



Teledentistry: A New View on Oral Health Care

**By Susan Elliott-Smith from interviews conducted
by Christine A. Hovliaras-Delozier, RDH, BS, MBA**

Video conferencing technology reduces the distance between patients and oral health care providers while it expands access to treatment for underserved communities.

The snowy, below-zero day in rural Minnesota did not keep the patient from her scheduled appointment with an orofacial pain specialist. Getting to the office on such a day would prove to be challenge enough, not to mention the trials of finding a specialist within a 350-mile radius of the patient's hometown. Fortunately for this patient, technology and a local link connected her to a specialist right in her hometown.

Current video conferencing technology – what is called teledentistry in the oral health field – made it possible for this patient to be in the exam chair in a quarter of the time it would have taken her to travel to a specialist, and it only required a few clicks of a computer mouse.

Teledentistry launched in 1994, according to Rocca, citing Vandre, when the U.S. Army conducted its first study using 15 periodontal patients.¹ The patients were first referred to Fort Gordon, Ga., for surgery. One week after surgery, each patient reported to Fort McPherson, Ga., for suture removal – a site located 120 miles away. Using a dental image management system in conjunction with an Intra-oral camera to capture color images of each patient’s mouth, the staff transmitted images from Fort McPherson to Fort Gordon. Only one of the 15 patients needed to return to Fort Gordon. The group’s overall consensus was that they received better care than normal and were quite pleased with the elimination of the long trip.¹

Teledentistry is the next phase of oral health care. While the futuristic term may conjure images of an anti-gravity operatory located on the International Space Station, what it amounts to is technology that most of us use in everyday life.

“I wouldn’t say it’s something that’s in the future; it’s right now,” said James Friction, DDS, MS. He explained that teledentistry has an audience: oral health practitioners who collaborate with specialists and community partners. It is simply a matter of spreading the word about the technology.

Hong Chen, DDS, MS, who works with Friction in the University of Minnesota School of Dentistry in a teledentistry program, agreed.

“I think this will be beneficial once people get used to the system,” said Chen. “Think about many years ago how telephones affected people. [Teleconferencing] is the same way. Ten or 20 years down the road, teledentistry will be a routine of life. It’s not scary and complicated. If you know how to turn on a television or how to make a phone call or how to fax something, you can learn this,” Chen concluded.

What Is Teledentistry?

Teledentistry, as defined by the staff at Apple Tree Dental, Minneapolis, Minn., is the use of technology to link a front line oral health provider working in a community setting with a dentist in an office to facilitate effective, efficient oral health care. Apple Tree Dental provides care at special care clinics and uses customized mobile dental offices to deliver on-site care at collaborating community sites in urban and rural areas.

Michael Helgeson, DDS, BS and chief executive officer of Apple Tree Dental, estimates that 600,000 Minnesotans are not able to get the dental care they need, with many people facing barriers that prevent them from traveling to traditional dental offices. He asserted that teledentistry strengthens the ability of the dental team to reach more people through what his team



The Apple Tree Dental team poses with community health partner Colleen Brickle, RDH, RF, EdD, of Normandale Community College in Bloomington, Minn., far left. Apple Tree team members include, beginning second from left, Jayne Cernohous, DDS, Michael Helgeson, DDS, BS, and Deborah Jacobi, RDH, MA.

refers to as “community collaborative practice”—a term used to describe health care beyond private practice. It is dental care delivered to the community via organizations such as Head Start centers, local schools, nursing homes, group homes, and/or sheltered workshops.

Now in its fifth year, Apple Tree’s teledentistry program has moved away from using teledentistry only as a referral system towards integrating it as a key component of a comprehensive delivery system. Apple Tree Dental has a history of being early adopters, especially when it comes to communication technologies, according to Helgeson. Apple Tree has also pioneered bringing oral health care to places where people live, work, go to school, or receive other health and social services.

“[Teledentistry is] very effective and efficient, especially in rural areas for where dental appointments are scarce,” said Deborah Jacobi, RDH, MA, director of policy and advocacy for the group. “You’re not making healthy people make long drives for multiple dental visits, and the people that do have disease are going to be able to be seen more rapidly...because the system is less clogged with healthy people.”

