STANDARDS OF PRACTICE
FOR
DENTAL PUBLIC HEALTH

Tennessee Department of Health
Bureau of Health Services
Oral Health Services Section

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STANDARDS OF PRACTICE FOR DENTAL PUBLIC HEALTH

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SECTION 1

GENERAL INFORMATION FOR PUBLIC HEALTH DENTAL CLINICS

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

GENERAL INFORMATION FOR PUBLIC HEALTH DENTAL CLINICS

I. PROLOGUE

The initial responsibility for instilling professional standards of care, values, and skills within dental providers resides with the professional and technical schools that provide the basic training within the profession of dentistry. Boards of dental examiners test basic clinical skills and knowledge on select procedures as dentists, hygienists and assistants present themselves for licensure and registration. Ultimately, it is individual professional integrity, supported by technical knowledge, clinical skills, and continued educational development that provides the foundation for the provision of needed dental services in a safe, effective, caring, and non-discriminatory manner.

The Oral Health Services Section of the Tennessee Department of Health is responsible for assuring that the dental care provided in public health clinics meets or exceeds existing standards in regard to quality, quantity, appropriateness, need, and safety. However, no administrative body can guarantee through quality assurance reviews that standards of care are being met on a patient-by-patient, procedure-by-procedure, or day-by-day basis. The maintenance of professional standards of care, in terms of individual provider responsibility for the quality and appropriateness of services provided to individual patients, rests with the provider. Our goal is that every provider should strive for excellence through practicing fundamentally sound dentistry at all times.

Essential to the accomplishment of the goals of the Oral Health Services Section is adherence to uniform standards of practice, accepted clinical technique, and accurate recordkeeping. The *Standards of Practice Manual* has been compiled to acquaint dental care providers employed in the public sector in Tennessee with the various clinical regulations, policies, recommendations, procedures, and forms used by the Oral Health Services Section. The *Standards of Practice Manual* serves as a reference source regarding policies and procedures of the Oral Health Services Section.

In addition to this manual, dental staff in public health clinics in Tennessee must adhere to the guidelines and regulations presented in two companion manuals: *Exposure Control Manual for Dental Health Care Workers* and *Hazard Communication Program for Public Health Dental Clinics*. Every public health dental clinic in Tennessee should have copies of the three aforementioned manuals for easy reference, and they should be made available to all personnel involved in the delivery of dental care in a public health setting. Revisions, additions, and deletions will be made to these manuals when necessary to keep current with new or revised standards. Updates should be inserted in the appropriate places in the manual(s). Up-to-date revisions of the Standards of Practice Manual are also available at http://health.state.tn.us/oralhealth/index.html.

II. ADMINISTRATIVE AND INTERDISCIPLINARY RELATIONS

Dentists, dental hygienists, and dental assistants working in dental public health clinics in Tennessee must be licensed or registered to practice dentistry, dental hygiene, or dental assisting. The Dental Practice Act, for scope of practice, for any of the above mentioned professionals may be found in TCA Title 63. The dentist, dental hygienist, and dental assistant are responsible for fees (registration, license renewal, or privilege taxes) imposed by the State of Tennessee to keep all licenses or registrations current throughout the period of employment with the state. A dentist who prescribes or dispenses scheduled narcotics in the course of patient treatment must have a current, unrestricted DEA number.

All persons employed in dental public health in Tennessee should be familiar with the *Tennessee Dental Practice Act* and *Rules of the Tennessee Board of Dentistry* and strictly adhere to all regulations regarding dental practice, professional conduct, utilization of auxiliaries, etc. The most current revisions of these two documents can be found in Sections 8 & 11 of this manual.

All rules, regulations, and policies promulgated by the State of Tennessee, the Department of Health, the Bureau of Health Services, and the appropriate local authorities will be followed. These rules include: attendance and leave procedures, work hours (including time of arrival and departure), proper dress code, and other rules as set forth by the supervising authority. Job performance planning, interim work reviews and employee performance evaluation will be completed at the proper intervals. Interaction and communication with supervisors and support personnel will be conducted at appropriate intervals and in a professional manner. Collegiality with other health care providers within the department is encouraged, and in-house referrals should be made when appropriate.

The normal workday consists of 7.5 hours. It is recommended that each full-time clinician have at least 2400 patient contacts per year, which translates into treatment of a minimum of 10 patients per day with 25 Relative Value Unit's (RVU) per day.

III. LEVELS OF DENTAL SERVICE

The purpose of this section is to outline the Oral Health Services guidelines regarding levels of service and provision of care by dental providers working within the framework of the Tennessee Department of Health.

A. Level I - Emergency Dental Services

All public health dental clinics should provide for treatment of adult dental emergencies and other populations as identified by the Department of Health. Dental emergency treatment is limited to diagnosis and treatment of an acute episode of pain, infection, swelling, hemorrhage, or trauma (i.e., relief of pain and suffering). These may include extractions and/or prescription medications.

B. Level II - Primary Prevention

All public health dental clinics should provide primary preventive services appropriate for the target population. Suggested primary preventive dental services include:

1. Oral Health Education

    a) Oral hygiene instruction
    b) Dietary counseling
    c) Trauma prevention – bicycle helmets, seat belts/child restraints and mouth guards
    d) Fluoride effectiveness
    e) Oral cancer prevention

2. Prophylaxis

3. Topical application of fluoride varnish

4. Supplemental fluoride therapy (tablets or drops) as indicated

    a) Community water fluoridation assessment
    b) Individual well water analysis
    c) Adherence to current supplemental fluoride dosage schedule (Section 1, page 20)

5. Physicals, medical examinations, and dental examinations should incorporate oral cancer detection and prevention principles.

6. Pit and fissure sealants

C. Level III - Basic Dental Services

Services that primarily control or eliminate oral diseases (e.g., dental caries, gingivitis, and periodontitis) should be provided. Examples include:

1. Comprehensive oral diagnostic procedures

2. Restorative dental procedures

3. Basic endodontic procedures

4. Basic periodontal procedures

5. Basic oral surgery procedures

D. Level IV - Rehabilitative Dental Services

Services that primarily restore oral structure may be provided. Examples include:

1. Removable prosthetic services

2. Fixed prosthetic services

IV. LEGAL ASPECTS OF TREATING MINORS

Written consent for treatment must be obtained for each patient prior to an examination or any subsequent treatment. This policy is relatively straightforward when adults present themselves for treatment at a public health facility, yet the majority of patients treated in most of our public health dental clinics are minors. The question that needs to be addressed is "When can a minor authorize or consent to any medical (dental) services?"

In 1993, Patricia L. Newton, Assistant General Counsel for the Tennessee Department of Health, rendered the following legal opinion regarding authorization and consent to medical or dental care for minors. This opinion is based on CARDWELL v. BECHTOL (Tenn. 1987) 724 S.W. 2d 739.

- A minor fourteen (14) years of age or older is presumed to be competent to authorize and consent to medical services offered by the health departments. The presumption is rebuttable and the determination of competency is a medical decision based upon the trained professional evaluation of the health care provider. Complete documentation of the decision making process is advised.

- A minor aged seven (7) through thirteen (13) years is presumed to be incompetent to authorize and consent to medical services offered by the health departments. The presumption is rebuttable and the determination of competency is a medical (nursing) (dental) decision based upon the trained professional evaluation of the health care provider.

- A minor under the age of seven (7) years is conclusively presumed to be incompetent to authorize and consent to medical services offered by the health departments. The presumption is not rebuttable and the determination of competency is not a medical (nursing) (dental) decision based upon the trained professional evaluation of the health care provider.

- A minor/teenage parent has the authority and duty to provide/obtain health care services for their children as well.

Note: It is the responsibility of each clinic to determine protocol regarding parents/guardians present in the treatment room with the child. This protocol must be clearly stated to the parent/guardian at the initial visit. This policy **must be posted** and be clearly visible in the reception area of the dental clinic.

V. DENTAL PATIENT RECORDS

It is necessary that we standardize the dental patient records that are being used in our dental public health clinics across the state. The *Clinic Oral Evaluation and Treatment Record* (PH-0205A, revised 02/08) and the *Health History for Dental Services* (PH-3990) that was developed by a subcommittee within our staff ***must*** be utilized in all dental public health clinics in all regions.

It is essential that we have complete and accurate records on all patients. Therefore, when admitting new patients, we are asking the dentist to ensure that the dental staff completes all sections of the dental patient record including the medical history, consent for treatment, charting of the examination and treatment, and thoroughly documents all services delivered to patients. The specific criteria and standards for public health dental records are delineated in the *Quality Assurance Review Instruments for the Direct Observation of Public Health Dental Practice* (refer to Section 3).

There must be a dental patient record for each individual seen in the clinic regardless of level of care being provided or payment source. **Every dental patient must have a complete, accurate, and up-to-date *Clinic Oral Evaluation and Treatment Record* (PH-0205A) and a *Health History for Dental Services* (PH-3990) as part of his or her dental record.**

In the area of recordkeeping, much of the information (e.g., patient identification, medical history, and charting) will be obtained or recorded by the dental assistant or clerical personnel. Standardized Charting **MUST** be used in all Rural Public Health Dental Clinics. The Metro Health Departments will follow Metro Policy for charting. Examples of the standardized charting are included in Section 2 of this manual, along with descriptions of the charting symbols. However, treatment entries (progress notes) are the responsibility of the dentist, and all pertinent patient information should be reviewed and signed by the dentist to ensure that it is correct, current, and complete.

Confidentiality of patient records and treatment is the "cornerstone" of building trust in a doctor-patient relationship. **This confidentiality must never be compromised.** The policies and procedures regarding confidentiality expressed in the Bureau of Health Services Policy 5.2 are strictly enforced. Failure to maintain confidentiality of patient records may result in disciplinary actions up to and including termination of the employee. **Each clinic and its professionals must be HIPAA compliant**.

The policies and procedures regarding Retention and Destruction of Records are found in Bureau of Health Services Policy 5.3. Following is the policy for retaining records:

- Medical records, to include dental, must be retained by the health department for 10 years following the last date of service(i.e. if the last date of service was April 25, 2007 then the record must be retained until April 25, 2017).

- The medical record of a minor or person with a mental disability must be retained for the period of minority (under 18 years of age) or mental disability, plus 1 year or 10 years following the last date of service, whichever is longer.

    - If a 17 yr. old's last date of service was May 1, 2007 then the record must be retained until May 1, 2017.

    - If a 7 yr. old's last date of service was May 1, 2007 then the record must be retained until May 1, 2019.

    - If a person with a mental disability continues to have a mental disability then the record cannot be disposed of, but if the person becomes better than the above guidelines will be followed.

Key identification information such as: name, gender, birth date, address, record number, and TennCare number (when applicable) must be present. A consent form or permission for treatment must be obtained from the patient, parent, or the patient's guardian before treatment is started. **It is required that a new medical history and signed consent form be completed for each patient annually**. Update the patient's medical history at each visit, on the Health History for Dental Services Form PH-3990 or in the progress note; document the date and any changes. Written informed consent ***must*** be obtained prior to performing any oral surgery procedure using *Informed Consent for Oral & Maxillofacial Surgery* (PH-3432, Rev 04/10). If the patient has taken an Oral Bisphosphonate drug, then the *Informed Consent for Patients Taking Oral Bisphosphonates* **(PH-4035)** must be completed as well. If the patient has no previous history of taking Oral Bisphosphonates only the Informed Consent for Oral & Maxillofacial Surgery (PH-3432) needs to be completed.

As our dental clinics are focusing more on adult dental emergency care, there is the possibility of encountering more individuals on bisphosphonates and therefore more individuals at risk for BRONJ post-extraction. In order to provide guidance to the dental clinical staff and to provide the highest quality care to our patient population, the health history has been revised (PH-3990) and specifically asks (question 15) about medications to treat osteoporosis or osteopenia.

Types of Patients who take Bisphosphonates:

I. Individuals who have taken an oral bisphosphonate for less than three years and have no clinical risk factors, no alteration or delay in the planned surgery is necessary. This includes any and all surgeries common to oral and maxillofacial surgeons and other dental providers.
    a. The following factors are thought to be risk factors for BRONJ:
        i. Corticosteroid therapy
        ii. Diabetes
        iii. Smoking
        iv. Alcohol use
        v. Poor oral hygiene
        vi. Chemotherapeutic drugs

II. Individuals who have taken an oral bisphosphonate for less than three years and have also taken corticosteroids concomitantly.

III. Individuals who have taken an oral bisphosphonate for more than three years with or without any concomitant prednisone or other steroid medication.

IV. Individuals who are being treated with IV bisphosphonates for hypercalcemia, bone metastases and other conditions.

The following guidelines, concerning extractions for this patient population, have been reviewed and approved by Central Office Oral Health Services as well as the rural regional dental directors. This policy is based on recommendations from the American Association of Oral and Maxillofacial Surgeons, the American Dental Association, and the University of Tennessee, School of Dentistry.

- Type I- Extractions can be performed on this classification of patient but the decision to treat is up to the individual dental provider's professional judgment- Bisphosphonate informed consent is required in addition to informed consent for oral surgery.
- Type II- To be referred to an oral surgeon for extraction.
- Type III- To be referred to an oral surgeon for extraction.
- Type IV- To be referred to an oral surgeon for extraction.

The Health History for Dental Services Form must be completed for each patient who is treated in a public health dental clinic. All health questions ***must*** be answered. Any medications or allergies should be noted. The health history must be dated and signed by the patient or parent/guardian ***and*** the dentist. **Any medical condition that could affect dental treatment should be noted on the record treatment page, and flagged using a sticker for med alerts, or an annotation is made using red ink. These stickers or annotations in red ink should be placed on the Clinic Oral Evaluation and Treatment Record and on the Health History Form.** The health history should be updated at every visit and any change noted on the PH-3990 or in the progress note.

An accurate and complete medical history is a prerequisite to patient treatment. Since information obtained from patients, parents, or guardians is subjective, it can never be assured that all responses are accurate. Pertinent information may be unreported. A well-structured medical history together with appropriate follow-up to key responses should give the baseline patient data on which determinations are made concerning referrals, patient management, treatment planning, and treatment.

A dental history should be taken on every patient and should include: 1) problems with or reactions to anesthesia, 2) specific complaint(s), and 3) problems with previous dental treatment. Existing oral conditions including restorations, caries, periodontal status, oral hygiene status, and any other pertinent observations will be recorded for all patients undergoing comprehensive or preventive care. Complete charting of the oral examination and treatment rendered for each patient is imperative. A chief complaint should be noted for every patient.

Appropriate radiographs as determined by the dentist as necessary for diagnosis or treatment should be labeled, dated, **mounted** and maintained as part of the patient's record. Retention of x-ray film should be in accordance with Bureau of Health Services Policy 5.3.b. It is recommended that the type and quantity of radiographs be based on the following guidelines:

- Initial radiographs for an adult patient should consist of individualized films including bitewings with panoramic exam or bitewings and selected periapicals. A full-mouth intraoral radiographic examination is appropriate when the patient presents with clinical evidence of generalized dental disease or extensive dental treatment.

- For children with primary teeth only, radiographs are made if the proximal surfaces of the primary teeth cannot be visualized or if there are specific problems.

- For children with a transitional dentition or adolescent with permanent dentition, initial radiographs should consist of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images.

- Recall bitewing radiographs should be made at a frequency based on caries activity, caries risk, disease activity, or specific problems.

- Recall panoramic radiographs for children with transitional dentition should be based on clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth & development. For adolescents with permanent dentition the recommendation is based on clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth & development.

X-Ray Inspections are required every 4 years. Scatter radiation is not routinely checked during inspections, but a scatter radiation monitoring test can be conducted if there is a concern about the amount of scatter radiation being emitted. Contact the Department of Environment and Conservation, Division of Radiological Health, in your area to request this test. Radiation Dosimetry badges are not required due to insignificant amount of scatter radiation, but if a dentist or assistant becomes pregnant or if an employee requests a dosimetry badge, the employer should purchase one for the employee.

Parents/guardians should be notified in those cases where there may be an alternate treatment (such as a root canal) to a non-reversible procedure (such as an extraction), and when the alternate procedure for any reason cannot be accomplished in the public health dental clinic. The parent/guardian should be offered the opportunity to seek treatment at an alternate source. Referral for treatment should be documented in the patient's record. If the parent elects the non-reversible procedure offered at the public health clinic, written informed consent for that procedure must be obtained.

Diagnosis and treatment of a condition shall be charted, using standardized charting symbols and a written entry made in the record. Progress notes must include tooth number, diagnosis, and a complete description of the procedure including materials used, and type and quantity of anesthetic given. All prescriptions and pre-op or post-op medications dispensed or used should be recorded including name of drug, quantity, and dosage. All canceled or broken appointments should be noted in the record and initialed by the appropriate person.

Progress notes must be legible using blue or black ink. **Each entry must be dated and signed (using signature on Legal Signature Page) by the provider, using proper credentials i.e. DDS, RDH or RDA.** Identifying patient information should be included on all forms. Errors should not be corrected with white out. A line should be drawn through the mistake to avoid the impression that a record may have been altered. Write CID (Correction in Documentation) immediately above the mistake, then initial and date if different from date of original entry.

A signed medical history and written consent for treatment will be obtained for each patient prior to examination or any subsequent treatment.

VI. TREATMENT FACILITY

The dental public health clinic should be located in a facility that provides for adequately sized clinical operatories, adequate heating and cooling, and proper lighting to provide dental treatment in optimal conditions. It is the responsibility of the dentist to assure that the public health dental clinic is maintained in a manner that provides dental staff and patients with a clean and orderly place to work and receive dental care. The dentist is responsible for assuring that the clinic has the necessary equipment and supplies.

VII. EMERGENCY PROTOCOL AND EQUIPMENT

Every dental public health clinic must have a written protocol for management of medical emergencies (refer to Section 4). Every dental clinic must be equipped with or have ready accessibility to an emergency kit containing devices and drugs per Bureau Policy 8.4 and that the dentist is trained to use to support life in an emergency situation. A separate medical emergency kit for the dental clinic is only necessary if the dental clinic is on a separate floor or in a separate building from the medical clinic and the health department emergency kit. The dentist should

communicate on a regular basis with the appropriate medical personnel (nursing director and/or health officer) to assure that the dental emergency kit (if necessary) is maintained with drugs that are "in-date". Each facility must be equipped with oxygen that can be delivered under positive pressure. Every dentist, dental hygienist, and dental assistant must maintain current certification in CPR throughout the course of employment.

VIII. QUALITY ASSURANCE REVIEW

The Oral Health Services Section quality assurance program is designed to provide an effective, objective, and uniform method of evaluating clinical dental services to assure that high quality care is provided to all patients in a professional manner. The quality assurance review process is an essential component of the employee's annual job performance cycle (i.e., job planning discussion, interim reviews, and job performance evaluation). The Oral Health Services Section with regional input has developed a quality assurance review instrument for dentists who deliver direct patient care in health department settings (refer to Section 3). The purpose of this process is to assess and improve the quality of dental care delivered to health department patients. The professional competency of dentists is assessed by chart review and by direct observation of clinical care by the Regional Dental Director. Regional QI staff will conduct administrative, availability, and risk minimization review for all dental clinics effective July 1, 2011.

