csrc.nist.gov/publications/nistpubs/800-30-rev1/sp800_30_r1.pdf. Although it is useful to have a guide, the typical dental practice may find this guide difficult to follow.

The ADA has developed a risk assessment tool for small dental practices as part of its *Practical Guide to HIPAA Compliance*. The tool poses a series of questions. For each question, a practice's security officer needs to assign a risk level and then determine if the practice already has a policy addressing the subject or if a policy must be written. Some questions included are:

- Do you keep an updated inventory of hardware and software owned by the practice?
- Do you have written job descriptions that define appropriate access to ePHI?
- Do you have a plan to temporarily relocate if you lose access to your physical location?

Another way to conduct an analysis is to become familiar with the standards and implementation specifications of the HIPAA Security Rule (see article on cda.org/practicesupport and related links) and do the following:

1. Identify/document where all ePHI in the practice is transmitted, received and stored. Be sure to include photocopiers, which have hard drives, mobile devices and cloud storage.

2. Identify/document all potential threats and vulnerabilities. A "threat" is a person or thing that potentially exposes system vulnerability. Examples include power outages, broken water pipes, computer viruses, office

break-ins, a disgruntled employee and loss of back-up media.

3. Assess current security measures and take steps to reduce risk and vulnerabilities. According to HHS:

"The security measures implemented to reduce risk will vary among organizations. For example, small organizations tend to have more control within their environment. Small organizations tend to have fewer variables (i.e., fewer workforce members and information systems) to consider when making decisions regarding how to safeguard ePHI. As a result, the appropriate security measures that reduce the likelihood of risk to the confidentiality, availability and integrity of ePHI in a small organization may differ from those that are appropriate in large organizations."

4. Determine/document the likelihood and potential impact of threats.

5. Assign/document the risk level for each threat/vulnerability combination.

Finally, HHS recently made available a downloadable security risk assessment tool. It is available in Windows, iPad and PDF versions. You can find it at healthit.gov/providers-professionals/security-risk-assessment-tool.

Is that it?

No. You must periodically review and update the risk assessment. "Periodic" is open to interpretation. It is best to review the risk assessment and all privacy and security policies and procedures at least once a year until such time as there are no changes in the practice's technology, facility and staffing. ■

Regulatory Compliance appears monthly and features resources about laws and regulations that impact dental practices. Visit cda.org/practicesupport for more than 600 practice support resources, including practice management, employment practices, dental benefit plans and regulatory compliance.

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3088 SAN JOSE GP & BUILDING

SOLD

Offering well-est. practice and 20 year old, 3,500 sq. ft. professional building. Office space is 1,755 sq. feet with 4 fully equipped ops. New laser, and Dexis digital x-ray, digital camera, intra oral camera, and panorex. Approx. 1,200 active pts. and 3.5 doctor days/week. Call for details.

4015 LOS ANGELES COUNTY GP

SOLD

Quality East San Gabriel Valley, Foothill Community practice. Retiring seller working 4 doctor-days, approx. 1,600 active pts., seasoned & loyal staff. 1,103 sq. ft. modern office w/4 fully-equipped ops. Prominent, well-travelled street corner in desirable neighborhood surrounded by healthcare professionals with large daytime population draw. Recent equipment upgrades. New computers and new cabinets. 2012 GR $877K+ Asking $722K.

4020 MID PENINSULA GP

SOLD

Well est. practice with modern recently upgraded equipment in 2 op. facility. Located in professional & residential area close to downtown, convenient to 101wn to the community for health care professionals. Asking $134K.

4025 SAN JOSE GP FACILITY

Great opportunity for a start up practice in a 1,029 sq. ft. fully equipped state-of-the-art 6 op. dental office in desirable San Jose location on a well traveled street and highly visible modern building in high-tech area. 6 ops. w/modern equipment. Assignable long term lease. Asking $250K.

4007 FREMONT PERIO

SOLD

Seller retiring from 30 year est. Periodontal practice in 3 op facility located in medical/dental building on well-traveled avenue in commercial neighborhood. Strictly Perio - no implants. Great starter practice opportunity, turnkey operation with equipment and no construction hassles. 2012 GR $133K+ w/just 1 Dr. day/week. Avg. 8 new pts. per month, 6 pts. per Dr. day & 7-8 pts. per hygiene Asking $75K.

4011 SANTA ROSA GP

SOLD

Seller is changing careers and offering a well-established and successful practice. No insurance contracts, 4 doctor day/week & attractive 1,700 sq. ft. office close to downtown. 2012 $576K+, 2013 on schedule for $612K+ as of June. Asking $450K.