The group’s efforts are supported by individual donors, foundation grants, and corporate sponsors. Jacobi added that Minnesota Department of Health Clinical Dental Education Innovation Grant linked Apple Tree with Minnesota’s Head Start program. Working with student dental hygienists from Normandale Community College in Bloomington, Minn.,² the team designed a school-based teledentistry project that allows students



Apple Tree Dental’s community health partner Colleen Brickle, RDH, RF, EdD, of Normandale Community College in Bloomington, Minn., assists a student with a teledentistry exam at Ridgeview Elementary in Minnesota.



Apple Tree Dental's portable equipment is set up in local elementary schools. The dental team, working with dental hygiene students from Normandale Community College in Bloomington, Minn., offer teledentistry services to children.

to prepare for the future and local children to receive regular dental care, said Colleen Brickle, RDH, RF, EdD, of the college.

"Teledentistry gives students an experience other than the private dental office settings," Brickle said. "With the shortage of dentists, we learned about teledentistry as a way to fully utilize dental hygienists."

Challenges

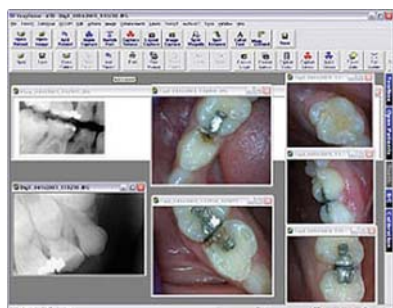
Incorporating students into teledentistry programs helps to clear one of the first hurdles of this new technology: getting out the word about it. Both the Apple Tree Dental team and those involved in teledentistry at the University of Minnesota work energetically to communicate its benefits to practitioners and their patients. Building trust among oral health care professionals once they know the technology exists can be a further challenge.

"[The teledentistry exam] is not a face-to-face or hands-on exam," said Chen. "You have to rely on your judgment of the other practitioner's exam. They have to try it several times to get more confident."

Productivity can be another issue as new practitioners become accustomed to the technology. "[Teledentistry] initially takes a longer time compared to their regular office visits," said Chen. "When they get used to the system, they get ... more efficient."

Apple Tree Dental has used two approaches to bring

teledentistry into welcoming community venues (to review the steps of a typical teledentistry appointment, see sidebar on page 11). Helgeson explained that the first approach is a live session where the dental hygienist and the dentist, from different locations, review the same electronic images of the patient's mouth, as well as dental and medical records, in real time via a videoconference. The Apple Tree team soon



This image from a computer program used in teledentistry reveals the images and information that a dental hygienist would collect and send to a dentist for review using the store-and-forward method.

stopped using this format because of its expense and the difficulty of obtaining a reliable bandwidth for live video at community locations.

The second approach the team utilized is a method called "store-and-forward." It involves collecting all the patient information and images and storing that data for review by a dentist specialist at a later time. At that time, the dentist reviews and synthesizes the information into a set of diagnoses and a treatment plan.

For the University of Minnesota School of Dentistry team, live video conferencing is at the core of the services they provide. Working with general dentists in remote locations, the University of Minnesota team focuses its efforts on patients with complex issues from temporomandibular joint (TMJ) disorders, orofacial pain and oral medicine conditions like dry mouth and lesions, to oral habits and behavioral problems that affect the oral cavity and create a need for physical therapy.

The school's teledentistry program, which began in 2004, combines both the store-and-forward method of patient evaluation and straightforward teleconferencing that allows Friction to interact live with a patient who may be as far away as an eight-hour drive. Friction accesses records from a variety of different locations as he conducts the video consultation.

"The video conferencing actually allows me to do a consult directly with a patient ... as if they're sitting right next to me," said Friction, who has 30 years of clinical expertise with patients who experience persistent jaw pain, facial pain and headaches.

The University of Minnesota's program operated for two years on an annual co-dental education innovation grant from the state of Minnesota, which helps increase access to dental care for underserved populations in remote areas through dental schools and training programs. One partnership the University of Minnesota team formed is with the Hibbing (Minn.) Community College. The resulting Hibbing Community College Dental Clinic, located 200 miles north of Minneapolis, attends to the underserved families of four counties. This partnership seeks to provide excellent clinical training for oral health practitioners, help address oral health care needs of underserved patients, and increase the long-term supply of dentists in greater Minnesota. Jerome Pedersen, DDS, Director, Hibbing Community Dental Clinic, commented that the clinic treats between two and six patients each week.