All dentists who deliver direct patient care in health department settings are to be reviewed at least once annually. New dentists must be reviewed after the first four months of employment. Regional dental directors are responsible for reviewing all sections of the Quality Assurance Review, for all dentists providing direct patient care in the health departments in their region.

The record review portion of the Quality Assurance must be done by the Regional Dental Director. During the record review portion of the Quality Assurance Review process, a minimum of **20** patient records ***must*** be reviewed, from the current fiscal year, i.e. if review is done in October 08 – you can review records with treatment dates from October 2007-October 2008. Records that are reviewed can be used only 1 time in the record review section. These records are not to be used in the Direct Observation Of Care Section. This will ensure a review of the comprehensive care provided by the dentist (under review). When doing the Record Review, a note must be placed in the progress notes of the chart stating that you have reviewed this chart.

Example: Date, Record Reviewed for QA, your signature, as shown on the Legal Signature Page, with credentials, (DDS).

During the Direct Observation of Patient Care, a notation must also be made in the progress note section of the chart.

Example: Date, Record used for Direct Observation of Patient Care for QA, your signature, as shown on the Legal Signature Page, with credentials, (DDS).

There is evidence that a relationship exists between the quality of clinical record keeping and the quality of care provided. Therefore, the focus of the quality assurance review program will be on the evaluation of the dental records of individual patients as well as the direct clinical observation of care.

To assure that dentist quality assurance review evaluations are completed as required by Bureau of Health Services Policy 8.6.a., this review process will be monitored statewide by the Oral Health Services Section. Hopefully, the "centralization" of dental quality assurance review will result in evaluations that are completed in an accurate and timely manner for all dentists providing direct patient care in public health facilities.

The regional dental director has the responsibility of assuring that necessary corrective action is taken to bring the evaluated dentist into compliance with the quality assurance criteria and standards of practice for public health dentistry. The template for a corrective plan of action is found in Section II Dental Public Health Forms. Besides improving individual performance, the findings from the quality assurance evaluations will be used to target specific areas of public health dental practice for discussion at future field staff meetings and continuing education programs.

IX. GENERAL TREATMENT INFORMATION

A. Efforts should be made to provide pertinent and accurate information to parents and children concerning their role in the maintenance of good oral health. Each patient should be given home care instruction to include oral hygiene care and dietary information.

B. Treatment of dental caries and major esthetic defects should be given the highest priority after relief of pain and infection. Treatment should follow a logical sequence. Normally, with minor variations, this is:

1. Relief of pain and suffering
2. Elimination of infection and traumatic conditions
3. Caries control (removal of soft, deep caries)
4. Prophylaxis, preventive procedures, and oral hygiene instruction
5. Endodontic therapy
6. Periodontal therapy
7. Extractions
8. Restoration of teeth
9. Replacement of teeth
10. Placement of the patient on an individualized recall schedule

C. Preventive and restorative dentistry should be emphasized rather than extractions unless there is no alternative.

D. Conduction block or infiltration anesthesia should be used whenever indicated during operative procedures to control pain and should always be used for extractions.

E. A child should not be physically forced to accept treatment. If reasonable persuasion or use of inhalation conscious sedation (nitrous oxide/oxygen with parental consent) does not result in the cooperation of the child, it is suggested that the child be referred to a pediatric dentist for treatment.

F. Respect for and awareness of the dignity of all patients should be an integral part of all interactions between patients and dental staff.

G. Accurate records must be kept in order to have available data on each patient's dental needs, treatment rendered, and the effectiveness of the overall program.

X. EMERGENCY SERVICES

Dental emergency treatment is limited to diagnosis and treatment of an acute episode of pain, infection, swelling, hemorrhage, or trauma (i.e., relief of pain and suffering). These may include extractions and/or prescription medications. Patients admitted to the clinic with a dental emergency should be treated by the most efficacious method. If the tooth is restorable and restorative procedures cannot be accomplished at the time of the emergency appointment, palliative care should be rendered and the patient scheduled for additional treatment. The progress notes in the dental record should reflect the fact that the patient presented to the clinic with an emergency condition, and the diagnosis and treatment rendered should be described in detail.

In *no* instance should a patient be sent home or referred without any measures taken to relieve his/her distress.

Public health dental clinics should operate on an appointment system. Scheduled appointments should have priority over routine type dental emergencies. In general, parents should accompany all minors to the dental clinic and be available in the reception area.

Because of manpower, resource, and time limitations only an emergency examination and treatment of the emergency condition should be performed at the emergency visit. Patients who qualify for additional comprehensive dental care should be scheduled for dental treatment at the public health facility.

A sufficient number of appropriate radiographs should be ordered and interpreted by the dentist. A periapical radiograph of diagnostic quality (i.e., adequate area of observation and proper density, contrast, and detail) ***must*** be made prior to extracting any tooth (except in the case of primary teeth near exfoliation). A current panoramic radiograph of diagnostic quality can be made prior to extraction of teeth # 1, 16, 17 or 32 only. Periapical Radiographs are indicated prior to an extraction because they show a view of the entire tooth and its periodontal supporting structures. Periapical radiographs also reveal the preoperative condition of the hard and soft tissues including pathology and possible surgical complications that might be encountered during treatment. Bitewing radiographs are inadequate due to the fact that they show only the crowns of the teeth and the alveolar crest in a dentition with normal to slight bone loss. If the patient

rejects radiographs recommended by the dentist, written confirmation to this effect must be made on the patient's record.

The emergency condition of the patient should be treated according to acceptable dental practice. The emergency condition should be treated by the most appropriate method as time allows. The following guidelines apply to emergency treatment.

1. If the tooth can be restored, but time does not allow for a permanent restoration, a temporary or sedative treatment filling (calcium hydroxide and IRM) can be placed after removal of the gross caries.

2. If root canal therapy or a pulpotomy is indicated, initial endodontic treatment should be performed to relieve pain. The patient should be scheduled to return in five to seven days for continued treatment.

3. Patients with acute conditions that negate the ability to achieve adequate local anesthesia should receive palliative treatment and scheduled for more definitive treatment when the acute conditions subside.

4. Appropriate antibiotics and/or analgesics are dispensed or prescribed if necessary.

5. If the emergency is complex and is beyond the ability of the dentist or outside the facility's scope of treatment, the dentist should arrange referral to other appropriate dental treatment sources.

XI. DIAGNOSTIC SERVICES

A proper diagnosis consists of the patient's state of oral health and the existence of any pathology or abnormal condition including the causes and type of pathology or condition. The primary diagnostic tools are the dental history, medical history, radiographs, and clinical examination. The dentist is responsible for obtaining adequate medical and dental histories for each patient. The medical history should be updated at each appointment and any change noted on the PH-3990. Medical **conditions** or **medications** requiring an alert should be flagged**, using appropriate sticker or an annotation made in red pen on** the **Health History for Dental Services and Clinic Oral Evaluation and Treatment Record to indicate medical alert.** Any condition that may affect dental treatment is to be noted on the treatment page. If there is a question or compromising condition, the patient's physician should be consulted.

If a patient has a history of rheumatic fever, the patient's physician should be consulted whenever possible. The new AHA Guidelines no longer require Prophylactic Antibiotics for an individual with a history of rheumatic fever. (refer to Section 6 on Infective Endocarditis).

A thorough intraoral examination of the hard and soft tissues and extraoral examination of the head and neck should be performed on all initial care patients. An abbreviated oral and extraoral examination should be performed on all emergency patients. Bitewing radiographs supplemented with a sufficient number of appropriate periapical films or panoramic radiographs for the proposed treatment are required prior to treating any patient. All patients should be

properly shielded with a lead apron and thyroid collar when radiographs are taken. If radiographs are not indicated or refused by the patient, the reason should be recorded on the patient's record.

A treatment plan should be developed for every patient undergoing comprehensive care. Examination findings for each tooth and its defective surface(s) should be recorded on the patient record. A systematic approach to treatment by mouth quadrants should be utilized with the objectives of completing necessary dentistry in the fewest number of patient visits. For example, if treatment is needed on the lower right quadrant for a permanent molar, second primary molar and first primary molar, block anesthesia may enable the dentist to perform necessary treatment of all three teeth at one visit.

XII. PREVENTIVE SERVICES

Ideally, dental prophylaxis, pit and fissure sealants, oral hygiene instruction, application of fluoride varnish, diagnostic radiographs, and examination charting are performed prior to providing restorative treatment. This is not always possible due to the magnitude or severity of disease frequently seen in public health settings, and therefore, some patients may receive restorative treatment on their first visit.

The majority (≥90 percent) of dental caries in the permanent dentition of school-aged children is located in pits and fissures. Numerous clinical studies have demonstrated that sealants are a safe and long-term method of preventing pit and fissure caries. The use of dental sealants is a logical approach for further improvement in children's oral health.

Pit and fissure sealants should be applied routinely in public health dental clinics. Indications for sealants include:

- Recently erupted teeth with well-defined morphology,
- individual history of past caries experience, and
- children at high risk for developing caries.

Some patients having pit and fissure caries are indicated for sealants and, when appropriate, dental providers should place sealants over incipient lesions. Studies specifically designed to measure caries progression under small sealed lesions have shown minimal or no caries progression. It is recommended that staff place sealants over incipient caries confined to the enamel because it is extremely effective in arresting this type of decay; it conserves tooth structure; and it is reversible. Sealants used to treat caries are referred to as therapeutic sealants.

If there is no gross oral hygiene problem or periodontal disease the dentist should perform the operative procedures necessary to complete the patient's treatment. If a patient has no restorative or surgical needs, a prophylaxis should be done to complete the treatment.

The use of dietary fluoride supplements is one alternative method of providing fluoride protection to the teeth of children, six months old thru 16 years of age, who consume fluoride-deficient water with 0.6 ppm fluoride or less. Dietary fluoride supplements, in the form of daily

tablets, drops, or vitamin-fluoride combinations, provide systemic benefits to developing teeth as well as topical benefits to erupted teeth.

When prescribed and used appropriately, fluoride supplements provide benefits similar to those obtained from ingesting optimally fluoridated water over the same period of time. When improperly prescribed, fluoride supplements may cause **mild** enamel fluorosis. Therefore, systemic fluoride supplements should never be prescribed to children in fluoridated communities who are receiving optimally fluoridated water (0.7 ppm fluoride).

Because of an increase in the milder forms of dental fluorosis associated with fluoride ingestion in excess of that necessary to prevent tooth decay, a conservative approach to fluoride supplementation should be used in accordance with the revised guidelines listed below. If a child's primary drinking water source is a well, spring, or non-fluoridated community water system, a water sample must first be taken and analyzed to determine the fluoride content and the dosage of fluoride supplement needed, if any.

Table 1
Supplemental Fluoride Dosage Schedule (in mg F/day)
Revised, winter 1994

Age of Child	PPM Fluoride in Water Supply		
	Less than 0.3 ppm	0.3 – 0.6 ppm	Greater than 0.6 ppm
Birth to 6 mo.	0	0	0
6 mo. to 3 yrs	0.25 mg	0	0
3 to 6 yrs	0.5 mg	0.25 mg	0
6 to 16 yrs	1.0 mg	0.5 mg	0

XIII. RESTORATIVE SERVICES

The practice of "watching" or "observing" a small carious lesion is no longer acceptable with the exception of an asymptomatic, carious primary tooth near exfoliation. As stated previously, dental sealants should be applied to teeth with pit and fissure enamel defects and incipient carious lesions.

Dryness of teeth should be maintained during treatment as appropriate. The use of rubber dams is encouraged. Mechanical matrices and gingival wedges must be used in the restoration of all Class II carious lesions with an adjacent tooth next to the preparation in order to establish good interproximal contact.

Sedative treatment fillings (zinc oxide eugenol [ZOE] temporaries) are to be used only when gross decay has first been removed. When possible, it is better to double base (calcium hydroxide and

ZOE) and place a permanent restoration rather than a temporary filling unless the prognosis of the tooth is questionable. In all deep cavity preparations, the pulp should be protected with a cavity liner and base. Pulp exposures and all near exposures should be indicated on the patient's record. Defective restorations (fracture lines, leaking, etc.) or restorations with recurrent caries should be completely removed and replaced. Dovetailing of existing restorations is not recommended.

Non-urgent treatment of primary incisors can be provided after treatment of posterior teeth.

A water-cooling spray must always be used in conjunction with high-speed tooth reduction to reduce hyperemia and subsequent damage to the pulp.

XIV. ENDODONTIC SERVICES

Pulpotomies should be performed when possible in order to prevent the premature loss of primary teeth. Teeth that have had pulpotomies should be protected when possible with a stainless steel crown.

Endodontics can be provided in the public health clinic if resources are available. If unavailable, pulpally involved permanent teeth should be referred to another dental provider for endodontic treatment. The patient and/or the parent/guardian should be made aware of the consequences of extraction and the subsequent cost of prosthetic replacement that will be their responsibility. If there is no other alternative and the parent/guardian insists, then extraction of the tooth may be considered**. Informed consent *must* be obtained before extracting any tooth that can be treated with endodontic therapy.**

XV. PERIODONTIC SERVICES

If there are oral hygiene problems, gingivitis, or periodontal disease, the dentist should inform the patient, parent, or guardian and provide the necessary treatment (full mouth periodontal charting, scaling, root planing and curettage, prophylaxis, and oral hygiene instruction), if possible. Moderate and severe periodontal disease should be referred to the periodontist.

XVI. ORAL SURGERY SERVICES

Teeth that cannot be successfully restored should be extracted or referred for extraction. Deciduous teeth that are indicated for extraction *and* are near exfoliation, asymptomatic, and causing no apparent pathology can be allowed to remain for space maintenance. Third molars that are indicated for surgical extraction (complete bony, partial bony or soft tissue impactions) should be referred for extraction.

When any tooth is extracted, all portions of the tooth should be removed, except under circumstances where injury to the surrounding hard and/or soft tissues is likely to occur with further attempts at retrieval. If it is necessary to leave a root tip, the patient should be informed; treatment options including referral should be discussed; and all pertinent information should be documented in the patient's record.

A periapical radiograph with diagnostic quality (i.e., adequate area of observation and proper density, contrast, and detail) *must* be made prior to extracting any tooth (except in the case of primary teeth near exfoliation). A current panoramic radiograph of diagnostic quality can be made prior to extraction of teeth # 1, 16, 17 or 32 only. Periapical Radiographs are indicated prior to an extraction because they show a view of the entire tooth and its periodontal supporting structures. Periapical radiographs also reveal the preoperative condition of the hard and soft tissues including pathology and possible surgical complications that might be encountered during treatment. Bitewing radiographs are inadequate due to the fact that they show only the crowns of the teeth and the alveolar crest in a dentition with normal to slight bone loss.

If the patient rejects radiographs recommended by the dentist, written confirmation to this effect must be made in the patient's record.

Written informed consent ***must*** be obtained prior to performing **any** oral surgery procedure using *Informed Consent for Oral & Maxillofacial Surgery* (PH-3432, Rev 04/10). If the patient has taken an Oral Bisphosphonate drug, then the *Informed Consent for Patients Taking Oral Bisphosphonates* **(PH-4035)** must be completed as well. If the patient has no previous history of taking Oral Bisphosphonates only the Informed Consent for Oral & Maxillofacial Surgery (PH-3432) needs to be completed.

Following oral surgery, all patients must be given oral post-operative instructions in addition to written post-operative instructions. These instructions must be documented in the patient's chart as follows: Oral & Written Post-op Instructions given to patient. Patients who have had oral surgical procedures should be scheduled for a post-operative evaluation and the recommended appointment date should be recorded in the patient's dental record. Thorough documentation in the dental record of the oral surgery procedure(s), complications, quantity and type of anesthetic, post-operative instructions, medication(s), and referrals must be completed by the dentist after all oral surgery.

XVII. REFERRALS

At a minimum, dental public health facilities should provide comprehensive oral diagnosis, oral disease preventive services, and routine dental treatment for children and emergency dental treatment for adults. However, it is recognized that uncooperative children will need to be referred on occasion to pediatric dentists. Also, referrals should be made for services not offered in the dental facility. All referrals for medical/dental consultation or treatment should be documented in the patient's dental record.

XVIII. PATIENT RECALL

Each patient undergoing routine dental care should be placed on recall based on the individual patient's needs, or at least once annually. The customary recall period is six months after the last preventive visit unless special conditions exist that indicate a need for a more frequent recall schedule.

SECTION 2

DENTAL CLINICAL PUBLIC HEALTH FORMS

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

Dental Clinical Public Health Forms

1.) **Health History for Dental Services (PH-3990)**
2.) **Health History for Dental Services, Spanish (PH-3990)**
3.) **Oral Evaluation and Treatment Record (PH-0205A, Version 02/08)**
4.) **Standardized Charting Examples & Instructions for Charting (Feb, 2008)**
5.) **Periodontal Charting Form (PH-3970)**
6.) **Periodontal Examples & Instructions (February 14, 2008)**
7.) **Progress Notes (PH-0205B, Version 09/03)**
8.) **Consent for Surgery (PH-3432, Version 04/10)**
9.) **Consent for Surgery, Spanish (PH-3432, Version 04/10)**
10.) **Consent for Surgery for Patients Who Have Received Oral Bisphosphonates (PH-4035)**
11.) **Consent for Surgery for Patients Who Have Received Oral Bisphosphonates, Spanish (PH-4035S)**
12.) **What To Do After Extraction of A Tooth (DH-0064, Version 08/06)**
13.) **What To Do After Extraction of A Tooth, Spanish (DH-0064, Version 08/06)**
14.) **Dental Encounter Form (PH - 3626, Version 06/08)**
15.) **Exit Interview Discussion Form**
16.) **Clinical Competency Checklist for Dental Assistants 1**
17.) **Clinical Competency Checklist for Dental Assistants 2**
18.) **Corrective Plan of Action Form**

SECTION 3

QUALITY IMPROVEMENT
AND
QUALITY ASSURANCE REVIEW
INSTRUMENT

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

QUALITY IMPROVEMENT REVIEW INSTRUMENT
AND
QUALITY ASSURANCE REVIEW INSTRUMENT

AND

GUIDELINES AND CRITERIA
FOR
STANDARDS OF ACCEPTABLE QUALITY
PUBLIC HEALTH DENTISTRY

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

Revised
July 2010

GENERAL MEDICAL 8.0
Peer Review -- 8.6

XIX. Professional Supervision -- 8.6.a

Issued: December 31, 1998

Signature:

By: Wendy J. Long, MD, Director
Bureau of Health Services

POLICY
All professional staff delivering direct patient care in health department settings are to have another professional in their line of review. In the case of midlevel providers (nurse clinicians/practitioners), dental hygienists and physicians/dentists, a physician/dentist will be included in the line of review. In the case of Regional Health Officers or Regional Dental Directors, the Bureau of Health Services Medical Director or Dental Director, respectively, or their designee, will be included in the line of review.

