

The influence of systemic diseases on oral health care in older adults

Crispian Scully, CBE, MD, PhD, MDS, MRCS, FDSRCS, FDSRCPS, FFDRCSI, FDSRCSE, FRCPath, FMedSci, FHEA, DSc; Ronald L. Ettinger, BDS, MDS, DDSc, DABSCD

Older adults in the United States are diverse and heterogeneous, and their health and health-related behaviors vary greatly. Many of these people have a variety of systemic diseases that will have an impact on their oral health care. To provide good oral health care, dental professionals must understand the complexities of older people, their special needs and their ability to undergo and respond to care.¹ Dentists should work closely with the rest of the health care team² and be prepared to manage emergencies that more commonly occur in older people.

In this article, we review some of the management modifications for oral health care for the 10 most common systemic diseases seen in functionally independent older adults living in the developed world. We also will discuss the needs and ways dental professionals should adapt their practices to safely treat these patients. Special descriptions about these diseases are available elsewhere.^{3,4}

ABSTRACT

Background and Overview. Systemic diseases are more common in older adults than in younger people, even among those who are functionally independent. Dentists should understand how these diseases can affect the dental care of their aging patients. The authors review some of the management issues associated with selected systemic diseases common in older adults who are functionally independent.

Conclusions. To provide good oral health care, dental professionals must understand the special needs of older people and their ability to undergo and respond to care; they should work closely with the rest of the health care team; and they should be prepared to manage emergencies.

Clinical Implications. Many older people have a variety of systemic diseases that have an impact on their oral health care. The dentist may need to consult with the patient's physician to develop an appropriate treatment plan.

Key Words. Oral health; older adults; systemic disease; medications; arthritis; head and neck cancer; chronic obstructive pulmonary disease; diabetes; heart disease; hypertension; mental health; osteoporosis; Parkinson disease; stroke.

JADA 2007;138(9 supplement):7S-14S.



Dr. Scully is the dean and director, University College London Eastman Dental Institute, 256 Gray's Inn Road, London, WC1X 8LD, England, e-mail "c.scully@eastman.ucl.ac.uk." Address reprint requests to Dr. Scully.

Dr. Ettinger is a professor, Department of Prosthodontics and Dows Institute for Dental Research, University of Iowa, Iowa City. He also is the guest editor of this supplement.

ORAL HEALTH NEEDS AND MANAGING THE CARE OF OLDER PEOPLE

Prevention is of paramount importance in caring for older adults.⁴ Therefore, the most important considerations for dental professionals are how well the patient has compensated for his or her medical condition and the exact dental intervention that is contemplated. Noninvasive procedures in patients with minimal incapacity carry less risk than do surgical procedures in ill people.

Older people tend to be more sensitive to drugs and to trauma. To control their pain and anxiety, dentists should use local anesthesia (LA) whenever possible, since the risks of using general anesthesia (GA) are greater than they are in younger patients. LA used with recommended dosages of epinephrine has no significant effect on cardiac arrhythmias in functionally independent older patients. Dentists should provide sympathetic reassurance and, if necessary, sedation, with short-acting benzodiazepines being preferable to opioids. Older people, especially women, also heal slowly and bruise readily if tissues are not handled carefully.⁵

MEDICAL CONDITIONS IN OLDER ADULTS

The 10 most common systemic diseases seen in functionally independent older adults in the developed world are arthritis, cancer, chronic obstructive pulmonary disease, diabetes, heart disease, hypertension, mental health conditions, osteoporosis, Parkinson disease and stroke.

Arthritis. It is estimated that about 49 percent of people older than 65 years in the United States have arthritis and that this condition limits the activities of 11.6 percent of people 65 years and older.⁶ Patients with rheumatoid arthritis (RA) may experience restricted manual dexterity, which may compromise their ability to maintain adequate oral hygiene.⁶ These patients may need toothbrushes with specially adapted handles (such as a handle with a ball added to help the patient grip) or may benefit from using electric toothbrushes.⁷

Since joint stiffness tends to improve during the day, short appointments in the late morning or in the early afternoon are recommended for

patients with arthritis. Supine positioning may be uncomfortable for them, and they may need neck and leg supports.