"[The] numbers depend on appointments scheduled, not only for consults with the University, but also patient visits that I have in the patient's continuing treatment plan," said Pedersen, who added that he has had positive comments from the patients, especially in regard to travel time and costs associated with going to the university.

"We have been able to help all the individuals that have seen us through teledentistry in one way or another," stated Pedersen. All but one of the practice's patients, who was referred to a local specialist and achieved improvement there, have experienced improvement in their oral health situation.

A Typical Teledentistry Appointment

What does the teledentistry visit look like?

It begins much like a standard first dental visit. The dental hygienist records the patient's medical and dental histories, performs an oral exam and turns the visit over to the dentist or specialist. The difference comes at this point. The dentist or specialist might review the data gathered by the dental hygienist hours later. Or the dentist will "step in" to the patient's appointment via a computer monitor or television screen.

Relying on a visual communications system, an Internet link and a digital or intra-oral camera, and sometimes digital radiography, a general dentistry practice in a remote area may offer the on-site services of a metropolitan specialist. It all comes down to technology, and patients of all ages are experiencing and enjoying it.

The initial teledentistry patients for Apple Tree Dental, Minneapolis, Minn., and Normandale Community College in Bloomington, Minn., have been children, although plans to expand teledentistry for disabled adults and elders are under way. Using a method called store-and-forward, the dental hygienist will conduct onsite exams in a school or in one of the state's Head Start centers.

Deborah Jacobi, RDH, MA, director of policy and advocacy for Apple Tree Dental, explained that the program also uses a telehygiene assessment to summarize a child's oral health status, ability to cooperate for dental care, a number of risk factors and other relevant information.

"With this teledentistry exam we know very accurately what needs we're going to be following up on," said Jacobi, describing how the store-and-forward method unfolds. Using a laptop computer, a USB-compatible intra-oral camera and the software, the dental hygienist carefully completes a patient triage and stores data for later review by the dentist.

"The entire process of care is more efficient for everyone, for the dentist, for the hygienist, for the Head Start facility staff and for the patients themselves," said Michael Helgeson, DDS, BS, chief executive officer of Apple Tree Dental.

In a similar manner, patients participating in the University of Minnesota teledentistry program first complete questionnaires about primary health complaints and medical/dental histories at their local dental clinic. The local dentist then will examine the patient and record for the university team what he or she finds.

Because the University of Minnesota team primarily treats TMJ and oral facial pain patients, they train dentists and dental hygienists who take part in the teledentistry program on the finer points of the orofacial exam, which is different from a regular dental exam. The dental hygienist or den-

tist forwards information by fax or through electronic record. With the information in hand, Friction joins the appointment via videoconference. Right away, he works to put the patient at ease.

"There are a lot of little things that you do to... engage [patients]. All those subtle things that go into developing a rapport with the patient so they feel confident in the information they're getting," Friction said.

The University of Minnesota teledentistry team uses the Sony PCS-TL50 Visual Communications System – equipment that is set up at both the School of Dentistry and a remote site at the Hibbing Community College Dental Clinic.

The unit resembles a typical desktop computer, with a 20-inch widescreen display that doubles as a PC monitor.¹ Hong Chen, DDS, MS, who works with Friction in the University of Minnesota School of Dentistry in a teledentistry program, noted that other manufacturers, such as Polycom (www.polycom.com) and Tandberg (<http://www.tandberg-conferencing.com/> Tandberg Conferencing), offer different viewing screens with their teleconferencing systems. The smaller, more portable PCS-TL50 offers the greatest flexibility for both teams. With this equipment, the team in Hibbing can display the UM team while working on another PC application.

"We also need either an intra-oral camera or just a digital camera that can hook up to the computer," explained Chen, who also mentioned that most of the manufacturers that offer this expensive equipment also provide a 24-hour help line as well as service contracts to troubleshoot problems. In addition to providing patient

services, the University of Minnesota team uses the teleconferencing equipment to train students and oral health care professionals, according to Chen.

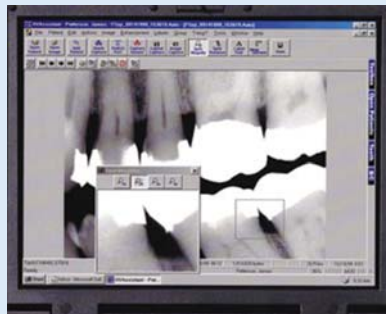
"We have staff training through this teleconference so that they don't have to travel. This system helps facilitate communication. It's much better than a telephone call," Chen concluded.

