Designing Computer Systems From the Ground Up

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Most of us add computer technology in measured, deliberate steps, nudged and nurtured along by the experience of our colleagues. But what if you were designing a whole new office and wanted to ensure your computer technology was as up to date as the rest of the physical facilities? You and your staff could suddenly find yourselves dealing with computerized appointment scheduling, operatory computing, digital radiography, "chartless" patient records, and the nuances of computerized practice management all at one time! The building blocks to ensure success are the same (Table), but applying all of these steps rapidly and simultaneously to all the various computer modules requires careful coordination and planning.

Critical thinking, being open to new ideas, and attention to the 5 building blocks of computer integration all contributed to the ultimate success in this oral and maxillofacial surgery group practice.

Table. Five Steps for Success in Dental Computing.*

(1) *Stable, Reliable Infrastructure.* For networks with more than 5 computers, a dedicated server computer running Microsoft Small Business Server 2003 and using RAID technology for redundant hard drives is recommended. On workstations, use Microsoft Windows 2000 Pro or Windows XP Pro. After the first 30 days, most problems are caused by software, not by hardware. Adding software, including upgrades of existing software, frequently destabilizes dental computers! Evaluate each proposed change carefully.

(2) *Multiple, Tested, Off-Site Daily Data Backup.* In-office, computer-to-computer backups are easy to set up and essentially free, but should always be supplemented by an off-site "clone" or "duplicate" computer, usually located in the dentist's home. The daily data backup is transported to the clone by any one of several very good media (CD, DVD, external hard drive, Internet transfer), then restored and tested at least weekly. Testing is the most critical part of backup!

(3) *Internal and Internet Security.* Your patients' privacy is now your responsibility. The days of no passwords are over. "Strong passwords" comprising at least 8 alphanumerical nonsense characters are recommended to protect access to a dental computer system. For Internet protection, you need a firewall, antivirus protection (perimeter hardware firewall with automatically updated antivirus is preferred), and anti-spy software. Your staff should be instructed never to open e-mail attachments unless they are expected ... and then only with extreme caution.

(4) *State-of-the-Art Computing.* An optimally computerized dental office requires software from several different vendors. Making good software choices is tough but can be made easier by visiting dentist-oriented Web sites such as the Internet Dental Forum (internetdentalforum.com) or DentalTown (dentaltown.com). Ask questions about the products you are considering, and you will probably get some very insightful answers!

(5) *Training, Training, Training!* It is not hard to spend $50,000 to $100,000 on hardware, software, digital radiography, etc, but you will end up with nothing but "shelfware" if no one knows how to use it. Training is the most essential part of your investment. Don't skimp on either the time or the money involved. You and your staff should take notes and ask for written handouts from your trainers. Human memory fades fast.

**Clip-and-save summary of the article's main points. Additional discussion of each of these topics is available at PaperlessDentistry.com.*

That is just what this 3-doctor group of oral and maxillofacial surgeons did—and did very adroitly. Drs. Jeff Clayton, Ron Takahashi, and Jerry Wang already had a very successful, long-established oral surgery practice when they decided to build an entirely new office suite in the same building, which would be designed just the way they wanted it from the ground up (Figures 1 and 2). Realizing how critical information and time management are in any business, they wanted to incorporate cutting-edge (but not bleeding-edge) computer technology. The building blocks and processes they used are useful to the rest of us who proceed on a more relaxed schedule.

STABLE INFRASTRUCTURE

"If we were going to entrust all our records to a computer, we wanted to be sure we had a very reliable system," noted Dr. Takahashi. "We wanted a central, dedicated file server that was as fail-safe as possible. We didn't want to buy a Ferrari; we wanted to buy a Brinks armored truck. But it's difficult for a dentist who is unfamiliar with current business computing standards to make an appropriate, cost-effective choice. Fortunately, we have an active dental computer-study group in our area, so we had a local resource of experienced dentists, IT (information technology) people, and consultants. There are 2 other 'chartless' dental practices in our same building. This was not a big jump into the unknown for us. It was a logical progression to a more efficient way to provide care. We could see that information flow through the office is just as important as patient flow or instrument flow. It needs just as much thought and architectural planning."

"We needed to be sure it worked all day, every day," added Dr. Clayton. Even though their 20-computer network is small by most business standards, it still needed modern operating systems for stability. The old Windows 95 and 98 had to go. "Because new computers are so inexpensive, we were better off replacing all of our old machines. Again, the advice from the local dental computer-study group, our IT person, and our consultant saved us a substantial amount of money and ensured we got the appropriate computers. Having these resources as we planned the office was very helpful." (For a list of the specific equipment, software, products, and people used in this practice, visit PaperlessDentistry.com, then click "Oral Surgery.")