When treating a patient with arthritis, the dentist should consider the patient's tendency to bleed as well as any need for corticosteroid supplementation or antibiotic coverage before performing any invasive procedures. Most infections of prosthetic joints have been caused by nonoral microorganisms such as staphylococci, and infections of oral origin have been estimated at only about 5 to 10 percent of cases.⁸ There thus is no reliable evidence of a need for antibiotic prophylaxis before most dental treatment in most patients with prosthetic joints, and the risks from adverse reactions to antibiotics probably exceed any benefit.⁹ Guidelines issued by the American Dental Association in conjunction with the American Association of Orthopedic Surgeons¹⁰ advocate using antibiotic prophylaxis when dental procedures that place the patient at risk of developing an infection are to be

carried out in patients who have received new joints within the last two years, when the joint has been infected previously, or when the patient is immunocompromised by virtue of conditions such as diabetes or RA.

Head and neck cancer. The estimated incidence of oral and pharyngeal cancer in 2007 in the United States is approximately 34,360 new cases with an estimated

7,550 deaths.¹¹ Careful treatment planning, as well as close monitoring of the oral cavity with strict application of preventive measures, can reduce the incidence of complications of the treatment of head and neck cancer significantly. Improved treatment techniques, such as the

When treating a patient with arthritis, the dentist should consider the patient's tendency to bleed as well as any need for corticosteroid supplementation or antibiotic coverage before performing any invasive procedures.

ABBREVIATION KEY. **BP:** Blood pressure. **CNS:** Central nervous system. **COMT:** Catechol-O-methyltransferase. **COPD:** Chronic obstructive pulmonary disease. **CPR:** Cardiopulmonary resuscitation. **GA:** General anesthesia. **IMRT:** Intensity-modulated radiotherapy. **INR:** International normalized ratio. **LA:** Local anesthesia. **MAOIs:** Monoamine oxidase inhibitors. **MI:** Myocardial infarct. **NSAIDs:** Nonsteroidal anti-inflammatory drugs. **ONJ:** Osteonecrosis of the jaws. **RA:** Rheumatoid arthritis. **TCAs:** Tricyclic antidepressants.

application of lower radiation doses or intensity-modulated radiotherapy (IMRT), use of shielding, reduction in the use of toxic drugs and improved oral hygiene often can reduce complications. Pain control is of paramount importance in patients with head and neck cancer. They may need potent analgesics, such as opioids, sedatives or antidepressants, particularly if they have terminal cancer. Completion of dental treatment before beginning cancer care benefits the patient greatly.¹²⁻¹⁶

Previous publications have recommended a dental care plan specifically for patients undergoing cancer therapy.^{3,4} We outline the plan below, divided into three stages: before, during and after therapy.

Before therapy. Before cancer therapy begins, the patient should implement meticulous oral hygiene and the dentist should institute preventive dental care.

The dentist should restore salvageable teeth and extract neglected and unsalvageable teeth in the radiation path. To minimize the risk of osteoradionecrosis, an interval of at least two weeks between extraction and the start of radiotherapy to the head and neck is ideal.

During therapy. During cancer therapy, the dentist should avoid performing invasive dental procedures whenever possible.^{3,4} During radiotherapy to the head and neck, mucosal and salivary gland protection with amifostine can minimize the mucositis and xerostomia that often result. During chemotherapy, it may be possible to reduce mucositis if the patient drinks ice-cold water or sucks ice during infusion of the agent. Oral ulceration caused by methotrexate can be reduced using systemic or topical folinic acid (leucovorin calcium). Mucositis may be relieved by means of warm normal saline mouthwashes and benzydamine oral rinses, or lignocaine (lidocaine) viscous 2 percent, and by maintaining good oral hygiene with twice-daily 0.12 percent alcohol-free chlorhexidine mouthrinses.^{3,4}

A saliva substitute such as carboxymethylcellulose may provide some symptomatic relief from xerostomia, as may salivary stimulants (sialogogues) such as pilocarpine or cevimeline.¹⁷

Trismus may be improved by performing jaw-opening exercises with tongue spatulas or wedges

or a jaw motion rehabilitation system, used three times per day.