APPLICABILITY
This policy applies to all Local Health Department, Regional and Central Office Nurse Clinicians/Practitioners, Public Health Nurses, Dental Hygienists, Dentists, and Physicians who deliver direct patient care in health department settings. This policy will not apply to non-state physicians and dentists working in CSS clinics.

PURPOSE
To assess and improve the quality of medical and dental care delivered to health department patients.

PROCEDURE
At a minimum, all physicians and dentists who deliver direct patient care in health department settings will be reviewed once a year. New physicians and dentists, including those under contract, must be reviewed after the first four (4) months of employment.

Review of the physician/dentist by the supervisory physician/dentist will assess both the current professional capabilities of the physician/dentist and the supervisory capabilities in overseeing the performance of midlevel providers or dental hygienists under their supervision. Professional competency of the physician/dentist will be assessed by means of both chart review and direct clinical observation of performance. Supervisory competency of the physician/dentist will be assessed by review of charts of midlevel providers or dental hygienists supervised by that physician/dentist. Additionally, interviews will be held with a sample of midlevel providers or dental hygienists to further evaluate the supervisory competency of the physician/dentist being reviewed. The number of charts reviewed, as well as the amount of time spent observing clinical performance and interviewing staff, will be at the discretion of the supervisory physician/dentist.
To insure input from any county director of any county in which the physician/dentist provides services, the first line supervisor must request written input on administrative issues from county directors. This written input is to be kept on file and discussed with the physician/dentist. When there is a problem, the county director from the county (where there is a problem) should be present for the performance evaluation and the development of a plan for improvement. This, too, should be documented in the performance evaluation. When the County Director and Regional Medical/Dental Director cannot reach consensus concerning the rating or the plan for improvement of a physician/dentist, the Regional Director, in consultation with the Bureau of Health Services Medical/Dental Director, will make the final decision.

As a component of the professional supervision process, a physician must be included in the line of review for nurse clinicians/practitioners, and a dentist must be included in the line of review for dental hygienists. These reviews will also take place once a year, at a minimum, and after the first four (4) months of employment for new hires. The frequency of review and sign-off on charts of midlevel providers and dental hygienists, as well as other matters related to their supervision, will adhere to existing state rules and regulations. Completion of required CME/CDE credits will be assessed during the performance review process.

Regional Health Officers/Dental Directors will be responsible for reviewing all health officers, dentists, and clinical physicians in their region. Regional Health Officers/Dental Directors providing clinical services will be reviewed by a physician/dentist of the Bureau of Health Services Central Office.

All reviews will be physician/dentist specific, not related to a site. Results of all reviews will be discussed with the physician/dentist, documented and placed in their personnel file.

REFERENCE DOCUMENT
Health Related Boards Rules and Regulations

OFFICE OF PRIMARY RESPONSIBILITY
Office of the Medical Director, Bureau of Health Services, (615)741-7305

Quality Improvement Tool

The link for the Quality Improvement Interpretive Guidelines can be accessed through the following hyperlink**.**

QI Interpretive Guidelines

http://hsaintranet.health.tn.gov/QmManual/QmManualMenu.htm

QUALITY ASSURANCE INSTRUMENT FOR
DENTAL RECORD REVIEW

Tennessee Department of Health
Bureau of Health Services
Oral Health Services Section

CHART NUMBER

CRITERIA										
II.A. MEDICAL/DENTAL HISTORY										
Dental Exam and Operative Record Current (PH-0205A), Health History for Dental Services (PH-3990) (A.1.)										
Patient Information (A.2.)										
Health Questionnaire (A.3.)										
Conditions Flagged (A.4.)										
Signed and Dated (A.5.)										
History Updated (A.6.)										
II.B. PATIENT EXAMINATION										
Consent for Treatment (B.1.)										
Blood Pressure (B.2.)										
Oral Conditions (B.3.)										
Charting Completed (B.4.)										
II.C. RADIOGRAPHS										
Diagnostic Quality (C.1.)										
BW/PA criteria (C.2.)										
Mounted and Labeled (C.3.)										
Pre-op Radiograph (C.4.)										
Anterior Radiographs (C.5.)										

CHART NUMBER

CRITERIA										
II.D. TREATMENT										
Appropriate (D.1.)										
Treatment Sequence (D.2.)										
Documentation of Informed Consent for Oral Surgery (D.3.)										
II.E. PROGRESS NOTES										
Legible, Dated, and Signed (E.1.)										
Chronological (E.2.)										
Date of Service (E.3.a.)										
Tooth Number (E.3.b.)										
Nature of the Service (E.3.c.)										
Anesthetic (E.3.d.)										
Materials (E.3.e.)										
Prescriptions (E.3.f.)										
Additional Comments (E.3.g.)										
Charting of Treatment (E.4.)										
Broken Appointments (E.5.)										
Documentation of Referrals (E.6.)										
Recall Plan (E.7.)										
Corrections (E.8.)										
II.F. PTBMIS VERIFICATION OF ENCOUNTER One encounter/patient record reviewed										
Correct provider number's posted for this DOS (F.1.)										
Correct program codes posted for this DOS (F.2.)										
Correct services & procedure codes posted for this DOS per PTBMIS Codes Manual & ADA (F.3)										
Services & procedures billed for are documented in the dental record (F.4.)										
II. G. TENNCARE ADVOCACY Documentation supports Level 1 (99401T) or level II (99402T)										

II. DENTAL RECORD REVIEW (20 Records must be Reviewed)

A. PERFORMANCE AND DOCUMENTATION OF THE MEDICAL/DENTAL HISTORY

1. A *Health History for Dental Services (PH-3990) and a Clinic Oral Health and Treatment Record* (PH-0205A) are completed for each patient seen in the dental clinic, using the most current versions.
2. Key patient identification information (address, phone number, emergency information, and source of payment) is located on PH-3990.
3. The health questionnaire (medical history) contains **no** unanswered questions. Questions that are answered yes, must be explained, i.e. Are you seeing a Physician – Yes – Why.
4. Medical conditions or medications requiring an alert are flagged. Alerts are to be flagged using appropriate stickers for Med Alerts and Allergies or by using a Red Pen. Stickers or red annotations are to be placed on the Health History for Dental Services, and on the Clinic Oral Health & Treatment Record.
5. The medical history is signed and dated by the patient or parent/guardian and the dentist.
6. The medical history is updated at each appointment, and any change is noted on the PH-3990 or in the progress notes. A new Health History must be completed annually.

B. PERFORMANCE AND DOCUMENTATION OF THE PATIENT EXAMINATION

1. Written (signed) consent for treatment is obtained for all patients. Patient's name must be written in treatment consent line.
2. Blood pressure recordings are taken at the initial visit of adult patients and prior to all surgical, invasive or stressful procedures. Blood pressures are taken at each visit on patients with a history of hypertension.
3. Oral conditions including restorations, caries, periodontal status, oral hygiene status and any other pertinent observations are recorded for each patient undergoing comprehensive or preventive care.
4. Charting of the examination findings are completed in the appropriate tooth grids on PH-0205A, using Standardized Charting.

C. RADIOGRAPHS

1. Radiographs have proper density, contrast, and detail.

2. Periapical radiographs include all of the crown, roots, and surrounding bone in the area of observation and are not distorted or overlapped (where anatomically possible).
   Bitewing radiographs split the contacts if possible and include the distal of the cuspids and the mesial of the last tooth in the arch. Bitewings are taken all initial exam appointments when there are close posterior contacts and updated based upon carious activity, caries risk, disease acitivity or specific problems.
3. Intraoral radiographs are mounted properly and labeled with the date and patient's name. Extra-oral radiographs are labeled with the date and the patient's name.
4. A periapical radiograph with diagnostic quality is taken prior to extracting any tooth (except primary teeth near exfoliation). A current panoramic radiograph of diagnostic quality can be made prior to extraction of teeth # 1, 16, 17 or 32 only. Periapical radiographs are indicated prior to an extraction because they show a view of the entire tooth and its periodontal supporting structures. Periapical radiographs also reveal the preoperative condition of the hard and soft tissues including pathology and possible surgical complications that might be encountered during treatment. Bitewing radiographs are inadequate due to the fact that they show only the crowns of the teeth and the alveolar crest in a dentition with normal to slight bone loss.
5. Anterior periapicals or panorex x-ray must be taken prior to any restorative procedures performed on anterior teeth.

D. TREATMENT

1. The treatment for each patient is based on the history, examination, and diagnosis.
2. The treatment follows a logical sequence. Normally, with minor variations, this is:

   a. Relief of pain and discomfort
   b. Elimination of infection and traumatic conditions
   c. Caries control (removal of soft, deep caries)
   d. Prophylaxis, preventive procedures, and oral hygiene instruction
   e. Endodontic therapy
   f. Periodontal therapy
   g. Necessary extractions
   h. Restoration of teeth
   i. Replacement of teeth
   j. Placement of the patient on an individualized recall schedule

3. *Informed Consent for Oral & Maxillofacial Surgery* (PH-3432) or Informed Consent for Patients Taking Oral Bisphosphonates (PH-4035) is completed for all oral surgery procedures. If the patient has taken an Oral Bisphosphonate drug, both forms must be filled out. If the patient has no previous history of taking Oral Bisphosphonates just the Informed Consent for Oral & Maxillofacial Surgery (PH-3432) needs to be completed.

E. PROGRESS NOTES

1. All progress notes are legible, dated, and signed by the provider on the date of service in blue or black ink, using signature found on Legal Signature Page, of dentist, hygienist or assistant and credentials (DDS).
2. All progress notes are in chronological sequence.

3. Documentation of services (treatment) rendered contains the following at a minimum: (see example below)

    a. Date of service
    b. Tooth number, if appropriate, in tooth number block
    c. Description of the service
    d. Anesthetic used, if any - including quantity
    e. Materials used, if any – i.e. shade of comp, brand of amalgam, type of base etc.
    f. Prescriptions or medications dispensed including name of drug, quantity, and dosage
    g. Additional comments on referrals, consultations, and instructions

4. Standardized charting of treatment is completed in the appropriate tooth grids on PH-0205A.
5. Broken appointments are documented in the progress note.
6. Copies of all referral slips, and correspondence from other providers are kept in the patient's chart.
7. A recall plan or next visit is included in the progress notes.
8. Errors should never be corrected with white out. A line should be drawn through the mistake to avoid the impression that a record may have been altered. CID (Correction in Documentation) is written immediately above the mistake, along with initials and date (if different from date of original entry).

Example of Progress Note:

1/18/07 **Pt. presents for operative #S (DO) & # T (M)**
Health History reviewed. NKDA. Pt. taking no meds. OHI reviewed.Caries # S (DO), #T (M).
Tx plan: 1. Today: amalgam #S (DO), #T (M), Used ½ carp 2%
Lido with epi 1:100,000. Removed all caries. #T – acid etched, 34% Caulk, bonded with Prime and bond NT, placed flowable composite,(Vivadent) shade A2. # S- placed amalgam (Tytin) checked margins and occlusion. 2. Findings & treatment explained to pt. Pt. dismissed in stable status. 3. Appt. made for #L (pulp & SSC).

John Doe, DDS

F. PTBMIS VERIFICATION OF ENCOUNTER One encounter/patient record reviewed

1. Correct provider numbers are listed for this DOS.
2. Correct program codes are posted for this DOS.
3. Correct services and procedure codes are posted for this DOS per PTBMIS Codes Manual and ADA.

4. The services and procedures billed for are documented in the dental chart. This would be marked no if they were coded as being done but not documented in the chart.

G. TENNCARE ADVOCACY

1. Level 1 – Can be done by any health department employee. Only one code may be coded on the patient encounter form per clinic visit.
2. Can be documented on the Tenncare Advocacy Encounter log or put a comment in date of service.
3. Level II – Can only be done by a dentist or hygienist.
4. In order to take this code it must be documented in the chart what was done for the patient – above & beyond everything else.

QUALITY ASSURANCE INSTRUMENT FOR THE
DIRECT OBSERVATION OF PATIENT CARE
Tennessee Department of Health
Bureau of Health Services
Oral Health Services Section

PATIENT'S CHART NUMBER

CRITERIA										
III.A. DIAGNOSIS										
Initial Exam/Recall Exam (A.1.)										
Initial Radiographs (A.2.) (A.3.) (A.4.)										
Recall Radiographs (A.5.) (A.6.)										
Lead Apron with Thyroid Collar (A.7.)										
Film Positioners (A.8.)										
Scatter Protection (A.9.)										
Appropriate Diagnosis (A.10.)										
Use of Diagnostic Aids (A.11.)										
Periodontal Disease (A.12.)										
Appropriate Referrals (A.13.)										
Appropriate Treatment (A.14.)										
III.B. PREVENTION										
Appropriate Preventive Procedures (B.1.)										
Prophylaxis/Recall (B.2.)										
Fluoride/Sealants (B.3.)										
III.C. OPERATIVE DENTISTRY										
Work Practice Controls (C.1.)										
Water Cooling Spray (C.2.)										
Proper Sedative Fillings (C.3.)										
Appropriate Bases (C.4.)										
Complete Removal of Defective Restorations (C.5.)										
Restorations Reproduce Sound Tooth Contours (C.6.)										
Class II Restorations Performed Correctly (C.7.)										
Stainless Steel Crowns (C.8.)										
Agitator Covered (C.9.)										
Storage & Recycling of Scrap Amalgam (C.10**)**										

III.D. REMOVABLE PROSTHODONTICS										
Partial Dentures – Clinically Acceptable (D.1.)										
Complete Dentures – Clinically Acceptable (D.2.)										

PATIENT'S CHART NUMBER

CRITERIA										
III.E. ENDODONTICS										
Radiograph (E.1.)										
Rubber Dam (E.2.)										
Obturation of Canal (E.3.)										
Pulpotomies Performed (E.4.)										
III.F. PERIODONTICS										
Proper Diagnosis (F.1.)										
Home Care Instructions (F.2.)										
Treatment (F.3.)										
Referrals (F.4)										
Recall (F.5.)										
III.G. ORAL SURGERY										
Complete Tooth Removal (G.1.)										
Root Tip (G.2.)										
Pre-op Radiograph (G.3.)										
Written Informed Surgical Consent (G.4.)										
Post-op Instructions (G.5.)										
III.H. EMERGENCY TREATMENT										
Palliative Measures Taken (H.1.) (H.2.)										
Appropriate Diagnosis (H.3.)										
Efficacious Treatment (H.4.)										
Temporary or Sedative Filling (H.5.)										
Initial Endodontic Treatment (H.6.)										
Appropriate Medications (H.7.)										
III.I. INFECTION CONTROL										
Dental Unit Waterlines (I.1)										
Critical and Semi-critical Instruments (I.2)										
Noncritical Instruments (I.3)										
Disposables (I.4.)										

Handwashing (I.5.)										
Personal Protective Equipment (I.6.)										

Y - Yes N - No N/A – Not Applicable I – Insufficient information to determine

Dentist _____

Clinic Site _____ Reviewer _____

I certify that the Findings of the Quality Assurance Direct Observation of Patient Care have been explained to me and I understand the Recommendations.

_____

SIGNATURE OF DENTIST DATE OF SIGNATURE

_____

SIGNATURE OF REVIEWER DATE OF SIGNATURE

GUIDELINES AND CRITERIA FOR STANDARDS OF ACCEPTABLE QUALITY PUBLIC HEALTH DENTISTRY

III. QUALITY OF PATIENT CARE SERVICES

A. DIAGNOSIS *

1. **An initial or recall examination is conducted on all patients.**
2. Initial radiographs for an adult patient consist of individualized films including bitewings with panoramic exam or bitewings and selected periapicals. A full-mouth intraoral radiographic examination is appropriate when the patient presents with clinical evidence of generalized dental disease or extensive dental treatment.
3. For children with primary teeth only, radiographs are taken if proximal surfaces of the primary teeth cannot be visualized or if there are specific problems.
4. For children with a transitional dentition, or an adolescent with permanent dentition, initial radiographs should consist of appropriate posterior bitewings with panoramic exam or posterior bitewings and selected periapical images.
5. Recall radiographs (bitewings) are taken at a frequency based on caries activity, caries risk, disease activity, or specific problems but should be taken at least once annually or more frequently if needed.
6. Recall radiographs (panoramic) for children with transitional dentition should be based on clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth & development. For adolescents with permanent dentition the recommendation is based on clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth & development.
7. Lead aprons, with thyroid collars, are used on all patients receiving radiographs.
8. Film positioners are used. Neither patient nor staff holds the film during exposure.
9. Staff is protected from scattered radiation during film exposure.
10. A proper diagnosis consists of the patient's state of oral health and the existence of any pathology or abnormal condition including the causes and type of the pathology or abnormal condition. The primary tools are the history and clinical examination.
11. The diagnosis includes the use of a variety of aids as necessary, such as, but not limited to radiographs, study casts, periodontal probing, pulp tests, percussion, palpation, transillumination, and biopsy.
12. Patients with periodontal disease are informed of their periodontal condition(s), and appropriate referrals are made for consultation and treatment.
13. The patient is referred for medical and/or dental consultation, if necessary, to reach a definite diagnosis.
14. The treatment for each patient is appropriate and is based on the history, examination, diagnosis, and discussion with the patient and/or parent (guardian).

- **Direct Observation of Patient Care QA review must include at least one patient from the following categories for the first review (conducted during the first four months of hire) for new providers. For annual reviews, Direct Observation of**

Patient Care QA review should include at least 1 patient from the following categories:

- **Operative Dentistry**
- **Oral Surgery**
- **Prevention**

B. PREVENTION

1. Treatment includes appropriate preventive procedures for each patient undergoing comprehensive care.
2. Professional prophylaxis, which removes plaque, extrinsic stains, and calculus, is performed at regular intervals appropriate to the individual.
3. Caries prevention in children includes, when appropriate, systemic or topical fluoride, sealants, and oral hygiene instruction.

C. OPERATIVE DENTISTRY

1. Rubber dams, high volume evacuation, and proper patient positioning are utilized to reduce formation of aerosols, droplets, and spatter.
2. A water-cooling spray must be used with high-speed tooth reduction.
3. Sedative treatment fillings are used only when gross caries have been removed.
4. Bases are used in all deep cavity preparations.
5. Defective restorations or restorations with recurrent caries are completely removed and replaced.
6. All restorations reproduce sound tooth contours, restore or achieve interproximal contact, and have flush margins.
7. Mechanical matrices and gingival wedges are used in the restoration of all class II caries with an adjacent tooth.
8. Significant interproximal carious lesions on primary teeth are restored with stainless steel crowns.
9. The agitator of the amalgamator functions under a protective cover.
10. Amalgam scrap is stored in a tightly closed container and recycled properly, to include extracted teeth with amalgam in them.

D. REMOVABLE PROSTHODONTICS

1. Partial Dentures

    a. Partials are designed so that they do not harm the remaining teeth with undue stresses and/or create food traps.
    b. Abutment teeth requiring restoration should be restored with a crown or onlay if areas supporting retention devises are involved.
    c. Tissue-bearing areas are covered to the physiological maximum within acceptable esthetic limits.
    d. All patients receive thorough instructions in oral hygiene procedures.

