

# CDA

Functional Training  
Working Postures  
Pain Relief

JOURNAL OF THE CALIFORNIA DENTAL ASSOCIATION VOL 33 NO 2

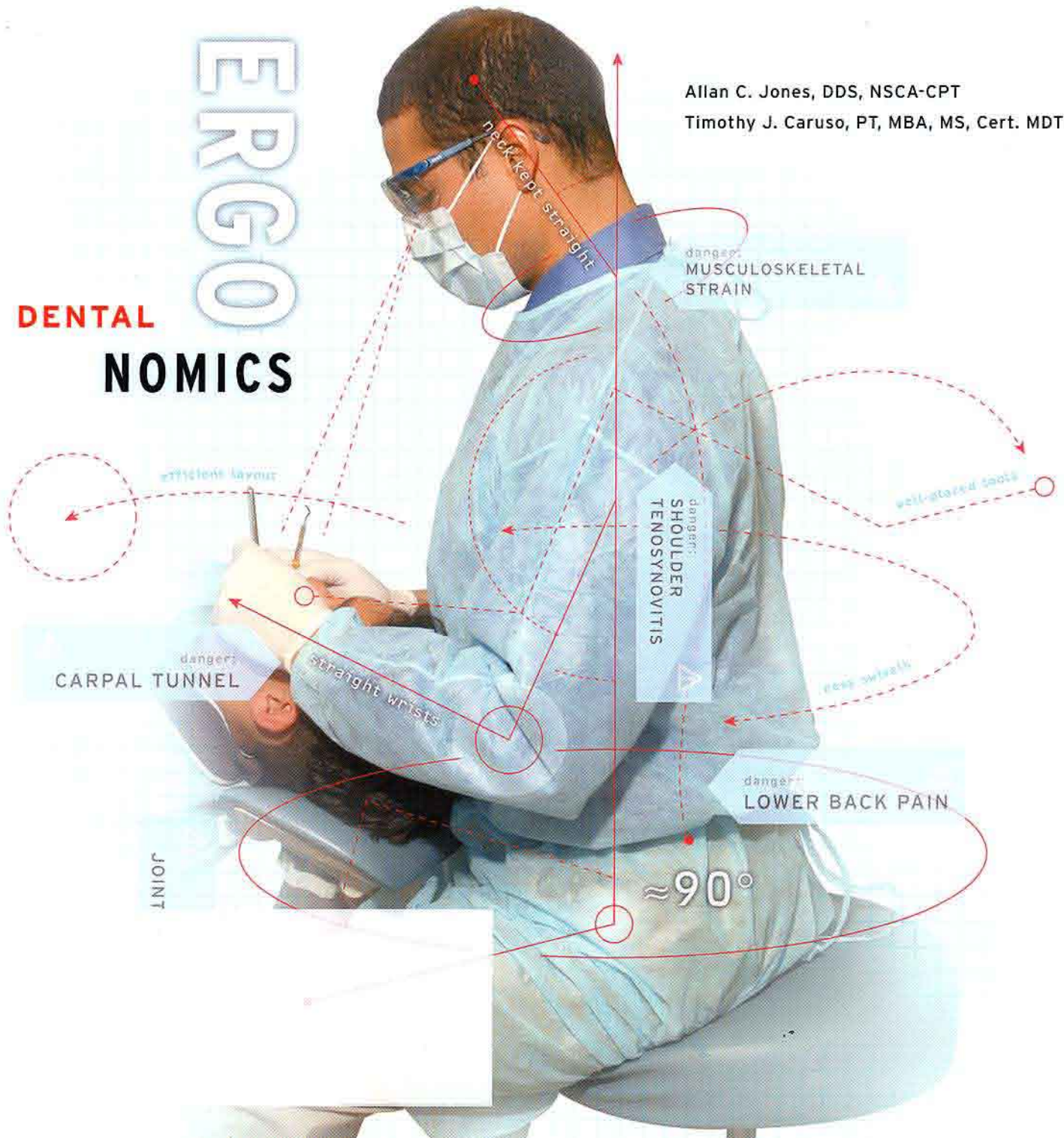
February 2005

## ERGONOMICS

**DENTAL**  
**NOMICS**

Allan C. Jones, DDS, NSCA-CPT

Timothy J. Caruso, PT, MBA, MS, Cert. MDT





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# Fifteen (or so) Things We Love About Dentistry

**I**n a recent issue of *Back-packer*, there was a list of 50 things we love about camping and the outdoors. In fact, it was more than a list; it was actually the entire issue. If there are 50 things we love about the outdoors, surely there must be an equal number of things we love about our profession. Due to space constraints, however, we had to pare down our list. With that, we offer 15 (or so) things we love about dentistry.

**Cast gold.** What could be better than inspecting a highly polished MOD inlay onlay with perfect occlusal anatomy, and finding the margins imperceptible to the sharpest explorer? Then finding out it was placed 35 years ago by your predecessor. Forget porcelain and composite, that is esthetic dentistry.

**Oral pathologists.** Let's face it. Oral pathology was one of those courses in dental school you could only cram for. As our training turned from the academic to the clinical, oral pathology was that last remaining purely scientific hurdle we had to jump in order to graduate. So the night before an exam, we got together in our study groups, ordered Domino's Pizza, loaded up on caffeine, projected our oral path slides onto a wall and tried to tell the difference between benign keratosis and cellular atypia. Most of us don't understand why anyone would make a career out of oral pathology; perhaps they find H and E stain intoxicating or simply enjoy playing with microscopes. Whatever the reason, we're glad they like taking the hunks of soft tissue we send them, slicing them up, and seeing what they're made of. And we're glad they can tell the difference between benign ker-

atosis and cellular atypia so we can call Mrs. Jones and tell her with confidence that she doesn't have oral cancer.

**Eugene Sekiguchi**, ADA immediate past president. Spend two minutes talking with him and you'll understand.

**Porcelain.** This is a material that has climbed many rungs on the prestige ladder. What once was relegated to use in bathtubs and toilets now adorns the smiles of the majority of the adult population. It has a remarkable ability to be transformed from a rather useless and unattractive powder into those beautiful little nuggets that look like teeth, and keep our patients happy, their smiles healthy and attractive, and our schedules full.

**Lab technicians.** The men and women responsible for creating the aforementioned nuggets of porcelain, as well as those made of gold, composite and whatever the material *du jour* happens to be. In the art and science of dentistry, they are the Van Goghs and the Renoirs. Like most good artists, they can be temperamental. However, they make it up to us by serving as our default scapegoat when there is a poorly fitting restoration or a mix-up in the due date, even when it is not their fault. Thus, our relationship flourishes. Besides, if it weren't for lab technicians advancing their craft, we would still be cementing crowns that look like Chiclets.

**Bob Horseman.** Those other journals may have their erudite wordsmiths, distinguished scientific researchers, and academ-



If it weren't for lab technicians advancing their craft, we would still be cementing crowns that look like Chiclets.



We love our profession, but a job is still a job and the weekend is still the weekend.

ic giants on their editorial boards. But damn it, WE HAVE HORSEMAN!

**Computers.** OK, so they crash in the middle of Monday morning, your software company gets bought out — four times — and they become obsolete within weeks of installation. But with the integration of digital radiographic and photographic technology, we can do things today we could not even conceive of 30 years ago. Besides, would you rather go back to a schedule in a three-ring binder, a pegboard system and your old Smith Corona typewriter?

**Nitrous oxide.** A gas composed of three simple atoms, yet it has allowed countless numbers of patients with high anxiety about dental treatment to safely and comfortably receive the care that they need. Note: Our research uncovered possible other uses by our colleagues who were young adults between the years 1967 and 1971. Such uses purportedly involved balloons and Jimi Hendrix records. Use of nitrous oxide in such a manner, if it ever occurred, cannot be recognized nor condoned in a professional scientific journal.

**Arthur Dugoni.** (See Sekiguchi entry.)

**Oral surgeons.** Sure, they may not be known for giving the most atraumatic injections, but we will forever be amazed at the ease with which they can flick out a lower third molar with a dilacerated root that is halfway imbedded into the ramus.

**Fridays.** We love our profession, but a job is still a job and the weekend is still the weekend.

**Dental society and association staff.** Although they are (with few exceptions) not dentists and never see the inside of our offices, these men and women are our extended staff and work as hard at dentistry on our behalf as we do.

**CDA Scientific Sessions.** Take your pick, San Francisco or Anaheim. Cabernet sauvignon, foie gras and the symphony, or beer, burgers and the House of Blues. Culture elegance and sophistication or Mickey, Donald and Goofy. Whichever city

you attend in, you can obtain world-class continuing education, shop for any and all items related to dentistry, get together with colleagues; and it's all a tax deduction.

**Dental school deans.** They're flamboyant, opinionated, and stubborn. They never do what we tell them. They're a slave to those alumni with bottomless checking accounts, but they are also a slave to excellence in the profession. They are visionaries and seemingly tireless leaders. They manage to orchestrate students, staff, faculty, and alumni in a grand symphony that advances the profession by preparing tomorrow's dentists and adding to the body of knowledge. While we are grateful for what they do, most of us would not dare wish for their job.

**Bill Emmerson and Sam Aanestad.** Giving up your dental practice to run for statewide public office? Are you kidding? That alone gets them on the list even if they hadn't won.

**Endodontists.** It's 3:30 p.m. Friday. You're getting ready to go fishing for the weekend in the High Sierras. Your patient walks in with an abscessed upper second molar. The roots are thin, the canals are conjoined and the patient can barely open wide enough for the X-ray due to the pain. Are you going to pick up the handpiece or the telephone?

**Optimism.** While complaints and negative comments about the profession sometimes garner more attention than they deserve, there is an overwhelming preponderance of optimism in dentistry. We seem to love our profession and it shows.

We would like to know what other things our members love about the profession. If you would like to add to the list, address your comments to the associate editor.

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*CDA has recently reorganized its e-mail system. All comments, letters or questions should now be addressed to the editor at [alan.felsenfeld@cda.org](mailto:alan.felsenfeld@cda.org). The previous address is no longer valid.*

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Illustration: Polly Powell

## Report Finds Claims Against Amalgam Lack Scientific Evidence

**a** review of seven years' worth of scientific studies concludes there is insufficient evidence “of a link between dental mercury and health problems, except in rare instances of allergic reactions,” according to a report released last December by the Life Sciences Research Office, Inc., in Bethesda, Md.

The Life Sciences Research Office conducted the independent scientific review of dental amalgam at the request of a work group made up of representatives from the National Institutes of Health, Centers for Disease Control and Prevention, Food and Drug Administration, and the U.S. Public Health Service. Established in 1962, the Life Sciences Research Office is a nonprofit, in-



### For More Information

The executive summary of the "Review and Analysis of the Literature on the Potential Adverse Health Effects of Dental Amalgam" is available on the Life Sciences Research Office website at <http://www.lсро.org>.

dependent organization with a worldwide network of experts who study issues in biomedicine, health care, nutrition, food safety and the environment.

The report, "Review and Analysis of the Literature of the Potential Adverse Health Effects of Dental Amalgam," updates and reaches the same conclusion as two earlier reviews by the U.S. Department of Health and Human Services. The American Dental Association estimates that 71 million amalgam restorations were placed in 1999, the most recent year for which statistics are available.

The basis of the Life Sciences Research Office report is a review of nearly 1,000 papers from peer-reviewed scientific literature. All peer-reviewed human, animal, and in vitro studies published since the beginning of 1996 that investigated the biochemical, behavioral, and/or toxicological effects resulting from exposure to dental amalgam, mercury vapor (Hg<sub>0</sub>), inorganic mercury (Hg<sub>2</sub><sup>+</sup>), or organic mercury (methyl and ethylmercury) were considered. The expert panel and the Life Sciences Research Office adopted the U.S. EPA's General Assessment Factors (2003) to select relevant articles of significant scientific merit from the initial pool of 961 articles. These assessment factors provided a framework for evaluating the soundness, applicability and utility, clarity and completeness, uncertainty and variability, and evaluation and review of the published information.

Approximately 300 of the studies met criteria for scientific merit and study design and were used to construct the final report. In addition to the literature gathered by the Life Sciences Research Office and the expert panel, recommendations submitted by the public in response to a federal Register Request for Information on Dental Amalgam were considered, as were oral and written public comments submitted by parties interested in the issue. The report involved a multidisciplinary panel of experts in fields such as tox-

icology, allergy, pediatrics, epidemiology, and pathology.

Based on a weight of evidence evaluation of the literature published between Jan. 1, 1996, and Dec. 31, 2003, the expert panel and the Life Sciences Research Office came to the following conclusions:

- There is insufficient evidence to support a correlation between dental amalgam exposure and kidney or cognitive dysfunction; neurodegenerative disease, specifically Alzheimer's disease and Parkinson's disease; or autoimmune disease, including multiple sclerosis.

- Various nonspecific complaints attributed to dental amalgam have not been shown to be due to increased mercury release and absorption from dental amalgam.

- Mercury exposure from dental amalgam in the general U. S. population is low, but increases with the number of dental amalgam restorations.

- Long-term use of nicotine chewing gum combined with intense chewing habits and greater than 20 dental amalgam surfaces have been shown to have more impact on exposure to mercury vapor than bruxism or dental amalgam placement and removal.

James B. Bramson, DDS, ADA executive director, said the Life Sciences Research Office report "further substantiates the ADA's position, based on science and clinical experience, that dental amalgam is a safe, effective material to fill cavities.

"Countless teeth have been saved by using amalgam, one of the most durable and affordable cavity filling materials available, especially for large cavities in the back teeth where chewing forces are the greatest."

The report concludes there is little evidence to support a causal relationship between mercury filling and human health problems. The authors noted, however, that many research gaps existed and, if addressed, could finally settle the dental amalgam controversy.



## Photodynamic Therapy Possible Option for Treating Periodontal Diseases

Periodontal researchers have found that photodynamic therapy is advantageous for suppressing anaerobic bacteria that lead to periodontal diseases, according to a recent study in the *Journal of Periodontology*.

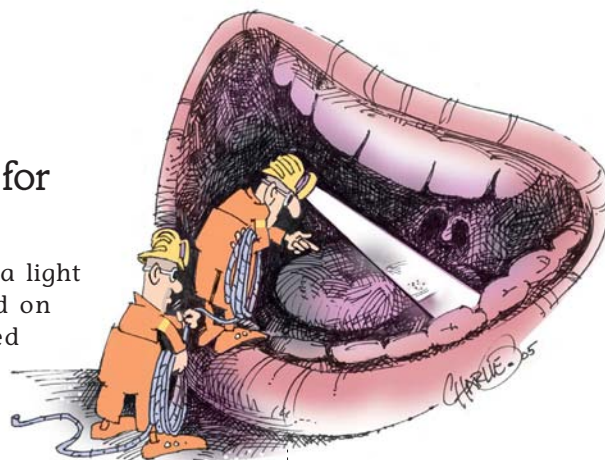
"Although this study is still in its early phase, with the recent number of reports about bacterial strains becoming resistant to frequent doses of antibiotics, PDT could be an alternative to conventional periodontal therapeutic methods," said Michael P. Rethman, DDS, MS, and president of the American Academy of Periodontology. "Antibiotics may be used as an adjunctive therapy for periodontal diseases, so there is a pronounced interest in the development of alternative antimicrobial concepts."

In the first stage of photodynamic therapy, a light-sensitive drug is applied. In

the second stage, a light or laser is shined on the area treated with the drug.

When the light is combined with the drug, phototoxic reactions are induced, destroying bacterial cells. The Food and Drug Administration approved photodynamic therapy in 1999 to treat pre-cancerous skin lesions of the scalp or face.