Prophylactic use of topical antifungal drugs (such as a nystatin suspension mouthrinse), used four times daily, may be required for patients likely to develop candidiasis. Systemic medications such as fluconazole may help with patients' compliance with the medication regimen, as it is taken once daily and it may be more appropriate for those who develop fever. To reduce candidal carriage, patients undergoing cancer therapy should clean and soak dentures carefully in 1 percent hypochlorite for up to 30 minutes per day to reduce bleaching or should soak them overnight in a 1.750 dilution of benzalkonium chloride.¹⁸

Prophylactic acyclovir has lowered the postchemotherapy incidence of herpes simplex and zoster infections and mortality from zoster.

The dentist should treat oral herpetic infections with acyclovir suspension or systemic acyclovir or valacyclovir (tablets or infusion). Zoster immune globulin may help ameliorate varicella or zoster infections.¹⁹

Gram-negative bacterial infections may require treatment with gentamicin or carbenicillin, as the oral lesions seen in such infections can be portals for systemic spread.

Possible drug interactions should be considered. Dentists should not give aspirin (acetylsalicylic acid) to patients taking methotrexate, as it may enhance that drug's toxicity.

If tooth extractions become unavoidable, trauma should be kept to a minimum, the socket should be sutured carefully and prophylactic post-operative antibiotics may need to be provided.

After therapy. Oral hygiene and preventive dental care should be continued. Dryness of the mouth can be managed with salivary supplements or sialogogues.¹⁷

Radiation caries and dental hypersensitivity can be controlled with a noncariogenic diet and with daily application of a neutral sodium fluoride (5,000 parts per million) by means of custom-fabricated carriers.

If tooth extractions become unavoidable, the dentist should minimize the trauma as much as possible, using atraumatic techniques, suturing carefully and providing prophylactic antibiotics.

If dentures are required, they should be fitted

Before cancer therapy begins, the patient should implement meticulous oral hygiene and the dentist should institute preventive dental care.

after the mucositis subsides and salivary flow has improved.

Rubber dam or packs may be used to protect the airway, providing there is no nasal obstruction.

Although the dentist may not be able to provide definitive restorative care to patients receiving palliative therapy, they must keep these patients free of active dental disease and pain. Glass ionomers may be useful in restorations, as they release fluoride.²⁰

Chronic obstructive pulmonary disease (COPD). COPD, which is characterized by progressive airflow limitations due to chronic bronchitis or emphysema, is a leading cause of mortality and morbidity. In the United States, more than 2.3 million people older than 65 years were diagnosed with COPD in the year 2000.²¹

Patients with COPD who need dental care can be classified as being at low, moderate or high risk of developing incapacity.

■ Patients at low risk experience dyspnea on effort but have normal blood gas levels; these patients can receive the full range of dental treatment with minor modifications.

■ Patients at moderate risk experience dyspnea on effort and are treated long-term with bronchodilators or, in a more recent development, with corticosteroids and partial pressure of oxygen (PaO₂); a medical consultation is advised to determine the level of control of the disease before any dental treatment can commence.

■ Patients at high risk have symptomatic COPD that is undiagnosed and untreated. With these patients, a medical consultation is essential before any dental treatment is carried out.

Patients with COPD are best treated in an upright position at midmorning or in the early afternoon, since they may become increasingly dyspneic if laid supine. It may be difficult to use a rubber dam, as some patients with COPD are mouth breathers and do not tolerate the additional obstruction.