4014 SAN FRANCISCO GP

SOLD

Seller has a sterling reputation throughout the community, and is ready to retire. Facility has 3 fully-equipped ops, reception area, business office, private office, lab + sterilization area, x-ray room, dark room + storage and bathroom. Asking $125K.

4018 NAPA COUNTY GP

SOLD

Seller retiring from a profitable, well-established Napa County practice w/large & loyal patient base. Located in 2,750 sq. ft. office w/6 modern fully-equipped & upgraded ops. including digital x-ray in each op. 2012 GR 1.7M+ & 2013 GR on schedule for 1.8M+ as of October. Asking $1.4M.

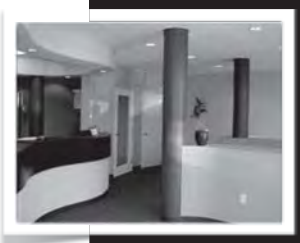
3094 NORTH BAY PERIO

SOLD

North Bay Perio now available. Seller retiring from well-est. practice with seasoned staff and active referral base. 2,100 sq. ft. very nice office with 4 fully- equipped operatories. 2012 GR $450K+ with just 3 1/2 doctor days and 5 days of hygiene per week. Great upside potential since owner does few implants. Asking $271K.

UPCOMING:

MARIN COUNTY GP
SANTA CRUZ GP
SANTA ROSA GP
SOLANO COUNTY GP & BLDG



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IMAGING

Preoperative CBCT imaging in treatment planning for impacted third molars

Matzen LH, Christensen J, Hintze H, et al. Influence of cone beam CT on treatment plan before surgical intervention of mandibular third molars and impact of radiographic factors on deciding on coronectomy versus surgical removal. *Dentomaxillofac Radiol* 42: 98870341, 2013.

Clinical problem: Injury to the inferior alveolar canal (IAC) is a complication of surgical extraction of impacted mandibular third molars, especially when the tooth is in contact with the IAC. Currently, panoramic imaging is most often used to assess the relationship between the tooth and the IAC. More recently, CBCT imaging has also been used to provide 3-D information. Depending on this information, the surgical technique may be modified to perform a coronectomy to minimize IAC damage.

Aim: To assess the contribution of CBCT imaging in surgical treatment planning for impacted mandibular third molars.

Methods: One hundred and eighty-six mandibular third molars were imaged by panoramic radiography combined with stereo-scanography, and with CBCT. The treatment plan (surgical extraction versus coronectomy) was formulated using each imaging modality individually.

Results: In 12 percent of the cases, imaging findings from the CBCT examination altered the treatment plan from surgical extraction to coronectomy. The following anatomical features were important considerations in the decision to pursue coronectomy: contact between the tooth root(s) and the IAC, narrowing of the canal lumen and location of the IAC in a groove on the root/root dilaceration.

Conclusions: CBCT imaging is important in formulating a treatment plan for management of impacted mandibular third molars.

Bottom line: Certain anatomical features, such as close proximity to or direct contact between the tooth root and mandibular canal, should be imaged by CBCT, preferably using a limited field of view protocol. This 3-D information has the potential to alter the treatment plan and minimize the risk of potential injury to the IAC.

– Sanjay M. Mallya, BDS, MDS, PhD, and Sotirios Tetradis, DDS, PhD

ENDODONTICS

Genetic predisposition for periapical disease

Menezes-Silva R, Khaliq S, Deeley K, Letra A, Vietra AR. Genetic susceptibility to periapical disease: conditional contribution of MMP2 and MMP3 genes to the development of periapical lesions and healing response. *J Endod* 38(5): 604-607, 2012.

Aim: The purpose of this study was to examine how genotypic variations in specific genes might influence the development and persistence of periapical disease.

Methods: The patient populations for this study were selected by reviewing radiographs for the presence of deep carious lesions, with or without associated periapical radiolucencies. A population of 268 patients was identified, and each gave consent to DNA characterization by salivary sampling. The group was divided into the control group (deep carious lesion, no apical radiolucency) and the case group (deep carious lesion, apical radiolucency). Each patient's DNA sample was analyzed for genotypic variants of matrix metalloproteinase enzymes (MMP) 2, 3, 9, 13 and 14, as well as tissue inhibitor of metalloproteinases (TIMP).

Results: A significant correlation between the presence of a periapical radiolucency and two MMP3 marker genotypes was found. There was also a correlation between an altered transmission of MMP2 marker alleles and the presence of an apical radiolucency.