2. Complete Dentures

    a. Patients are informed of the limitations of complete dentures.
    b. Baseline radiographs (panoramic x-ray) of edentulous areas are taken before denture construction.
    c. Dentures cover the maximum areas physiologically possible.
    d. Dentures maintain vertical dimension and physiologic occlusion.
    e. Dentures are esthetic and shaped to minimize phonetic problems.
    f. All patients receive thorough instructions in oral hygiene procedures.

E. ENDODONTICS

1. An accurate periapical radiograph of the involved tooth (including apices) is taken prior to the start of endodontic therapy.
2. A rubber dam must be used for all endodontic cases.
3. Gutta percha is used in the root canal filling and is densely packed and sealed to about one millimeter of the apex.
4. Pulpotomies are not performed on primary teeth with apical involvement, intraradicular involvement, or noticeable mobility.

F. PERIODONTICS

1. Periodontal treatment is preceded by examination to include periodontal charting, diagnosis, and treatment planning.
2. All patients are instructed in home care to attain plaque control and caries prevention.
3. Mild periodontal disease is treated by scaling, root planing, and replacing or modifying defective restorations.
4. Patients with moderate or advanced periodontal disease are referred to appropriate specialists for consultation, treatment, and follow-up care.
5. Periodontal patients treated in the clinic are placed on regular recall at intervals specific to the each patient.

G. ORAL SURGERY

1. When teeth are extracted, all portions of the tooth are removed, except under circumstances where injury to the surrounding hard and/or soft tissues is likely to occur with further attempts at retrieval.
2. If it is necessary to leave a root tip, the patient is informed; treatment options including referral are discussed; and all pertinent information is documented in the patient's record.
3. A periapical radiograph with diagnostic quality is taken prior to extracting any tooth (except primary teeth near exfoliation). A current panoramic radiograph of diagnostic quality can be made prior to extraction of teeth # 1, 16, 17 or 32 only.
4. Written informed consent using form PH-3432. If the patient has taken an Oral Bisphosphonate drug, then the *Informed Consent for Patients Taking Oral Bisphosphonates* (PH-4035) must be completed as well. If the patient has no previous history of taking Oral Bisphosphonates only the Informed Consent for Oral & Maxillofacial Surgery (PH-3432) needs to be completed.
5. After extractions all patients are given oral & written post-operative instructions.

H. EMERGENCY TREATMENT

1. No patient is sent home or referred without measures taken to relieve his/her distress.
2. Patients with acute conditions that negate the ability to achieve adequate local anesthesia receive palliative treatment.
3. A sufficient number of radiographs with diagnostic quality are made, and other diagnostic aids are utilized, as needed, to reach a definitive diagnosis.
4. The emergency condition is treated by the most efficacious method.
5. If the tooth can be restored, but time does not allow for a permanent restoration, a temporary or sedative filling is placed after removal of gross caries.
6. If root canal therapy or pulpotomy is indicated, initial endodontic treatment is performed to relieve pain.
7. Appropriate antibiotics and/or analgesics are dispensed or prescribed as necessary.
8. If the emergency is complex and beyond the ability of the dentist, the dentist arranges referral to the appropriate dental specialty.

I. INFECTION CONTROL (From section 1)

1. Dental unit waterlines to all instruments (high-speed handpiece, air/water syringe, and ultrasonic scaler) are flushed for several minutes at the beginning of the each clinic day and for a minimum of 20-30 seconds after use on each patient. Dental unit waterlines must be treated with appropriate products (i.e. Sterilex), and all water monitoring recommendations must be adhered to.
2. Critical and semicritical instruments – After thorough cleaning, all heat-stable Instruments, including handpieces, are heat sterilized. Handpieces, to include low speed attachments & motors must be sterilized between patients.
3. Noncritical instruments - After thorough cleaning using the Ultrasonic cleaner, all instruments and medical devices receive intermediate or low-level disinfection.
4. Disposable covers and disposable supplies are used whenever possible. Disposable items are never reused.
5. Hands are washed thoroughly before and after treatment of each patient with antimicrobial soap or hand sanitizer.
6. Protective attire (gloves; masks; and eye, face, and long - sleeved clothing protection) is worn, by the dental staff.

SECTION 4

PROTOCOL FOR MANAGEMENT OF MEDICAL EMERGENCIES

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

PROTOCOL FOR MANAGEMENT OF MEDICAL EMERGENCIES

All DHCW's must be prepared to respond to patient-centered emergencies. This policy applies to all staff providing and/or supporting clinical services in public health regardless of the service delivery setting (i.e., local health department, regional office, school, or community site). All staff members must maintain an acceptable level of preparedness in order to respond competently when emergency action is required. All licensed staff must maintain current certification in an approved CPR course. Other staff, including clerical, must receive instruction in CPR.

The attached clinical procedures and medical protocol outline the steps to be followed in the event of a medical emergency in the dental clinic. This protocol will be reviewed at least annually or more often as indicated. In addition, each health department should conduct an unannounced patient emergency drill at least annually with a check sheet used for evaluation.

Emergency supplies and equipment must be kept in an accessible, easily identifiable location in the clinical setting (i.e., health department). The emergency kit and oxygen equipment must be at the site of the emergency within one minute. As outlined in Bureau of Health Services Policy, 8.4.a – Patient – Centered Emergencies, each health department clinic setting should have appropriate equipment and supplies including, but not limited to:

- Oxygen Supplies & Equipment
  - Oxygen Tank, with gauge and valve (check monthly to ensure adequate supply)
  - Face Mask; ventilating with oxygen inlet port, suitable for adult & pediatric use, with head strap
  - Oxygen Tubing, tank to mask
- Personal Protective Equipment:
  - Goggles
  - Masks/shields
  - Gloves (no latex, powder free)
  - Mouth to mask disposable resuscitative
  - Gown
- Pharmaceuticals:
  - Aspirin 325 mg tab (At least 5 doses)
  - Diphenhydramine (Benadryl) injection 50 mg/ml (At least 2 doses)
  - Epinephrine HCL (Adrenaline) injection 1:1000 (At least 5 doses)

- Optional Pharmaceuticals: (use governed by locality protocol)
  - Ammonia Inhalants (Ampule or swab)
  - Atropine Injection (0.1 mg/ml in 10cc pre-filled syringes) # 10
  - Diphenhydramine (Benadryl) capsules (25mg) and liquid (12.5 mg/5cc)
  - Glucose (gel tubes, 24 gm or 32 gm tubes) #3

- Glucagon injection (1mg)

- Supplies:
  - Airways, oral: infant: #3 (small), #4 (medium), #5 (large)
  - Alcohol Packets
  - Bandage Scissors
  - Blood Pressure Cuff (pediatric, adult and extra large)
  - Bulbs, irrigation, sterile
  - Cotton Swabs
- Emergency Delivery Kit (Minimum):
  - Cord clamp or tie, sterile
  - Scissors, sterile
  - Baby Blanket, X 1 Each
  - Kelly Clamp
  - Surgical Gloves (non-latex)
- Flashlight, with extra batteries
- Gauze Pads, sterile and bandages
- Stethoscope (pediatric & adult)
- 50 cc Irrigating Bulb
- Syringes (sterile)
  - 3 cc with #25 G x 5/8 needle
  - 3 cc with #23 or #21 G x 11/2 inch needle
  - Tuberculin with needle
- Tape, adhesive, cloth and paper
- Tongue Blades
- Optional Equipment: Glucometer, if used under written locality protocol

In the event of a patient-centered emergency, the dentist will remain with the patient and get an initial check of respiration and pulse. The dental assistant will get oxygen, the emergency kit, the emergency guidelines, blood pressure cuff, and stethoscope. The assistant will record what happens, the type and quantity of drugs given, vital signs, and the times that drugs are given and vitals are taken. If a physician is present in the facility, he/she should be paged.

In an emergency, do not hesitate to call 911 or activate EMS!

Emergency telephone numbers:

Emergency Medical Services (EMS): **911**

Hospital Emergency Room: _____

Poison Control Center: **1-800-222-1222**

ALLERGIES

Definition**:** A hypersensitive state acquired through exposure to a particular allergen, reexposure to which produces a heightened capacity to react.

SIGNS AND SYMPTOMS

Allergic skin reactions are the most common sensitization reactions to drug administration. Rash, localized swelling, whelps, itching, and angioedema are common symptoms.

MANAGEMENT

Skin reaction – delayed (more than one hour)

1. Administer antihistamine.
2. Diphenhydramine 50 mg P.O.3-4 x a day for 2-3 days or 50 mg I.M. (PO – 25 mg for children over 20 lbs, IM 25 mg).
3. Medical consultation with patient's physician

Skin reaction - immediate (less than one hour)

1. Monitor & Record vital signs-heart rate & rhythm, BP, respirations every 5 minutes.
2. Consider administering epinephrine 1:1000 I.M. (.3 mg for adults, .15 mg child, can be given every 5 to 20 minutes as needed, max of 3 doses.).
3. Administer diphenhydramine 50 mg P.O. or 50 mg I.M. (25 mg for child).
4. Observe the patient for one hour for signs of recurrence.
5. Medical consultation with patient's physician, if respiratory or cardiovascular involvement occurs. Pt. should be transported to ER.

Respiratory reaction - bronchial constriction

1. Terminate dental procedures.
2. Place the patient in a position of comfort.
3. Administer oxygen.
4. Administer bronchodilator inhalation with epinephrine(Primatene Mist)
5. Administer epinephrine 1:1000 I.M. (.3ml of 1:1000 dilution).
6. Observe the patient. If pt. not improving call 911.
7. Administer diphenhydramine 50 mg I.M. for adults (.2 mg/kg IM or IV children).
8. Medical consultation with patient's physician

Respiratory reaction – laryngeal edema

1. ***Call 911 or activate EMS.***
2. Place the patient in a position of comfort.
3. Maintain airway. Administer Oxygen.
4. Administer epinephrine 1:1000 I.M. (.3ml adults, .15ml child).
5. Administer diphenhydramine 50 mg I.M. (25 mg child).

6. Perform a cricothyrotomy only if airway is totally obstructed and EMS personnel are not available in a timely manner. ***Perform only as a measure of last resort.***

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

ANAPHYLAXIS

Definition: An acute systemic allergic reaction resulting in respiratory difficulty and cardiovascular collapse. This condition may occur rapidly following parenteral drug administration reaching maximum intensity in 5-30 minutes after onset.

SIGNS AND SYMPTOMS

Phase 1: Skin - Intense itching with generalized warmth & tingling of the face, mouth, upper chest, palms, soles or the site of the antigenic exposure.
Increased mucous secretion

Phase 1: GI/GU - Abdominal cramps
Nausea and vomiting
Diarrhea
Incontinence, pelvic pain, headache, sense of impending doom, decrease in level of consciousness

Phase 2: Respiratory - dyspnea, cyanosis, and laryngeal edema

Phase 3: Cardiovascular - pallor, light-headedness, palpitation, hypotension, cardiac dysrhythmias, tachycardia, loss of consciousness, and cardiac arrest.

MANAGEMENT

1. ***Call 911 or activate EMS.***
2. Place the patient in a position of comfort.
3. Administer oxygen.
4. Maintain the airway and do CPR if necessary.
5. Administer epinephrine 1:1000 I.M. (.3 mL – Adults, .15mL - child).
6. Administer diphenhydramine 50 mg I.M. (25 mg for child).
7. If necessary, can repeat epinephrine 1:1000 every 20-30 minutes up to three doses.
8. Monitor and record vital signs.

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

ANGINA PECTORIS

Definition**:** A spasmodic, cramp-like, choking feeling or suffocating pain in the chest, precipitated chiefly by exercising, emotion or a heavy meal.

SIGNS AND SYMPTOMS

Sudden onset of chest pain described as a sensation of squeezing, burning, pressure, choking, aching, bursting, tightness or "gas".

MANAGEMENT

1. Recognize Problem – Chest pain.
2. Stop the dental treatment.
3. Place the patient in a position of comfort.
4. Follow A-B-C's as needed.
5. Administer oxygen & nitroglycerin - the patient's own if possible,(i.e. nitrolingual spray or sublingual tablet) **Spray** - usual dose is .3-.6 mg. 1 or 2 metered sprays recommended initially. No more than 3 metered doses within a 15 minute period. **Sublingual Tablets** - .3-.6 mg, every 5 minutes as needed. No more than 3 tablets every 15 minutes.
6. Monitor & Record Vital Signs.
7. After giving nitroglycerin, if the pain persists or gets worse, assume it is a myocardial infarction. ***Call 911 or activate EMS.***
8. After angina episode has terminated, consider modification of future dental treatment to prevent reoccurrence of chest pain.

IN ORDER TO TREAT A PATIENT WITH CHEST PAIN FOR ANGINA THEY <u>MUST</u> HAVE A PRIOR HISTORY OF ANGINA PECTORIS.

ALL INSTANCES OF FIRST TIME CHEST PAIN OCCURING IN A DENTAL SETTING REQUIRE <u>IMMEDIATE</u> ACTIVATION OF EMERGENCY MEDICAL SERVICES (EMS).

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

ASTHMA

Definition: A chronic inflammatory disorder that is characterized by reversible obstruction of the airway.

SIGNS AND SYMPTOMS

1. History of asthma
2. Feeling of chest congestion
3. Spells of coughing with or without sputum production
4. Wheezing, Dyspnea
5. Slow, labored breathing, nasal flaring
6. Patient wants to sit or stand
7. Chest tightness
8. Anxiety and apprehension, Agitation
9. Tachypnea, increase in BP, Heart Rate, Diaphoresis
10. Somnolence, Confusion, Cyanosis, Supra Clavicular & Intercostal Retraction

MANAGEMENT

1. Recognize problem (Respiratory distress, wheezing)
2. Stop dental treatment
3. Position patient upright.
4. Assess & perform basic life support as needed
5. Administer oxygen.
6. Administer bronchodilator via inhalation
7. If the episode continues, Activate EMS (911), Administer Parental drugs: epinephrine .3 ml 1:1000 I.M. Adult. (Child - .15-.3 mg dose of epi). Hospitalization or discharge per EMS.
8. If the episode stops after administration of the bronchodilator, dental care can be continued or rescheduled depending upon the patient, then discharge patient.
9. Observe the patient for signs of status asthmatics:
    a. Mental confusion
    b. Extreme fatigue
    c. Cyanosis
    d. Heavy perspiration

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

Diabetes Mellitus
Hyperglycemia & Hypoglycemia

Definition: The most common endocrine disease. It is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action or both.

SIGNS AND SYMPTOMS

Hyperglycemia – High Blood Sugar

1. Bright red color in the face, hot & dry skin, Signs of dehydration, Respirations are deep and rapid
2. Breath is fruity, with a sweet smell of acetone
3. Rapid Heart Rate with a BP lower than normal

Hypoglycemia – Low Blood Sugar

1. Diminished Cerebral Function
2. Changes in mood
3. Decreased spontaneity
4. Hunger & Nausea

More Severe Stage

1. Sweating, Tachycardia, Piloerection, Increased anxiety, Bizarre behavioral problems
2. Belligerence, poor judgment, uncooperativeness

Later Severe Stage

1. Unconsciousness, Seizure activity, Hypotension, Hypothermia

MANAGEMENT

Conscious patient for hyperglycemia:

1. Do not do any dental treatment.
2. Patient needs to contact medical provider and be seen immediately.

Unconscious patient for hyperglycemia:

1. Recognize problem – lack of response to sensory stimulation
2. Discontinue dental treatment
3. Position patient in supine position with feet elevated
4. Access and perform basic life support as needed
5. Provide definitive as needed, Summon Emergency medical service
6. Establish IV if possible, Administer Oxygen
7. Transport to hospital for definite management

Conscious patient with hypoglycemia:

1. Recognize problem – altered consciousness

2. Stop dental treatment
3. Position patient comfortably
4. Access & Perform basic life support as needed
5. Administer Oral Carbohydrates – i.e. orange juice, soda (4-6 oz. of soda or water with 2-4 tsp. of added sugar).
6. Permit patient to recover. Observe the patient for one hour.
7. Seek medical assistance if recovery is not complete.

Unconsciousness patient with hypoglycemia:

1. Recognize problem – lack of response to sensory stimulation
2. **Call 911 or activate EMS**
3. Stop dental treatment
4. Position patient in supine position with feet elevated
5. Access and perform basic life support as needed
6. Administer carbohydrates: IV 50% dextrose solution
   1 mg glucagon via IV or IM route
   Transmucosal sugar or rectal honey or sugar
7. Monitor vital signs every 5 minutes
8. Administer Oxygen
9. Allow patient to recover and discharge per medical recommendations

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

LOCAL ANESTHETIC OVERDOSE REACTION

Definition: An overdose reaction to a local anesthetic that is related to the blood level of the local anesthetic in certain tissues and organs. (Myocardium & CNS)

SIGNS AND SYMPTOMS

1. Low to moderate overdose – confusion; Nystagmus – rapid eye movement; talkativeness; excitedness; apprehension; elevated BP, pulse, and respiratory rate; dizziness; and loss of consciousness, slurred speech, generalized stutter, muscular twitching of the face.
2. Moderate to high blood levels - generalized seizure; CNS depression; drop in BP, pulse, and respiratory rate. There may be a loss of consciousness.
3. Rapid intravascular injection – rapid symptoms, seizures or unconsciousness developing within seconds.

MANAGEMENT

Mild overdose reaction (Rapid Onset)

1. Reassure the patient.
2. Administer oxygen.
3. Monitor vital signs.
4. Administer anticonvulsant drug if needed.
5. Activate EMS as needed
6. Recovery

Mild overdose reaction (Delayed Onset) >10 minutes after anesthetic administration

1. Reassure the patient.
2. Assess airway, breathing, circulation, & administer basic life support as needed.
3. Administer oxygen.
4. Monitor vital signs.
5. Administer anticonvulsant if needed.
6. Summon medical assistance if needed.
7. Medical consultation prior to subsequent dental care.
8. Permit patient to recover & then discharge patient.

Severe overdose reaction (rapid onset) Symptoms appear within 1 minute.

1. ***Call 911 or activate EMS.***
2. Place the patient in supine position with feet slightly elevated.
3. Manage seizure - prevent injury.
4. Basic life support - airway, ventilation, and monitor vital signs.
5. Administer Oxygen.
6. Monitor vital signs.

7. IV anticonvulsant administration should not be considered unless the doctor is well trained in venipuncture, has the appropriate drugs available & can manage an unconscious patient.
8. Postictal management; BLS as needed, monitor vital signs, EMS personnel will transport the patient to a hospital for definitive management, observation & discharge.

Severe overdose reaction (slow onset - over 10 minutes or more)

1. ***Call 911 or activate EMS.***
2. ***Stop Dental treatment***
3. Position patient is supine position with legs slightly elevated if unconscious, if Conscious position patient comfortably.
4. Basic life support and administer oxygen.
5. Monitor vital signs.
6. Administer anticonvulsant if a seizure occurs
7. Postictal management; BLS as needed, monitor vital signs
8. Emergency personnel will transport patient to a hospital for definitive management, observation and discharge.