"The photosensitizers we investigated were able to completely suppress the anaerobic key pathogens leading to periodontal diseases; however, facultative anaerobic bacteria tested responded to a lesser extent to PDT," said Dr. Bernd W. Sigusch, Friedrich Schiller University of Jena, Conservative Dentistry, Germany.



## Mood Disorder Medications Have Dental Side Effects

Those undergoing treatment for mood disorders may experience adverse dental side effects, according to a study that appeared last fall in *General Dentistry*.

Mood disorders are a group of mental conditions, including bipolar disorder and depression, that affect up to 37 percent of adults at some point in their lives.

Early diagnosis and treatment can greatly reduce the risk of suicide, but medications for treating mood disorders can result in dry mouth, an increased rate of periodontal disease and caries.

"Many patients who are taking antidepressants will have dry mouth," said David. F. Halpern, DMD, and AGD spokesman.

"In an effort to curtail any tooth decay, we stress with patients the importance of maintaining an extremely high level of oral hygiene care by brushing, flossing and daily fluoride therapy," Halpern said.

Sipping water during the day and chewing sugarless gum can help treat dry mouth. Halpern also suggested artificial saliva substitutes such as liquids, gels, and sprays. Those with dry mouth should contact a dentist for an evaluation appropriate solution.

Preventing gum disease includes removing plaque through brushing daily, flossing and professional cleaning.

Major depression generally lasts eight to nine months if the individual is not treated. James W. Little, DMD, lead author, said, "If treated, it will take about one to three weeks to begin to feel better and get rid of thoughts of suicide."

Psychotherapy and antidepressants are common treatments. Bipolar disorder is treated with antidepressants and mood stabilizers to prevent manic episodes. When medication and psychotherapy are coupled, more than 60 percent begin to notice improvements.



**“Employers are advised to take the temperature of their workplace and prescribe new retention strategies before they face the consequences of losing great talent.”**

Rhonda Lipsey

## Health Services Workers Experiencing Overload

It is a continuing struggle to manage the growing workloads, health services workers reported in an online survey. In an industry where quality of care and attention to details are essential, 53 percent report their workloads have increased in the last six months; with 41 percent describing their workloads as too heavy. Forty-five percent of these workers say they are working under a great deal of stress.

The CareerBuilder.com survey, “The Pulse: Health Services Workers,” was conducted from Aug. 5-24, 2004, of more than 140 health services workers.

“Health services workers know they’re in demand and are not likely to stay with an employer who is not affording a positive work experience,” said Rhonda Lipsey, healthcare employment expert at CareerBuilder.com.

“One-fourth of health services workers plan to change jobs by February. Employers are advised to take the temperature of their workplace and prescribe new retention strategies before they face the consequences of losing great talent,” she said.

Sixteen percent of health services workers say they searched for a new job on a weekly basis; 33 percent said their No. 1

criteria in looking for a potential employer is stability, followed by reputation for fairness (12 percent).

The top three factors motivating job changes for health services workers are the desire for better compensation, more career advancement opportunities, and an improved balance of time spent at work and home. Thirty-nine percent of health

services workers said they are dissatisfied with compensation, with 44 percent reporting they did not receive a raise last year; 30 percent felt there is not much room for upper mobility at

their organization, and 21 percent said they are having trouble managing their work and life balance.

Of those who did not expect to change jobs, 11 percent said they are staying with their employer for the benefits, while 10 percent said it is due to the fear of the unknown.

In collecting data for the survey, CareerBuilder.com commissioned SurveySite to utilize an e-mail methodology where those who are members of the SurveySite Web Panel were randomly selected and approached by e-mail invitation to participate in the online survey.



## Imported Mineral Water Provides Excellent Source of Calcium

An Italian mineral water new to the United States is the only bottled water deemed a “good source of calcium” by the Federal Drug Administration. Drinking eight glasses of the all-natural, lightly effervescent Sanfaustino provides up to 80 percent of the adult calcium required daily allowance.

“With osteoporosis on the rise, it is increasingly important to get adequate calcium in your diet,” said Joseph Lane, medical director of the Metabolic Bone Disease Service and Osteoporosis Prevention at Cornell’s Hospital for Special Surgery in New York City. “But the fact is, high calcium foods do not always fit into the rapid lifestyles of Americans. The beauty of Sanfaustino is that you can get small amounts of calcium continuously throughout the day. And because of the properties inherent in water, the natural calcium content is absorbed in the most efficient way.”

Italians have enjoyed Sanfaustino since 1895. It comes directly from a one-of-a-kind mountain spring in Umbria that generates lightly effervescent water high in calcium. It is available at natural food and gourmet stores, and in the natural foods section in grocery stores. Sanfaustino is a carb-free, fat-free, calorie-free and sodium-free alternative to other calcium sources.

“Many of my clients find it a challenge to eat three or more servings of dairy per day,” said Heidi Skolnik, MS, leading nutritionist and sports nutrition consultant. “Sanfaustino gives consumers another delicious nutritious way to meet calcium needs.”



## Dental Care Initiative Launched for Baby Boomers

According to a landmark U.S. surgeon general's report on oral health, approximately 60 percent of Americans older than 50 have dental insurance and most will lose that benefit when they retire and face fixed or reduced incomes.

As the American baby boom generation inches toward retirement, its ranks continue to swell. The 50-plus population was estimated at 27 percent in 2000; by 2020, it is expected to jump by more than 115 million, to about 35 percent, according to the U.S. Census.

"As the 50-plus population continues to grow in numbers, and with the current lack of accessibility, there is a critical need for affordable dental insurance for this population, as well as public information focused on the importance of dental health as we age," said Dawn Sweeney, president of AARP Services, Inc.

To meet those needs, AARP, through its subsidiary AARP Services, Inc., teamed with Delta Dental Insurance Company to create the AARP Dental Insurance Plan and launch a dental care initiative targeting those 50-plus years and older.

"Our members have been asking us for this type of program because they realize the value of continuing dental care," Sweeney said. "However, because of financial limitations, many have had to eliminate regular dental care from their budget."

The AARP plan features comprehensive family coverage and the freedom to choose any licensed dentist. It will initially be available to AARP members in 21 states and D.C. There are plans to make the program available to all 35 million AARP members across the country this year.

The health implications for post-retirement dental care are significant, said Harold C. Slavkin, DDS, dean at the University of Southern California School of



Dentistry and one of the chief architects of the landmark Surgeon General's report which was released in 2000.

"Medicare does not cover routine dental services and, in most states, neither does Medicaid," Slavkin said. "With continued dental care, those who are 50-plus can avoid a myriad of health problems, including tooth loss, gum disease and mouth cancers. With continued care, we can all enjoy a robust lifestyle and a wide range of foods, communicate effectively, maintain self-esteem and meet our social responsibilities within our family and community."

The AARP dental insurance plan provides immediate coverage for the most preventative diagnostic and basic restorative services, as well as endodontics and oral surgery. After a year, coverage expands to include major restorations, periodontics and prosthodontics.

"Dental insurance for retirees and those who are 50-plus is often very restrictive or simply unavailable, said Gary D. Radine, president and CEO of the holding company that includes Delta Dental Insurance Company. "This new program balances the need for immediate benefits with the need for affordable monthly premiums."

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Harold C. Slavkin, DDS



## UCSF Fetal Treatment Center to Receive \$500,000

Rep. Nancy Pelosi, (D-San Francisco), has obtained \$500,000 from Congress to help fund capital costs for the Fetal Treatment Center at UCSF Children's Hospital.

UCSF's fetal treatment team is well-known for pioneering fetal surgery as well as its continuing search for new methods to detect, cure, ameliorate and prevent birth defects.

The new funding supports a centralized location in UCSF's Ambulatory Care Center for advanced prenatal and postnatal care for mothers and infants with birth defects, and their families. Pelosi requested the

funding as part of the Fiscal Year 2005 Omnibus Spending Bill.

"Congresswoman Pelosi's support for this center is an indication of her concern for a better future for children and their families," said Mark Laret, CEO of UCSF Medical Center and UCSF Children's Hospital. "This will allow our specialists, already leaders in care for women and children, to have even better tools for helping these patients."

Michael R. Harrison, MD, coordinating director of the center and founder of the field of fetal surgery, said UCSF's team, combining the efforts of some of the nation's most respected experts in prenatal diagnosis, high-risk pregnancy, neonatology, anesthesia and fetal/newborn surgery, is leading a new standard.

"We are taking the old attitude toward birth defects, of 'wait and see' and replacing it with the more optimistic 'what can we do,'" Harrison said.

The fetal treatment team at UCSF identifies serious birth defects prior to the child being born, working with the mother and her doctors to create a plan for care from the moment the baby is delivered. There are an increasing number of cases in which the defect can be treated before birth.

In 1981, Harrison and his colleagues performed the world's first fetal surgery, and they continue to set the standards for this field.

Expected to open this year, the facility will include web-based telemedicine, and advanced diagnostic and treatment capabilities. Women and their physicians throughout the country already consult UCSF experts about diagnoses of birth defects. The new Telemedicine Global Portal makes the service more interactive and more easily accessible on a national and international basis.

## Upcoming Meetings

### 2005

<b>Feb. 2-5</b>	American Academy of Dental Group Practice Annual Conference and Exhibition, New Orleans, <a href="http://www.aadgp.org">www.aadgp.org</a>
<b>Feb. 24-27</b>	Chicago Dental Society Midwinter Meeting, Chicago, (312) 836-7330.
<b>March 17-19</b>	Thomas P. Hinman Dental Meeting, Atlanta, (404) 231-1663.
<b>April 6-9</b>	Academy of Laser Dentistry 12th Annual Conference and Exhibition, New Orleans, (954) 346-3776.
<b>April 12-16</b>	International Dental Show, Cologne, Germany, <a href="http://www.koelnmesse.de">www.koelnmesse.de</a>
<b>May 12-15</b>	CDA Spring Session, Anaheim, (866) CDA-MEMBER (232-6362).
<b>Aug. 17-20</b>	Sixth Annual World Congress of Minimally Invasive Dentistry, San Diego, (800) 973-8003.
<b>Sept. 9-11</b>	CDA Fall Session, San Francisco, (866) CDA-MEMBER (232-6362).
<b>Oct. 6-9</b>	ADA Annual Session, Philadelphia (312) 440-2500.

### 2006

<b>Oct. 6-9</b>	ADA Annual Session, Orlando, Fla., (312) 440-2500.
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To have an event included on this list of nonprofit association meetings, please send the information to Upcoming Meetings, *CDA Journal*, P.O. Box 13749, Sacramento, CA 95853 or fax the information to (916) 554-5962.



# Musculoskeletal Pain and the Dental Health Care Community

Allan C. Jones, DDS, NSCA-CPT

**T**his issue of the *Journal of the California Dental Association* is an attempt to bring to the dental profession of California, from many useful sources, some of the most helpful information from the current literature on exercise and posture. It is intended to foster the preservation of musculoskeletal health of dental health care workers.

Having been a dentist who has grappled with back and neck pain for more than 20 years, my attempts to understand musculoskeletal pain have been a matter of profound personal interest. I have searched for truthful and useful information from the multitude of sources. As I have taught "Occlusion and Facial Pain" at the University of Southern California for nearly 20 years, most of my searching has been from publications of the facial pain community, the occlusion community, and the health and fitness community. These sources have provided much useful information about the painful conditions that seem to affect so many dental health care workers.

Dentists are well-prepared for understanding pain and dysfunction of musculoskeletal origin, as this knowledge is essential to providing treatment for many dental patients. Our training and academic orientation as dentists give us an academic foundation from which to understand the literature from a vast

array of sources outside of our own field. This is especially true of the scientific literature on exercise from which this article on "functional training" was derived.

My pursuit of useful information regarding spinal pain led me to an organization I regard as the best source on matters related to exercise science: the National Strength and Conditioning Association. Having been certified by this group as a personal fitness trainer, I have been immersed in this world of elite professional coaches for many years. Dentists may benefit enormously from the lessons these individuals have learned regarding posture and fitness. Their prescriptions for exercise are developing and preserving the most talented athletes in the world; they can do the same for dental health care workers.

For the purpose of developing an exercise regimen for dental health care workers, I spent 12 weeks at the Athletes Performance Center in Carson, Calif. Their focus on preventing injury by developing superior posture through "torso" training is what I sought to learn. For 12 weeks, they coached me. The coaches analyzed the postural stress of seated dental workers and devised a series of exercises specifically for their needs. Shad Forsythe, the strength and conditioning coach for Galaxy, our local professional soccer team, was my coach and co-author during the weeks I spent training at their

Carson facility. This was one of the most challenging and rewarding experiences of my athletic endeavors. I am very grateful for all they have done to improve my health and fitness for dental practice.

The scientific literature on postural issues exists largely in the domain of physical therapy. Literature about posture in the context of the work environment falls into the domain of ergonomics. There is a small, but useful body of literature in physical therapy and ergonomics that is relevant to dental practice. For this reason, I have invited Tim Caruso, a physical therapist and ergonomics expert, to contribute to this issue of the *Journal* as an added guest editor.

Tim is a popular speaker to audiences of dental meetings throughout the United States. While hosting Tim at one of these meetings, I realized his perspective on ergonomics and physical therapy could help the dental profession. For this reason, I invited him to bring information from his resources outside the realm of dental literature to the dentists of California in this edition of the *Journal*.

CDA



**Guest Editor /** Allan C. Jones, DDS, NSCA-CPT, is a certified personal trainer through the National Strength Conditioning Association. He has been on faculty at the University of Southern California School of Dentistry since 1984 and has a practice in Torrance, Calif.





# Work Doesn't Have to Be Painful

Timothy J. Caruso, PT, MBA, MS, Cert. MDT

As a reader, you may wonder how I came to this place in your professional journal as a guest editor. As a practicing physical therapist with more than 20 years of experience, I became actively interested in the practice of dentistry while working with a dental hygienist who had undergone her second bilateral carpal tunnel surgery. She came to my clinic for rehabilitation, expressing grave reservations about returning to work in general and as a hygienist in particular. As I began to evaluate her and the specifics of her job, I wondered why she performed some of her work tasks in the manner she described and observed others that may have caused some of her problems. That particular interaction more than 16 years ago started my journey. As a physical therapist, we are trained to evaluate musculoskeletal problems, determine the causative factors, and recommend solutions. These solutions may consist of modalities to alleviate pain, exercise to stretch or strengthen tissues, education to promote independence, and develop injury prevention strategies and job modifications to protect the patient upon their return to work. In short, we are detectives looking for clues to solve problems. Since that encounter in 1989, I have been personally challenged to find a solution to this "problem" and have since met many other dental professionals with similar and numerous other

complaints. The list runs the gamut from headaches to back pain, numbness, tingling, and weakness. The bottom line is that many dental professionals accept pain as part of their daily routine.

While much is known about posture, musculoskeletal pain and injury in the medical literature, I have found little scientific discussion in the dental literature that evaluates these issues and makes recommendations for solutions. In traveling and consulting with dental professionals, I find that many have accepted pain as part of their daily routine. Many are not certain how they got it, and fewer are aware of how to alleviate it. I find this troubling as someone who is passionate about my work. It is disheartening to think a career we could be so passionate about may be harmful to us. Having been inspired by all of these circumstances and not having come up with an absolute solution in all cases, I have attempted to identify several reasonable solutions for one particular type of complaint in this publication, namely back/neck pain. And so my journey continues.