Conclusions: The findings suggest that markers in the MMP3 as well as MMP2 genes could help predict host susceptibility to developing periapical lesions and the healing response.

Clinical relevance: As genetic screening becomes easier and more practical, individuals at higher risk for development of disease can be identified and counseled about their risks. Understanding the mechanism of the genetic predisposition can also guide future research in therapeutics to more effectively treat and possibly prevent the disease, in this case periapical pathosis.

– Craig Noblett, DDS, MS, FACD

CDA JOURNAL, VOL 42, N°6

PUBLIC HEALTH

The relationship between chronic kidney disease and periodontitis

Ioannidou E, et al. Periodontitis associated with chronic kidney disease among Mexican Americans. *J Public Health Dent* 2013 Spring;73(2):112-9.

Objective: In comparison to non-Hispanic whites, a number of health care disparities, including poor oral health, have been identified among Hispanics in general and Mexican Americans in particular. Additionally, individuals with reduced kidney function have a higher prevalence of periodontitis compared with those with normal kidney function. The authors hypothesized that Mexican Americans with chronic kidney disease (CKD) would have a higher prevalence of chronic periodontitis compared with Mexican Americans with normal kidney function, and that the level of kidney function would be inversely related to the prevalence of periodontal disease.

Methods: The researchers examined this hypothesis using the National Health and Nutrition Examination Survey 1988-1994 (NHANES III) data set, a nationally representative sample. They followed the American Academy of Periodontology/Centers for Disease Control and Prevention case definition for periodontitis. Glomerular filtration rate was estimated using the CKD-epidemiology equation for Hispanic populations. The classification to CKD stages was based on the National Kidney Foundation Kidney Disease Outcomes Quality Initiative.

Results: Periodontitis prevalence increased across the kidney function groups, showing a statistically significant dose-response association ($P < 0.001$). Mexican Americans with reduced kidney function were twofold more likely to have periodontitis compared with Mexican Americans with normal kidney function after adjusting for potential confounders such as smoking, diabetes and socioeconomic status. Multivariate adjusted odds ratio for periodontitis significantly increased with 1, 5 and 10 mL/minute estimated glomerular filtration rate reduction from the mean.

Conclusions: The results showed an increase of periodontitis prevalence with decreased kidney function in this population.

Clinical implications: The study supports the current evidence on the contribution of periodontal infections to systemic inflammation in the general population, as well as in the CKD population with a dose-response association. Persistent periodontal inflammation usually evidenced by elevated serum cytokine levels is considered to be a nontraditional risk factor for the development (or incident) of cardiovascular disease in patients with CKD. The population in general and patients with chronic periodontal conditions/CKD in particular should be advised about the link between the two conditions. Patients with CKD need to be managed by an interdisciplinary team, including oral health care providers.

– Mina Habibian, DMD, MS, PhD

PERIODONTICS

Periapical lesions and oral implants

Lefever D, Van Assche N, Temmerman A, Teughels W, Quirynen M. Aetiology, microbiology and therapy of periapical lesions around oral implants: a retrospective analysis. *J Clin Periodontol* 2013; 40: 296–302.

Background: Symptomatic apical radiolucency, also known as retrograde periimplantitis, is one of the possible early complications of implant therapy. Although various studies suggest different causes for retrograde periimplantitis, the definitive cause has not yet been proven. This retrospective study evaluated the influence of pre-extraction periapical pathosis in the implant site or in the teeth adjacent to the implant site on the development of retrograde periimplantitis. In addition, the authors analyzed the effectiveness of the various treatment procedures and microbial aspects of the lesions.

Methods: Two hundred and forty-eight implants were analyzed in relation to the pre-extraction periapical condition at the site of implant placement and the adjacent teeth. In cases of retrograde periimplantitis, the lesions were treated and in 21 cases, microbial sampling was performed.

Results: The association of different periapical conditions to retrograde periimplantitis was as follows. When there was no periapical radiolucency, periapical radiolucency or endodontic therapy without periapical radiolucency at the implant site prior to extraction, the incidence of retrograde periimplantitis was 2.1 percent, 13.6 percent and 8.2 percent, respectively. Moreover, the same periapical conditions at the adjacent teeth were associated with 1.2 percent, 25 percent and 0 percent retrograde periimplantitis, respectively. Nine of 21 samples cultured bacteria, mainly *Porphyromonas gingivalis*.