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

MYOCARDIAL INFARCTION

Definition: A clinical syndrome caused by a deficient coronary arterial blood supply to a region of myocardium that results in cellular death & necrosis.

SIGNS AND SYMPTOMS

Symptoms

1. Severe to intolerable pain lasting 30 minutes or more.
2. Pain is crushing or choking.
3. Radiates left arm, hand, epigastrum, shoulders, neck & jaw
4. Patient will usually have:
    a. Cold sweat
    b. Weakness
    c. Sense of impending doom
    d. Dizziness
    e. Nausea & Vomiting
    f. Palpitations

Signs

1. Restlessness
2. Acute distress
3. Skin – cool, pale , moist
4. Heart Rate – bradycardia to tachycardia; PVC's common

MANAGEMENT

1. ***Call 911 or activate EMS.***
2. Check for history of angina, if no history, presume MI.
3. Administer Oxygen, consider nitroglycerin.
4. Have the patient chew an aspirin.
5. Manage pain.
6. Monitor & record vital signs. Record vitals every 5 minutes.
7. Manage complications.
8. If cardiac arrest occurs, start CPR.
9. Stabilize & transfer to ER.

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

SEIZURES

Definition: A recurrent paroxysmal disorder of cerebral function marked by sudden, brief attacks of altered consciousness, motor activity or sensory phenoma.

MANAGEMENT OF PETIT MAL AND PARTIAL SEIZURES

1. Recognize the problem – lack of response to sensory stimulation.
2. Position patient in supine position with feet elevated.
3. Watch the patient and prevent injury.
4. Don't try to move the patient.
5. Never place anything in the patient's mouth.
6. After the seizure is over, reassure patient, allow patient to recover.
7. If seizure continues, (more than 5 minutes), **Call 911.**
8. Perform Basic life support as needed.

MANAGEMENT OF TONIC-CLONIC SEIZURE (GRAND MAL)

1. Recognize aura.
2. Stop dental treatment.
3. Position patient in supine position with feet elevated.
4. Consider activation of EMS.
5. Assess and perform Basic life support as needed.
6. Protect patient from injury.
7. Administer oxygen & monitor vital signs.
8. Reassure patient and permit recovery.
9. Discharge patient either to hospital, to home or to physician.

A life-threatening medical emergency exists when a seizure lasts more than five minutes, when repeated seizures occur, or if the patient begins having continuous seizures (status epilepticus). If one of these conditions is occurring, ***call 911 or activate EMS.*** The patient should be placed in a safe position as noted above. The patient should also be given oxygen at five liters per minute via a face mask.

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

SYNCOPE

Definition: Syncope is a general term referring to a sudden, transient loss of consciousness that usually occurs secondary to a period of decreased blood flow to the brain.

PRESYNCOPAL SIGNS AND SYMPTOMS

EARLY

1. The patient feels warm on the head and neck
2. Loss of color; pale or ashen-gray skin tone
3. Heavy perspiration
4. Reports of "feeling bad" or "feeling faint"
5. Nausea & Tachycardia
6. BP at baseline level or slightly lower

LATE

1. Pupillary dilation
2. Yawning, hyperpnea
3. Cold hands and feet, hypotension
4. Bradycardia
5. Visual disturbances, dizziness
6. Loss of consciousness

MANAGEMENT

1. Assess consciousness – lack of response to secondary stimulation.
2. Position patient on their back with feet slightly elevated.
3. Establish airway - tilt head back and lift the chin - assess breathing. If the patient is not breathing, retilt and check again, if still not, check for an obstruction. If fluid is present in the back of the throat, tilt the head to one side, suction the throat, and start artificial ventilation.
4. Check for circulation
5. Loosen tight fitting clothes.
6. Administer Oxygen.
7. Monitor vital signs. (BP, pulse, and respiration)
8. Administer ammonia inhalant.
9. Administer atropine if bradycardia persists. DO NOT PANIC.
10. Consciousness should return within a few seconds to a few minutes. If not within five minutes, another cause should be considered. ***Call 911 or activate EMS.***

Source: Medical Emergencies in the Dental Office; Malamed, Stanley F.

Table 1
EMERGENCY DRUG CHART

AGE/WEIGHT	Diphenhydramine Oral, IM, IV	Max Dose	Epinephrine EpiPen I.M.
2 to <6 years	6.25 mg q 4-6 hrs	37.5 mg/day	
6 to <12 years	12.5 – 25 mg q 4-6 hrs	150 mg/day	
>12 years	25-50 mg q 4 - 6 hrs	300 mg/day	
<66 lbs			.15 mg
>66 lbs			.3 mg

DIPHENHYDRAMINE FOR A CHILD:

Treatment of moderate to severe allergic reactions:

-PO/IM/IV 5 mg/kg/day or 150mg/m square/day in divided doses every 6-8 hours. Do not exceed 300 mg daily

Table 2
EMERGENCY MEDICATIONS

DRUG	**INDICATION**	**DOSAGE**
Aromatic Spirits of Ammonia Ampule	Syncope	Inhalation
Valium (Diazepam)	Convulsions Sedation	5-10 mg IV, at a rate of of 5 mg per minute & repeated every 10-15 minutes as needed. Max dosage is 30 mg.
Dextrose 50% solution	Hypoglycemia	25-50 mL IV
Glucose Gel (insta-glucose)	Hypoglycemia	Orally as necessary
Epinephrine 1:1,000 1 mg/ml	Cardiac Arrest (Profound Hypertension) Acute Allergic Reaction Acute Asthmatic Reaction	**1-mg IV, IM or subcutaneous, every 3-5 minutes** 0.3 mL subcutaneous
Nitroglycerin	Angina Pectoris	.3-.6 mg, tablet sublingual, every 5 minutes as needed, no more than 3 tablets every 15 minutes.
Narcan 0.4 mg/ml	Narcotic Depression	0.4 - 2 mg, q 2-3 minutes as needed. May need to repeat doses every 20-60 minutes. IV, IM or subcutaneously
Atropine 0.5 mg/ml in 1 mL vials	Bradycardia	IV .5 -1 mg every 5 minutes, do not exceed 3 mg.
Diphenhydramine (Benadryl)	Allergic Reactions	PO 25-50 mg q 6-8 hrs,IM, IV-10-50 mg q 2- 4 hrs, Max dose 400mg/day
Albuterol Inhaler	Asthma	Inhalation

SECTION 5

INFECTION CONTROL POLICIES AND PROCEDURES

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

INFECTION CONTROL POLICIES AND PROCEDURES

I. INTRODUCTION

Percutaneous or permucosal exposure of dental personnel and patients to pathogenic microorganisms (viruses or bacteria) can cause infections that lead to debilitating or life-threatening diseases. In order to prevent or minimize the risk of transmitting disease occupationally, dental health care workers (DHCWs) should practice **STANDARD PRECAUTIONS** – an approach to infection control that assumes all human blood and certain body fluids are infectious for HBV, HCV, HIV, and other bloodborne pathogens. In addition, DHCWs should adhere to practical infection control practices including recommended immunizations, personal protective equipment, sterilization, and disinfection.

This practical approach to infection control, whether in a health department setting or in a portable dental care environment, requires commitment on the part of the entire dental team as well as availability of appropriate support including expertise, training, and adequate resources. All public health dental staff should routinely practice and adhere to the infection control policies, recommendations, and guidelines from the Centers for Disease Control and Prevention (CDC), the Occupational Safety and Health Administration (OSHA), and the American Dental Association (ADA). Although the dental environment may never be pathogen-free, well-trained, committed, and knowledgeable staff can significantly reduce the likelihood of occupational disease transmission.

II. CHECKLIST FOR DENTAL HEALTH CARE WORKERS

A. Immunization

All dentists, dental hygienists and dental assistants including part-time, contractual and volunteers who have patient contact and are at risk of effective exposure, shall be offered the Tetanus Vaccine. "Dental Health Care Workers are at risk for exposure to and possible transmission of vaccine-preventable diseases; accordingly, vaccination against influenza, measles, mumps, rubella & tetanus may be appropriate for DHCW's"

b. Hepatitis B Vaccine is made available, at no cost, to all employees who have occupational exposure to blood or other potentially infectious materials within 10 working days of assignment. (Federal Register Vol. 56 #235) (HSA Policy 8.2b). "At Risk" employees must sign an OSHA approved Declination Form if the choice is not to receive Hepatitis B Vaccine. (HSA Policy 3.9 & 8.2b)

c. One to 2 months after completion of the 3 – dose vaccination series, employees are tested for antibody to Hepatitis B surface antigen and non-responders (<10mlU/ml) are re-vaccinated with 3-dose series. (TOSHA CPL 02-02-036) Effective Sept. 3, 2003.

d. All employees, including part-time, contractual, and volunteers, who have patient contact and are at risk of other effective exposure, shall be screened for Tuberculosis. (HSA Policy 8.2a) The Regional Health Officer shall determine the risk of effective exposure.

-At the time of employment, or when employees are assigned to an area where they will have patient contact which could result in effective exposure, they shall receive a tuberculin skin test. The skin test may be given at the health department at no cost to the employee.

-Employees identified as positive reactors at the time of employment or assignment to an area where they will have patient contact should receive a chest x-ray and be considered for preventive therapy.

- Employees who have patient contact and have a negative tuberculin test must have a tuberculin test at least annually as long as the skin test remains negative.

- Employees who convert from negative to positive at any time after the initial test must be evaluated by the Regional or Metropolitan Tuberculosis Control Physician. If treatment of disease or preventive therapy is indicated, it should be prescribed and monitored as with any other patient.

e. All employees, including part-time, contractual, and volunteers, born in 1957 or later shall show proof of immunity to Measles, Mumps & Rubella viruses, or be offered MMR immunization. (HSA Policy 8.2c).

f. All employees, including part-time, contractual and volunteers, shall provide proof of immunity to Varicella. Those employees who are not immune shall be offered Varicella Vaccine.

g. All dentists, dental hygienists, and dental assistants including part-time, contractual, and volunteers who have patient contact and are at risk of effective exposure, shall be offered the tetanus vaccine. At the time of employment, or when the Tetanus booster needs to be updated, dentists, dental hygienists, and dental assistants shall receive the tetanus vaccine at no cost to the employee. If an employee refuses immunization, a refusal statement must be signed and placed in her/his personnel file.

B. Before Patient Treatment

1. Obtain a thorough medical history.

2. Disinfect prostheses and appliances received from the laboratory.

3. Flush all dental unit waterlines for several minutes at the beginning of each day as well as 20-30 seconds after each patient.

4. Place disposable coverings to prevent contamination of surfaces or disinfect surfaces after treatment.

C. During Patient Treatment

1. Treat all patients as potentially infectious (i.e., practice standard precautions).

2. Use protective attire and barrier techniques when contact with body fluids or mucous membranes are anticipated.

   - Wear gloves
   - Wear a mask
   - Wear protective eyewear
   - Wear long-sleeved uniforms, laboratory coats, or gowns

3. Use single-use, disposable items whenever possible.

4. Open contaminated x-ray film packets in the darkroom with disposable gloves without touching the film.

5. Minimize the formation of droplets, spatters, and aerosols.

6. Use a rubber dam to isolate the tooth and field when appropriate.

7. Use high-volume vacuum evacuation.

8. Protect hands.

   - Wash hands before gloving and after gloves are removed
   - Change gloves between each patient
   - Discard gloves that are torn, cut, or punctured
   - Avoid hand injuries

9. Avoid injury with sharp instruments and needles.

- Handle sharp items carefully

- Do not bend or break disposable needles

- All needles should be recapped. To recap needles a needle stick protection device (i.e. Jenker, AmSafe or Needle Capper) must be used.

- Place sharp items in appropriate containers

D. After Patient Treatment

1. Wear heavy-duty rubber gloves.

2. Clean instruments thoroughly.

3. Sterilize instruments.

    - Sterilize instruments that penetrate soft tissue or bone.

    - Sterilize, whenever possible, all instruments that come into contact with oral mucous membranes, body fluids, or those that have been contaminated with secretions of patients. Otherwise use appropriate disinfection.

    - Monitor the sterilizer weekly with biological monitors. Place chemical indicator strips in packages prior to sterilization.

4. Clean handpieces and flush dental unit waterlines.

    - Flush handpieces, dental units, ultrasonic scalers, and air/water syringes for 20-30 seconds between patients.

    - Clean and sterilize air/water syringes and ultrasonic scalers if possible; otherwise, disinfect them.

    - Clean and sterilize handpieces to include low speed attachments and motors between patients.

5. Handle sharp instruments with caution.

    - Place disposable needles, scalpels, and other sharp items intact into puncture-resistant containers before disposal.

6. Decontaminate environmental surfaces.

    - Wipe work surfaces with absorbent towels to remove debris and dispose of towels appropriately.

- Disinfect with appropriate chemical disinfectant.

- Change protective coverings on light handles, x-ray unit, and other items betweeen patients.

7. Decontaminate supplies and materials.

   - Rinse and disinfect impressions, bite registrations, and appliances to be sent to the laboratory.

8. Communicate infection control program to dental laboratory.

9. Remove contaminated wastes properly.

   - Pour blood, suctioned fluids, and other liquid waste into drain connected to a sanitary sewer system.

   - Place solid waste contaminated with blood or saliva in sealed, sturdy, impervious bags; dispose according to local government regulations.

   - Dispose of amalgam waste according to ADA guidelines. These guidelines are included in this section. Amalgam must be recycled, to include extracted teeth with amalgam.

   - X-ray fixer and lead foils are to be recycled by a recycling company that meet federal, state, and local guidelines.

10. Remove gloves and wash hands.

III. SCREENING AND REFERRAL PROGRAMS

Any dental screening and referral program or oral health survey designed for children or adults has need for adequate infection control protocols to assure that no cross-contamination occurs between the dental staff and the population being screened. Public health dentistry maintains a higher profile (i.e., a more visible role) in the community than the private sector because of school-based disease prevention programs and oral health promotion programs. Therefore, dental public health professionals should serve as role models in practicing and promoting sound infection control practices. At a minimum, these infection control protocols will include the following:

A. Precautions

1. Place used tongue blades in a trash bag and dispose of them properly. Place used mouth mirrors in an appropriate container with disinfecting solution until such time that the mirrors can be cleaned, bagged, and sterilized.

2. It is recommended that charting of records be done by another person. If this is not possible, you must ensure that all Infection Control Protocols are followed to prevent any cross-contamination.

B. Proper Handling of Waste

It is not practical or necessary to treat items that have had contact with saliva as infectious from the standpoint of requiring special waste disposal precautions. (MMWR, Dec 19, 2003, Vol. 52, No. RR-17). Solid waste materials contaminated with saliva should be disposed of in the same manner as with other solid wastes.

IV. DENTAL SEALANT PROGRAMS IN A PORTABLE DENTAL CARE ENVIRONMENT

Please see the *School Based Dental Prevention Program Manual* for recommendations concerning use of portable equipment.

V. PUBLIC HEALTH DENTAL CLINICS

Dental personnel in public health in Tennessee ***must*** comply with OSHA's Bloodborne Pathogens Standard.

The following information, from the CDC, describes their recommendations for infection control practices in dentistry. These guidelines mandate the infection control protocol policies for the Department of Oral Health Services.

RECOMMENDED INFECTION CONTROL PRACTICES FOR DENTISTRY

Centers for Disease Control and Prevention
(MMWR, Dec 19, 2003, Vol. 52, No. RR-17)

Table 1
Sterilization of Dental Instruments, Materials,
And Some Commonly Used Items*

Instrument, material, or item	Steam autoclave	Dry heat oven	Chemical vapor	Ethylene oxide†	Other methods and comments
Angle attachments*	‡	‡	‡	§	
Burs					
Carbon steel	**	††	††	††	Discard
Steel	‡	††	††	††	Discard
Tungsten carbide	‡	††	‡	††	Discard
Condensers	††	††	††	††	
Dappen dishes	††	‡	‡	††	
Endodontic instruments (broaches, files, reamers)	††	††	††	††	
Stainless steel handles	‡	††	††	††	
Stainless with plastic handles	††	††	**	††	
Fluoride gel trays					
Heat-resistant plastic	††	§	**	††	
Non-heat-resistant plastic	§	§	**	††	Discard (††)
Glass slabs	††	††	††	††	
Hand instruments					
Carbon steel (steam autoclave with chemical protection [2 percent sodium nitrite]	**	††	††	††	
Stainless steel	††	††	††	††	
High speed handpieces*	(††)*	**	(‡)*	§	

Contra angles	††	**	††	§	
Prophylaxis angles* (disposable preferred)	‡	‡	‡	§	

Instrument, material, or item	**Steam autoclave**	**Dry heat oven**	**Chemical vapor**	**Ethylene oxide†**	**Other methods and comments**
Impression trays					
Aluminum metal	††	‡	††	††	
Chrome-plated	††	††	††	††	
Custom acrylic resin	§	§	§	††	Discard (††)
Plastic	§	§	§	††	Discard preferred (††)
Instruments in packs	††	‡ small packs	††	†† small packs	
Instrument tray setups					
Restorative or surgical	‡ size limit	‡	‡ size limit	†† size limit	
Mirrors	**	††	††	††	
Needles					
Disposable	§	§	§	§	Discard (††) do not reuse
Nitrous oxide					
Nose piece	(††)*	§	(††)*	§	
Hoses	(††)*	§	(††)*	§	
Orthodontic pliers					
High-quality stainless	††	††	††	††	
Low-quality stainless	**	††	††	††	
With plastic parts	§	§	§	††	
Pluggers and condensers	††	††	††	††	
Polishing wheels and disks					
Garnet and cuttle	§	**	**	§	

Rag	††	**	‡	§	
Rubber	‡	**	**	§	
Prosthesis, removable	**	**	**	§	

Instrument, material, or item	Steam autoclave	Dry heat oven	Chemical vapor	Ethylene oxide†	Other methods and comments
Rubber dam equipment					
Carbon steel clamps	**	††	††	††	
Metal frames	††	††	††	††	
Plastic frames	**	**	**	††	
Punches	**	††	††	††	
Stainless steel clamps	††	††	††	††	
Rubber items					
Prophylaxis cups	**	**	**	§	Discard (††)
Saliva evacuators, ejectors (plastic)	**	**	**	**	Discard (††) (single use / disposable)
Stones					
Diamond	‡	††	††	††	
Polishing	††	‡	††	††	
Sharpening	††	††	††	**	
Surgical instruments					
Stainless steel	††	††	††	††	
Ultrasonic scaling tips	‡	§	§	††	
Water-air syringe tips	††	††	††	§	Discard (††)
X-ray equipment					
Plastic film holders	(††)*	§	(‡)*	††	
Collimating devices	**	§	§	††	

* Since manufacturers use a variety of alloys and materials in these products, confirmation with the equipment manufacturers is recommended, especially for handpieces and their attachments.