Resources

The Sony Corporation Web site, www.sony.com. For more information on the PCS-TL50 Visual Communications System, visit http://bssc.sel.sony.com/BroadcastandBusiness/docs/brochures/pcs_tl50.pdf



Jayne Cernohous, DDS, reviews a patient's digital X-rays. The information was gathered at an earlier appointment and later shared with Cernohous, who then came to the patient's next visit with a treatment plan ready.



The onscreen capture of a patient's digital X-ray is what the dentist might review after the patient's initial visit with a dental hygienist in a community location.

Apple Tree Dental, Minneapolis, Minn.

Apple Tree's programs provide care at special care clinics and use customized "Apple Tree Mobile Dental Offices" to provide on-site care at collaborating "Community Sites" in urban and rural areas. During 2006 alone, more than 14,000 patients received over 48,000 dental visits plus nearly 7,500 screenings valued at over \$8.4 million. Low-income children were served in schools and Head Start centers, adults with special needs were served in their group homes and frail elderly were served in nursing homes and senior assisted living centers. The Apple Tree Dental Institute carries out clinical innovations projects, educational collaborations, and policy and advocacy projects.

University of Minnesota School of Dentistry

Located in the heart of the Minneapolis-St. Paul metropolitan area, the University of Minnesota School of Dentistry is an integral part of the University's comprehensive Academic Health Center. As the only dental school in the state – and the only dental school between Wisconsin and the Pacific Northwest – it is a regional resource to five states for dental education, consulting services, patient treatment, and ongoing continuing dental education. The school educates dentists, dental hygienists, dental specialists, dental educators and dental researchers; it is home to the only dental hygiene baccalaureate program in the state that is associated with a dental school.

With more than 50,500 active patients on file, the School of Dentistry is a major provider of dental services. Students and faculty treat 1,000 patients a month in the school's 377-operatory campus clinics. Students also serve thousands of underserved patients in area nursing homes, aboard a mobile dental unit that travels the state, and in community-based educational facilities in the metropolitan area and in greater Minnesota. The school's reputation for clinical excellence is complimented by its international reputation for contributions to the understanding of fluoride and decay prevention, microbiology and oral-facial genetic anomalies, biomaterials, periodontal disease prevention, pain control, oral cancer and effective care delivery.

"[Teledentistry] provides that general dentist up in Hibbing, Minn., an extramural location for the University Minnesota School of Dentistry," Fricton concluded.

There have been at least 10 faculty members from the University of Minnesota School of Dentistry involved in the project, from general dentists to specialists in TMJ, orofacial pain, oral medicine, health psychology, physical therapy, dental radiology, and endodontics, said Fricton. In addition, at least six others – orofacial pain residents and dental students rotating in the Hibbing Dental Clinic as observers – have been involved.

Fricton also explained that the school currently plans to use dental hygienists to collect histories and examination data for use by remote specialists to allow for consults in rural or remote parts of the state that are supported by dental hygienists, but not dental specialists.

"Since much of the management of TMJ, orofacial pain, oral medicine, physical therapy, health psychology is based on instruction, this model is particularly well suited to dental hygienists to provide this instruction and will be more practical and cost effective than use of the dentist," said Fricton.

Community Impact

For the University of Minnesota patients whose chronic conditions require on-going treatment, teledentistry offers great convenience and consistent care. "Those patients always have to drive 200 or 300 miles one way to us to see a doctor," Chen explained. Approximately 12 patients involved in the University of Minnesota's teledentistry program make an average of 22 visits in the course of their care.

"They really love [the teledentistry program] because otherwise it is very difficult for them to get access to the care," said Chen. These patients give the service a high rating on surveys. An average teledentistry visit is less than two hours, compared to the 18 to 19 hours and 230-mile trip the patients would travel to the Minneapolis-St. Paul metro area.

"I'm sure most of these patients will not be able to travel all the way down to University of Minnesota and they just go on suffering," Fricton added. "We're providing outreach services that are very unique and provide really good public relations for the school of dentistry." In addition, the service educates professionals and their patients about existing medical conditions that impact oral health.