Patients taking corticosteroids for COPD should be treated with appropriate consideration, as they do not heal well or tolerate stress well.²²

Diabetes. More than 80 percent of cases of diabetes mellitus in the United States are adult onset type 2, and the annual incidence for people

older than 65 years is 680 per 100,000 population, or more than 625,000 people per year.²³ For patients with diabetes, the main hazard during dental treatment is hypoglycemia, as dental disease and treatment may disrupt the normal pattern of food intake. The dentist can prevent this by planning, such as by administering oral glucose just before the appointment if a patient has taken his or her medication but has not had the appropriate meal.²⁴ The dentist should avoid administering tetracyclines, aspirin and corticosteroids, since they can disturb diabetic control. However, amoxicillin and acetaminophen, alone or combined with codeine, can be used safely.

The dentist should manage infections aggressively, as people with diabetes may be immunocompromised. People with well-controlled diabetes usually can tolerate routine dental procedures, even a single-tooth extraction under LA, without problems.

People who are insulin-dependent can undergo minor surgical procedures within two hours of eating breakfast and receiving their morning insulin injection, with no change needed in the insulin regimen. Dentists

should refer to an oral surgeon any patient who has poorly controlled diabetes or who needs invasive procedures such as multiple extractions.^{23,25}

Heart disease. Ischemic heart disease is common among people 65 years and older in the United States and is responsible for 70 percent of all deaths after age 75 years.²⁶ All staff members in a dental office should be certified in basic cardiopulmonary resuscitation (CPR), and the dentist should have the entire team rehearse emergency protocol procedures regularly, including knowing how to gain access to nitroglycerin, oxygen and emergency medical help. Patients with heart disease should take their medications as usual on the day of the dental procedure, and they should bring all their medications to the dental office for review at the time of the first dental appointment.

The most important aspect for dentists to consider is how well the patient's heart condition is compensated for by treatment, especially in relation to the exact dental intervention contemplated.²⁶ Patients with stable ischemic heart disease receiving atraumatic treatment under LA

For patients with diabetes, the main hazard during dental treatment is hypoglycemia, as dental disease and treatment may disrupt the normal pattern of food intake.

can receive treatment in the dental office. Since cardiac events are most likely to occur in the early morning, dentists should see patients with cardiac disease in late morning or early afternoon appointments.^{27,28}

Prophylactic administration of 0.3 to 0.6 milligrams of nitroglycerine may be indicated if the patient has angina more than once a week. The dentist should consult the patient's physician before providing dental care for patients with unstable angina or to patients who have had a recent myocardial infarct (MI), angioplasty or stent placement.²⁹

Because undergoing dental procedures can release a patient's natural catecholamines (epinephrine/norepinephrine) owing to anxiety or pain, the concomitant increases in blood pressure (BP) can precipitate angina or an MI. The dentist and team should provide dental care with a stress-reduction protocol and with good analgesia, limiting the dosage of epinephrine in LA to 0.036 mg, which translates to two carpules of LA with 100,000 epinephrine with deliberate aspiration while monitoring BP and pulse.^{30,31}

Dentists should be cautious about the use of certain drugs with patients who have heart disease.

- Nonsteroidal anti-inflammatory drugs (NSAIDs), if the patient uses them for more than three weeks, can impair the effect of β -blockers and angiotensin-converting enzyme inhibitors.
- Antimicrobial drugs can affect the function of cardiac drugs. Ampicillin, in prolonged use, reduces atenolol levels; erythromycin and tetracycline can induce digitalis toxicity; azole antifungals and macrolides such as erythromycin and clarithromycin can interact with statins to increase muscle damage (rhabdomyolysis).
- Antihypertensive drugs may lead to orthostatic hypotension, so the dentist should raise the back of the patient's reclined dental chair to the upright position slowly and in stages.
- Warfarin (coumadin) therapy may put the patient at an increased risk of experiencing intra- and postoperative bleeding as well as internal or external bruising. Dentists treating these patients should consult with the patients' physicians to discuss the type of procedure and the

level of the patients' international normalized ratio (INR). Dentists never should alter a patient's anticoagulant treatment without the agreement of the patient's physician. The INR should be used as a guideline of hemostatic risk, and the dentist should check it on the day of the invasive procedure or in the preceding 24 hours. Warfarin's effect may be enhanced by many drugs such as aspirin (acetylsalicylic acid) and NSAIDs, antibiotics and azole antifungal agents.^{32,33}

Hypertension. High BP is one of the most modifiable risk factors for cardiovascular disease.