BACKUP: "ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS!"

"You can't talk to a computer user for more than a few minutes without hearing some backup horror stories," added the third partner, Dr. Wang. "They all seem to end sadly. Nobody tested the backup until it was too late ... then it failed. We wanted to be sure our new office did not contribute any stories to this genre. California is supportive of computerized patient records but requires off-site data backup. We wanted to make it even safer, so we have an entire 'duplicate' computer off site, and we transfer the data to that system every day. If the entire office burned to the ground, we could have all our patient records, including all our x-rays, available again in 30

minutes. Because the off-site computer has all our 'stem cells' (copies of our software installation CDs), we can use it to clone a whole new office full of computers. We test our data backup frequently on the off-site computer, and we test our stem cells by using them every time we install a new workstation. We know our backup system works because we test it."

INTERNAL AND INTERNET SECURITY

Ignorance of proper computer security can put any dentist using computers at risk. Protecting patients' private information used to be just a matter of good locks on the doors. If someone broke in with the intent to steal information, it would take quite awhile to get very much by searching through one paper chart at a time. But computers have made this "identity theft" much easier and more prevalent. Any computer used for billing has all of the patients' information, including birthdates and social security numbers, and is neatly organized in one place. A bank in California was recently badly embarrassed in the press when a computer containing confidential customer data was stolen. Dental practices that do only the most basic things with their computers are most at risk for this type of exposure because they tend not to update their software or procedures.

"California has a privacy law that requires a physician or dentist to inform patients if their confidential data is made public. I know of one case where a physician had to send a letter to all his patients when his computer was stolen," notes Dr. Clayton. "By using newer operating systems such as Windows XP and strong passwords, we can make it very difficult for even a dedicated identity thief to access our data. There is no security with Windows 98. It's like leaving your patient files sitting on the street. But this internal security was not our only concern. We know of all the threats coming from the Internet with virus attacks, hackers, and the growing problem of spyware programs like 'key-loggers.' They can be silently installed on a computer by simply visiting a harmless-looking Web site. What if a nefarious person in some distant part of the world was watching your front office person type in patient information? We have protected our office system with a hardware firewall that also has a 'corporate-level,' automatically updated antivirus and antispyware subscription. Soon we will start encrypting the e-mail and radiographs we send to our referring doctors. I don't know which of these things will be required by the new HIPAA regulations, but these seem to be common sense to us."

STATE-OF-THE-ART DENTAL COMPUTING

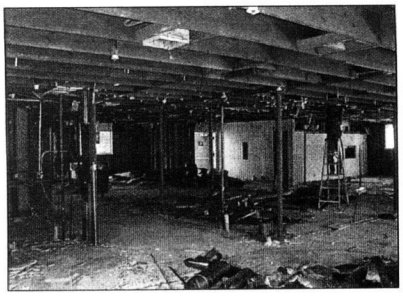
Stable infrastructure, tested off-sight backup, and security precautions provide the underlying structure for all modern dental computing systems. But it is the dental components that are more interesting to most of us.

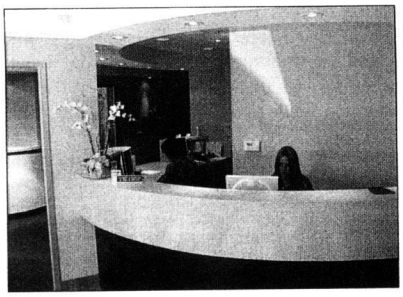
"We sat down with our key staff and paperless consultant to discuss every one of our office systems, from the first telephone call through the final

continued on page 146

Designing Computer Systems...

continued from page 145





Figures 1 and 2. These oral surgeons literally built a new office from the ground up. The time and effort spent planning the physical space and the computer systems ensured an exceptional result.

communication back to the referring doctor. How could we use computers to improve these paper-based systems?" comments Dr. Clayton. "We knew we would have to use software from several different sources to get the best results, and it was important for these various programs to work together. What the dental computer vendors tout as 'integration' is called 'interoperability' by the computer industry. And the more proprietary a software product is, the harder it is to make it interoperate with other software. We also wanted our data to be as 'open' as possible because we recognize how important data mining is becoming in dentistry. The proprietary data formats used by some dental software make it very difficult to get this information back out."