"A lot of general dentists are confused about facial pain conditions, oral medicine and dry mouth," Fricton continued. From the public health perspective, it is advantageous to spread the word about conditions that are not difficult to diagnose.

"There are major dental conditions that fall between the cracks of medicine and dentistry. Medicine and neurology as well ENT have addressed these to some extent, but dentistry has really taken the responsibility more to providing care," Fricton continued.

Apple Tree Dental's small patients are enthusiastic about teledentistry services. Dental hygienists, armed with an intra-oral camera no larger than a toothbrush and a laptop computer, interact with young children in a non-threatening environment that helps everyone relax and expedites the examination process. Because today's children have grown

up in the technology age, seeing their teeth and mouth on screen makes the exam more fun and stimulates questions and dialogue about their oral health.

“Kids generally have little or no health history because they’re just too young, and their most common problem is caries, so they’re very amenable to this technology,” said Helgeson.

“I’ve recorded some videos of hygienists collecting images for a teledentistry exam, and what you see is ... the kid glued to the monitor as they’re looking at enlarged pictures of their own teeth,” said Helgeson. “It’s such a great way to talk about what’s going on in their mouth, much better than them staring at the ceiling.”

Helgeson stressed that most patients feel that the quality of a teledentistry exam was equal to or superior to a traditional exam. He shared that in a telemedicine conference he attended, a lecturer discussed a survey of psychiatric patients in a telemedicine program who reported higher treatment satisfaction when they met with a local front line practitioner and then used a live telemedicine link with a psychiatrist, than after a traditional visit in a psychiatrist’s office. The patients felt better prepared because of the time spent with the front line practitioner, which made the videoconference time with the psychiatrist more effective.

“We’ve all had that experience where you go to the doctor, get back home and [realize] you forgot to mention a symptom or ask an important question in the rush of [the appointment],” said Helgeson.

Gaining Momentum and Getting Involved

Keeping the momentum of teledentistry programs relies a lot on the funding the programs receive. A portion of the funding for the University of Minnesota teledentistry program comes from a state grant that was established as a result of legal settlements between tobacco companies and the state for health-related issues that stem from tobacco use.

Fricton reported that the state had to send out a Response for Applications to engage potential teledentistry programs. In addition to the funding the University of Minnesota receives, it also charges for consults just as they would in a clinic setting. “It’s provided some funds to continue the program,” Fricton said.

For Apple Tree Dental, 2007 will see the addition of two NOMAD handheld X-ray units, thanks to a grant from



With an intraoral camera no larger than a toothbrush, images of a patient’s mouth can be gathered in a community setting and transferred to a dentist’s office for evaluation.



A dental hygiene student from Normandale Community College in Bloomington, Minn., takes digital x-rays during an elementary school teledentistry exam. Digital technology makes record storing and sharing more convenient.

Tom’s of Maine, a manufacturer of personal care products. These handheld X-ray machines will make it possible to obtain X-rays on a variety of patients who have special needs.

Grants and funding aside, Helgeson expressed that widespread change is needed to move teledentistry to its full potential. First, he said the practice should be viewed as a clinical innovation. Then, teledentistry programs needed to move throughout the oral health educational system. Finally, to

ensure the program’s success, there must be a push for policy changes and advocacy, particularly in the area of funding reform.

The beneficiaries of teledentistry will not only be the vulnerable patients who aren’t able to obtain care in traditional dental practices, but the oral health teams that can work together in exciting and productive new ways.

“Hygienists are already well trained to be the frontline oral health practitioner in this new model for care,” asserted Helgeson. “They are optimally skilled in patient education, prevention, assessment and triaging care, as members of a collaborative oral health team.” Helgeson recommended that dental hygienists who want to become actively involved in treating children adults or elders with special needs consider joining the Special Care Dentistry Association (SCDA) or visiting its website at www.SCDOonline.org.

Jacobi added, “Teledentistry allows the dental hygienists as that oral health care practitioner to create a new entry point to the dental care system that’s at the right time, in the right places.” She checked off a list of skills sets necessary to successful teledentistry, from establishing a collaborative agreement and learning digital radiography, to using an Intra-oral camera and electronic dental records.