In this edition, Dr. Jones and I have attempted to provide the readers with insight into the lives of relatively healthy dental professionals while describing some of the common maladies associated with those suffering with back and neck problems. In addition, this issue introduces two specific strategies that may extend the productivity and career longevity of the practitioner. My hope is

to provide a basis from which to achieve an improved level of health and fitness while alleviating pain from your daily practice. As guest editor of this edition of the *Journal of the California Dental Association*, I have been invited to bring to the dentists of California information regarding posture and pain. This information comes from the domains of physical therapy, rehabilitation, engineering, and ergonomics. To accomplish this, I have asked distinguished individuals, well known in their areas of expertise, to contribute to the issues that uniquely affect the community of dental healthcare workers. Our hope is to provide an outstanding regular exercise routine to healthy dental professionals while providing injury prevention strategies for relief of back and neck pain in practitioners who work with pain day in and day out. In addition, we hope to lay the foundation for future research in this area. Our authors will shed some light on the effects of career training on dental and hygiene, along with some of the habits that seem to be acquired along the way which may create certain musculoskeletal problems. Dr. Jones and I have



**Guest editor /** Timothy J. Caruso, PT, MBA, MS, Cert. MDT, is a certified mechanical diagnostic therapist, staff physical therapist and chair of the ergonomics committee at Shriners Hospital for Children in Chicago. He is owner and president of Chicagoland Performance Consultants.

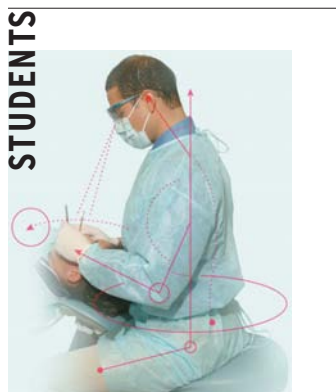
had a “meeting of the minds” in recommending preventive strategies for individuals with and without persistent pain and feel that this issue of the *Journal* will be a resource for both. Thank you for your interest.

Dr. Richard Marklin is a researcher and ergonomist in the Department of Mechanical and Industrial Engineering at Marquette University in Milwaukee. His article presents the results of a study to measure the seated working postures of dentists and dental hygienists. Given the significant amount of time spent by the dental professional in a seated position, I felt that Dr. Marklin’s findings would shed some light on potential risks for musculoskeletal disorders and pain commonly found in the dental operator.

Dr. Robert Werner is a physician, epidemiologist, and chief of Physical Medicine and Rehabilitation at the Ann Arbor VA Medical Center and professor at the University of Michigan. He has done extensive work with the American Dental Association over the years to quantify the incidence and prevalence of musculoskeletal disorders in dental professionals attending the national meetings. His article establishes a “baseline” for the musculoskeletal status among dental and dental hygiene students as they begin their careers as dental healthcare workers. The baseline data will be the basis for a longitudinal study of musculoskeletal pain among dental professionals over the course their careers.

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# Prevalence of Upper Extremity Symptoms and Disorders among Dental and Dental Hygiene Students

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## ABSTRACT

**CONTEXT:** Upper extremity musculoskeletal disorders are common among dental professionals. The natural history of these disorders is not well-understood. These disorders are more common in older workers, but the prevalence among younger workers has not been well-studied.

**OBJECTIVE:** The objective of this study was to determine if dental/dental hygiene students had a similar prevalence of upper extremity musculoskeletal disorders compared to age-matched clerical workers. We hypothesize students will have a lower prevalence of upper extremity musculoskeletal disorders compared to clerical workers.

**DESIGN:** This was a cross-sectional design.

**SETTING:** Dental and dental hygiene students from three schools were compared to clerical workers from three locations (an insurance company and two data processing plants).

**SUBJECTS:** There were 343 dental and dental hygiene students and 164 age-matched clerical workers.

**MAIN OUTCOME MEASURES:** Regional discomfort was the primary outcome. The secondary health outcomes were diagnoses of carpal tunnel syndrome and upper extremity tendinitis.

**RESULTS:** Clerical workers had a higher prevalence of hand symptoms (62 percent vs. 20 percent), elbow symptoms (34 percent vs. 6 percent) and shoulder/neck symptoms (48 percent vs. 16 percent) and a higher prevalence of carpal tunnel syndrome (2.5 percent vs. .6 percent) and upper extremity tendinitis (12 percent vs. 5 percent). The clerical workers were more obese, smoked more, exercised less frequently, and had lower educational levels and less control of their work environment.

**CONCLUSIONS:** Dental and dental hygiene students have a very low prevalence of upper extremity musculoskeletal disorders. A longitudinal study is necessary to evaluate ergonomic and personal risk factors.

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Upper extremity musculoskeletal disorders are well-known problems among industrial workers but have also had an impact upon clerical and white collar workers, especially among dental professionals. These upper extremity musculoskeletal disorders cost employers billions of dollars each year in medical costs, lost wage replacement, and reduced productivity. Among dentists and dental hygienists, several studies have demonstrated a high prevalence of upper extremity symptoms and the American Dental Association and American Dental Hygienists' Association have reported that these musculoskeletal disorders have impacted their professions dramatically with more than 20 percent reporting a leave of absence due to these disorders.<sup>1-8</sup>

According to a survey of practicing dentists performed by the American Dental Association, more than 50 percent of female dentists shortened their work hours due to repetitive motion disorders.<sup>1</sup> Although this statistic may reflect a sample bias, it still demonstrates that upper extremity musculoskeletal disorders have a significant impact of the professional's ability to work. It has been reported that 7 percent to 12 percent of dental hygienists have been diagnosed with carpal tunnel syndrome in cross-sectional studies.<sup>3,4</sup> Prior cross-sectional studies of active dentists and dental hygienists have demonstrated a high prevalence of symptoms in the upper extremities although the prevalence of carpal tunnel syndrome was only slightly higher than the general population.<sup>9,10</sup> Hygienists have a higher prevalence of upper extremity tendinitis compared to the general population and it is similar to the rate among industrial workers.<sup>10</sup>

It is clear that repetitive motion disorders exist among white-collar workers and the dental professionals appear to be at relatively high risk.

Recent cross-sectional studies of dentists and dental hygienists have demonstrated upper extremity musculoskeletal disorder problems among practicing dental professionals, the onset of these problems and causally related factors can only be determined by a prospective, longitudinal study. In an effort to assess workers at the begin-

**According to a survey of practicing dentists performed by the American Dental Association, more than 50 percent of female dentists shortened their work hours due to repetitive motion disorders.**

ning of their careers, the authors recruited dental and dental hygiene students to participate in a baseline study of their musculoskeletal conditions and assessment of their median and ulnar nerve function. Access to a similar dataset that reflects a large population of active clerical workers was available. The authors compared the characteristics of the cohort of dental and dental hygiene students to age-matched clerical workers to determine if their symptom and electrophysiologic profiles were similar.

Clerical workers are known to have a low rate of carpal tunnel syndrome compared to industrial workers, but it is not known if they are representative of

the general population or have increased risk of other upper extremity musculoskeletal disorders due to the repetitive hand activity.

The authors hypothesized that dental and dental hygiene students would have low prevalence of symptoms and musculoskeletal disorders due to their age and relatively low exposure to repetitive stress during their training years. The authors hypothesized that the age-matched clerical workers would also have low levels of symptoms and musculoskeletal disorders that were similar to the dental and dental hygiene students.

## Methods

Dental and dental hygiene students were recruited from three training programs: the University of Michigan (dental and dental hygiene programs), Forsyth Institute (dental hygiene) and the University of Illinois-Chicago (dental and dental hygiene). All students, regardless of their class standing in the respective programs, were invited to participate. All subjects signed a written consent approved by the University of Michigan and the respective local Institutional Review Boards. Students over the age of 29 were excluded from the analyses to avoid potential confounding of prior ergonomic stress and aging. The clerical workers were selected from an earlier study and clerical workers under the age of 30 were used as a comparison group.<sup>11</sup> These subjects had completed the same medical screening the dental and dental hygiene students underwent. All clerical subjects had worked on their job for at least six months prior to the study.

The medical screening included the following procedures: completion of a self-administered symptom questionnaire (all subjects); a limited physical

examination of the upper extremities and neck (symptomatic subjects only); and limited electrodiagnostic testing of both hands (all subjects). The standardized physical examination included tests for range of motion, strength, muscle stretch reflexes, and provocative maneuvers to identify possible tendinitis and nerve entrapment.<sup>12</sup> The physical examinations were conducted by the lead authors (Werner and Franzblau) who were blinded to the results of the other measures. The nerve conduction testing, the physical examination, and the symptom surveys were conducted independently of each other.

Subjects completed a self-administered symptom questionnaire. The questionnaire focused on demographic information, prior medical conditions, occupational history, current health status, and symptoms which may be related to upper extremity cumulative trauma disorders. These questionnaires have been previously investigated and demonstrated to have good reliability.<sup>13</sup> Subjects were instructed to report a regional symptom if it had been present on at least three separate episodes, or one episode that had lasted more than one week, in the 12 months preceding the survey. The survey queried subjects

about nine symptoms (burning, stiffness, pain, cramping, tightness, aching, soreness, tingling, and numbness) in each of 15 body locations (neck, right or left shoulder, right or left upper arm, right or left elbow, right or left forearm, right or left wrist, right or left hand and right or left fingers). For the purpose of analysis these were combined to create three regions: neck/shoulder/upper arm, elbow/forearm, and wrist/hand/finger.

Subjects were asked to rate each regional discomfort by defining "current discomfort" and "worst discomfort in the past 30 days" on a visual analog scale of 0 to 10. Subjects who reported

numbness, tingling, burning, or pain in the hand and/or fingers were asked to shade in a hand diagram to determine if the symptoms matched the distribution of the median nerve in the hand.<sup>14,15</sup> Psychosocial variables were assessed using a questionnaire based on the one developed by Karasek.<sup>16</sup> The areas assessed included estimates of skill discretion, job insecurity, perceived stress and job satisfaction based on the decision latitude of the worker and the psychological demands placed upon the worker. Each worker was weighed and measured for height to calculate the body mass index (BMI, kg/m<sup>2</sup>).

Electrodiagnostic studies of the median and sensory nerves were conducted bilaterally with the techniques described by Kimura.<sup>17</sup> These techniques have been investigated previously and shown to have high reliability with the median-ulnar peak latency difference being a particularly stable measure.<sup>18</sup> The tests were performed with antidromic, supramaximal stimulation, a distance of 14 cm, and ring-recording electrodes placed around digits two and five. A standard distance of 3 cm between electrodes was used. Hand temperature was recorded and the hand was warmed if the mid-palmar temperature was below 32 degrees Celsius. All studies were performed or supervised on-site by a certified electromyographer and/or a certified electrodiagnostic technician. There were three physicians and three technicians collecting data during the study. The peak latency, sensory amplitude, and takeoff latency were recorded for each sensory nerve. A difference of 0.5 msec or greater between the median and ulnar peak latencies was considered as the definition for a median mononeuropathy.

The hand diagrams were scored according to the methods described by

Franzblau et al.<sup>15</sup> Scores ranged from 0 to 3 (unlikely, possible, probable and definite) with respect to the likelihood of establishing a diagnosis of carpal tunnel syndrome. Carpal tunnel syndrome was defined as numbness, tingling, burning, or pain in the distribution of the median nerve (based on a hand diagram score of "probable" or "definite") with ipsilateral median ulnar nerve conduction difference of  $\geq 0.5$  msec. These

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criteria for defining carpal tunnel syndrome are consistent with those recommendations by expert consensus.<sup>19</sup>

Consistent with expert consensus criteria for tendinitis, a diagnosis of tendinitis was established if the subject reported symptoms in a specific area and the physical examination demonstrated focal tenderness to palpation and/or reproduced symptoms with specific provocative tests in the same area.<sup>20</sup>

## Results

A total of 429 dental and dental hygiene students were recruited into the study, but excluded students over the age of 29 and thus, analyzed data from 343 students. This included 232 dental students and 111 dental hygiene students from the three sites. Among

the dental students, freshmen represented 26 percent of the sample; sophomores, 18 percent; juniors, 26 percent; and seniors, 29 percent. The dental hygiene students were equally divided between first and second year. The demographics, symptom and electrophysiologic data of the dental and dental hygiene students are presented in **Table 1**. The total number of students eligible for the study was 1005, with a 43 percent participation rate. The dental and dental hygiene students were similar in most respects except for gender (dental students 51 percent female vs. dental hygiene students 93 percent female); smoking (dental students 11 percent vs. dental hygiene students 23 percent); wrist/hand/finger discomfort rating (dental students .5 vs. dental hygiene students 0.9), and elbow discomfort rating (dental students .03 vs. dental hygiene students .2). Electrophysiologic features were also similar in terms of the relative latency of the median and ulnar sensory latencies but the absolute latencies were shorter in the dental hygiene students. This difference most likely represents the gender differential.<sup>11</sup>

The dental and dental hygiene student data was grouped for the remaining analyses. The comparison of the students versus the young clerical workers is presented in **Table 2**. There are many differences noted between the two groups. The clerical workers have the same mean age and gender distribution, but the clerical workers have many more complaints of upper extremity symptoms and a history of more tendinitis. The clerical workers had three times as many complaints of hand/wrist/finger symptoms (62 percent vs. 20 percent,  $p < .01$ ) and elbow/forearm complaints (48 percent vs. 16 percent,  $p < .01$ ) and five times as



**Table 1****COMPARISON BETWEEN DENTAL AND DENTAL HYGIENE STUDENTS**

	Dental students (age<29) n=232	Dental hygienist (age < 29) n=111	P
<b>Demographic variables</b>			
BMI	23.8	22.8	0.03
Age	25	24	<0.01
Gender (% female)	51.3%	93.7%	<0.01
Hand dominance (right hand)	93.1%	94.55%	0.61
Diabetes	0.86%	0%	1
Rheumatoid arthritis	0.86%	0%	1
Exercise	90.9%	90.7%	0.94
Smoking	11.3%	23.4%	<0.01
<b>Regional discomfort variables</b>			
Worst discomfort rating in last 30 days			
Wrist/hand/finger	0.23	0.37	0.21
Wrist/hand/finger	0.47	0.94	0.01
Neck/shoulder	0.32	0.56	0.09
Neck/shoulder	0.59	0.99	0.08
Elbow/forearm	0.034	0.22	0.03
Elbow/forearm	0.15	0.38	0.08
<b>Carpal tunnel syndrome variables</b>			
CTS based on abnormal hand diagram & prolonged median lat. (>=0.5msec)	0.43%	0.9%	0.62
Median sensory peak lat. (dominant side)	3.1	3.02	0.01
Ulnar sensory peak lat. (dominant side)	3.095	2.99	<0.01
Median peak lat.-ulnar peak lat., dominant side	0.005	0.028	0.33
<b>Regional tendinitis variables</b>			
Shoulder tendinitis (our diagnosis)	1.72%	3.6%	0.28
Elbow tendinitis (our diagnosis)	0.43%	0%	1
Wrist/hand/finger tendinitis (our diagnosis)	1.29%	1.8%	0.66
Any upper extremity tendon (overall tendinitis based on self-report)	5.6%	2.7%	0.28

**Table 2****DENTAL AND DENTAL HYGIENE STUDENTS COMPARISON WITH YOUNG CLERICAL WORKERS (AGE <29)**

	All students (age<29) n=343	Young clerical workers (age < 29) n=164	P<0.01
<b>Demographic variables</b>			
Age	24.7	24.8	0.53
Body mass index (BMI)	23.6	26.5	<0.01
Gender (% female)	65%	73.2%	0.07
Hand dominance (right hand)	93.6%	86%	<0.01
Diabetes	0.58%	0%	1
Rheumatoid arthritis	0.58%	0.61%	1
Regular exercise	90.9%	80%	<0.01
Smoking	15.3%	31.7%	<0.01
<b>Regional discomfort variables</b>			
Worst discomfort rating in last 30 days			
Wrist/hand/finger	1.42	2.09	0.04
Wrist/hand/finger	3.2	5.45	<0.01
Neck/shoulder	2.55	2.67	0.76
Neck/shoulder	4.62	5.69	0.02
Elbow	1.52	1.82	0.61
Elbow	3.67	5.4	0.02
<b>Carpal tunnel syndrome variables</b>			
CTS (self-report based on questionnaire)	0.58%	2.45%	0.09
CTS (based upon positive hand diagram and median nerve slowing)	0.58%	0%	1
Median sensory peak latency (dominant side)	3.075	3.073	0.92
Ulnar sensory peak latency (dominant side)	3.063	3.005	0.01
Median – ulnar sensory peak latency	0.012	0.067	0.01
Difference (dominant side)			
<b>Regional tendinitis variables</b>			
Shoulder tendinitis	2.33%	3.05%	0.63
Elbow tendinitis	0.29%	3.05%	0.02
Wrist/hand/finger tendinitis	1.46%	6.71%	<0.01
Tendinitis (overall tendinitis based on self-report)	4.66%	11.66%	<0.01
<b>Psychosocial variables</b>			
Education level*	5.94	4.14	<0.01
Skill discretion**	36.56	20.47	<0.01
Social support**	12.75	11.48	<0.01
Job dissatisfaction**	0.195	0.338	<0.01
Colleague support**	12.75	11.67	<0.01
Job insecurity**	4.16	6.17	<0.01