Much of the discussion under "Heart disease" above applies to hypertension. It is particularly important to help a patient with hypertension avoid anxiety and pain, and, ideally, the BP should be controlled before the dentist begins elective dental treatment.

If the patient has a persistently high BP, the dentist should seek the opinion of the patient's physician before commencing dental treatment.³⁴⁻³⁶ In these patients, continuous or periodic BP monitoring may be indicated.³⁷

If the patient's BP rises, the dentist should discontinue dental treatment, place the patient in a supine position, allow the patient to rest, and re-check the BP after

five minutes. If at that point the BP is consistently high and severe, the dentist should call 911.

Mental health. Of the many mental health conditions that can be encountered, dementia and depression are particular problems in older people.

Dementia. Dementia is not a sign, a symptom or a disease, but rather a variety of syndromes that involve progressive irreversible changes. The patient's stage of dementia and the complexity of the dental treatment will help the dentist decide what treatment is possible and where care would be best carried out. Dentists should complete comprehensive oral rehabilitation as early as possible in the patient's course of disease, since patients who have it almost inevitably demonstrate reduced cooperation as the disease advances. Informed consent is a complex issue in all patients with dementia and requires that the dentist consult with the patient's guardian or significant other (if the patient has a living will). The patient with Alzheimer's disease may be

Because undergoing dental procedures can release a patient's natural catecholamines owing to anxiety or pain, the concomitant increases in blood pressure can precipitate angina or a myocardial infarction.

medically healthy otherwise or may have accumulated a host of additional medical problems, but in either case the chief issues are behavioral.

Preventive dentistry is crucial in patients with dementia. The patient may forget oral hygiene, dental appointments and instructions unless a caregiver or family member also is involved. The dentist should carry out treatment, as far as possible, in the morning, when cooperation tends to be best, with the usual caretakers present and in a familiar environment and allowing time to explain every procedure before it is carried out. To avoid aspiration and postural hypotension, the patient should be treated while sitting upright in the dental chair or slightly reclined.³⁸⁻⁴¹

Depression and mood disorders. Community research suggests that 25 percent of older adults in the United States report having some symptoms of depression, which can lead to impairment in physical, mental and social functioning.⁴² Dentists preferably should defer treatment until the depression is under control, but they should institute preventive programs at an early stage. Dentists must exhibit great tact, patience and a sympathetic, unpatronizing manner in handling patients who are depressed.^{43,44}

To avoid causing adverse drug interactions, the dentist should take special precautions when administering certain antibiotics, analgesics and sedatives. Any central nervous system (CNS) depressant, especially opioids and phenothiazines, given to patients who are taking monoamine oxidase inhibitors (MAOIs) or within 21 days of the withdrawal of MAOIs may precipitate a coma. Benzodiazepines and erythromycin may be potentiated in patients using selective serotonin reuptake inhibitors. Acetaminophen can inhibit the metabolism of tricyclic antidepressants (TCAs). TCAs and MAOIs can cause postural hypotension and a risk of falls.⁴⁴

Osteoporosis. Fractures resulting from minimal trauma can result in significant morbidity and mortality in older adults who are functionally independent. These fragility fractures are related to an underlying osteoporosis.

Bisphosphonates, such as pamidronate and zoledronate, particularly used intravenously can

lead to painful refractory bone exposures in the jaws. This outcome sometimes has been termed “osteonecrosis” or “osteonecrosis of the jaws” (ONJ) and typically is observed after oral surgical procedures.⁴⁵ The prevalence of ONJ in the United States appears to be approximately 1 to 10 percent in patients who have a malignancy being treated with very high doses of intravenous bisphosphonates. However, in osteoporosis, in which the doses used are an order of magnitude lower, the prevalence of ONJ also appears to be much lower—probably less than 1 in 60,000.⁴⁶