“I think medicine has done a far better job than dentistry at looking at how to effectively reach people,” Jacobi continued. She offers as an example the public health immunization programs for young children. “They didn’t say, ‘And we want you to each individually call an office and make an appointment.’ They did outreach. Now you can go to an accessible location and receive that service,” Jacobi said. She viewed teledentistry as one means for oral health care to

achieve the same widespread impact. She encouraged dental hygienists to get involved.

“Look at what the needs in your community are, look at what the resources are and then use teledentistry, use collaborative practice, and create new relationships that effectively meet the needs of your community,” said Jacobi. “That’s satisfying and exciting for everyone.”

“Both the University of Minnesota and the School of Dentistry have a strong commitment to community outreach, and today’s advances in technology expand access to University resources for communities in greater Minnesota,” commented Patrick M. Lloyd, DDS, MS, Dean of the University of Minnesota School of Dentistry. “Whether that takes the form of distance learning or conferencing and consultations, the opportunity to share our expertise in patient care is a win-win for patients and their health care providers.”

He further commented that the school is still in the process of reviewing the program’s utilization, costs and outcomes. With an expansion of community-based education programs, distance learning and consultations has come the potential to become an even more effective vehicle for educating students and practitioners, and for enhanced student familiarity with learning from afar.

“[This] will make them more comfortable with distance learning as practitioners,” asserted Lloyd.

The teledentistry program also has the added advantage of re-connecting practicing professionals with their dental school, Lloyd added.

“As the increasing complexity of patient care for an aging population requires more and more that professionals work together across the full spectrum of health care disciplines, we’re able to consult with colleagues in other institutions and health care professions, as well,” Lloyd concluded.

Fricton viewed dental hygienists as key players in teledentistry in part because of a shortage of dentists in rural areas, but also because of the close relationships dental hygienists develop with their patients.

“[Dental hygienists] are responsible as these primary caregivers to be able to recognize when new problems come up that are beyond just dental or tooth problems. It’s not just cleaning the teeth, but it’s maintaining the whole oral facial health of the individual,” he said. “What we have found is the hygienist is the ideal person to be able to collect the data that we need to properly do a consult. I can sit and talk to the patient with a video conferencing system very easily, but what I can’t do is examine the patient.”

Resources

1. Rocca M, Kudryk VL, et al. The evolution of a teledentistry system within the Department of Defense. American Medical Informatics Association (www.amia.org; paper available at <http://www.amia.org/pubs/symposia/D005388.PDF>). See also: Vandre RH, Kudryk VL, et al. US Army Teledentistry. I.E.E.E. Proceedings of the National Forum: Military telemedicine on-line today:

research, practice, and opportunities, I.E.E.E. Computer Society Press, Los Alamitos, CA. 1995;53-6.

2. For more information on the community collaborative concept of oral health care, visit this Web site link within the Normandale Community College: <http://www.normandale.edu/dental>. This area of the Normandale site will connect you to resources such as a collaborative agreement form, grant funding information, how to bill for services, and for Medicaid, state guidelines on unsupervised practice and much more.

Additional Resources

Tracy J. A guide to getting started in telemedicine. University of Missouri – School of Medicine, 2004. Available at: <http://telehealth.muhealth.org>.

Special Care Dentistry Association, visit the Web site at: www.specialcaredentistry.org.



Colleen M. Brickle RDH, RF, EdD, graduated from the University of Minnesota in 1976 and has been a practicing dental hygienist for the past 30 years. Her passion is for innovation and creating a future in which dental hygienists are able to take on a variety of exciting new roles that will bring access to care to those who need it most. For the past 20 years, her primary role has been as a dental hygiene educator, but she still works as a clinical dental hygienist in private practice and volunteers each week in the Normandale Community Dental Clinic.

Brickle is currently on sabbatical but has served as the dental hygiene program chair at Normandale Community College for the past four years and has taught many different courses within the dental hygiene curriculum as well as many continuing education programs.



Hong Chen, DDS, MS, is co-investigator and project coordinator for the Teledentistry Project at the University of Minnesota School of Dentistry. She received graduate training in TMD/ Orofacial Pain and in Health Informatics. She is currently in part-time practice at the Minnesota Head and Neck Pain Clinic. Dr. Chen is an active member of the American Academy of Orofacial Pain, the American Dental Association and the Minnesota Dental Association.