\*Education level: 4=High school diploma, 5=some college, 6=college degree, 7=graduate degree

\*\*Psychosocial variables as defined by Karasac<sup>16</sup>

**Table 3****LOGISTIC REGRESSION MODEL FOR HAND/WRIST DISCOMFORT (YES/NO), ODDS RATIO AND 95% CI.**

Variable	Odds ratio	P value	95% CI
Smoking	2.13	.03	1.04, 2.98
Elbow/forearm discomfort	5.41	<0.01	2.74, 10.65
Neck/shoulder discomfort	2.85	<0.01	1.72, 4.72
History of tendinitis	2.71	.03	1.12, 6.55
Skills discretion	0.93	<0.01	0.91, 0.96

N=487, p value for model<.01, Pseudo R<sup>2</sup>=.26

many shoulder complaints (33 percent vs. 6 percent,  $p<.01$ ). The clerical workers had a higher body mass index and were less likely to exercise regularly. Clerical workers also were more likely to have a history of carpal tunnel syndrome or upper extremity tendinitis. The prevalence of both of these disorders was low. The electrophysiologic measures of the median sensory nerves were similar however, there was a slight difference in the ulnar sensory nerves; clerical workers had a shorter peak latency. Clerical workers had a significantly lower level of job satisfaction, job security, skill discretion, and social support on the job compared to the student population.

Table 3 presents the logistic regression model using hand discomfort (yes/no) as the dependent variable and assessing the influence of demographic, psychosocial, symptoms and medical history as independent variable. The final model demonstrated that other regional symptoms such as shoulder and elbow complaints as well as a history of an upper extremity tendinitis, smoking, and decreased skill discretion were independent risk factors. Most of the psychosocial variables were highly correlated and there was a significant

**Despite the wide disparity in symptoms between the students and the clerical workers, their nerve function was almost identical.**

difference when stratified by job classification. The skill discretion variable was the best fit in the model and if the variable for job classification (student vs. clerical) was forced into the model, the psychosocial variables would no longer be significant in the model. Age or years in training did not influence the model.

### Discussion

This study demonstrates that dental and dental hygiene students start their respective careers with few symptoms of upper extremity musculoskeletal disorders. They are less likely to complain of upper extremity musculoskeletal symptoms than age-matched clerical workers. Age and duration of time in their respective training program did not appear to influence their symptoms

or the function of the median nerve; i.e. senior dental students did not have more symptoms compared to freshmen and their nerve conduction measures were similar.

Some psychosocial variables, such as job discretion, appear to influence the reporting of hand discomfort. The authors chose to evaluate a student's perception of their training in a similar fashion as a "job." The psychosocial assessment was developed by Karasek for active workers, not students, but an argument could be made that the training phase is their job.<sup>16</sup> This is a potential limitation of the interpretation of this study.

Other influences include smoking and reports of other regional upper extremity discomfort. A history of proximal upper extremity tendinitis or other proximal musculoskeletal complaints in the upper limb is strongly associated with reporting hand symptoms. This association of symptoms has been demonstrated in several recent studies and are known to be associated with higher reports of carpal tunnel syndrome and upper extremity tendinitis.<sup>21,22</sup> This relationship may be due to an underlying diagnosis of carpal tunnel syndrome and the associated pain

referral patterns to the elbow and the shoulder. Alternatively, these individuals may compensate for one region of the arm by overusing another group of muscles. A third explanation would be related to some underlying genetic predisposition to soft tissue injury or delayed repair of connective tissue.

Despite the wide disparity in symptoms between the students and the clerical workers, their nerve function was almost identical. The differences in the prevalence of complaints of pain are not due to measurable nerve impairment. The median nerve func-

tion among practicing dental professionals does deteriorate over time with more impairment in the median nerve compared to the ulnar nerve function. This is the hallmark of carpal tunnel syndrome.

Unanswered questions include: when does the stress on the median nerve begin in dental professions; how is it influenced by work activity versus other avocational activities; and are there changes in psychosocial variables such as job satisfaction that may influence later reporting of hand discomfort? A prospective study is necessary to

fully understand the process. It has been demonstrated among hand intensive industries that changes in the median nerve function can occur in the early stages of employment in a new, and physically stressful, work environment.<sup>23</sup> This is not the case when evaluating workers who have been on the same job for many years. We have looked at prospective studies of industrial and clerical workers as well as dentists who have been working for a number of years and demonstrated that the rate of change after the first five to 10 years on the job are minimal.<sup>21</sup> A



prospective study of these dental and dental hygiene students would be an ideal study to help define the role of work versus avocational risk factors. We have baseline data that demonstrates a very healthy population and have demonstrated that these dental professionals will have upper extremity musculoskeletal problems during their careers but, when do they occur and which factors are the ones temporally related to their problems? A prospective study would allow cause and effect to be evaluated and would elucidate preventive measures that could be taken. We hope to evaluate these students during their career to identify the risk factors for upper extremity musculoskeletal disorders, some of which may be responsive to primary or secondary preventive measures, and the identify the timing of the change in median nerve function. If we can separate the work-related ergonomic factors from the aging process, we will greatly contribute to an improved understanding of the process associated with upper extremity musculoskeletal disorders.

The practicing dentist and dental hygienist have a high rate of upper extremity symptoms and musculoskeletal disorders, however, when starting in the profession they are relatively symptom free. When does the practicing dentist or dental hygienist start to develop symptoms and how much can be attributable to the type of work they perform are questions that remain unanswered. Differentiating the impact of aging from work activity is sometimes difficult but this could be assessed with a longitudinal study. Determining when the changes occurred in these populations will allow for preventive strategies to be developed and tested.

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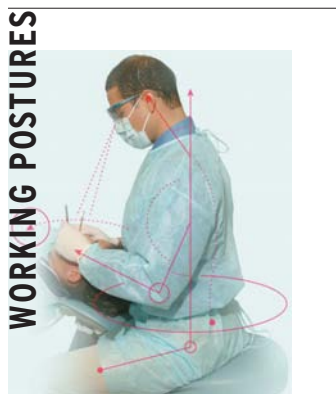
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# Working Postures of Dentists and Dental Hygienists

Richard W. Marklin, PhD, and Kevin Cherney, BS

## ABSTRACT

A joint study was conducted by a manufacturer of dental stools in the Midwest of the United States and Marquette University to measure the occupational postures of dentists and dental hygienists. The postures of 10 dentists and 10 dental hygienists were assessed using work sampling and video techniques. Postural data of the neck, shoulders and lower back were recorded from video and categorized into 30-degree intervals: 0 (neutral posture of respective joint), 30, 60 and 90 degrees. Each subject's postures were observed while they were treating patients during a four-hour period, during which 100 observations of postures were recorded at random times. Compared to standing, dentists and dental hygienists were seated 78 percent and 66 percent of the time, respectively. Dentists and dental hygienists flexed their trunk at least 30 degrees more than 50 percent of the time. They flexed their neck at least 30 degrees 85 percent of the time during the four-hour duration, and their shoulders were elevated to the side of their trunk (abducted) at least 30 degrees more half of the time. The postures of the trunk, shoulders, and neck were primarily static. This database of postures can be used by dental professionals and ergonomists to assess the risk dentists and dental hygienists are exposed to musculoskeletal disorders, such as low back pain or shoulder tenosynovitis, from deviated joint postures. They could use these data to select dental furniture or dental devices that promote good body posture, i.e., reduce the magnitude and duration of deviated joint postures, which, in theory, would decrease the risk of musculoskeletal disorders.

Numerous studies, including an exhaustive review of the literature,<sup>1</sup> have shown that dentists and dental hygienists work in postures that make them susceptible to musculoskeletal disorders.<sup>2-4</sup> Dentists and dental hygienists work in postures that expose them to long-duration static muscle loads that can cause musculoskeletal disorders and pain. Examples of musculoskeletal disorders are low back pain and shoulder tendinitis. Prolonged exertions of the muscles of the neck, back and shoulders have been reported as the greatest number of complaints from both dentists and hygienists,<sup>5-6</sup> and these prolonged exertions could pose dental professionals to risk of musculoskeletal disorders. To the authors' knowledge, no detailed task analysis of the magnitude and duration of joint postures have been conducted. Results from a detailed task analysis would enable dental professionals and ergonomists to determine which joints have the most non-neutral (deviated) postures, and thus, where to direct their efforts to reduce the deviated postures.



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New office furniture or dental devices that promote more neutral joint postures could be implemented in operatories, which in theory would reduce the risk of musculoskeletal disorders.

In response to reports of dental workers' pain from static postural loading and the lack of documentation of magnitude and duration of dental professional's body postures, a task analysis consisting of work sampling techniques and video analysis was conducted to collect postural data of dentists and hygienists.

## Method

### Approach

There are many dental procedures that demand dentists and hygienists to maintain working postures that put them at risk of musculoskeletal disorders. Previous studies have shown there is a high frequency of musculoskeletal problems among both dentists and dental hygienists.<sup>2,3,5</sup> In 1987, the annual income lost due to musculoskeletal complaints in dentistry was \$41 million; the present amount in annual income would be much greater than \$41 million, given the effect of inflation.<sup>6</sup> While statistics have been recorded for the incidence of musculoskeletal disorders in the dental profession, there is a lack of data concerning the working postures of dentists and hygienists.<sup>1</sup> Quantitative data on the working postures of dental professionals could be used to design dental equipment in order to improve postures and reduce the risk of musculoskeletal disorders.

The approach of the task analysis was to use work sampling techniques in order to collect postural data from dentists and dental hygienists at work. Preliminary data collection and analysis were conducted at the Marquette University Dental School in order to develop the appropriate procedures and protocol. After this was completed, four

Milwaukee-area dental practices were selected as sites for data collection. The dentists and dental hygienists were monitored in their normal work areas (operatories) while performing their tasks in a typical manner. Each dentist, hygienist, and the patient being worked on were informed that the work sampling data were being collected.

### Subjects

Working postures of 10 dentists and 10 dental hygienists at four different dental practices in the Milwaukee area were observed.

### Apparatus

The equipment used in the task analysis was a video recorder and a chronograph. The video recorder was placed in the best available location in the operatory to observe the working postures of the dentists and hygienists. It was set for continuous recording during a four-hour work sampling period, with the video tapes being changed at the two-hour mark. The chronograph was used to keep track of the scheduled observation times, which were generated randomly throughout the four-hour session.

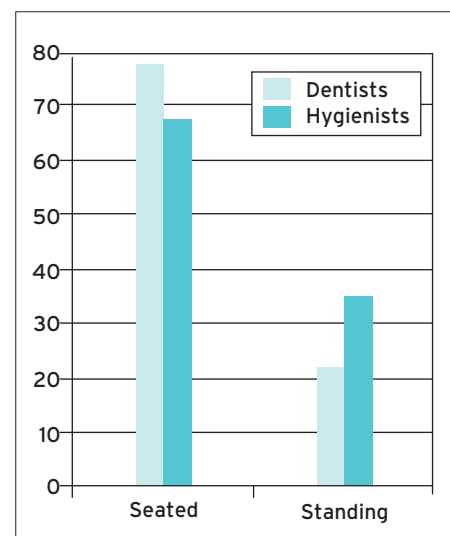
### Experimental Protocol

A work sampling packet was created for each of the 10 dentists and 10 dental hygienists during the data collection phase of the task analysis. This packet was developed from a preliminary analysis conducted at the Marquette University Dental School. Using the postural analysis protocol, the analyst recorded the following data at 100 randomly generated times during a four-hour session.<sup>7</sup> At each observation time, the analyst estimated the angles of the major joints of the dentists or hygienists.

### Operator Status

P = working on the patient

W = working on something other than the patient



**Figure 1.** Percentage of time dentists and hygienists spent sitting vs. standing.

T = talking to the patient while not doing P or W

0 = out of the room

### Seated or Standing

Marked one column if seated and another column if standing

### Trunk Posture

0 = 0-degree trunk flexion (trunk vertical)

30 = 30-degree trunk flexion (trunk bent forward 30 degrees from vertical)

60 = 60-degree trunk flexion (trunk bent forward 60 degrees from vertical)

### Neck Posture

0 = 0-degree neck flexion (neck in line with the axis of trunk)

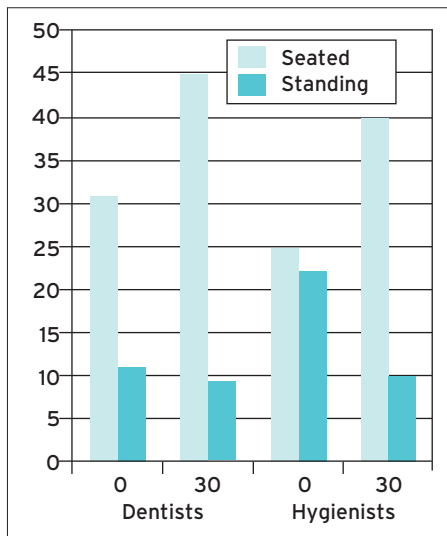
30 = 30-degree neck flexion (neck bent 30 degrees forward from axis of trunk)

60 = 60-degree neck flexion (neck bent 60 degrees forward from axis of trunk)

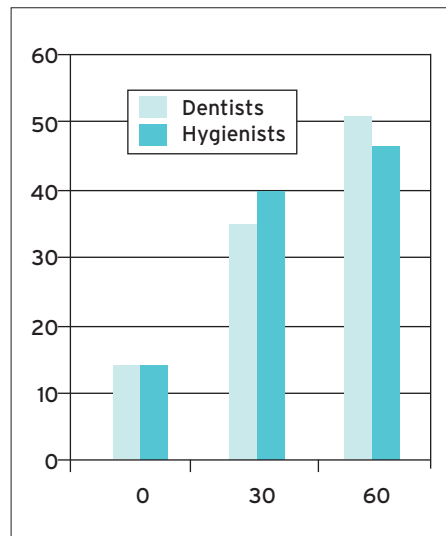
### Shoulder Posture

0 = 0-degree shoulder abduction (arms at the side of the trunk)

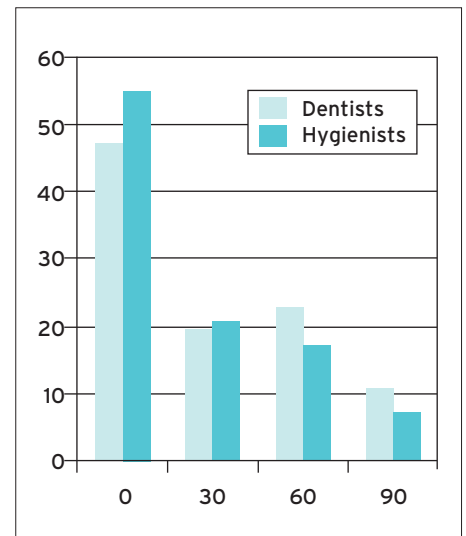
30 = 30-degree shoulder abduction



**Figure 2.** Percentage of time dentists and hygienists worked with different angles (in degree) of trunk flexion (from vertical). The percentage of time spent in a posture greater than 60 degrees was less than 3 percent.