After dental treatment, patients with ONJ usually develop painful, exposed, necrotic bone, primarily of the alveolar bone of the mandible and, to a lesser extent, the maxilla. Lamina dura sclerosis or loss and widening of the periodontal

ligament space also may occur. Although the precipitating event that produces this complication may be spontaneous, there is no doubt that oral surgical procedures are the main precipitant. The presently postulated mechanism of ONJ is that prolonged use of bisphosphonates may suppress bone turnover to the point at which the repair function of physiologic microdamage of bone is abolished. Therefore, whenever possible, dentists should avoid performing extractions and elec-

tive oral surgery in patients taking bisphosphonates. If surgery is essential, the dentist must counsel the patient about the risks of intravenous bisphosphonate treatment, or oral bisphosphonates taken for more than three years, as these forms of medication put them at high risk.

Parkinson disease. Parkinson disease is a progressive degenerative disorder of the CNS and is not often seen in people younger than 55 years. The movements, drooling and spasmodic head positioning associated with the disease may compromise the dentist’s ability to carry out restorative care. These patients’ involuntary movements can make the use of sharp and rotating instruments hazardous. Catechol-O-methyltransferase (COMT) inhibitors, which are used to allow a larger amount of levodopa to reach the brain and raise dopamine levels, may interact with epinephrine to cause tachycardia, arrhythmias and hypertension. Erythromycin and other macrolides may increase levels of bromocriptine or cabergo-

.....
Dentists should complete comprehensive oral rehabilitation as early as possible in the patient’s course of dementia, since patients who have it almost inevitably demonstrate reduced cooperation as the disease advances.
.....

line, which are dopamine receptor agonists used to treat Parkinson disease either by themselves or in combination with levodopa.^{3,4,47,48}

Stroke. Stroke is the acute onset of neurological deficits persisting for at least 24 hours. About 8 percent of the U.S. population older than 65 years has a history of stroke.⁴⁹

Many of these patients initially suffer confusion and emotional lability; therefore, encouragement is an extremely important motivating factor for them. Access, mobility and communication may be impaired in many of these patients, since they may have cognitive and visual defects as well as dysarthria, aphasia, confusion, memory loss and emotional distress and depression. Support with preventive care is critical; oral hygiene tends to deteriorate on the paralyzed side, and impaired manual dexterity may interfere with toothbrushing. Use of an electric toothbrush or adaptive holders may help.

Dentists should defer elective and invasive dental care for patients who have had transient ischemic attacks or strokes for three months after the event. It is important to communicate clearly with the patient who has experienced a cerebrovascular accident by not wearing a mask, by facing the patient and by speaking slowly and clearly and by using language that is not complex.

Short treatment sessions in midmorning are desirable for these patients. They are best treated in the upright position, with extra care taken to avoid foreign bodies' entering the pharynx. The practitioner needs to monitor BP and anticoagulation status before beginning any dental treatment.^{50,51}

SUMMARY

This article has focused on the 10 most common systemic diseases found in the aging U.S. population. While it is not possible to provide a comprehensive description of all the issues associated with each of these 10 diseases, we have attempted to highlight some of the patient management issues associated with the dental treatment of patients who have these diseases. The dentist's focus always is on prevention of dental disease, especially in people who have progressive, debilitating systemic diseases. ■

1. Berkey DB, Berg RG, Ettinger RL, Mersel A, Mann J. The old-old dental patient: the challenge of clinical decision-making. *JADA* 1996;127(3):321-32.

2. Durso SC. Interaction with other health team members in caring

for elderly patients. *Dent Clin North Am* 2005;49(2):377-88.

3. Scully C, Cawson RA. *Medical problems in dentistry*. 5th ed. Edinburgh, Scotland: Elsevier Churchill Livingstone; 2005.

4. Scully C, Diz Dios P, Kumar N. *Special care in dentistry: Handbook of oral healthcare*. Edinburgh, Scotland: Elsevier Churchill Livingstone; 2007.

5. Engeland CG, Bosch JA, Cacioppo JT, Marucha PT. Mucosal wound healing; the roles of age and sex. *Arch Surg* 2006;141(12):1193-7.