Conclusions: The results of this study showed that implants placed in sites that had periapical pathosis present at the time of extraction had a seven times greater risk of developing retrograde periimplantitis than implants that were placed in healthy sites. Furthermore, if the periapical pathosis existed on the teeth adjacent to the implant site, the risk of developing such disease was eight times greater. Additionally, there is not enough evidence to suggest the best treatment modality for retrograde periimplantitis.

Clinical significance: The clinical implication of this study underscores the potential negative outcome of implant therapy at sites or in proximity to sites with a history of periapical pathosis. Careful risk assessment, thorough debridement and resolution of endodontic lesions at or in proximity to implant sites are recommended to reduce the potential negative outcome of periapical lesions around implants. In addition, alternative implant sites may be considered whenever possible.

– Neema Bakhshalian DDS, PhD; Alfonso Gil DDS; and Kian Kar DDS, MS

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SOLD

6052 BERKELEY Trendy north side shopping area. Very strong foundation. 2,000 active patients. 4-days of Hygiene. Beautiful hi tech office with great curb appeal. 2012 collected $590,000. Lots of work referred out.

SOLD

6051 FRESNO'S FIG GARDEN VILLAGE AREA Not a Delta Premiere practice. Collected $430,000 in 2013 on 3.5 day week.

6050 MERCED 2013 trending $360,000. Very profitable. Refers Endo, OS & Perio. Not a Delta Premiere Practice. Great foundation to build upon. Full Price $125,000.

SOLD

6048 SALINAS Great opportunity for the ambitious, Ideal for two Dentists. 10 days of Hygiene per week. 2012 collected $1.1 Million. 2013 tracking $1.2 Million. Practice did well during Great Recession.

SOLD

6047 STOCKTON Best location outside Brookside Community on West March Lane. 2013 collected $530,000. Attractive 3-Op office. Package sale includes condo.

SOLD

6046 PINOLE Collected $[illegible],000 in 2012. 4-days of Hygiene produced $178,600. Beautiful office. Refers Endo. Lots of Goodwill here.

6043 EL SOBRANTE 3-day practice collected $184,000 in 2013. 3-ops. Building optional purchase. Full price $50,000.

ANAHEIM $30,000/mth part-time. 6 ops, $30,000 invested in digital Dentrix upgrade & x-ray system. Full Price $225,000.

ANAHEIM HILLS Group member needed. GP has space to share with Specialist.

APPLE VALLEY – HESPERIA AREA Grosses $700,000+, nets approximately $350,000. 8 Ops. Can do $1 Million. Full Price $595,000.

BAKERSFIELD AREA Grossing $400,000. Full Price for practice & building $350,000.

BAKERSFIELD Grosses $800,000. 5 Ops. Successor should do $1Million. Low overhead. Full Price $500,000.

DENTURE CENTER Grosses $1.3 Million. Patients not given option for implants. Full Price $1 Million. Specialist can take to $2 Million.

HEMET Grosses $650,000 part-time. Will do $1,000,000. 10 op office. Full Price $585,000.

HMO 3 Practices grossing $6 Million. $52,000 cap checks/mth. One includes RE.

HUNTINGTON PARK 98% Hispanic. Grosses $600,000. Low overhead. 4-ops.

LANCASTER Proven hi identity location only. Seller needed more room. 2-ops. Full Price $55,000.

NEVADA RESORT AREA Grosses $600,000 on 3-days. Beautiful office. Needs more days. Full Price $600,000.

PASADENA AREA Grosses $900,000 part time. Did $1 Million+ with more time. Hi identity building also For Sale. REDLANDS Low overhead digital 4 Ops. Gross $300-to-$400K first year. Full Price $285,000.

REDLANDS Bank Repo! 4 Ops. Hi identity. Practice operating. Bargain at $285,000. Make Offer.

RIVERSIDE Grosses $860,000+. Can do $1.5 with right Buyer. Digital 10 Ops in hi identity center near Walmart. Full Price $800,000.

SAN DIEGO 4 Practices doing $2 Million. Absentee Owner. Buy one or all.

SAN FERNANDO VALLEY Part-time $300,000+. Full time will do $500,000. Building also available.

SAN FERNANDO VALLEY – BEST HISPANIC LOCATION 7 Ops & room to grow. 70 New Patients/mth. $2 Million location. Practice $1 Million, Building $1.75 Million.

SAN FERNANDO VALLEY HMO Grossing $1.6 Million. High end area where patients have discretionary income.

SANTA ANA Hi identity strip center. 3 Ops, low overhead, Grosses $200,000.