**Figure 3.** Percentage of time dentists and hygienists worked with different angles (in degrees) of neck flexion. Zero-degree neck posture was the posture when the neck was in line with the trunk.



**Figure 4.** Percentage of time dentists and hygienists worked with different angles (in degrees) of left shoulder elevation (abduction). Zero-degree shoulder elevation was the posture when the arm was at the side of the trunk.

(arms elevated 30 degrees to side of trunk)  
 60 = 60-degree shoulder abduction  
 (arms elevated 60 degrees to side of trunk)

90 = 90-degree shoulder abduction  
 (arms horizontal to the side of trunk)

The information recorded above formed the basis of the task analysis. The video camera was set up inconspicuously in a corner of the room, and the analyst minimized his presence by making the observations from outside the working area. At the beginning of the four-hour period, the camera was turned on and observations were recorded whether the dentist or hygienist began working on a patient or not. Each patient during that period was told what type of study was being conducted and then asked for his/her permission to be filmed during the procedure. The session was filmed for four hours, during which time the 100 observations were made. In addition to the data collected on the work sampling charts, other valuable information was gained during the task analysis simply by speaking with each of the subjects and

finding out their personal opinions on their posture, the dental stools currently in use, and what improvements they would like to see.

## Results

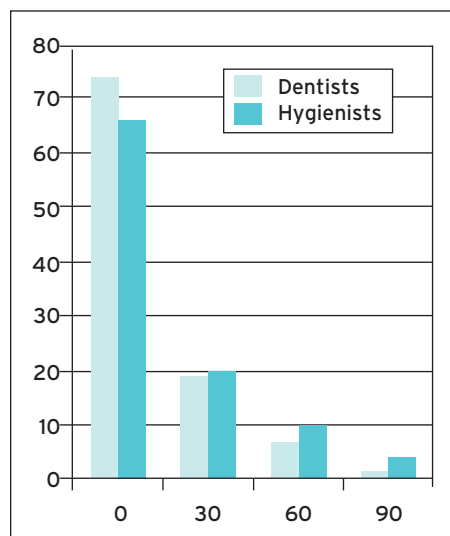
Operator status reveals the percentage of time actually spent working in the operatory where the work sampling and video taping was taking place. The dentists were in the room approximately 70 percent of the time and the hygienists were in the room 80 percent of the time. The percentages on joint posture were based on the time spent working in the operatory. For instance, as shown in Figure 3a, the dentists flexed their neck approximately 30 degrees 35 percent of the time while they were actually observed in the room, not 35 percent of the entire four-hour observation period.

As shown in Figure 1, the seated vs. standing data showed that the dentists spent about 78 percent of their working time seated and only 22 percent standing. (Note: working time is the time spent in the operatory, which is equal

to P+W+T in the Experimental Protocol section.) The hygienists spent 66 percent of working time in a seated position. The main reason for this difference is that the hygienists spent a portion of their working time cleaning the room and equipment between patients, while the dentists had their assistants clean and prepare the room for the next patient. The trunk posture data provided in Figure 2 reveals that the dentists spend almost 58 percent of their working time in some degree of trunk flexion, whether seated or standing. A trunk flexion of approximately 30 degrees is most prevalent, occurring almost 45 percent of the time. The postural results for the hygienists are quite similar to that of the dentists. As shown in Figure 2, the hygienists flexed their trunk 30 degrees about 50 percent, similar to the 53 percent for dentists.

Figure 3 provides the neck posture data for the dentists, which indicate dentists exhibited at least 30 degrees of neck flexion 86 percent of the time while working in the room, 35 percent of the time at 30 degrees and 51 percent of the





**Figure 5.** Percentage of time dentists and hygienists worked with different angles (in degrees) of right shoulder elevation (abduction). Zero-degree shoulder elevation was the posture when the arm was at the side of the trunk.

time at 60 degrees. The hygienists exhibited results similar to those of the dentists in that hygienists had at least 30 degrees of neck flexion 86 percent of the time, the same percentage as the dentists.

The shoulder posture data shows the dentists had some degree of elevation (abduction) more than 50 percent of the time in the left shoulder, as seen in Figure 4, but only about 25 percent of the time in the right shoulder, as shown in Figure 5. The hygienists' left shoulders were abducted 45 percent of the time, while their right shoulders were abducted 34 percent of the time.

## Discussion

In this study, the analyst estimated the postural angles in discrete 30-degree increments for ease of observation and analysis. Although this technique has been used previously to record upper extremity posture in a poultry processing plant, this method does have limitations due to the low resolution of the measurement intervals.<sup>7</sup> Therefore; the results from this study must be interpreted to show only patterns of trunk

and upper extremity postures and not exact angles.

The data from this task analysis agree well with postural data and incidence of musculoskeletal disorders reported in the published literature. The seated vs. standing data showed that the dentists spent about 78 percent of their working time seated and only 22 percent standing, which agrees with the literature.<sup>5</sup> A trunk flexion of approximately 30 degrees is most prevalent, occurring almost 45 percent of the time, which may explain why pain is often reported in the lower back of dentists.<sup>2,3,5</sup> The dentists spent more than half of their working time with their neck flexed approximately 60 degrees, which agrees with the results found previously in the literature that the neck is an area of primary concern.<sup>2,3,5</sup> The reason for the difference in the abduction angle between the right and left shoulders is due to the right-handed dominance of all the dentists and hygienists surveyed. The typical working position for right-handed dentists and hygienists is to abduct the left shoulder and hold the right arm close to the trunk.

The postural data from the task analysis of both dentists and dental hygienists show that they spent at least half of their time working with their necks flexed 60 degrees or greater, their trunks flexed 30 degrees or greater, and one of their shoulders abducted. Because of the mechanical disadvantage of the muscles with respect to their joints, flexed and abducted joint postures require high muscle forces to hold these static postures. The high muscle forces then produce high compression loads on the joint. The postures assumed by dentists and dental hygienists can require sizeable muscle forces, and concomitantly, high compression loads on the joint. Except for the weight of small instruments, and an occasional push or pull from the hand, the only

external forces acting on dentists' and hygienists' joints are from the weights of their body segments, which have to be maintained at flexed and abducted angles at least half of the time spent working on patients. The clinical consequences of prolonged, flexed or abducted postures of the joints can be numerous, such as muscle pain in the neck, shoulder, and lower back musculature; rotator cuff syndrome in the shoulder, and low back pain or disorders. Postural data from this study can be used by designers of dental equipment and instruments as a baseline to either modify existing or design new equipment and instruments that would promote more neutral joint postures. Reductions in back and neck flexion and shoulder abduction would, in theory, improve the occupational health of dentists and dental hygienists. **CDA**

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# Functional Training for Dentistry: An Exercise Prescription for Dental Health Care Personnel

Allan C. Jones, DDS, NSCA-CPT, and Shad Forsythe, MS, ATC, CSCS

## ABSTRACT

Athlete's Performance, an organization of specialists in the development of athleticism and injury prevention, has analyzed the seated postural demands of dental health care workers for the purpose of developing an exercise protocol appropriate to the dental profession. As with their individualized exercise prescriptions for some of the world's most acclaimed athletes, the conditioning of the torso is the focus of a prescription for exercise when injury prevention is emphasized. An analysis of the seated postural demands common to dental health care workers is the basis for an exercise protocol intended to strengthen the torso and encourage "good" seated posture.

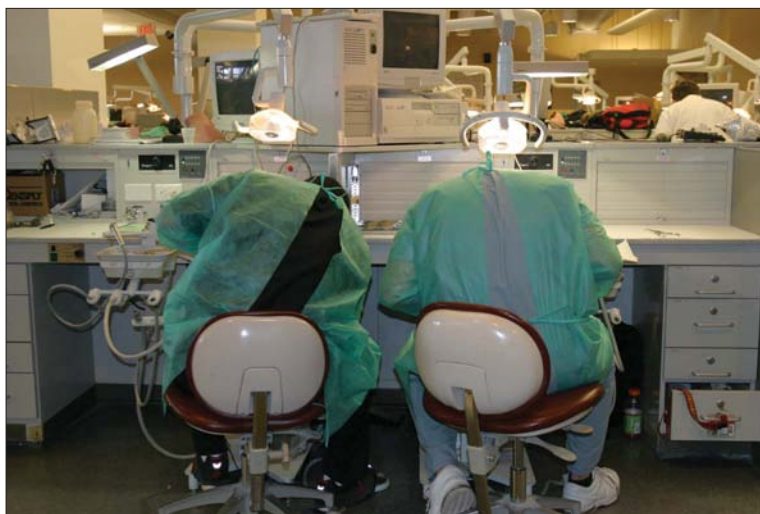
What do dental health care workers have in common with elite athletes? More than one might think. As dental health care workers, there are enormous physical demands on the back, neck, and shoulders while performing daily work. We must maintain exquisite fine motor control of arms, hands and fingers, while forcefully and continuously recruiting the many muscles required for maintaining a stable working position. Seeking visual access to small and poorly illuminated areas of the oral cavity, dental practice often requires an extreme posture, with numerous spinal articulations placed at the limits of their ability to move. Athletes must also complete their work by moving their hands and arms with great precision from often-



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**Figure 1.** USC School of Dentistry clearly demonstrates poor postural tendencies.



extreme positions. Elite strength and conditioning specialists now emphasize the function of the torso in providing a stable foundation for athletic movement of the extremities.<sup>1</sup> They teach that fitness of the torso is essential to conferring control during athletic movements because the athlete's torso is the biomechanical core from which all controlled movements of the extremities emanate. It is well known that dysfunction of the torso and its spinal elements is not only compromising to the quality of athletic movement, but may ultimately limit the ability of dental health care workers to function professionally.<sup>2-6</sup> The common need for optimal function of the torso, combined with prevention of injury to its supporting structures, unites dental health care workers and professional athletes in common purpose concerning functional torso development. Through the application of concepts developed for the enhancement of athletic torso function, dental health care workers can perform better professionally and be more resistant to injuries in a manner that is exactly the same as professional athletes.

Optimal function of the human torso

is developed by exercises that are derived from functional movements. Well-educated athletic trainers are presently teaching such movement in a very popular protocol known as "functional" training.<sup>7</sup> This method of training for athletic movement emphasizes the recruitment of muscles that work in harmony to complete a certain task or movement. Functional training does not seek to isolate muscles in a fashion that is typical of machine-based exercises common to most health clubs. Unlike machine-based exercises, functional training movements require the practitioner to exercise with feet firmly grounded, and the torso unaided in support. Additionally, when performing movements of all types that are intended to enhance the function of the torso, whether seated or standing, the trainee creates a specific postural adjustment of the torso by drawing in the abdominal musculature to narrow the waist and to lengthen the spinal column to its full upright extent. As a result of performing training movements with this drawn in and upright posturing maneuver, these exercises will train the torso to maintain stable upright posture by development of all relevant musculoskeletal and neuro-

muscular elements through their recruitment with each and every movement. Exercises performed in this manner create optimal posture of the spinal column that are intended to reduce the forces borne by the vertebral disks. This posture-specific exercise tends to foster not only ideal upright posture while training, but also the development of the upright movement of the torso for all functional movement. The ability to achieve stable upright posture through posture-specific training movements bears great relevance to dental practice as it has profound impact on the dental health care worker's ability to resist the negative consequences of leaning forward and rotating to view the oral cavity.

Prolonged postural stress, that so often occurs as a dental health care practitioner leans forward and rotates the head, is especially problematic for the finite supply of connective tissue within the spinal column that invests and supports the skeletal elements of the torso. Chronic excessive loading from this "poor posture" will predictably result in damage to these tissues in many vulnerable practitioners.



**Figure 2.** This demonstration shows that use of a microscope promotes upright posture of the torso.

Vertebral support, when compromised by the degenerative process, may ultimately fail, leaving the nerve roots that pass through the vertebrae without adequate room for function. The resulting nerve root impingement, or radiculopathy, may disable dental health care workers with back and neck pain, along with dysfunction of the extremities. While dental health care workers struggle for visibility through extreme postural maneuvering, their torsos become a battleground between operator movements to maintain stability and the perturbing force of gravity. As they lean forward and rotate, gravity exerts extreme compressive forces to the spinal column that is borne by connective tissue and resisted by the muscles of the torso. If the muscles that upright this biomechanical core of the torso are not conditioned adequately so as to resist gravity, spinal health may be the casualty of a lengthy battle lost to its inexorable force. The exercises presented in this article are given as an antidote to the negative forces of chronic postural stress that is all too common in dental health care workers.

What's wrong with the posture of dental health care workers? A recent tour of the simulation laboratory of the second-year class at the University of Southern California School of Dentistry clearly demonstrates the postural tendencies induced by the unique challenges of working within the oral cavity (Figure 1). Unless one is blessed with the aid of a microscope, as are the selected residents at USC (Figure 2), upright posture of the torso is rarely observed in these students. Instead, we see flexion and rotation of the spinal column, along with forward head positioning and internal rotation of the shoulders. Invariably, the weight of the upper body is borne asymmetrically by the seated pelvis with the load of gravity borne asymmetrically by one side of

the spinal column. The result of this typical working posture is the most extreme form of biomechanical stress to the vertebral disks of the spinal column.<sup>8</sup> As with the athlete, dental health care workers do not function optimally, nor do they age well, when the joints of the torso are chronically subjected to such an extreme position or "poor posture." This is an orthopedic concept that dentists know intimately as they are experts in the articulation they

**The common need for optimal function of the torso, combined with prevention of injury to its supporting structures, unites dental health care workers and professional athletes in common purpose concerning functional torso development.**

monitor in every day of clinical dental practice, the temporomandibular joint.

The loaded fibrocartilage of the spine — the vertebral disk — like the loaded fibrocartilage of the temporomandibular joint — the articular disk — becomes a source of joint inflammation when subjected to overloading. A joint so afflicted will not only hurt when touched, but the muscles that move it will hurt and persist in a contracted state that will limit movement.<sup>9,10</sup> Temporomandibular joint inflammation will cause muscle contraction that limits jaw opening while vertebral inflammation will initiate a similar process that limits torso movement. If overloading and joint inflammation become chronic, as in the dental patient who is afflicted by malocclusion with

bruxism, or the dental health care worker with chronically poor working posture, affected joints may degenerate painfully so as to become the cause of musculoskeletal pain and movement dysfunction of chronic duration. Spinal dysfunction and pain, when viewed in this manner, can be understood as occurring by a process that is similar to the process that affects the temporomandibular joint. Our efforts as dentists to preserve the articular disk of the temporomandibular joint through the creation of a bite that optimizes its position, and by preventing the overloading of parafunction, is the same as the efforts of those who coach athletic movement in preserving the vertebral disks of the spine. "Good" working posture of the athletic spine tends to preserve its connective tissue just as a "good" bite tends to preserve the connective tissue of the temporomandibular joint. The exercises presented herein are intended to preserve the vertebral disks of the spine in a similar fashion to the efforts of dentists to preserve the articular disk of the temporomandibular joint.