"Because medical histories and patient consents are so important, we wanted to see what was available to improve our old, paper-based systems," adds Dr. Wang. "We found a program called MedicTalk DentForms (MedicTalk Software, medictalk.com), which does this very nicely. It fully integrates with our practice management software so we don't have to re-enter information, and it allows the patient to fill out and electronically sign a completely computerized medical history, consent form, financial agreement, HIPAA, treatment options discussion ... virtually any form we can dream up. The completed form can be printed to paper for the patient to take home, but the encrypted, secure copy is stored and backed up in our database. These types of records are accepted by courts and are used in some hospitals. It eliminates all the paper forms we used to have to deal with (Figures 3 and 4). A quick glance at one screen shows us which forms the patient has signed and which forms still need to be finished. It even supports translation into some other languages. We were really impressed by how much easier and more organized it is using this software. It saves time, it saves money, it saves paper, and it allows us to provide better, safer patient care."

"This is also true with our clinical charting on the computers," interjects Dr. Takahashi. "I have to admit, with our old paper charts there were days I didn't get all my charting done. Charts backed up on my desk, stressing me and making our staff's jobs harder. Computer clinical charting is so fast and requires such little effort, I now get it done before the patient leaves the operatory. Like our consents, it is stored instantly, legibly, and securely in our computer system. We know that there is still a real horserace going on as far as dental computer products are concerned. It was tempting to just sit back until the clear winners were established. But, while waiting, we would miss all the advantages of the top products here today."

TRAINING: GROUND SCHOOL AND FLIGHT SCHOOL

"Getting our staff on board was easier because of the 2 other 'chartless' dental practices in our building. Our staff could talk with their staff. And we were coached by our paperless consultant, so what we were doing didn't seem so alien. We had some dental software trainers come in before we moved to help the staff with some 'ground school' that they might have been shown but had forgotten because they never used it. Then, just before we actually moved, we spent time in the new office 'flight training' before we actually put patients on our airplane. This rehearsal was very beneficial.

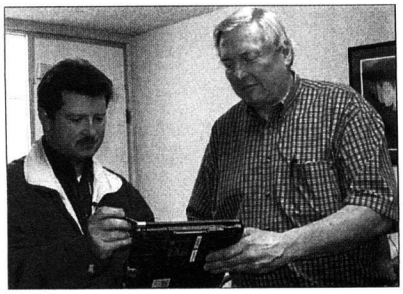


Figure 3. Alex Furer, founder of MedicTalk, shows the author how patient and doctor signatures can be added using a wireless tablet PC computer. Any paper form can now be signed and stored electronically. A brief video about MedicTalk can be viewed at PaperlessDentistry.com/MedicTalk.

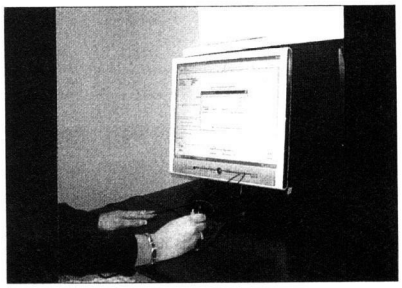


Figure 4. A small, inexpensive signature pad is another device that can be used to collect electronic signatures. It is easily connected by USB to an existing computer.

It made the staff more comfortable, as they saw that they really could do all this stuff, and it allowed us to work out some of the unforeseen kinks in the system. For example, some of our staff used to spend a lot of their time searching for and refiling paper charts. Or waiting for then searching through our paper appointment book. Those jobs are completely gone now. We had very good staff input on how that time could be better spent. Another suggestion from our consultant was to make our office more 'user friendly' to our referring doctors by putting the current ADA recommendations for premedication protocols on our Web site. It's not only useful but free! These flight-training and group-thinking exercises provided a lot of valuable insights we didn't have to come up with ourselves."

CONCLUSION

Critical thinking, being open to new ideas, and attention to the 5 building blocks of computer integration all contributed to the ultimate success in this oral and maxillofacial surgery group practice. These same principles can be applied even in the smallest solo practice, proceeding with computers at a more leisurely pace. "To fail to plan is to plan to fail" is certainly true. However, even the best plan never accomplished anything all by itself. At some point, "analysis paralysis" has to stop, and "just do it" has to start. Like it or not, we need to practice both technology and dentistry to succeed and to prosper. Fortunately, as this office illustrates, there is now an abundance of people and information available to help us.✦

Dr. Stephenson is a graduate of the University of California at Berkeley and University of California at San Francisco Dental School (1977). He bought his first dental computer in 1979 and has been lecturing, consulting, and writing about dental computing since 1985. He maintains a 4-day-per-week paperless restorative practice in San Leandro, Calif. To reach him or for a free copy of his dental computing newsletter, visit PaperlessDentistry.com or call (510) 483-2164.

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