SOUTHERN CALIFORNIA $4.5 Million Gross. HMO. Prestigious hi identity.

SOUTH ORANGE COUNTY Two Practices, one Grossed $950,000 in 2013. One is beautiful 5 ops, other 5-ops in shopping center. Major employer across street.

TORRANCE - GARDENA Conservative Chinese DDS. Refers lots of work. Chinese/American Successor will do $600,000 first year. Bargain at $185,000.

VICTOR VALLEY Hi identity shopping center practice. Conservative Lady DDS nets $350K on Gross of $700K. Can do more.

YUCCA VALLEY Hi identity 600 sq.ft. 2 op building on .44 acres, zoned for additional home plus apts. Full Price $110,000.

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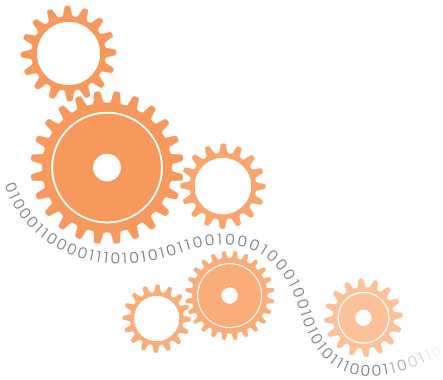

A look into the latest dental and general technology on the market

Revictionary (Nikaash Puri, Free)

Revictionary is a word app for Android users only that goes beyond a dictionary or thesaurus. The app allows users to look up a phrase and find a word that matches that phrase. The home screen is simple and to the point. At the top, users can type in any word , thought or feeling. Below that, users can click the "Revictionary it" button, which will search for phrases or words that are similar in nature. For example, type in "moving fast" and users will get results such as "sped," "swifter," "whip through" and "outrun." The Revictionary it button is the only button on the home screen that requires Internet access. The "Solve Crossword" button allows users to type incomplete words into the search bar using dashes as the missing letters and Revictionary will come up with possible words. For example, type in "r- - - -f" and the results churn out "rebuff," "relief" and "runoff." (Talk about a Scrabble lover's dream.) The app also includes "Rhyme it" and "Anagram it" buttons, and of course, a "dictionary" button. Revictionary uses the WordNet database of words from Princeton University. The database consists of 100,000 English words, according to the Revictionary developer. Revictionary is a unique tool that goes beyond the simple dictionary app.

– Blake Ellington, Tech Trends editor

Medium (A Medium Corporation, Free)

Medium is a new reading app currently available only for the iPhone, enabling users to read and recommend user-generated stories, essays and articles. Signing in is done via Twitter. It's been billed as a sort of YouTube for text, where the experience is tailored to the readers' interests based on their Twitter accounts. Medium creates an individualized experience by using the people the user follows on Twitter and collecting popular stories based on followers. The user experience is fairly easy and straightforward. Browsing through stories is done by swiping endlessly to the left or right. Stories are arranged in no particular order and are very mixed in terms of genre. Currently, there is no search function. At the bottom of each story the author is visible, so users can select and view other stories by a given author. Bookmarking, sharing and recommending articles is available and users can contribute their own content as well, though not through Medium at the moment.

– Darien Hakimian, DDS

Office for iPad (Microsoft, Free to download; $9.99 per month for Office 365 Home service)

The suite of Microsoft Office apps finally makes its introduction to the iPad and does not disappoint. Users need not wait any longer for full-featured standalone versions of Office apps. Word, Excel and PowerPoint have all been built from the ground up for the tablet platform, making full use of the touchscreen interface. The apps are free to download as viewers and Office 365 subscribers can unlock the apps to their full potential. Many users will find little to criticize when comparing these apps with their desktop counterparts. Beautiful templates grace the main screen when users start new documents. Users can save files to the cloud on OneDrive or locally on their iPad. Each app comes with a full complement of Office-compatible fonts to ensure cross-platform compatibility. Saved files can be shared via email attachments or links to the files on OneDrive. The touchscreen interface is innovative, yet familiar. Menu items that users are accustomed to from the desktop are unobtrusively part of the suite of apps. Selecting a menu item will load the appropriate toolbar underneath. Each toolbar contains a full complement of tools, not just stripped down versions for mobile apps. Selecting text or objects is consistent with iOS functionality and relevant contextual options appear when a selection is held. Pinch-to-zoom and rotation gestures can be applied to pages and objects, respectively. There are no compromises with these apps when including Excel functions and PowerPoint transitions. Users can display PowerPoint presentations in full widescreen quality from the iPad when directly connected to a projector. Users will find Word, Excel and PowerPoint for iPad to be notable replacements for their respective desktop apps. Productivity is not compromised, due to the subtly perfect combination of a familiar user interface with the ease of using touchscreen gestures. With Office for iPad, users now have more reasons to be free from their desktop computers.