† Ethylene oxide should only be used to sterilize instruments that can be thoroughly cleaned and dried.
‡ Effective and acceptable method.
§ Ineffective method.
** Effective method, but risk of damage to materials.
†† Effective and preferred method.

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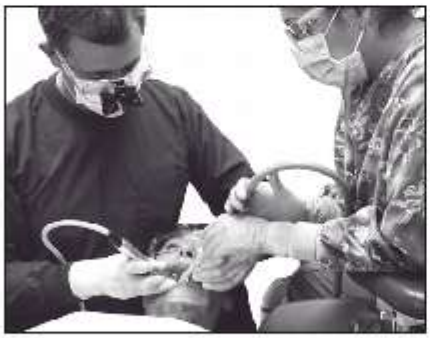
Guidelines for Infection Control in Dental Health-Care Settings — 2003



INSIDE: Continuing Education Examination

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

Guidelines for Infection Control in Dental Health-Care Settings --- 2003

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XX. *Summary*

This report consolidates previous recommendations and adds new ones for infection control in dental settings. Recommendations are provided regarding 1) educating and protecting dental health-care personnel; 2) preventing transmission of bloodborne pathogens; 3) hand hygiene; 4) personal protective equipment; 5) contact dermatitis and latex hypersensitivity; 6) sterilization and disinfection of patient-care items; 7) environmental infection control; 8) dental unit waterlines, biofilm, and water quality; and 9) special considerations (e.g., dental handpieces and other devices, radiology, parenteral medications, oral surgical procedures, and dental laboratories). These recommendations were developed in collaboration with and after review by authorities on infection control from CDC and other public agencies, academia, and private and professional organizations.

XXI. Introduction

This report consolidates recommendations for preventing and controlling infectious diseases and managing personnel health and safety concerns related to infection control in dental settings. This report 1) updates and revises previous CDC recommendations regarding infection control in dental settings (*1*, *2*); 2) incorporates relevant infection-control measures from other CDC guidelines; and 3) discusses concerns not addressed in previous recommendations for dentistry. These updates and additional topics include the following:

- application of standard precautions rather than universal precautions;
- work restrictions for health-care personnel (HCP) infected with or occupationally exposed to infectious diseases;
- management of occupational exposures to bloodborne pathogens, including postexposure prophylaxis (PEP) for work exposures to hepatitis B virus (HBV), hepatitis C virus (HCV); and human immunodeficiency virus (HIV);
- selection and use of devices with features designed to prevent sharps injury;
- hand-hygiene products and surgical hand antisepsis;
- contact dermatitis and latex hypersensitivity;
- sterilization of unwrapped instruments;
- dental water-quality concerns (e.g., dental unit waterline biofilms; delivery of water of acceptable biological quality for patient care; usefulness of flushing waterlines; use of sterile irrigating solutions for

oral surgical procedures; handling of community boil-water advisories);
- dental radiology;
- aseptic technique for parenteral medications;
- preprocedural mouth rinsing for patients;
- oral surgical procedures;
- laser/electrosurgery plumes;
- tuberculosis (TB);
- Creutzfeldt-Jakob disease (CJD) and other prion-related diseases;
- infection-control program evaluation; and
- research considerations.

These guidelines were developed by CDC staff members in collaboration with other authorities on infection control. Draft documents were reviewed by other federal agencies and professional organizations from the fields of dental health care, public health, and hospital epidemiology and infection control. A *Federal Register* notice elicited public comments that were considered in the decision-making process. Existing guidelines and published research pertinent to dental infection-control principles and practices were reviewed. Wherever possible, recommendations are based on data from well-designed scientific studies. However, only a limited number of studies have characterized risk factors and the effectiveness of prevention measures for infections associated with dental health-care practices.

Some infection-control practices routinely used by health-care practitioners cannot be rigorously examined for ethical or logistical reasons. In the absence of scientific evidence for such practices, certain recommendations are based on strong theoretical rationale, suggestive evidence, or opinions of respected authorities based on clinical experience, descriptive studies, or committee reports. In addition, some recommendations are derived from federal regulations. No recommendations are offered for practices for which insufficient scientific evidence or lack of consensus supporting their effectiveness exists.

XXII. Background

In the United States, an estimated 9 million persons work in health-care professions, including approximately 168,000 dentists, 112,000 registered dental hygienists, 218,000 dental assistants (*3*), and 53,000 dental laboratory technicians (*4*). In this report, dental health-care personnel (DHCP) refers to all paid and unpaid personnel in the dental health-care setting who might be occupationally exposed to infectious materials, including body substances and contaminated supplies, equipment, environmental surfaces, water, or air. DHCP include dentists, dental hygienists, dental assistants, dental laboratory technicians (in-office and commercial), students and trainees, contractual personnel, and other persons not directly involved in patient care but potentially exposed to infectious agents (e.g., administrative, clerical, housekeeping, maintenance, or volunteer personnel). Recommendations in this report are designed to prevent or reduce potential for disease transmission from patient to DHCP, from DHCP to patient, and from patient to patient. Although these guidelines focus mainly on outpatient, ambulatory dental health-care settings, the recommended infection-control practices are applicable to all settings in which dental treatment is provided.

Dental patients and DHCP can be exposed to pathogenic microorganisms including cytomegalovirus (CMV), HBV, HCV, herpes simplex virus types 1 and 2, HIV, *Mycobacterium tuberculosis*, staphylococci, streptococci, and other viruses and bacteria that colonize or infect the oral cavity and respiratory tract. These organisms can be transmitted in dental settings through 1) direct contact with blood, oral fluids, or other patient materials; 2) indirect contact with contaminated objects (e.g., instruments, equipment, or environmental surfaces); 3) contact of conjunctival, nasal, or oral mucosa with droplets (e.g., spatter) containing microorganisms generated from an infected person and propelled a short distance (e.g., by coughing, sneezing, or talking); and 4) inhalation of airborne microorganisms that can remain suspended in the air for long periods (*5*).

Infection through any of these routes requires that all of the following conditions be present:

- a pathogenic organism of sufficient virulence and in adequate numbers to cause disease;
- a reservoir or source that allows the pathogen to survive and multiply (e.g., blood);
- a mode of transmission from the source to the host;
- a portal of entry through which the pathogen can enter the host; and
- a susceptible host (i.e., one who is not immune).

Occurrence of these events provides the chain of infection (*6*). Effective infection-control strategies prevent disease transmission by interrupting one or more links in the chain.

Previous CDC recommendations regarding infection control for dentistry focused primarily on the risk of transmission of bloodborne pathogens among DHCP and patients and use of universal precautions to reduce that risk (*1*,*2*,*7*,*8*). Universal precautions were based on the concept that all blood and body fluids that might be contaminated with blood should be treated as infectious because patients with bloodborne infections can be asymptomatic or unaware they are infected (*9*,*10*). Preventive practices used to reduce blood exposures, particularly percutaneous exposures, include 1) careful handling of sharp instruments, 2) use of rubber dams to minimize blood spattering; 3) handwashing; and 4) use of protective barriers (e.g., gloves, masks, protective eyewear, and gowns).

The relevance of universal precautions to other aspects of disease transmission was recognized, and in 1996, CDC expanded the concept and changed the term to *standard precautions*. Standard precautions integrate and expand the elements of universal precautions into a standard of care designed to protect HCP and patients from pathogens that can be spread by blood or any other body fluid, excretion, or secretion (*11*). Standard precautions apply to contact with 1) blood; 2) all body fluids, secretions, and excretions (except sweat), regardless of whether they contain blood; 3) nonintact skin; and 4) mucous membranes. Saliva has always been considered a potentially infectious material in dental infection control; thus, no operational difference exists in clinical dental practice between universal precautions and standard precautions.

In addition to standard precautions, other measures (e.g., expanded or transmission-based precautions) might be necessary to prevent potential spread of certain diseases (e.g., TB, influenza, and varicella) that are transmitted through airborne, droplet, or contact transmission (e.g., sneezing, coughing, and contact with skin) (*11*). When acutely ill with these diseases, patients do not usually seek routine dental outpatient care. Nonetheless, a general understanding of precautions for diseases transmitted by all routes is critical because 1) some DHCP are hospital-based or work part-time in hospital settings; 2) patients infected with these diseases might seek urgent treatment at outpatient dental offices; and 3) DHCP might become infected with these diseases.

Necessary transmission-based precautions might include patient placement (e.g., isolation), adequate room ventilation, respiratory protection (e.g., N-95 masks) for DHCP, or postponement of nonemergency dental procedures.

DHCP should be familiar also with the hierarchy of controls that categorizes and prioritizes prevention strategies (*12*). **For bloodborne pathogens, engineering controls that eliminate or isolate the hazard (e.g., puncture-resistant sharps containers or needle-retraction devices) are the primary strategies for protecting DHCP and patients.** Where engineering controls are not available or appropriate, work-practice controls that result in safer behaviors (e.g., one-hand needle recapping or not using fingers for cheek retraction while using sharp instruments or suturing), and use of personal protective equipment (PPE) (e.g., protective eyewear, gloves, and mask) can prevent exposure (*13*). In addition, administrative controls (e.g., policies,

procedures, and enforcement measures targeted at reducing the risk of exposure to infectious persons) are a priority for certain pathogens (e.g., *M. tuberculosis*), particularly those spread by airborne or droplet routes.

Dental practices should develop a written infection-control program to prevent or reduce the risk of disease transmission. Such a program should include establishment and implementation of policies, procedures, and practices (in conjunction with selection and use of technologies and products) to prevent work-related injuries and illnesses among DHCP as well as health-care--associated infections among patients. The program should embody principles of infection control and occupational health, reflect current science, and adhere to relevant federal, state, and local regulations and statutes. An infection-control coordinator (e.g., dentist or other DHCP) knowledgeable or willing to be trained should be assigned responsibility for coordinating the program. The effectiveness of the infection-control program should be evaluated on a day-to-day basis and over time to help ensure that policies, procedures, and practices are useful, efficient, and successful (see Program Evaluation).

Although the infection-control coordinator remains responsible for overall management of the program, creating and maintaining a safe work environment ultimately requires the commitment and accountability of all DHCP. This report is designed to provide guidance to DHCP for preventing disease transmission in dental health-care settings, for promoting a safe working environment, and for assisting dental practices in developing and implementing infection-control programs. These programs should be followed in addition to practices and procedures for worker protection required by the Occupational Safety and Health Administration's (OSHA) standards for occupational exposure to bloodborne pathogens (*13*), including instituting controls to protect employees from exposure to blood or other potentially infectious materials (OPIM), and requiring implementation of a written exposure-control plan, annual employee training, HBV vaccinations, and postexposure follow-up (*13*). Interpretations and enforcement procedures are available to help DHCP apply this OSHA standard in practice (*14*). Also, manufacturer's Material Safety Data Sheets (MSDS) should be consulted regarding correct procedures for handling or working with hazardous chemicals (*15*).

Previous Recommendations

This report includes relevant infection-control measures from the following previously published CDC guidelines and recommendations:

- CDC. Guideline for disinfection and sterilization in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR (in press).
- CDC. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR 2003;52(No. RR-10).
- CDC. Guidelines for the prevention of intravascular catheter-related infections. MMWR 2002;51(No. RR-10).
- CDC. Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR 2002;51 (No. RR-16).
- CDC. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. MMWR 2001;50(No. RR-11).
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- Larson EL, 1992, 1993, and 1994 Guidelines Committee. APIC guideline for handwashing and hand antisepsis in health-care settings. Am J Infect Control 1995;23:251--69.
- CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care facilities, 1994. MMWR 1994;43(No. RR-13).
- CDC. Recommendations for preventing transmission of human immunodeficiency virus and hepatitis B virus to patients during exposure-prone invasive procedures. MMWR 1991;40(No. RR-8).
- Garner JS. CDC guideline for prevention of surgical wound infections, 1985. Supersedes guideline for prevention of surgical wound infections published in 1982. (Originally published in November 1985). Revised. Infect Control 1986;7:193--200.
- Garner JS, Favero MS. CDC guideline for handwashing and hospital environmental control, 1985. Infect Control 1986;7:231--43.

Selected Definitions

Alcohol-based hand rub: An alcohol-containing preparation designed for reducing the number of viable microorganisms on the hands.

Antimicrobial soap: A detergent containing an antiseptic agent.

Antiseptic*:* A germicide used on skin or living tissue for the purpose of inhibiting or destroying microorganisms (e.g., alcohols, chlorhexidine, chlorine, hexachlorophene, iodine, chloroxylenol [PCMX], quaternary ammonium compounds, and triclosan).

Bead sterilizer: A device using glass beads 1.2--1.5 mm diameter and temperatures 217°C--232°C for brief exposures (e.g., 45 seconds) to inactivate microorganisms. (This term is actually a misnomer because it has not been cleared by the Food and Drug Administration [FDA] as a sterilizer).

Bioburden: Microbiological load (i.e., number of viable organisms in or on an object or surface) or organic material on a surface or object before decontamination, or sterilization. Also known as *bioload* or *microbial load*.

Colony-forming unit (CFU): The minimum number (i.e., tens of millions) of separable cells on the surface of or in semisolid agar medium that give rise to a visible colony of progeny. CFUs can consist of pairs, chains, clusters, or as single cells and are often expressed as colony-forming units per milliliter (CFUs/mL).

Decontamination: Use of physical or chemical means to remove, inactivate, or destroy pathogens on a surface or item so that they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Dental treatment water: Nonsterile water used during dental treatment, including irrigation of nonsurgical operative sites and cooling of high-speed rotary and ultrasonic instruments.

Disinfectant: A chemical agent used on inanimate objects (e.g., floors, walls, or sinks) to destroy virtually all recognized pathogenic microorganisms, but not necessarily all microbial forms (e.g., bacterial endospores). The U.S. Environmental Protection Agency (EPA) groups disinfectants on the basis of whether the product label claims limited, general, or hospital disinfectant capabilities.

Disinfection: Destruction of pathogenic and other kinds of microorganisms by physical or chemical means. Disinfection is less lethal than sterilization, because it destroys the majority of recognized pathogenic microorganisms, but not necessarily all microbial forms (e.g., bacterial spores). Disinfection does not ensure the degree of safety associated with sterilization processes.

Droplet nuclei: Particles ≤5 μm in diameter formed by dehydration of airborne droplets containing microorganisms that can remain suspended in the air for long periods of time.
Droplets: Small particles of moisture (e.g., spatter) generated when a person coughs or sneezes, or when water is converted to a fine mist by an aerator or shower head. These particles, intermediate in size between drops and droplet nuclei, can contain infectious microorganisms and tend to quickly settle from the air such that risk of disease transmission is usually limited to persons in close proximity to the droplet source.
Endotoxin: The lipopolysaccharide of gram-negative bacteria, the toxic character of which resides in the lipid protein. Endotoxins can produce pyrogenic reactions in persons exposed to their bacterial component.
Germicide: An agent that destroys microorganisms, especially pathogenic organisms. Terms with the same suffix (e.g., *virucide*, *fungicide*, *bactericide*, *tuberculocide*, and *sporicide*) indicate agents that destroy the specific microorganism identified by the prefix. Germicides can be used to inactivate microorganisms in or on living tissue (i.e., antiseptics) or on environmental surfaces (i.e., disinfectants).
Hand hygiene: General term that applies to handwashing, antiseptic handwash, antiseptic hand rub, or surgical hand antisepsis.
Health-care--associated infection: Any infection associated with a medical or surgical intervention. The term *health-care--associated* replaces *nosocomial*, which is limited to adverse infectious outcomes occurring in hospitals.
Hepatitis B immune globulin (HBIG): Product used for prophylaxis against HBV infection. HBIG is prepared from plasma containing high titers of hepatitis B surface antibody (anti-HBs) and provides protection for 3--6 mos.
Hepatitis B surface antigen (HBsAg): Serologic marker on the surface of HBV detected in high levels during acute or chronic hepatitis. The body normally produces antibodies to surface antigen as a normal immune response to infection.
Hepatitis B e antigen (HBeAg): Secreted product of the nucleocapsid gene of HBV found in serum during acute and chronic HBV infection. Its presence indicates that the virus is replicating and serves as a marker of increased infectivity.
Hepatitis B surface antibody (anti-HBs): Protective antibody against HBsAg. Presence in the blood can indicate past infection with, and immunity to, HBV, or immune response from hepatitis B vaccine.
Heterotrophic bacteria: Those bacteria requiring an organic carbon source for growth (i.e., deriving energy and carbon from organic compounds).
***High-level disinfection*:** Disinfection process that inactivates vegetative bacteria, mycobacteria, fungi, and viruses but not necessarily high numbers of bacterial spores. FDA further defines a high-level disinfectant as a sterilant used for a shorter contact time.
Hospital disinfectant: Germicide registered by EPA for use on inanimate objects in hospitals, clinics, dental offices, and other medical-related facilities. Efficacy is demonstrated against *Salmonella choleraesuis*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*.
Iatrogenic: Induced inadvertently by HCP, medical (including dental) treatment, or diagnostic procedures. Used particularly in reference to an infectious disease or other complication of treatment.
Immunization: Process by which a person becomes immune, or protected against a disease. Vaccination is defined as the process of administering a killed or weakened infectious organism or a toxoid; however, vaccination does not always result in immunity.
Implantable device: Device placed into a surgically or naturally formed cavity of the human body and intended to remain there for ≥30 days.
Independent water reservoir: Container used to hold water or other solutions and supply it to handpieces and air and water syringes attached to a dental unit. The independent reservoir, which isolates the unit from the public water system, can be provided as original equipment or as a retrofitted device.
Intermediate-level disinfection: Disinfection process that inactivates vegetative bacteria, the majority of fungi, mycobacteria, and the majority of viruses (particularly enveloped viruses) but not bacterial spores.
Intermediate-level disinfectant: Liquid chemical germicide registered with EPA as a hospital disinfectant and

with a label claim of potency as tuberculocidal (Appendix A).

Latex: Milky white fluid extracted from the rubber tree *Hevea brasiliensis* that contains the rubber material cis-1, 4 polyisoprene.

Low-level disinfection: Process that inactivates the majority of vegetative bacteria, certain fungi, and certain viruses, but cannot be relied on to inactivate resistant microorganisms (e.g., mycobacteria or bacterial spores).

Low-level disinfectant: Liquid chemical germicide registered with EPA as a hospital disinfectant. OSHA requires low-level hospital disinfectants also to have a label claim for potency against HIV and HBV if used for disinfecting clinical contact surfaces (Appendix A).

Microfilter: Membrane filter used to trap microorganisms suspended in water. Filters are usually installed on dental unit waterlines as a retrofit device. Microfiltration commonly occurs at a filter pore size of 0.03--10 µm. Sediment filters commonly found in dental unit water regulators have pore sizes of 20--90 µm and do not function as microbiological filters.

Nosocomial: Infection acquired in a hospital as a result of medical care.

Occupational exposure: Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or OPIM that can result from the performance of an employee's duties.