## Exercise Prescription

### *Movement Preparation*

At the beginning of an exercise program, it is essential to "warm up," that is, to increase the temperature and thus, the pliancy of those tissues about to be stretched and stressed. Since all exercise requires dynamic changes in the length of muscles, their investing connective tissues and articulations, we describe warming up as preparation for movement, or the "movement preparation" phase of our regimen. This phase is also intended to stimulate and prepare the neurological systems that control movement and balance for optimal kinesthetic function. "Movement preparation" prescribed for these purposes is comprised of four elements: (1) increasing



**Table 1.1****DYNAMIC FLEXIBILITY**

Exercise		How to	Elongation	Activation
Knee hugs		Walking forward, bring one knee to chest and hold. Next, extend to elevate the heel of the down foot.	Maximus of flexed leg	Gluteus maximus of standing leg
Back lunge and twist		Step back and drop back knee straight down. Contract "glute" of back leg and turn towards up knee with arms extended.	Hip flexor	Gluteus maximus
Forward lunge with elbow to instep		Large step forward, keep back leg straight and drop same side elbow to the ground, place hand outside knee and straighten extended leg.	Gluteus maximus, abductors, hip flexors, hamstrings	Gluteus maximus
Leg cradles		Grab knee with same arm and ankle with opposite and lift knee and rotate ankle up toward chest.	Piriformis, hip rotators	Opposite gluteus maximus
Inverted hamstring		Arms up straight out to side of shoulders, turn thumbs toward the back and rotate at the hip pushing heel back, making yourself as long as you can from head to heel.	Hamstring	Opposite gluteus maximus
Lateral squat		Stand with feet double shoulder width, lean and sit hips back behind knee, keeping knee outside of foot and back leg straight. Keep toes forward.	Abductors	Hip abductors

core body temperature; (2) increasing blood flow to working muscles; (3) actively elongating our musculature with safe mobilization of our joints; and (4) activating our nervous system.

To increase the temperature of tissues needed for movement, we rely on the metabolic production of heat along with heat dispersion achieved by perfusion of blood. For this purpose, a short bout of nonstressful movement on an exercise machine is optimal. Five to 10 minutes of biking, elliptical machine, or walking on a treadmill is recommended. This phase should result in a light sweat at its completion. In this warm-up phase, exercises are preferred that subject the body to low impact and thus, low stress during this critical early phase when the body is not prepared for the rigors of athletic movement.

Static stretching (lengthening muscles with externally applied, nonfunctional force while remaining at a given location) is a thing of the past for pre-exercise warm-up routines. The stretching that lengthens muscles and joints well beyond their functional range of motion does not prevent athletic injury and tends to impair balance and muscle function.<sup>11-14</sup> As an alternative to stretching, movement preparation actually improves total body strength and balance. These movements achieve flexibility with a functional movement routine that elongates specific muscles while activating others needed for mobility and stability (Table 1.1).

Repeat each of these exercises until stability is achieved. Typically, as you attempt to stand on one foot, you are initially unable to maintain the required posture for more than a few seconds. With repeated efforts, you may become confident in your ability to maintain this posture for a prolonged period. This confident sense of stability heralds the readiness for more demanding movements to follow. Each of the positions described as movement prepa-

ration exercises should be maintainable for 30 seconds before the next phase is undertaken.

Neural activation is the final phase of movement preparation. Jumping rope for three 15-second periods, with 30 seconds of rest after each period, is recommended for this endeavor. These exercises will challenge the nervous system such that working muscle connections are ready to train.

### Torso Training

As a dental health care worker, the most important component of the training program is torso training. This phase will tend to combat problems

**It is recommended  
that one consume  
protein and carbohydrates  
within the first hour  
after exercise.**

that may arise from a "poor" seated posture. "Torso training," frequently referred to as "core training" by fitness professionals, describes the exercises intended for the midsection of the body (the body exclusive of the head, neck, and limbs). For our purposes, the authors separated the torso into three components that confer stability: (1) the shoulders, including the scapulothoracic articulation; (2) the abdominal muscles; and (3) the hips, including all muscles that stabilize the hips in standing or seated position. Table 1.2 describes a regimen for training your torso effectively and safely.

### Strength/Resistance Training

Resistance training will increase lean metabolically active tissue and increase total body strength. Selecting exercises can be a complex process as so many choices present themselves to the

exercising public. To assist in choosing among the multitude of exercises, the authors offer four groupings of exercises: (1) lower body-push/knee dominant; (2) lower body-pull/hip dominant; (3) upper body push; and (4) upper body pull. A recommended program involves choosing one exercise from each group and doing three to four sets of 10 repetitions two to three times per week. Table 1.3 lists exercise progressions for each category.






### Interval Training




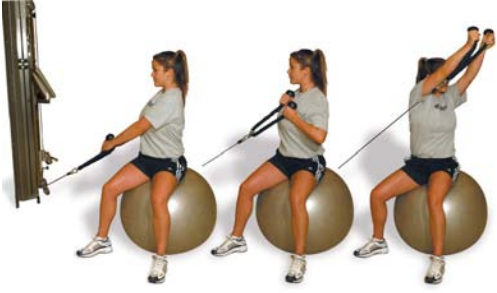

The last phase prescribed in this exercise program is training of the body's energy producing system that oxidizes glucose for the work of movement. Interval training, achieved through bursts of intense exercise with subsequent rest intervals, will increase aerobic capacity; that is, its ability to fully oxidize glucose to carbon dioxide. When oxidation of glucose within muscle cells is incomplete, lactic acid is produced and accumulates within the cellular cytoplasm. This phenomenon degrades muscle function. With increasing aerobic capacity, there is an improved work capacity of the individual. Interval training is intended to develop all of the intracellular mechanisms utilized for producing energy and minimizing the accumulation of lactic acid.

Interval training is the most challenging and yet the most transforming element in this exercise prescription. One must be medically cleared and verifiably capable of enduring the rigors of this physiological stress before undertaking this phase of the exercise prescription. Machines such as the Versa Climber, treadmill, elliptical, Nordic Track, Stairmaster, and others offer excellent options for this type of work. Whichever exercise or exercise machine that is used for this training, the technique is the same; maximal exertion for 10 to 15 seconds followed by resting for

**Table 1.2**










## TORSO TRAINING

Exercise		How to	Purpose
Ys, Ts, Ws, Ls		In prone position with torso supported by physioball, make the letters with your arms by moving from your shoulder blade first.  2x8-15 reps each	Promote scapular stability and prevent rounded shoulder posture
Stick crunch		In hook lying position, place hands or dowel on midhigh, arms extended, draw in abdominals, bring chin to chest, hold this position and try to bring hands or stick over knees.  2x10-15 reps	Promote transverse abdominus, internal oblique, and rectus abdominus strength
Reverse stick crunch		In hook lying position, hold hands or a stick straight above shoulders, draw in abdominals, hold that position and bring heels to butt, lift hips off ground and try to bring knees under the stick. Keep head in contact with the ground.  2x10-15 reps	Promote transverse abdominus, external oblique, and rectus abdominus strength
Seated medicine ball Parallel throws		Sit on a physioball with knees flexed at less than 90 degrees. Face a wall. Draw in abdominals. Coil to the right. Throw and receive the ball while maintaining torso posture. Repeat to the left.  2x10 reps each side	Promote stability of the torso while rotating
Seated medicine ball Perpendicular throws		Sit on a physioball with knees flexed at less than 90 degrees and left shoulder facing the wall. Draw in abdominals. Coil to the right. Throw and receive the ball while maintaining torso posture. Repeat to the left.  2x10 reps each side	Promote stability of the torso while rotating

Exercise	How to	Purpose
Side bridge, right and left		<p>Lie on right side with elbow directly under shoulder and feet on top of one another. Draw in abdominals. Keep elevated shoulder back. Squeeze underside hip. Lift and hold for 20 to 30s and repeat on the left side,</p> <p>2 reps each side</p>
"Glute" bridge		<p>Lie on your back with heels only on ground; knees flexed to 90 degrees. Draw in abdominals by pulling belly button to spine. Contract gluteal muscles to lift the hips off the ground.</p> <p>2x10 reps</p>
Seated cable chop		<p>With the rope of a cable machine set to its high position, sit on a physioball with shoulder perpendicular to the cable. Grasp rope with both hands while rotating the shoulders to face the cable. Pull to your chest, rotate around to face away from the cable and push away. Repeat on the other side.</p> <p>2x10 reps each side</p>
Seated cable lift		<p>With the rope of a cable machine in its low position, sit on a physioball with shoulder perpendicular to the cable. Grasp rope with both hands as shoulders rotate to face the cable. Pull to your chest. Rotate to face away from the cable with arm going over the cable. Press away and up. Repeat to the other side.</p> <p>2x10 reps each side</p>
Seated one-arm cable row		<p>With a handle on cable machine set to its low position, sit on a physioball with shoulders perpendicular to the cable. Rotate shoulders and grasp handle. With inside leg and hip, accelerate cable and rotate through the torso until the handle is on the opposite hip. Repeat to the other side.</p> <p>2x10 reps each side</p>



**Table 1.3****STRENGTH TRAINING**

Exercise	Progression	Purpose		
Lower body push/knee  Dominant exercise  Progression	  1. Split squat rear foot elevated	  2. Balance squat	Promote single leg strength and stability without the risk of low back injury	
Lower body pull/hip  Dominant exercise  Progression	  1. Double leg bridge for time	  2. Single leg bridge for repetitions	  3. Physioball bridge with curl	Promote appropriate hip extension using primarily gluteous maximus and second- arily the hamstrings
Upper body push  Exercise progression	  1. Incline pushup feet elevated	  2. Alternating incline DB press	Promote chest and shoulder strength while enhancing over- all torso and scapular stability	
Upper body Pull  Exercise progression	  1. Natural grip pull- up/neutral grip pull-down in front	  2. One arm, one leg DB rows	Promote back strength for scapu- lothoracic and low back stabilization	

30 to 45 seconds of recovery. Repeat this process six to 10 times. Progress is made by lengthening the exertion intervals, increasing the number of intervals, or shortening the rest period.

## Recovery and Postexercise Nutrition

The low-carbohydrate fad does a great disservice to one's athletic progress. For little more than an hour after intense exercise, muscle tissues are depleted of glucose and in need of amino acids for repair. Insulin and insulin growth factors are essential to this process as these hormones are essential to their transport across cell membranes. After exercise, muscle tissues are grossly depleted of nutrients essential to their restoration and enhancement in adapting to exercise. Immediately following exercise, the rate of uptake of amino acids and glucose is enhanced such that protein synthesis is 350 percent of normal if postexercise carbohydrate and amino acid sources are optimal.<sup>15-17</sup> It is recommended that one consume protein and carbohydrates within the first hour after exercise. This will enhance muscle development and recovery.

## Conclusion

Dental health care workers often attempt to gain access to the oral cavity with seated posture that is stressful and potentially harmful to the spine. Especially stressful is that most commonly observed position that is achieved by leaning forward through flexion of the lower back with protrusion of the neck. This posture is additionally made worse by tilting the body to one side while rotating the head toward the patient. Dental health care workers are well known to suffer painful malady of the low back and neck induced by this "poor" posture. Just as a "poor" bite, chronically endured, may cause painful changes in the temporomandibular joint along movement dys-

function of the mandible, chronic "poor" working posture of dental health care workers may cause painful malady and dysfunction of the spine. "Good" posture, like a "good" bite, tends not to create a biomechanical load that is excessive and destructive to the relevant musculoskeletal elements as it places the articular disks in their most favorable load-bearing position. Analogously, positioning the torso to its most upright position is optimal for maintaining spinal health. The muscles of the torso that function against the force of gravity to elevate the spine to its most upright extent can be developed with an exercise protocol described herein. These exercises are a part of the training protocol for injury prevention in some of the world's most elite athletes. They are comprised of functional movements that are performed while seated or standing with feet firmly grounded and the abdomen drawn in. This is believed by expert strength and conditioning specialists to achieve optimal spinal posture during training movements intended to enhance the function of the torso. Through the recruitment of muscles of the torso, "good" posture is reinforced with all dynamic exercises performed in this prescription. In the same manner, recruitment of the torso muscles will encourage "good" posture by the dental health care worker while engaged in the practice of dentistry. **CDA**

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# Getting Your Back Back To Work: Pain Relief – Where to Start?

Timothy J. Caruso, PT, MBA, MS, Cert. MDT, and David J. Pleva, PT, MA, Dip. MDT

## ABSTRACT

Dental health care workers are vulnerable to back and neck pain resulting from poor occupational posture. While numerous choices exist for treatment, this article will provide them with a practical approach to seeking out appropriate care for this common malady. The McKenzie treatment approach is discussed and recommendations for its application are presented to provide the reader with a starting point for treatment. For the dental health care worker experiencing pain and dysfunction of the back and/or neck, as more than half will during their careers, this article will seek to provide an overview of potential causes while creating a roadmap for seeking the most appropriate conservative “antidote” for their care.

Orthopedic research has shown that 70 percent to 80 percent of the population will experience transient neck or low back pain during the course of their lives.<sup>1,2</sup> Studies have found that 23 percent to 79 percent have symptoms that persist or recur.<sup>3-6</sup> A majority of dentists and hygienists have musculoskeletal complaints related to the back and neck.<sup>7-9</sup> Although dental practice changed from standing to sitting postures in the mid-1960s, ostensibly to decrease the incidence of back and neck problems, a decrease in the prevalence of reported discomfort has not been observed.<sup>10</sup> Numerous choices exist for treatment of spinal ailments including but not limited to: massage, acupuncture, chiropractic, yoga, Rolfing, Pilates, physical therapy, osteopathic, orthopedics and surgery. While there is not a one-size-fits-all approach to caring for back pain, with the proper training and advice, the majority of dental health care workers with pain can learn to treat their condition independently.

Classification systems may be a clin-



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ically relevant way to characterize different sub-groups of back and neck pain and thereby to offer pain management strategies while excluding serious spinal pathology.<sup>11-14</sup> This article will present a classification system for the treatment of spinal pain created by physical therapist Robin McKenzie. According to McKenzie, the majority of low back pain appears to be mechanical in nature, having been initiated by excessive mechanical forces. Such an event may result from bending down to pick something up, or getting items out of a car trunk after prolonged sitting.<sup>15</sup> Mechanical pain is thought to involve injury to soft tissue. There is no single reason for mechanical low back pain, but the gamut of possible causes is vast considering the number of structures in the spine that have a nerve supply and are therefore capable of producing pain.<sup>16</sup>

The benefit of the McKenzie approach lies in identifying the movement “preference” of an individual with back or neck pain in order to alleviate the symptoms. The approach has had favorable clinical acceptance among therapists and patients and offers a conservative alternative to treating back and neck pain. The article will provide an overview of the McKenzie approach, in order to provide the reader with back/neck pain basic information to determine the most appropriate course of action for conservative treatment of their disorder.

The McKenzie physical examination assesses four areas of relevance: 1) sitting and standing postures; 2) range of movement; 3) neurological testing assessing strength, sensation, reflexes, and dural status; and 4) directional movement preference testing. The repeated movement testing is a series of dynamic movements and loading strategies that attempt to determine a directional preference. This preference is determined by assessing the effect of the movements on pain. McKenzie

advises that self-treatment should not be performed by individuals with the following complaints:<sup>17</sup>

- A first episode of back pain that persists for more than 10 days
- Bowel and bladder symptoms associated with back pain
- Back or neck pain caused by trauma
- Leg pain with symptoms below the knee including numbness, tingling or weakness
- Malaise
- Pain that disturbs sleep

In the event of any of these symptoms, treatment must be administered by a qualified medical professional.<sup>17</sup>

**The treatment for mechanical pain involves identifying the correct direction to move the spine and alleviating the symptoms while limiting movements and activities that aggravate the symptoms for a period of time.**

In the McKenzie assessment scheme, mechanical pain is characterized by: 1) pain that can be constant or intermittent, 2) limited range of motion of the back or neck that improves as symptoms diminish, and 3) movements in certain “incorrect,” or exacerbating directions increases the pain while simultaneously decreasing range of motion in the opposite direction. The treatment for mechanical pain involves identifying the correct direction to move the spine and alleviating the symptoms while limiting movements and activities that aggravate the symptoms for a period of time. As symptoms improve, activities are reintroduced that may have been

previously limited until all activities have returned to normal. For example, a patient may present with low back pain along with referred symptoms into the thigh. Following the performance of extension exercises, the thigh symptoms are abolished and remain better following completion of the exercises. This demonstrates mechanically produced pain that responds to the performance of the exercise in the correct direction. According to McKenzie, in most cases, the pain one experiences, at least initially, will have a combination of chemical and mechanical components. He proposed three nonspecific mechanical syndromes – posture, dysfunction and derangement syndromes, which are now widely used in the musculoskeletal care of the spine.<sup>18</sup> These three separate syndromes can be identified by their unique clinical presentations and through assessment of a specific sequence of loading strategies. Each syndrome responds to repeated and/or sustained end-range loading in different ways. Within these three syndromes we can identify and diagnose the vast majority of non-specific spinal problems<sup>18</sup>.