– Hubert Chan, DDS

Would you like to write about new technology?

Dentists interested in contributing to this section should contact Tech Trends Editor Blake Ellington at blake.ellington@cda.org.

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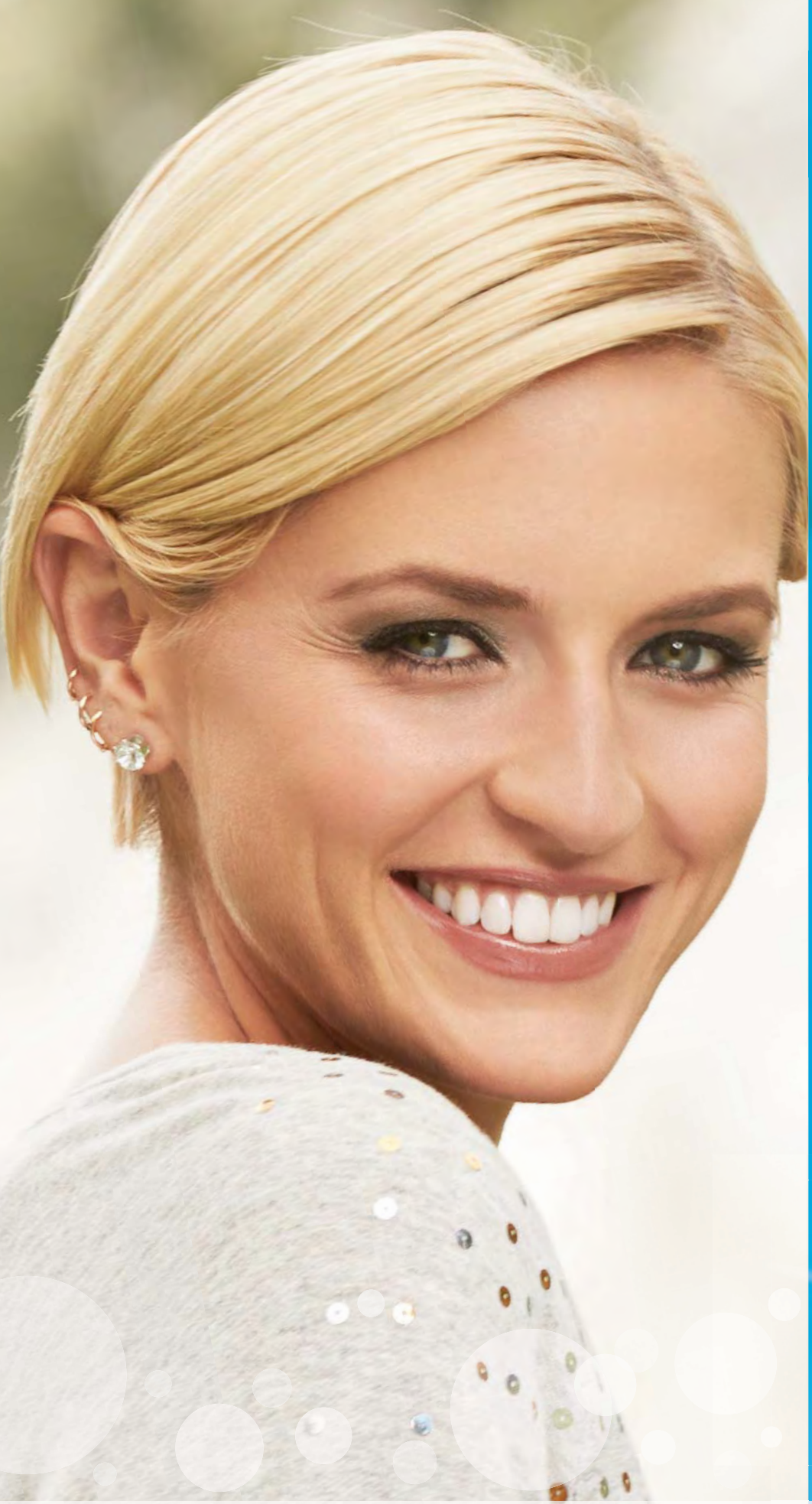

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