6. Montandon AA, Pinelli LA, Fais LM. Quality of life and oral hygiene in older people with manual functional imitations. *J Dent Educ* 2006;70(12):1261-2.

7. Ettinger RL. Oral care for the homebound and institutionalized. *Clin Geriatr Med* 1992;8(3):659-72.

8. LaPorte DM, Waldman BJ, Mont MA, Hungerford DS. Infections associated with dental procedures in total hip arthroplasty. *J Bone Joint Surg Br* 1999;81(1):56-9.

9. Seymour RA, Whitworth JM, Martin M. Antibiotic prophylaxis for patients with joint prostheses: still a dilemma for dental practitioners. *Br Dent J* 2003;194(12):649-53.

10. American Dental Association; American Academy of Orthopedic Surgeons. Advisory statement: antibiotic prophylaxis for dental patients with total joint replacements. *JADA* 1997;128(7):1004-8.

11. American Cancer Society. Estimated new cancer cases and deaths by sex for all sites, US, 2007. In: American Cancer Society. *Cancer facts and figures 2007*. Available at: "www.cancer.org/downloads/STT/CAFF2007PWSecured.pdf". Accessed July 25, 2007.

12. Bruins HH, Koole R, Jolly DE. Pretherapy dental decisions in patients with head and neck cancer: a proposed model for dental decision support. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;86(3):256-67.

13. McGuire DB. Barriers and strategies in implementation of oral care standards for cancer patients. *Support Care Cancer* 2003;11(7):435-41.

14. Barker D, Donachie MA. The need for dental treatment in a group of patients undergoing treatment for malignancies other than of the head and neck. *Eur J Prosthodont Restor Dent* 2005;13(4):182-5.

15. Arosarena OA. Perioperative management of the head and neck cancer patient. *J Oral Maxillofac Surg* 2007;65(2):305-13.

16. Epstein JB, Parker IR, Epstein MS, Gupta A, Kutis S, Witkowski DM. A survey of National Cancer Institute-designated comprehensive cancer centers' oral health supportive care practices and resources in the United States. *Support Care Cancer* 2007;15(4):357-62.

17. Gupta A, Epstein JB, Sroussi H. Hyposalivation in elderly patients. *J Can Dent Assoc* 2006;72(9):841-6.

18. Redding SW, Zellars RC, Kirkpatrick WR, et al. Epidemiology of oropharyngeal *Candida* colonization and patients receiving radiation for head and neck cancer. *J Clin Microbiol* 1999;37(12):3896-900.

19. Nicolatou-Galitis O, Athanassiadou P, Kouloulis V, et al. Herpes simplex virus-1 (HSV-1) infection in radiation-induced oral mucositis. *Support Care Cancer* 2006;14(7):753-62.

20. Chalmers JM. Minimal intervention dentistry, part 2: strategies for addressing restorative challenges in older adults. *J Can Dent Assoc* 2006;72(5):435-40.

21. Anto JM, Vermeire P, Vestbo J, Sunyer J. Epidemiology of chronic obstructive pulmonary disease. *Eur Respir J* 2001;17(5):982-94.

22. Foley NM. Chronic obstructive pulmonary disease. *SAAD Dig* 2000;17(3):3-12.

23. Miley DD, Terezhalmay GT. The patient with diabetes mellitus: etiology, epidemiology, principles of medical management, oral disease burden, and principles of dental management. *Quintessence Int* 2005;36(10):779-95.

24. Fiske J. Diabetes mellitus and oral care. *Dent Update* 2004;31(4):190-8.

25. McKenna SJ. Dental management of patients with diabetes. *Dent Clin North Am* 2006;50(4):591-606.

26. Hupp JR. Ischemic heart disease: dental management considerations. *Dent Clin North Am* 2006;50(4):483-91.

27. Andreotti F, Davies GJ, Hackett DR, et al. Major circadian fluctuations in fibrinolytic factors and possible relevance to time of onset of myocardial infarction, sudden cardiac death and stroke. *Am J Cardiol* 1988;62(9):635-7.