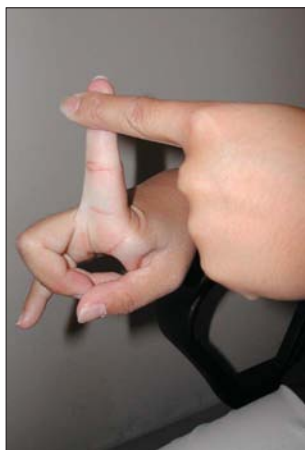
### **Postural Syndrome**

Postural pain syndrome is thought to be due to poor seated or standing posture, which stresses soft tissue structures at their end range of movement without any actual pathology. This poor posture position, if held over time, tends to decrease the blood supply to the area and overloads the supporting soft tissue structures, thus causing back pain. The hallmark of postural syndrome is that once the poor posture is corrected and the end-range stress is removed, the pain resolves. McKenzie gives the example of stressing one’s finger by pushing it into an “over extended” position toward the wrist and holding it (**Figures 1 and 2**). As this position is held, pain begins to develop and tends to worsen with time. Once the





**Figure 1.**  
Overex-  
tending a  
finger.



**Figure 2.**  
Overex-  
tending a  
finger.



**Figure 3a.**  
Slouching  
posture.



**Figure 3b.**  
Slouching  
posture.

position is released, the pain subsides. In many cases the treatment is just as simple as that, once again enforcing what our mothers always told us, to “sit up straight.”

In the case of the dental health care worker, poor posture is defined as forward head with rounded shoulders, flexed thoracic and lumbar spine, with the pelvis posteriorly tilted; also called slouching (**Figure 3**). Whether due to training, habit, or fatigue, slouched posture appears to be a regular part of the working day in the dental clinic. The ill-effects of poor seated posture are

coming to light in the literature. Recently published studies have confirmed that slouched sitting causes the spinal musculature to diminish its activity and place increasing stress on the posterior ligamentous structures of the spine resulting in increased length or “creep.”<sup>19</sup> Bogduk defines creep as a constant force, that if left applied for a prolonged period to collagen tissue will result in further movement or length of the ligamentous tissue.<sup>16</sup> This creep phenomenon when combined with diminished muscular activity is thought to result in an imperceptible

increase of unprotected movement of the lumbar spine and thought to place it at greater risk of injury. He went on to say that sustaining a flexed posture also reduces the resistance of the spinal ligaments. This reduction in resistance makes the spinal support structures weaker and thus, increases the chance of injury. In animal studies, it was found that the amount of time to cause the creep phenomenon to occur was as little as 20 minutes. Recovery took more than 24 hours and never returned to the original resting tissue length. It has been theorized that the combination of diminished muscle activity, combined with ligamentous creep may, in fact, lead to musculoskeletal cumulative trauma disorders over time as the amount of soft tissue damage exceeds the rate of repair and recovery in humans. It may also explain why individuals may experience ongoing or chronic low back pain over time with no apparent pathological condition with radiographic and other special studies.<sup>19</sup> Clinically, individuals with back pain may seek treatments that only address their symptoms and do not get at the cause of the problem. Having a one-hour massage may alleviate the discomfort for that particular day, while returning to the same slouched seated posture the next day causes a return of the symptoms.

McKenzie theorized that the behavior of the lumbar discs mimics that of a soap cake between one’s palms, wherein squeezing the palms backwards, the soap moves forward and squeezing the fingers together, the soap moves toward the wrist. This being the case, it can be seen that compressing the anterior aspect of the disc during forward flexion of the spine will cause the nucleus to migrate posteriorly and stretches the posterior annulus.<sup>20-23</sup> With spinal flexion, the vertebral canal is lengthened and this places tension on the spinal cord and peripheral nervous tissues. Flexion caus-





**Figure 4.** Good posture. Note the ear, shoulder and hip are in line.

es an increase in intradiscal pressure of up to 80 percent.<sup>24</sup> Conversely, extension of the spine compresses the posterior aspect of the disc moving the nucleus anteriorly.<sup>19-23</sup> The intradiscal pressure is decreased up to 35 percent with extension.<sup>24</sup> Andersson identified changes in intradiscal pressure with changes in posture in an historical publication. Slouched seated posture with weighted upper extremities demonstrated the highest intradiscal pressure of all postures measured. He found that in the unsupported sitting position, the highest level of myoelectric activity was in anterior sitting and the lowest in posterior sitting. Both myoelectric activity and disc pressure were found to decrease when the back was supported, particularly as the lumbar support was increased and armrests were used.<sup>25</sup> Anatomically, it is known that the posterolateral aspect of the disc is the weakest point of the structure with less radius, not as firmly attached to the vertebral end-plate, and not covered by the posterior longitudinal ligament.<sup>26,27</sup> If the “creep” phenomenon evidenced above holds true, recovery takes up to 24 hours irrespective of the load. Dentists and hygienists have been observed to assume a notably for-

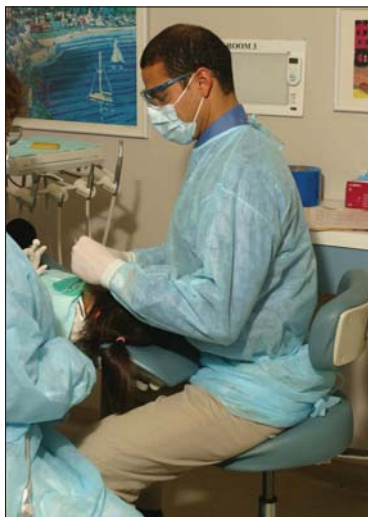
ward flexed posture greater than 50 percent of the time that they are working with their patients.<sup>28</sup> When a flexed posture is maintained, the stress of holding this position will fatigue the posterior annulus of the disc, overcoming its strength. If overstretching of the annulus exceeds 4 percent, irreversible damage will result.<sup>29</sup> As dental health care workers, sitting in this relatively poor position for extended periods of time is a natural part of the working day and may, in fact, lead to debilitating spinal disorders.

**By adjusting the chair and oneself in a good, balanced, seated posture where the spine has assumed its natural curves, surviving the stresses of the work day becomes much easier.**

When back pain sufferers are evaluated, measurement of their back strength has been found to be diminished.<sup>30-32</sup> The question of whether the weakness is a result of the back pain, or the back pain is a result of the weakness remains to be answered. There is, however, evidence to show that isolated strengthening of the back extensor muscles had a positive effect on complaints of low back pain.<sup>30-32</sup> Clinically, we often see significant weakness of the back extensor and posterior scapular musculature with an associated tightness of the anterior chest and shoulder musculature in individuals having back and neck pain. Additionally, we find weak abdominal musculature and tightness of the suboccipital soft tissue structures. If we were to combine the effects of weakness with limited mobility,

stress, and fatigue in the working day, it is easy to see how this scenario can become problematic. For dental health care workers, good posture is a key ingredient to successful practice. For the purpose of clarity, we will define good posture as that position which places the ear over the shoulder, the shoulder over the hip, while the legs are supported and parallel or slightly inclined (knees lower than the hips approximately 5 degrees) with the feet supported on the floor (**Figure 4**). In a recent article by Pynt et al., the authors concluded that lordosed seated posture, regularly interspersed with movement, is the optimal seated posture and assists in maintaining lumbar postural health and preventing low back pain.<sup>33</sup> Balancing the spine while seated provides a more stable base from which to work with less stress.

McKenzie promotes the use of a “lumbar roll” in order to re-establish and support the natural lordosis of the spine and a cervical roll for sleeping to support the neck. He theorized that one of the main culprits causing low back pain is the loss of this lordosis in the lumbar and cervical spine, combined with excessive flexion of the spine throughout the day. In speaking with the average dental practitioner, they report not using the back of the operator chair regularly. In fact, some report not adjusting the chair prior to beginning their treatments. As a simple preventive strategy, adjusting one’s chair prior to beginning work may counteract the ill-effects of poor seated posture. By adjusting the chair and oneself in a good, balanced, seated posture where the spine has assumed its natural curves, surviving the stresses of the work day becomes much easier. With the spine balanced, the head is over the shoulders and the natural spinal curvature is returned (**Figures 5 and 6**). For back pain of postural origin, the act of sitting up straight consistently through-



**Figure 5.** A balanced spine.

out the working day and while driving, alleviates symptoms entirely.

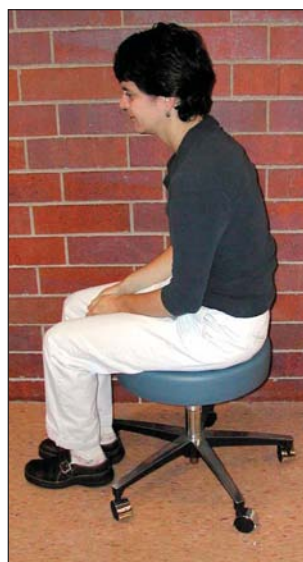
As a dental health care practitioner, tuning into good posture, while adding a few general chairside exercises, may ease the day-to-day stiffness and discomfort experienced during a typical working day. While there is sparse support in the dental literature, at least one publication has identified the benefits of exercises performed by video display unit operators.<sup>34,35</sup> It was found that exercises performed while working at the video display resulted in short-term decreases in both musculoskeletal discomfort and postural immobility.<sup>36</sup> Another study found limited evidence based on randomized trials and epidemiological studies that exercises to strengthen back or abdominal muscles and to improve overall fitness, can decrease the incidence and duration of low back pain episodes.<sup>37</sup> So, where does one start? Family practitioner, orthopedist, chiropractor, physical therapist, massage, acupuncture? How about doing it yourself? Try the McKenzie approach.

McKenzie recommends self-treatment exercises under the following conditions:<sup>15</sup>

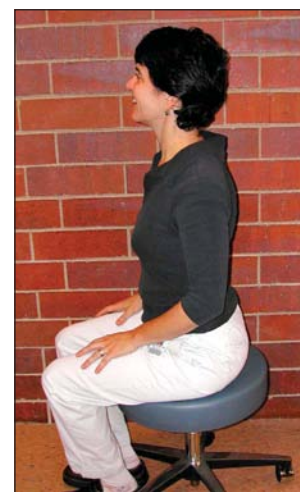


**Figure 6.** A balanced spine with back support.

- Periods in the day when you have no pain
- Pain is confined to areas above the knee
- Symptoms are generally worse with sitting for prolonged periods and better with standing or walking
- Symptoms are worse with bending or stooping and with inactivity
- If symptoms are better with lying face down



**Figure 7.** An extreme slouched posture.



**Figure 8.** An exaggerated lordotic posture.

■ Several episodes of back/neck pain have been experienced over the past few years

As a general rule to follow for the McKenzie exercises: If pain does not centralize, decrease, or otherwise improve with the exercises; if pain was getting worse before starting the exercises and does not improve after the first two days; or if symptoms worsen following performance of the exercises and remain worse, seek advice from a medical doctor as this program may not be appropriate.<sup>18</sup>

As a first step, correct poor seated posture by way of a technique called "slouch-overcorrect." In this procedure, one assumes an extreme, slouched position. From this position one "rises" into an exaggerated, lordotic posture (Figures 7 and 8). One can repeat this procedure 10 times and then "reposition" oneself back into a good seated posture with appropriate lumbar lordosis. This can be repeated throughout the working day as a simple chairside exercise. Repeat the process eight to 10 times throughout the day. After completion of the slouch-overcorrect maneuver, make sure to resume the good seated posture. This is the key to ongoing success.



**Figure 9.**  
Extension in  
standing.



**Figure 10.**  
Cervical retrac-  
tion.

Extension in standing is another exercise used for counteracting poor postural habits. It requires one to stand with feet apart, shoulder width; placing hands in the small of your back or at the top of your buttocks; bending your trunk backward as far as possible while keeping the knees straight, and using the hands as a fulcrum (**Figure 9**). Repeat the process eight to 10 repetitions. This exercise can also be repeated four to six times throughout the day or as often as needed to counteract the stresses of forward flexion.

In the case of neck pain of postural origin, good seated posture is the first activity to master. One can choose from several other movements to perform. Included are neck flexion, extension, and retraction. Since cervical flexion and extension are quite common, retraction will be discussed. While sitting up straight, retraction consists of moving the head posteriorly on the neck and shoulders as if someone is pushing your face gently backward (**Figure 10**). The movement itself reverses the cervical lordosis and opens

up the suboccipital space. A feeling of pulling or pressure in the cervical region at the end range of movement with no pain is normal. Retractions can be performed eight to 10 repetitions throughout the working day. The beauty of the postural syndrome is that the exercises to relieve it fit very neatly into the work day.

Even though the postural syndrome is an entity in its own, poor posture also plays a significant role in the next two syndromes described by McKenzie. The sitting posture of individuals identified with dysfunctions and derangements must also be addressed in order to effectively resolve their conditions.

### Dysfunction Syndrome

McKenzie theorized that the dysfunction syndrome is thought to occur when structural changes affect the joint capsules or adjoining soft tissues. Pain is experienced when the end range of movement is attained in one or more directions. Analogous to the dysfunction syndrome is a Colle's fracture of the wrist. Once the cast is removed from the wrist, movement of the wrist causes the shortened soft tissues to stretch and produce pain. As movement improves, pain decreases. Dysfunctions can be described in a variety of ways such as shortened, contracted, adhered, scarred, or fibrosed. Dysfunctions result from poor posture, trauma or surgery and the

lasting effect of imperfect healing. Dysfunctions are time dependent and take at least six to eight weeks after the onset of injury to develop.<sup>18</sup> The pain from dysfunction is intermittent in nature and felt locally, in the neck or low back regions without extremity symptoms. The symptoms from dysfunctions are only produced when the shortened tissues are placed on stretch, and cease when the loading has stopped or decreased. Additionally, movement of the spine will be limited in the direction of the pain. The pain one feels from dysfunction syndrome will persist until full range of motion of the spinal segments has been recovered, and remodeling of the affected soft tissue structures has been achieved.

In order to remodel a dysfunction, the soft tissues need to be stressed regularly throughout the day in order to return them to their normal resting length and full function. In dysfunction syndromes, the direction of movement in which this syndrome is treated is the one that causes discomfort. An initial pain that wears off gradually as you complete more repetitions is appropriate, whereas pain that is increasing with each repetition or moving distally is not, and one should stop the exercise. For example, if flexing forward causes discomfort confined to the back, without any symptoms into the buttocks or extremities, and improves as you increase the number of repetitions, then flexion in lying is the exercise of choice (**Figure 11**). Flexion in lying is performed while in a supine, hook lying position with the knees bent and the feet flat on the floor. Gently bring the knees up toward the chest until a feeling of pull or stretch is felt in the back. Repeat these exercises in sets of eight to 10 repetitions until the feeling of stretch subsides or until the knees reach the chest easily with no discomfort. Once the knees are brought to the chest easily, the progression is to flexion in sitting and standing.