OPIM*:* Other potentially infectious materials. OPIM is an OSHA term that refers to 1) body fluids including semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures; any body fluid visibly contaminated with blood; and all body fluids in situations where differentiating between body fluids is difficult or impossible; 2) any unfixed tissue or organ (other than intact skin) from a human (living or dead); and 3) HIV-containing cell or tissue cultures, organ cultures; HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral: Means of piercing mucous membranes or skin barrier through such events as needlesticks, human bites, cuts, and abrasions.

Persistent activity: Prolonged or extended activity that prevents or inhibits proliferation or survival of microorganisms after application of a product. This activity can be demonstrated by sampling a site minutes or hours after application and demonstrating bacterial antimicrobial effectiveness when compared with a baseline level. Previously, this property was sometimes termed *residual activity*.

Prion: Protein particle lacking nucleic acid that has been implicated as the cause of certain neurodegenerative diseases (e.g., scrapie, CJD, and bovine spongiform encephalopathy [BSE]).

Retraction: Entry of oral fluids and microorganisms into waterlines through negative water pressure.

Seroconversion: The change of a serological test from negative to positive indicating the development of antibodies in response to infection or immunization.

Sterile: Free from all living microorganisms; usually described as a probability (e.g., the probability of a surviving microorganism being 1 in 1 million).

Sterilization: Use of a physical or chemical procedure to destroy all microorganisms including substantial numbers of resistant bacterial spores.

Surfactants: Surface-active agents that reduce surface tension and help cleaning by loosening, emulsifying, and holding soil in suspension, to be more readily rinsed away.

Ultrasonic cleaner: Device that removes debris by a process called cavitation, in which waves of acoustic energy are propagated in aqueous solutions to disrupt the bonds that hold particulate matter to surfaces.

Vaccination: See immunization.

Vaccine: Product that induces immunity, therefore protecting the body from the disease. Vaccines are administered through needle injections, by mouth, and by aerosol.

Washer-disinfector: Automatic unit that cleans and thermally disinfects instruments, by using a high-temperature cycle rather than a chemical bath.

Wicking: Absorption of a liquid by capillary action along a thread or through the material (e.g., penetration of liquids through undetected holes in a glove).

XXIII. Review of Science Related to Dental Infection Control

Personnel Health Elements of an Infection-Control Program

A protective health component for DHCP is an integral part of a dental practice infection-control program. The objectives are to educate DHCP regarding the principles of infection control, identify work-related infection risks, institute preventive measures, and ensure prompt exposure management and medical follow-up. Coordination between the dental practice's infection-control coordinator and other qualified health-care professionals is necessary to provide DHCP with appropriate services. Dental programs in institutional settings, (e.g., hospitals, health centers, and educational institutions) can coordinate with departments that provide personnel health services. However, the majority of dental practices are in ambulatory, private settings that do not have licensed medical staff and facilities to provide complete on-site health service programs. In such settings, the infection-control coordinator should establish programs that arrange for site-specific infection-control services from external health-care facilities and providers before DHCP are placed at risk for exposure. Referral arrangements can be made with qualified health-care professionals in an occupational health program of a hospital, with educational institutions, or with health-care facilities that offer personnel health services.

Education and Training

Personnel are more likely to comply with an infection-control program and exposure-control plan if they understand its rationale (*5,13,16*). Clearly written policies, procedures, and guidelines can help ensure consistency, efficiency, and effective coordination of activities. Personnel subject to occupational exposure should receive infection-control training on initial assignment, when new tasks or procedures affect their occupational exposure, and at a minimum, annually (*13*). Education and training should be appropriate to the assigned duties of specific DHCP (e.g., techniques to prevent cross-contamination or instrument sterilization).

For DHCP who perform tasks or procedures likely to result in occupational exposure to infectious agents, training should include 1) a description of their exposure risks; 2) review of prevention strategies and infection-control policies and procedures; 3) discussion regarding how to manage work-related illness and injuries, including PEP; and 4) review of work restrictions for the exposure or infection. Inclusion of DHCP with minimal exposure risks (e.g., administrative employees) in education and training programs might enhance facilitywide understanding of infection-control principles and the importance of the program. Educational materials should be appropriate in content and vocabulary for each person's educational level, literacy, and language, as well as be consistent with existing federal, state, and local regulations (*5,13*).

Immunization Programs

DHCP are at risk for exposure to, and possible infection with, infectious organisms. Immunizations substantially reduce both the number of DHCP susceptible to these diseases and the potential for disease transmission to other DHCP and patients (*5,17*). Thus, immunizations are an essential part of prevention and infection-control programs for DHCP, and a comprehensive immunization policy should be implemented for all dental health-care facilities (*17,18*). The Advisory Committee on Immunization Practices (ACIP) provides national guidelines for immunization of HCP, which includes DHCP (*17*). Dental practice immunization policies should incorporate current state and federal regulations as well as recommendations from the U.S. Public Health Service and professional organizations (*17*) (Appendix B).

On the basis of documented health-care--associated transmission, HCP are considered to be at substantial risk for acquiring or transmitting hepatitis B, influenza, measles, mumps, rubella, and varicella. All of these diseases are vaccine-preventable. ACIP recommends that all HCP be vaccinated or have documented immunity to these diseases (*5,17*). ACIP does not recommend routine immunization of HCP against TB (i.e., inoculation with

bacille Calmette-Guérin vaccine) or hepatitis A (*17*). No vaccine exists for HCV. ACIP guidelines also provide recommendations regarding immunization of HCP with special conditions (e.g., pregnancy, HIV infection, or diabetes) (*5*,*17*).

Immunization of DHCP before they are placed at risk for exposure remains the most efficient and effective use of vaccines in health-care settings. Some educational institutions and infection-control programs provide immunization schedules for students and DHCP. OSHA requires that employers make hepatitis B vaccination available to all employees who have potential contact with blood or OPIM. Employers are also required to follow CDC recommendations for vaccinations, evaluation, and follow-up procedures (*13*). Nonpatient-care staff (e.g., administrative or housekeeping) might be included, depending on their potential risk of coming into contact with blood or OPIM. Employers are also required to ensure that employees who decline to accept hepatitis B vaccination sign an appropriate declination statement (*13*). DHCP unable or unwilling to be vaccinated as required or recommended should be educated regarding their exposure risks, infection-control policies and procedures for the facility, and the management of work-related illness and work restrictions (if appropriate) for exposed or infected DHCP.

Exposure Prevention and Postexposure Management

Avoiding exposure to blood and OPIM, as well as protection by immunization, remain primary strategies for reducing occupationally acquired infections, but occupational exposures can still occur (*19*). A combination of standard precautions, engineering, work practice, and administrative controls is the best means to minimize occupational exposures. Written policies and procedures to facilitate prompt reporting, evaluation, counseling, treatment, and medical follow-up of all occupational exposures should be available to all DHCP. Written policies and procedures should be consistent with federal, state, and local requirements addressing education and training, postexposure management, and exposure reporting (see Preventing Transmission of Bloodborne Pathogens).

DHCP who have contact with patients can also be exposed to persons with infectious TB, and should have a baseline tuberculin skin test (TST), preferably by using a two-step test, at the beginning of employment (*20*). Thus, if an unprotected occupational exposure occurs, TST conversions can be distinguished from positive TST results caused by previous exposures (*20*,*21*). The facility's level of TB risk will determine the need for routine follow-up TSTs (see Special Considerations).

Medical Conditions, Work-Related Illness, and Work Restrictions

DHCP are responsible for monitoring their health status. DHCP who have acute or chronic medical conditions that render them susceptible to opportunistic infection should discuss with their personal physicians or other qualified authority whether the condition might affect their ability to safely perform their duties.

However, under certain circumstances, health-care facility managers might need to exclude DHCP from work or patient contact to prevent further transmission of infection (*22*). Decisions concerning work restrictions are based on the mode of transmission and the period of infectivity of the disease (*5*) (Table 1). Exclusion policies should 1) be written, 2) include a statement of authority that defines who can exclude DHCP (e.g., personal physicians), and 3) be clearly communicated through education and training. Policies should also encourage DHCP to report illnesses or exposures without jeopardizing wages, benefits, or job status.

With increasing concerns regarding bloodborne pathogens and introduction of universal precautions, use of latex gloves among HCP has increased markedly (*7*,*23*). Increased use of these gloves has been accompanied by increased reports of allergic reactions to natural rubber latex among HCP, DHCP, and patients (*24*--*30*), as well as increased reports of irritant and allergic contact dermatitis from frequent and repeated use of hand-hygiene products, exposure to chemicals, and glove use.

DHCP should be familiar with the signs and symptoms of latex sensitivity (*5*,*31*--*33*). A physician should

evaluate DHCP exhibiting symptoms of latex allergy, because further exposure could result in a serious allergic reaction. A diagnosis is made through medical history, physical examination, and diagnostic tests. Procedures should be in place for minimizing latex-related health problems among DHCP and patients while protecting them from infectious materials. These procedures should include 1) reducing exposures to latex-containing materials by using appropriate work practices, 2) training and educating DHCP, 3) monitoring symptoms, and 4) substituting nonlatex products where appropriate (*32*) (see Contact Dermatitis and Latex Hypersensitivity).

Maintenance of Records, Data Management, and Confidentiality

The health status of DHCP can be monitored by maintaining records of work-related medical evaluations, screening tests, immunizations, exposures, and postexposure management. Such records must be kept in accordance with all applicable state and federal laws. Examples of laws that might apply include the Privacy Rule of the Health Insurance Portability and Accountability Act (HIPAA) of 1996, 45 CFR 160 and 164, and the OSHA Occupational Exposure to Bloodborne Pathogens; Final Rule 29 CFR 1910.1030(h)(1)(i--iv) (*34*,*13*). The HIPAA Privacy Rule applies to covered entities, including certain defined health providers, health-care clearinghouses, and health plans. OSHA requires employers to ensure that certain information contained in employee medical records is 1) kept confidential; 2) not disclosed or reported without the employee's express written consent to any person within or outside the workplace except as required by the OSHA standard; and 3) maintained by the employer for at least the duration of employment plus 30 years. Dental practices that coordinate their infection-control program with off-site providers might consult OSHA's Bloodborne Pathogen standard and employee Access to Medical and Exposure Records standard, as well as other applicable local, state, and federal laws, to determine a location for storing health records (*13*,*35*).

Preventing Transmission of Bloodborne Pathogens

Although transmission of bloodborne pathogens (e.g., HBV, HCV, and HIV) in dental health-care settings can have serious consequences, such transmission is rare. Exposure to infected blood can result in transmission from patient to DHCP, from DHCP to patient, and from one patient to another. The opportunity for transmission is greatest from patient to DHCP, who frequently encounter patient blood and blood-contaminated saliva during dental procedures.

Since 1992, no HIV transmission from DHCP to patients has been reported, and the last HBV transmission from DHCP to patients was reported in 1987. HCV transmission from DHCP to patients has not been reported. The majority of DHCP infected with a bloodborne virus do not pose a risk to patients because they do not perform activities meeting the necessary conditions for transmission. For DHCP to pose a risk for bloodborne virus transmission to patients, DHCP must 1) be viremic (i.e., have infectious virus circulating in the bloodstream); 2) be injured or have a condition (e.g., weeping dermatitis) that allows direct exposure to their blood or other infectious body fluids; and 3) enable their blood or infectious body fluid to gain direct access to a patient's wound, traumatized tissue, mucous membranes, or similar portal of entry. Although an infected DHCP might be viremic, unless the second and third conditions are also met, transmission cannot occur.

The risk of occupational exposure to bloodborne viruses is largely determined by their prevalence in the patient population and the nature and frequency of contact with blood and body fluids through percutaneous or permucosal routes of exposure. The risk of infection after exposure to a bloodborne virus is influenced by inoculum size, route of exposure, and susceptibility of the exposed HCP (*12*). The majority of attention has been placed on the bloodborne pathogens HBV, HCV, and HIV, and these pathogens present different levels of risk to DHCP.

Hepatitis B Virus

HBV is a well-recognized occupational risk for HCP (*36*,*37*). HBV is transmitted by percutaneous or mucosal exposure to blood or body fluids of a person with either acute or chronic HBV infection. Persons infected with

HBV can transmit the virus for as long as they are HBsAg-positive. The risk of HBV transmission is highly related to the HBeAg status of the source person. In studies of HCP who sustained injuries from needles contaminated with blood containing HBV, the risk of developing clinical hepatitis if the blood was positive for both HBsAg and HBeAg was 22%--31%; the risk of developing serologic evidence of HBV infection was 37%--62% (*19*). By comparison, the risk of developing clinical hepatitis from a needle contaminated with HBsAg-positive, HBeAg-negative blood was 1%--6%, and the risk of developing serologic evidence of HBV infection, 23%--37% (*38*).

Blood contains the greatest proportion of HBV infectious particle titers of all body fluids and is the most critical vehicle of transmission in the health-care setting. HBsAg is also found in multiple other body fluids, including breast milk, bile, cerebrospinal fluid, feces, nasopharyngeal washings, saliva, semen, sweat, and synovial fluid. However, the majority of body fluids are not efficient vehicles for transmission because they contain low quantities of infectious HBV, despite the presence of HBsAg (*19*). The concentration of HBsAg in body fluids can be 100--1,000-fold greater than the concentration of infectious HBV particles (*39*).

Although percutaneous injuries are among the most efficient modes of HBV transmission, these exposures probably account for only a minority of HBV infections among HCP. In multiple investigations of nosocomial Hepatitis B outbreaks, the majority of infected HCP could not recall an overt percutaneous injury (*40,41*), although in certain studies, approximately one third of infected HCP recalled caring for a patient who was HBsAg-positive (*42,43*). In addition, HBV has been demonstrated to survive in dried blood at room temperature on environmental surfaces for ≤1 week (*44*). Thus, HBV infections that occur in HCP with no history of nonoccupational exposure or occupational percutaneous injury might have resulted from direct or indirect blood or body fluid exposures that inoculated HBV into cutaneous scratches, abrasions, burns, other lesions, or on mucosal surfaces (*45--47*). The potential for HBV transmission through contact with environmental surfaces has been demonstrated in investigations of HBV outbreaks among patients and HCP in hemodialysis units (*48--50*).

Since the early 1980s, occupational infections among HCP have declined because of vaccine use and adherence to universal precautions (*51*). Among U.S. dentists, >90% have been vaccinated, and serologic evidence of past HBV infection decreased from prevaccine levels of 14% in 1972 to approximately 9% in 1992 (*52*). During 1993--2001, levels remained relatively unchanged (Chakwan Siew, Ph.D., American Dental Association, Chicago, Illinois, personal communication, June 2003). Infection rates can be expected to decline further as vaccination rates remain high among young dentists and as older dentists with lower vaccination rates and higher rates of infection retire.

Although the potential for transmission of bloodborne infections from DHCP to patients is considered limited (*53--55*), precise risks have not been quantified by carefully designed epidemiologic studies (*53, 56, 57*). Reports published during 1970--1987 describe nine clusters in which patients were thought to be infected with HBV through treatment by an infected DHCP (*58--67*). However, transmission of HBV from dentist to patient has not been reported since 1987, possibly reflecting such factors as 1) adoption of universal precautions, 2) routine glove use, 3) increased levels of immunity as a result of hepatitis B vaccination of DHCP, 4) implementation of the 1991 OSHA bloodborne pathogen standard (*68*), and 5) incomplete ascertainment and reporting. Only one case of patient-to-patient transmission of HBV in the dental setting has been documented (CDC, unpublished data, 2003). In this case, appropriate office infection-control procedures were being followed, and the exact mechanism of transmission was undetermined.

Because of the high risk of HBV infection among HCP, DHCP who perform tasks that might involve contact with blood, blood-contaminated body substances, other body fluids, or sharps should be vaccinated (*2, 13, 17,19,69*). Vaccination can protect both DHCP and patients from HBV infection and, whenever possible, should be completed when dentists or other DHCP are in training and before they have contact with blood.

Prevaccination serological testing for previous infection is not indicated, although it can be cost-effective where prevalence of infection is expected to be high in a group of potential vacinees (e.g., persons who have emigrated from areas with high rates of HBV infection). DHCP should be tested for anti-HBs 1--2 months after completion of the 3-dose vaccination series (*17*). DHCP who do not develop an adequate antibody response (i.e., anti-HBs <10 mIU/mL) to the primary vaccine series should complete a second 3-dose vaccine series or be evaluated to determine if they are HBsAg-positive (*17*). Revaccinated persons should be retested for anti-HBs at the completion of the second vaccine series. Approximately half of nonresponders to the primary series will respond to a second 3-dose series. If no antibody response occurs after the second series, testing for HBsAg should be performed (*17*). Persons who prove to be HBsAg-positive should be counseled regarding how to prevent HBV transmission to others and regarding the need for medical evaluation. Nonresponders to vaccination who are HBsAg-negative should be considered susceptible to HBV infection and should be counseled regarding precautions to prevent HBV infection and the need to obtain HBIG prophylaxis for any known or probable parenteral exposure to HBsAg-positive blood.

Vaccine-induced antibodies decline gradually over time, and 60% of persons who initially respond to vaccination will lose detectable antibodies over 12 years. Even so, immunity continues to prevent clinical disease or detectable viral infection (*17*). Booster doses of vaccine and periodic serologic testing to monitor antibody concentrations after completion of the vaccine series are not necessary for vaccine responders (*17*).

Hepatitis D Virus

An estimated 4% of persons with acute HBV infection are also infected with hepatitis Delta virus (HDV). Discovered in 1977, HDV is a defective bloodborne virus requiring the presence of HBV to replicate. Patients coinfected with HBV and HDV have substantially higher mortality rates than those infected with HBV alone. Because HDV infection is dependent on HBV for replication, immunization to prevent HBV infection, through either pre- or postexposure prophylaxis, can also prevent HDV infection (*70*).

Hepatitis C Virus

Hepatitis C virus appears not to be transmitted efficiently through occupational exposures to blood. Follow-up studies of HCP exposed to HCV-infected blood through percutaneous or other sharps injuries have determined a low incidence of seroconversion (mean: 1.8%; range, 0%--7%) (*71--74*). One study determined transmission occurred from hollow-bore needles but not other sharps (*72*). Although these studies have not documented seroconversion associated with mucous membrane or nonintact skin exposure, at least two cases of HCV transmission from a blood splash to the conjunctiva (*75,76*) and one case of simultaneous transmission of HCV and HIV after nonintact skin exposure have been reported (*77*).

Data are insufficient to estimate the occupational risk of HCV infection among HCP, but the majority of studies indicate the prevalence of HCV infection among dentists, surgeons, and hospital-based HCP is similar to that among the general population, approximately 1%--2% (*78--86*). In a study that evaluated risk factors for infection, a history of unintentional needlesticks was the only occupational risk factor independently associated with HCV infection (*80*).

No studies of transmission from HCV-infected DHCP to patients have been reported, and the risk for such transmission appears limited. Multiple reports have been published describing transmission from HCV-infected surgeons, which apparently occurred during performance of invasive procedures; the overall risk for infection averaged 0.17% (*87--90*).