James Fricton, DDS, MS, is a professor in the Department of Diagnostic and Surgical Sciences in the University of Minnesota School of Dentistry. He also has a clinical appointment in the Department of Physical Medicine and Rehabilitation and department of Health Informatics in the School of Medicine. Since 1980, Fricton has dedicated full-time effort in patient care, research and teaching in at the School of Dentistry with a focus on the field of temporomandibular disorders (TMD) and orofacial pain. In 1978, he graduated with a BS and DDS from the University of Iowa and completed a two-year post-graduate training in chronic pain management in the Department of Anesthesiology at UCLA School of Medicine in 1980. He also received a MS from UCLA in Oral Biology and training in TMJ disorders and orofacial pain at UCLA School of Dentistry during the same period. A prolific writer and researcher, Fricton also has held positions with a number of prestigious universities. He is currently director of NIDCR’s TMJ Implant Registry and Repository.



Michael Helgeson is chief executive officer of Apple Tree Dental. Apple Tree's community collaborative practice model has been replicated in North Carolina and Louisiana and has received recognition from the Surgeon General, the American Dental Association, Oral Health America and the Robert Wood Johnson and Kellogg Foundations. Helgeson served as project executive for the Minnesota Oral Healthcare Solutions Project, bringing together Minnesota's leaders in community health and dentistry to redesign the state's broken Medicaid program. Helgeson's educational background includes completing BS and DDS degrees, followed by a two-year post-graduate program in geriatric dentistry, and a mini-MBA program in nonprofit management. Helgeson has served as past presidents of both the American Society for Geriatric Dentistry and the Special Care Dentistry Association.



Deborah Jacobi, RDH, MA, is a 1978 graduate of Hawkeye Community College's Dental Hygiene Program, Jacobi's dental hygiene career has included private practice in Iowa, Wisconsin and Switzerland. She received a bachelor's degree in sociology with a Concentration in Analysis and Research and a master's degree in Public Policy and Health Administration from the University of Wisconsin - Madison. Upon completion of her graduate studies, Jacobi joined the U.S. Public Health Service / Billings Area Indian Health Service. In Minnesota for the past 10 years, she has played a variety of roles in helping promote the optimal utilization of dental hygienists to improve access to oral

health care. She is currently the director of policy and advocacy for Apple Tree Dental.



Patrick M. Lloyd, DDS, MS, is the dean of School of Dentistry at the University of Minnesota. He is a graduate of Marquette University School of Dentistry, and he earned his certificate in prosthodontics from the VA Medical Center in Milwaukee, Wis., as well as a Master of Science from the Graduate School of Marquette University. After completing his specialty training, Lloyd directed a fellowship in geriatric dentistry at the Milwaukee VA Medical Center. In 1987, he was appointed to serve as National Coordinator for Geriatric Dental Programs for the Department of Veterans Affairs. In 1992, he joined the faculty at Marquette University, where he was director of the Special Patient Care Clinic and the Wisconsin Geriatric Education Center. He was chair of the Department of Family Dentistry at the University of Iowa from 1996 to 2003. He a past-president of the American College of Prosthodontists (ACP) and was, for 10 years beginning in 1993, the editor-in-chief of the *Journal of Prosthodontics*, the official journal of the ACP. Lloyd is a diplomate of the American Board of Prosthodontics and a fellow of the American College of Prosthodontists and the Gerontological Society of America. His professional interests are in the area of geriatric dentistry. He lectures on a variety of issues related to caring for the older adult and publishes articles on treatment strategies for the aged dental patient.

lowship in geriatric dentistry at the Milwaukee VA Medical Center. In 1987, he was appointed to serve as National Coordinator for Geriatric Dental Programs for the Department of Veterans Affairs. In 1992, he joined the faculty at Marquette University, where he was director of the Special Patient Care Clinic and the Wisconsin Geriatric Education Center. He was chair of the Department of Family Dentistry at the University of Iowa from 1996 to 2003. He a past-president of the American College of Prosthodontists (ACP) and was, for 10 years beginning in 1993, the editor-in-chief of the *Journal of Prosthodontics*, the official journal of the ACP. Lloyd is a diplomate of the American Board of Prosthodontics and a fellow of the American College of Prosthodontists and the Gerontological Society of America. His professional interests are in the area of geriatric dentistry. He lectures on a variety of issues related to caring for the older adult and publishes articles on treatment strategies for the aged dental patient.