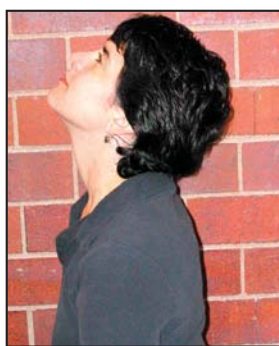




**Figure 11.** Flexion in lying.

In the cervical spine, if extension of the neck is limited and a feeling of pulling, stretching or pressure confined to the neck is felt with no other symptoms; extension in sitting is the exercise of choice (**Figure 12**). Extension in sitting consists of raising the chin upward while extending the neck. The head is extended back until a feeling of pulling, stretching or pressure in the neck is felt. Return to the starting position, rest and repeat eight to 10 times throughout the day. As the exercise progresses, range of movement will tend to improve with less feeling of pulling or pressure.

Several points of caution need to be made. It is known that the spinal discs hydrate during the night and that excessive flexion early in the morning may place individuals at risk for injury.<sup>18</sup> Snook et al. found that controlling lumbar spine flexion in the early morning was an effective form of self-care with potential for reducing nonspecific low back pain.<sup>20</sup> McKenzie recommended that flexion exercises always be followed by extension exercises, either extension in standing or lying (**Figure 13**). He theorized that performing extension after flexion could restore any distortion caused by flexion exercises. In the cervical spine, known pathology such as arthritic conditions, abnormal signs or symptoms, such as dizziness, disorientation or confusion with performing extension of the cervical spine is an absolute indication to stop and seek medical advice.



**Figure 12.**  
Extension of  
the neck.

### Derangement Syndrome

The second condition McKenzie described is the spinal derangement syndrome. As previously mentioned, self-treatment for individuals with derangements is ill-advised and potentially dangerous. This discussion of derangement syndrome is for informational purposes only in order to provide readers with a conservative alternative to be considered prior to undergoing a potential surgical procedure for pain of discogenic origin. According to McKenzie, spinal derangements are the most commonly seen clinical condition.<sup>18</sup> A displacement or disturbance in the normal resting position of a spinal motion segment is the cause of derangement. The disruption will be pain provoking until it is reduced. In regard to the spine, this disruption can be anywhere in the motion segment, which is defined as the vertebrae above and the vertebrae below including the disc and soft tissues associated with this joint. This disruption can lead to a loss of one or more movements in the cervical or lumbar regions with associated pain.

Derangements have varying clinical presentations, but usually respond to specific loading strategies. Symptoms can be felt locally in the spine, distally in the extremities or both. The hallmark of treating the derangement syndrome is called centralization. Centralization only occurs in derange-

ments and is characterized by the identification of a movement that reduces the distal symptoms with a concomitant increase in local neck or back pain. With this decrease in symptoms, one will notice a dramatic, simultaneous increase in range of motion of the cervical or lumbar spine. The opposite occurs when a movement worsens symptoms or peripheralizes them into the extremities. Centralization includes the restoration of full movement with reduction or abolishment of symptoms.<sup>18</sup> For those facing a possible surgical intervention, this represents a reasonable treatment to try prior to undergoing more invasive treatments.

Clinically, the majority of patients with a derangement respond to the extension principle of movement, however the treatment strategy for derangements is based strictly on identifying a directional preference. In other words, directional preference is determined by identifying the direction that decreases, abolishes or centralizes the symptoms while simultaneously increasing the lost range of motion of the spine. Donelson et al. reported that directional preference is guided by centralization.<sup>38</sup> Long-term correction of this condition is also dependent upon eliminating poor postures, whether sitting, standing or lying, which can be a contributing or underlying causative factor in the persistence of this condition. Research has shown centralization to be a reliable indicator in determining which patients will have a good prognosis.<sup>39-42</sup> Eighty-seven percent of the patients who centralized had good or excellent outcomes when compared to those who did not centralize.<sup>38</sup> In the chronic back pain population, 47 percent centralized and of the group that did centralize, 68 percent returned to work versus 52 percent of the noncentralizing group.<sup>42</sup> Donelson et al. reported that centralization most often occurs with extension.<sup>43</sup> In the case of the "cen-

*Continued on Page 155*





**Figure 13a.**  
Extension in  
standing.



**Figure 13b.** Extension in lying.

*Continued from Page 152*

tralization phenomenon" described by McKenzie, the pain can be a bit unnerving to individuals who may report feeling a worsening of their symptoms while experiencing it. A thorough explanation of symptom identification, understanding of potential pain behavior and location allows individuals to monitor and control their pain. Individuals must be assured that increasing central low back pain is desirable if distal, radicular symptoms in the arm or the leg are resolving or abolished. Once a treatment regimen has been established, ongoing postural education and awareness is a key ingredient to a successful treatment program.

Derangements can be summed up as a condition that is inconsistent and rapidly changing.<sup>11,18</sup> To support the concept of sitting in lordosis with the derangement population, Williams took patients with back and referred pain and divided them into two groups. One group was to sit in lordosis, and the other group was instructed to sit in kyphosis for 24 to 48 hours. The group that sat in lordosis had their back and

leg pain significantly reduced versus the kyphotic group.<sup>39</sup> When experiencing symptoms consistent with the derangement or dysfunction syndromes, seeking professional guidance by an experienced practitioner initially during your care will assure a successful recovery. Having a complete McKenzie evaluation may allow one to more accurately direct one's own care and the return to pain-free, daily activities in a timely manner. With the McKenzie system, individuals beyond the scope of conservative treatment can often be identified within a reasonable number of visits (three to six), rather than an extended period of time. If successful conservative intervention cannot be achieved, individuals can be referred to the appropriate practitioner with a written report in order to make an educated decision about more invasive treatment options. In the cases where surgery is indicated, returning to a McKenzie-trained practitioner following a surgical procedure can facilitate a return to pain-free function.

### Prevention

Prevention as a result of exercise has not been strongly supported in the literature, however; there is ample evidence that healthier, stronger individuals are at significantly less risk of health-related maladies including musculoskeletal disorders. One study has suggested that good dynamic trunk extension performance may protect against back-related permanent work disability.<sup>44</sup> Weakness of the spinal

musculature in individuals with low back pain has been identified in the literature, and general poor health has been associated with back/neck pain in older individuals.<sup>45</sup> Spinal extensor musculature has been shown to have large potential for strength increase.<sup>44</sup> Medx is one particular treatment strategy utilizing a frame which specifically isolates the lumbar spine in order to strengthen back extensor musculature and has met with good results.<sup>30</sup> Lastly, the benefit of good working posture cannot be overstated. Poor seated posture may be a result of the combination of equipment choices and training.<sup>46</sup> (See Dr. Allan Jones article on Page 137.) Marklin noted that poor seated posture is quite prevalent among dentists and hygienists.<sup>28</sup> While the cause of poor seated posture is often difficult to pinpoint, several theories have been proposed including equipment selection, muscle weakness and debilitation, training techniques, work habits, workload, years in practice or some combination of these factors. Suffice to say, there is not one simple solution to this multifactorial problem. The addition of exercise alone to the dental health care worker's daily routine is only part of a complete solution. Several exercises have been recommended, however having a specific program customized for one's specific needs is the most appropriate approach to beginning an exercise program, particularly if there is underlying pathology. Having a complete musculoskeletal evaluation by a trained practitioner is a great place to start.

Choosing an ergonomically designed workspace and properly fitting equipment may further reduce the risk associated with some of these causative factors. Denis et al. found that EMG activity of dental hygienists' upper trapezius musculature was significantly reduced with the elbows supported by armrests on the operator

Table 1 NONSPECIFIC MECHANICAL SYNDROMES				
SYNDROME	SYMPTOMS	STRENGTH	SPINAL RANGE OF MOTION	TREATMENT
Posture	Local, Intermittent	+/- weakness of trunk	No limitation	Postural correction General strengthening
Dysfunction	Local, Intermittent	+/- weakness of trunk	Limited, painful at end range	End range stretch in direction of pain throughout the day General strengthening
Derangement	Local/distal/both Radicular pain Possible sensory changes, motor deficits bowel/bladder symptoms	+/- weakness of trunk/ extremities	Limited, painful during range of movement and/or at end range	Rule out serious pathology with physician. Determine directional preference under trained practitioner. Exercises performed throughout the day Centralization

stools during the working day.<sup>47</sup> Reducing this type of stress is one part of the resolution. Looking at the layout of the clinic is a good place to start and analyzing the specifics of your dental practice. Answering the following questions may be informative:

- Is scheduling helping or hindering the work flow?
- Is needed equipment within easy reach while working with patients?
- Can you get close to the patient? Do you have them move to accommodate your needs?
- How is the lighting in the operatory? Do you use magnification? Does it help?
- Are you using fitted gloves of the appropriate size?
- Is your chair adjustable? Is it comfortable? Does it provide you the support to assume a good seated posture?
- Have you had your posture observed or have you observed others in your office? Are you able to take a small break between patients to perform a few simple exercises?
- Are you stressed during the day? Have you had to modify your

work hours/techniques due to discomfort or pain?

- Take a picture of your seated work posture. What does it look like?
- Being aware of the things we can control is extremely important. The concept of caring for our most important instrument, our body, is invaluable. Becoming aware of our aches, pains and general health is a vital part of attaining and maintaining a pain-free life. For years, dental health care workers have been constrained by the limitations of their own work environment and have paid the price physically. Equipment that does not work properly, adjust properly or limits lighting and visibility, along with increasing workloads, and poor ergonomic awareness and training, may all play a role. Fitting the worker to the work can have significant physical costs. Working with discomfort can only negatively impact the profitability of a dental practice. Likewise, career satisfaction, from quality of work to patient satisfaction, can also be greatly affected. It is often advantageous to have an objective third party perform a practice

analysis to determine if the work environment is to blame for musculoskeletal aches and pains.

### Conclusion

Given the numerous exercise routines and recommendations for treating back pain along with the countless health care practitioners available to seek advice from, it's always an advantage to be able to help yourself. There is an old proverb that goes something like this: "Feeding an individual a fish takes care of their hunger, while teaching them to fish allows them to survive for life." The benefit of having a custom-tailored home program based on your particular needs will allow you to be proactive with your back/neck pain. In most cases, "nipping it in the bud" before an annoying pain becomes more chronic and self-limiting is an obvious advantage.

The authors have attempted to summarize the characteristic symptoms of mechanical back/neck pain, along with providing a logical approach for seeking the most appropriate conservative care. As an ongoing treatment strategy, the McKenzie approach fits

very nicely into a regular workout routine and can be advanced to include a complete strength and conditioning program. McKenzie creates a framework within which one can perform all of their daily activities as well as their nightly activities safely, without pain. The ultimate success of the program combines the expertise of the trained health care practitioner including postural awareness, compliance of the patient and his/her self-treatment strategies. Making a conscious effort to include these components into daily and nightly activities will generally assure a much greater level of success. In general, being "tuned in" to how you feel will make a significant difference in your life, your staff, and in the lives of your patients. (Table 1).

Footnote: It is strongly encouraged you seek the advice of a trained health care provider when experiencing low back or neck pain prior to beginning any type of exercise program to rule out serious pathology. If experiencing symptoms consistent with dysfunction or derangement syndromes it is advised to have these evaluated under the guidance of a trained professional. **CDA**

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# Waiting Room Blues



The one-on-one time with your personal health provider is variously estimated to be between 45 seconds and five minutes, comparable to the quality time received at Albertson's checkout line.

Forty-three year-old Dr. Gordon Moore of Rochester, N.Y., has had an epiphany. Either that or he is embroiled in the greatest medical hoo-ha since George Hull perpetrated the Cardiff Giant shenanigan in 1869. Hull, you may recall, sculpted a slab of gypsum into an antediluvian giant 10-feet tall with 21-inch feet. It was secretly buried on a remote farm in upstate New York and "discovered" later by workers while ostensibly digging a well. A gullible public lined up by the hundreds to view the fake at 50 cents a look. Their acceptance of the validity of the hoax was based on their desire to believe it, a faith shared years later by UFO devotees.

This same public, older, but not necessarily wiser, is about to be tested again. The medical profession with its sensitive fingers on the public's pulse has become increasingly aware of the vast dissatisfaction engendered by HMOs, long waits for appointments and even longer ones in reception rooms. According to a dispatch from the Associated Press, Dr. Moore is one of a growing group of doctors nationwide who have adopted the concept of same-day service. The idea, AP reported, is that scheduling patients immediately for even routine physicals will keep them healthier and happier, while at the same time saving them money in the long run. This is known in the industry as "open access." Marie Schall, a training

director at the Boston-based Institute for Healthcare Improvement, concurred. "We've seen it work in every kind of clinic imaginable," she beamed. The American Academy of Family Physicians and the U.S. Department of Veterans Affairs have also adopted open access as their goal.

Open access is an electrifying idea, particularly as a recent survey in 15 cities reports the average wait for a cardiology exam is 19 days. The cooling heels period for a dermatology appointment is 24 days, and 23 days for an obstetrics-gynecology exam.

The changeover to open access isn't

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## These people have been led to believe that “same-day service” actually means today!

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exactly a piece of cake. Kurt Mosley of Merritt, Hawkins & Associates, a national firm that recruits medical workers, warned: “You have to get rid of the backlog first. You have to stop long-term scheduling cold turkey. Doctors aren’t used to that. You have to have an office manager who takes control and says, ‘You’re **not** going to fill up your schedule on this day!’” Huh? Already the one-on-one time with your personal health provider is variously estimated to be between 45 seconds and five minutes, comparable to the quality time received at Albertson’s checkout line. Inviting the ailing hordes in for instant servicing appears to place the scheduler in an awkward position of writing more names in the margins of the appointment book while at the same time not filling up the doctor’s day.

It seems to us that a 3-year-old chimpanzee could come up with a working hypothesis that might illuminate the problems, if not the solution for this new medical breakthrough. Bonzo, our own primate, delicately fingered the worn keys of his ancient Underwood, offered this:

J. Elwood Goodpants, DMD, Family Practice/Cosmetic/Implants/Braces/Teeth Whitened While-You-Wait, has summoned his team of dedicated auxiliaries to evaluate the initial impact of their new Same-Day Service Open Access scheduling.

**Doctor:** Everybody clear on this? Patient calls for an appointment, he gets one today, no waiting, no exceptions? Got it?

**Marilouanne:** Got it! Here’s your schedule for today: 47 patients, no

lunch hour. These people have been led to believe that “same-day service” actually means today! We can close at 9:30 p.m. if there are no more calls. And we’re on the clock for time-and-half after 5.

**Anastasia:** There are 14 people in the waiting room right now, doctor. They’re saying they like the idea of same-day service, but the two-hour wait to see you stinks! If this “open access” thing includes your private office, they’d like to talk to you.

**Doctor:** Would you get Dr. Gordon Moore, Rochester, New York, on the phone for me? I have some questions.

So do we, Elwood. Although Dr. Moore said he was tired of working long hours with patients double and triple booked into time slots, he felt the open access plan is working just fine. We must be missing something here.

Marie Schall attempted to clear it up: “It’s all very data driven and based on predictions and having a clear understanding of your supply and demand.” Oh. Nice try, Marie!

Moore agreed, saying he is able to address several needs of patients all at once, rather than refer them to a specialist or schedule a later appointment. Great idea! Who wants to wait 24 days to have a dermatologist sort out your various dermal deficiencies when you can wait right here in this waiting room until they heal spontaneously?

We have, in spite of all this congratulatory evidence, decided to postpone implementing open access in our office until we see how the guy down the hall does with it. This is the same chap who bought Caridex and the Mystique veneers.

Meanwhile, if you are ever find yourself in Cooperstown, N.Y., drop by the Farmer’s Museum where, for a mere pittance, you may have same-day viewing of the Cardiff Giant, on display as “America’s Greatest Hoax.” Until now, anyway.

CDA