28. Panza JA, Epstein SE, Quyyumi AA. Circadian variation in vascular tone and its relation to alpha-sympathetic vasoconstrictor activity. *N Engl J Med* 1991;325(14):986-90.

29. Niwa H, Sato Y, Matsuura H. Safety of dental treatment in patients with previously diagnosed acute myocardial infarction or unstable angina pectoris. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;89(1):35-41.

30. Haas DA. An update of local anesthetics in dentistry. *J Can Dent*

Assoc 2002;68(9):546-51.

31. Gordon SM, Dionne RA. The integration of clinical research into dental therapeutics: making treatment decisions. *JADA* 2005;136(12):1701-8.

32. Jeske AH, Suchko GD, ADA Council on Scientific Affairs and Division of Science, Journal of the American Dental Association. Lack of a scientific basis for routine discontinuation of oral anticoagulation therapy before dental treatment [published correction in *JADA* 2004;135(1):28]. *JADA* 2003;134(11):1492-7.

33. Scully C, Wolff A. Oral surgery in patients on anticoagulant therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;94(1):57-64.

34. Glick M. The new blood pressure guidelines: a digest. *JADA* 2004;135(5):585-6.

35. Herman WW, Konzelman JL Jr, Prisant LM; Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. New national guidelines on hypertension: a summary for dentistry. *JADA* 2004;135(5):576-84.

36. Bavitz JB. Dental management of patients with hypertension. *Dent Clin North Am* 2006;50(4):547-62.

37. Yagiela JA, Haymore TL. Management of the hypertensive dental patient. *J Calif Dent Assoc* 2007;35(1):51-9.

38. Fiske J, Frenkel H, Griffiths J, Jones V. Guidelines for the development of local standards of oral health care for people with dementia. *Gerodontology* 2006;23(supplement 1):5-32.

39. Ettinger RL. Dental management of patients with Alzheimer's disease and dementias. *Gerodontology* 2000;17(1):8-16.

40. Kocaelli H, Yaltirik M, Yargic LI, Ozbas H. Alzheimer's disease and dental management. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;93:521-4.

41. Friedlander AH, Norman DC, Mahler ME, Norman KM, Yagiela JA. Alzheimer's disease: psychopathology, medical management and dental implications. *JADA* 2006;137(9):1240-51.

42. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the national comorbidity survey replication (NCS-R). *JAMA* 2003;289(23):3095-105.

43. Little JW. Dental implications of mood disorders. *Gen Dent* 2004;52(5):442-50.

44. Friedlander AH, Friedlander IK, Marder SR. Bipolar I disorder: psychopathology, medical management and dental implications. *JADA* 2002;133(9):1209-17.

45. Marx RE. Oral and intravenous bisphosphonate-induced osteonecrosis of the jaws: History, etiology, prevention and treatment. Chicago: Quintessence Publishing; 2006.

46. Bolland M, Hay D, Grey A, Reid I, Cundy T. Osteonecrosis of the jaw and bisphosphonates: putting the risk in perspective. *N Z Med J* 2006;119(1246):U2339.

47. Fiske J, Hyland K. Parkinson's disease and oral care. *Dent Update* 2000;27(2):58-65.

48. Dirks SJ, Paunovich ED, Terezhalmay GT, Chiodo LK. The patient with Parkinson's disease. *Quintessence Int* 2003;34(5):379-93.

49. Prevalence of stroke: United States, 2005. *MMWR Morb Mortal Wkly Rep* 2007;56(19):469-74. Available at: "www.cdc.gov/mmwr/preview/mmwrhtml/mm5619a2.htm". Accessed June 18, 2007.

50. Sacco D, Frost DE. Dental management of patients with stroke or Alzheimer's disease. *Dent Clin North Am* 2006;50(4):625-33.

51. Fatahzadeh M, Glick M. Stroke: epidemiology, classification, risk factors, complications, diagnosis, prevention, and medical and dental management. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;102(2):180-91.