Human Immunodeficiency Virus

In the United States, the risk of HIV transmission in dental settings is extremely low. As of December 2001, a

total of 57 cases of HIV seroconversion had been documented among HCP, but none among DHCP, after occupational exposure to a known HIV-infected source (*91*). Transmission of HIV to six patients of a single dentist with AIDS has been reported, but the mode of transmission could not be determined (*2, 92, 93*). As of September 30, 1993, CDC had information regarding test results of >22,000 patients of 63 HIV-infected HCP, including 33 dentists or dental students (*55, 93*). No additional cases of transmission were documented.

Prospective studies worldwide indicate the average risk of HIV infection after a single percutaneous exposure to HIV-infected blood is 0.3% (range: 0.2%--0.5%) (*94*). After an exposure of mucous membranes in the eye, nose, or mouth, the risk is approximately 0.1% (*76*). The precise risk of transmission after skin exposure remains unknown but is believed to be even smaller than that for mucous membrane exposure.

Certain factors affect the risk of HIV transmission after an occupational exposure. Laboratory studies have determined if needles that pass through latex gloves are solid rather than hollow-bore, or are of small gauge (e.g., anesthetic needles commonly used in dentistry); they transfer less blood (*36*). In a retrospective case-control study of HCP, an increased risk for HIV infection was associated with exposure to a relatively large volume of blood, as indicated by a deep injury with a device that was visibly contaminated with the patient's blood, or a procedure that involved a needle placed in a vein or artery (*95*). The risk was also increased if the exposure was to blood from patients with terminal illnesses, possibly reflecting the higher titer of HIV in late-stage AIDS.

Exposure Prevention Methods

Avoiding occupational exposures to blood is the primary way to prevent transmission of HBV, HCV, and HIV, to HCP in health-care settings (*19, 96, 97*). Exposures occur through percutaneous injury (e.g., a needlestick or cut with a sharp object), as well as through contact between potentially infectious blood, tissues, or other body fluids and mucous membranes of the eye, nose, mouth, or nonintact skin (e.g., exposed skin that is chapped, abraded, or shows signs of dermatitis).

Observational studies and surveys indicate that percutaneous injuries among general dentists and oral surgeons occur less frequently than among general and orthopedic surgeons and have decreased in frequency since the mid-1980s (*98--102*). This decline has been attributed to safer work practices, safer instrumentation or design, and continued DHCP education (*103,104*). Percutaneous injuries among DHCP usually 1) occur outside the patient's mouth, thereby posing less risk for recontact with patient tissues; 2) involve limited amounts of blood; and 3) are caused by burs, syringe needles, laboratory knives, and other sharp instruments (*99--102,105,106*). Injuries among oral surgeons might occur more frequently during fracture reductions using wires (*104,107*). Experience, as measured by years in practice, does not appear to affect the risk of injury among general dentists or oral surgeons (*100,104,107*).

The majority of exposures in dentistry are preventable, and methods to reduce the risk of blood contacts have included use of standard precautions, use of devices with features engineered to prevent sharp injuries, and modifications of work practices. These approaches might have contributed to the decrease in percutaneous injuries among dentists during recent years (*98--100,103*). However, needlesticks and other blood contacts continue to occur, which is a concern because percutaneous injuries pose the greatest risk of transmission.
Standard precautions include use of PPE (e.g., gloves, masks, protective eyewear or face shield, and gowns) intended to prevent skin and mucous membrane exposures. Other protective equipment (e.g., finger guards while suturing) might also reduce injuries during dental procedures (*104*).

Engineering controls are the primary method to reduce exposures to blood and OPIM from sharp instruments and needles. These controls are frequently technology-based and often incorporate safer designs of instruments and devices (e.g., self-sheathing anesthetic needles and dental units designed to shield burs in handpieces) to

reduce percutaneous injuries (*101,103,108*).

Work-practice controls establish practices to protect DHCP whose responsibilities include handling, using, assembling, or processing sharp devices (e.g., needles, scalers, laboratory utility knives, burs, explorers, and endodontic files) or sharps disposal containers. Work-practice controls can include removing burs before disassembling the handpiece from the dental unit, restricting use of fingers in tissue retraction or palpation during suturing and administration of anesthesia, and minimizing potentially uncontrolled movements of such instruments as scalers or laboratory knives (*101,105*).

As indicated, needles are a substantial source of percutaneous injury in dental practice, and engineering and work-practice controls for needle handling are of particular importance. In 2001, revisions to OSHA's bloodborne pathogens standard as mandated by the Needlestick Safety and Prevention Act of 2000 became effective. These revisions clarify the need for employers to consider safer needle devices as they become available and to involve employees directly responsible for patient care (e.g., dentists, hygienists, and dental assistants) in identifying and choosing such devices (*109*). Safer versions of sharp devices used in hospital settings have become available (e.g., blunt suture needles, phlebotomy devices, and butterfly needles), and their impact on reducing injuries has been documented (*110--112*). Aspirating anesthetic syringes that incorporate safety features have been developed for dental procedures, but the low injury rates in dentistry limit assessment of their effect on reducing injuries among DHCP.

Work-practice controls for needles and other sharps include placing used disposable syringes and needles, scalpel blades, and other sharp items in appropriate puncture-resistant containers located as close as feasible to where the items were used (*2,7,13,113--115*). In addition, used needles should never be recapped or otherwise manipulated by using both hands, or any other technique that involves directing the point of a needle toward any part of the body (*2, 7, 13, 97, 113, 114*). A one-handed scoop technique, a mechanical device designed for holding the needle cap to facilitate one-handed recapping, or an engineered sharps injury protection device (e.g., needles with resheathing mechanisms) should be employed for recapping needles between uses and before disposal (*2,7,13,113,114*). DHCP should never bend or break needles before disposal because this practice requires unnecessary manipulation. Before attempting to remove needles from nondisposable aspirating syringes, DHCP should recap them to prevent injuries. For procedures involving multiple injections with a single needle, the practitioner should recap the needle between injections by using a one-handed technique or use a device with a needle-resheathing mechanism. Passing a syringe with an unsheathed needle should be avoided because of the potential for injury.

Additional information for developing a safety program and for identifying and evaluating safer dental devices is available at

- http://www.cdc.gov/OralHealth/infectioncontrol/forms.htm (forms for screening and evaluating safer dental devices), and
- http://www.cdc.gov/niosh/topics/bbp (state legislation on needlestick safety).

Post exposure Management and Prophylaxis

Postexposure management is an integral component of a complete program to prevent infection after an occupational exposure to blood. During dental procedures, saliva is predictably contaminated with blood (*7, 114*). Even when blood is not visible, it can still be present in limited quantities and therefore is considered a potentially infectious material by OSHA (*13, 19*). A qualified health-care professional should evaluate any occupational exposure incident to blood or OPIM, including saliva, regardless of whether blood is visible, in

dental settings (*13*).
Dental practices and laboratories should establish written, comprehensive programs that include hepatitis B vaccination and postexposure management protocols that 1) describe the types of contact with blood or OPIM that can place DHCP at risk for infection; 2) describe procedures for promptly reporting and evaluating such exposures; and 3) identify a health-care professional who is qualified to provide counseling and perform all medical evaluations and procedures in accordance with current recommendations of the U.S. Public Health Service (PHS), including PEP with chemotherapeutic drugs when indicated. DHCP, including students, who might reasonably be considered at risk for occupational exposure to blood or OPIM should be taught strategies to prevent contact with blood or OPIM and the principles of postexposure management, including PEP options, as part of their job orientation and training. Educational programs for DHCP and students should emphasize reporting all exposures to blood or OPIM as soon as possible, because certain interventions have to be initiated promptly to be effective. Policies should be consistent with the practices and procedures for worker protection required by OSHA and with current PHS recommendations for managing occupational exposures to blood (*13*, *19*).

After an occupational blood exposure, first aid should be administered as necessary. Puncture wounds and other injuries to the skin should be washed with soap and water; mucous membranes should be flushed with water. No evidence exists that using antiseptics for wound care or expressing fluid by squeezing the wound further reduces the risk of bloodborne pathogen transmission; however, use of antiseptics is not contraindicated. The application of caustic agents (e.g., bleach) or the injection of antiseptics or disinfectants into the wound is not recommended (*19*). Exposed DHCP should immediately report the exposure to the infection-control coordinator or other designated person, who should initiate referral to the qualified health-care professional and complete necessary reports. Because multiple factors contribute to the risk of infection after an occupational exposure to blood, the following information should be included in the exposure report, recorded in the exposed person's confidential medical record, and provided to the qualified health-care professional:

- Date and time of exposure.
- Details of the procedure being performed, including where and how the exposure occurred and whether the exposure involved a sharp device, the type and brand of device, and how and when during its handling the exposure occurred.
- Details of the exposure, including its severity and the type and amount of fluid or material. For a percutaneous injury, severity might be measured by the depth of the wound, gauge of the needle, and whether fluid was injected; for a skin or mucous membrane exposure, the estimated volume of material, duration of contact, and the condition of the skin (e.g., chapped, abraded, or intact) should be noted.
- Details regarding whether the source material was known to contain HIV or other bloodborne pathogens, and, if the source was infected with HIV, the stage of disease, history of antiretroviral therapy, and viral load, if known.
- Details regarding the exposed person (e.g., hepatitis B vaccination and vaccine-response status).
- Details regarding counseling, postexposure management, and follow-up.

Each occupational exposure should be evaluated individually for its potential to transmit HBV, HCV, and HIV, based on the following:

- The type and amount of body substance involved.
- The type of exposure (e.g., percutaneous injury, mucous membrane or nonintact skin exposure, or bites resulting in blood exposure to either person involved).
- The infection status of the source.

- The susceptibility of the exposed person (*19*).

All of these factors should be considered in assessing the risk for infection and the need for further follow-up (e.g., PEP).

During 1990--1998, PHS published guidelines for PEP and other management of health-care worker exposures to HBV, HCV, or HIV (*69*, *116*--*119*). In 2001, these recommendations were updated and consolidated into one set of PHS guidelines (*19*). The new guidelines reflect the availability of new antiretroviral agents, new information regarding the use and safety of HIV PEP, and considerations regarding employing HIV PEP when resistance of the source patient's virus to antiretroviral agents is known or suspected. In addition, the 2001 guidelines provide guidance to clinicians and exposed HCP regarding when to consider HIV PEP and recommendations for PEP regimens (*19*).

Hand Hygiene

Hand hygiene (e.g., handwashing, hand antisepsis, or surgical hand antisepsis) substantially reduces potential pathogens on the hands and is considered the single most critical measure for reducing the risk of transmitting organisms to patients and HCP (*120*--*123*). Hospital-based studies have demonstrated that noncompliance with hand hygiene practices is associated with health-care--associated infections and the spread of multiresistant organisms. Noncompliance also has been a major contributor to outbreaks (*123*). The prevalence of health-care--associated infections decreases as adherence of HCP to recommended hand hygiene measures improves (*124*--*126*).

The microbial flora of the skin, first described in 1938, consist of transient and resident microorganisms (*127*). Transient flora, which colonize the superficial layers of the skin, are easier to remove by routine handwashing. They are often acquired by HCP during direct contact with patients or contaminated environmental surfaces; these organisms are most frequently associated with health-care--associated infections. Resident flora attached to deeper layers of the skin is more resistant to removal and less likely to be associated with such infections.
The preferred method for hand hygiene depends on the type of procedure, the degree of contamination, and the desired persistence of antimicrobial action on the skin (Table 2). For routine dental examinations and nonsurgical procedures, handwashing and hand antisepsis is achieved by using either a plain or antimicrobial soap and water. If the hands are not visibly soiled, an alcohol-based hand rub is adequate.

The purpose of surgical hand antisepsis is to eliminate transient flora and reduce resident flora for the duration of a procedure to prevent introduction of organisms in the operative wound, if gloves become punctured or torn. Skin bacteria can rapidly multiply under surgical gloves if hands are washed with soap that is not antimicrobial (*127,128*). Thus, an antimicrobial soap or alcohol hand rub with persistent activity should be used before surgical procedures (*129--131*).

Agents used for surgical hand antisepsis should substantially reduce microorganisms on intact skin, contain a nonirritating antimicrobial preparation, have a broad spectrum of activity, be fast-acting, and have a persistent effect (*121,132--135*). Persistence (i.e., extended antimicrobial activity that prevents or inhibits survival of microorganisms after the product is applied) is critical because microorganisms can colonize on hands in the moist environment underneath gloves (*122*).

Alcohol hand rubs are rapidly germicidal when applied to the skin but should include such antiseptics as chlorhexidine, quaternary ammonium compounds, octenidine, or triclosan to achieve persistent activity (*130*). Factors that can influence the effectiveness of the surgical hand antisepsis in addition to the choice of antiseptic agent include duration and technique of scrubbing, as well as condition of the hands, and techniques used for drying and gloving. CDC's 2002 guideline on hand hygiene in health-care settings provides more complete

information (*123*).

Selection of Antiseptic Agents

Selecting the most appropriate antiseptic agent for hand hygiene requires consideration of multiple factors. Essential performance characteristics of a product (e.g., the spectrum and persistence of activity and whether or not the agent is fast-acting) should be determined before selecting a product. Delivery system, cost per use, reliable vendor support and supply are also considerations. Because HCP acceptance is a major factor regarding compliance with recommended hand hygiene protocols (*122,123,147,148*), considering DHCP needs is critical and should include possible chemical allergies, skin integrity after repeated use, compatibility with lotions used, and offensive agent ingredients (e.g., scent). Discussing specific preparations or ingredients used for hand antisepsis is beyond the scope of this report. DHCP should choose from commercially available HCP handwashes when selecting agents for hand antisepsis or surgical hand antisepsis.

Storage and Dispensing of Hand Care Products

Handwashing products, including plain (i.e., nonantimicrobial) soap and antiseptic products, can become contaminated or support the growth of microorganisms (*122*). Liquid products should be stored in closed containers and dispensed from either disposable containers or containers that are washed and dried thoroughly before refilling. Soap should not be added to a partially empty dispenser, because this practice of topping off might lead to bacterial contamination (*149,150*). Store and dispense products according to manufacturers' directions.

Lotions

The primary defense against infection and transmission of pathogens is healthy, unbroken skin. Frequent handwashing with soaps and antiseptic agents can cause chronic irritant contact dermatitis among DHCP. Damage to the skin changes skin flora, resulting in more frequent colonization by staphylococci and gram-negative bacteria (*151,152*). The potential of detergents to cause skin irritation varies considerably, but can be reduced by adding emollients. Lotions are often recommended to ease the dryness resulting from frequent handwashing and to prevent dermatitis from glove use (*153,154*). However, petroleum-based lotion formulations can weaken latex gloves and increase permeability. For that reason, lotions that contain petroleum or other oil emollients should only be used at the end of the work day (*122,155*). Dental practitioners should obtain information from lotion manufacturers regarding interaction between lotions, gloves, dental materials, and antimicrobial products.

Fingernails and Artificial Nails

Although the relationship between fingernail length and wound infection is unknown, keeping nails short is considered key because the majority of flora on the hands are found under and around the fingernails (*156*). Fingernails should be short enough to allow DHCP to thoroughly clean underneath them and prevent glove tears (*122*). Sharp nail edges or broken nails are also likely to increase glove failure. Long artificial or natural nails can make donning gloves more difficult and can cause gloves to tear more readily. Hand carriage of gram-negative organisms has been determined to be greater among wearers of artificial nails than among nonwearers, both before and after handwashing (*157--160*). In addition, artificial fingernails or extenders have been epidemiologically implicated in multiple outbreaks involving fungal and bacterial infections in hospital intensive-care units and operating rooms (*161--164*). Freshly applied nail polish on natural nails does not increase the microbial load from periungual skin if fingernails are short; however, chipped nail polish can harbor added bacteria (*165,166*).

Jewelry

Studies have demonstrated that skin underneath rings is more heavily colonized than comparable areas of skin on fingers without rings (*167--170*). In a study of intensive-care nurses, multivariable analysis determined rings

were the only substantial risk factor for carriage of gram-negative bacilli and *Staphylococcus aureus,* and the concentration of organisms correlated with the number of rings worn (*170*). However, two other studies demonstrated that mean bacterial colony counts on hands after handwashing were similar among persons wearing rings and those not wearing rings (*169,171*). Whether wearing rings increases the likelihood of transmitting a pathogen is unknown; further studies are needed to establish whether rings result in higher transmission of pathogens in health-care settings. However, rings and decorative nail jewelry can make donning gloves more difficult and cause gloves to tear more readily (*142,143*). Thus, jewelry should not interfere with glove use (e.g., impair ability to wear the correct-sized glove or alter glove integrity).

Personal Protective Equipment

PPE is designed to protect the skin and the mucous membranes of the eyes, nose, and mouth of DHCP from exposure to blood or OPIM. Use of rotary dental and surgical instruments (e.g., handpieces or ultrasonic scalers) and air-water syringes creates a visible spray that contains primarily large-particle droplets of water, saliva, blood, microorganisms, and other debris. This spatter travels only a short distance and settles out quickly, landing on the floor, nearby operatory surfaces, DHCP, or the patient. The spray also might contain certain aerosols (i.e., particles of respirable size, <10 µm). Aerosols can remain airborne for extended periods and can be inhaled. However, they should not be confused with the large-particle spatter that makes up the bulk of the spray from handpieces and ultrasonic scalers. Appropriate work practices, including use of dental dams (*172*) and high-velocity air evacuation, should minimize dissemination of droplets, spatter, and aerosols (*2*).

Primary PPE used in oral health-care settings includes gloves, surgical masks, protective eyewear, face shields, and protective clothing (e.g., gowns and jackets). All PPE should be removed before DHCP leave patient-care areas (*13*). Reusable PPE (e.g., **clinician or patient protective eyewear and face shields)** should be cleaned with soap and water, and when visibly soiled, disinfected between patients, according to the manufacturer's directions (*2, 13*). **Wearing gloves, surgical masks, protective eyewear, and protective clothing in specified circumstances to reduce the risk of exposures to bloodborne pathogens is mandated by OSHA (*13*).** General work clothes (e.g., uniforms, scrubs, pants, and shirts) are neither intended to protect against a hazard nor considered PPE.

Masks, Protective Eyewear, Face Shields

A surgical mask that covers both the nose and mouth and protective eyewear with solid side shields or a face shield should be worn by DHCP during procedures and patient-care activities likely to generate splashes or sprays of blood or body fluids. **Protective eyewear for patients shields their eyes from spatter or debris generated during dental procedures.** A surgical mask protects against microorganisms generated by the wearer, with >95% bacterial filtration efficiency, and also protects DHCP from large-particle droplet spatter that might contain bloodborne pathogens or other infectious microorganisms (*173*). The mask's outer surface can become contaminated with infectious droplets from spray of oral fluids or from touching the mask with contaminated fingers. Also, when a mask becomes wet from exhaled moist air, the resistance to airflow through the mask increases, causing more airflow to pass around edges of the mask. If the mask becomes wet, it should be changed between patients or even during patient treatment, when possible (*2, 174*).

When airborne infection isolation precautions (expanded or transmission-based) are necessary (e.g., for TB patients), a National Institute for Occupational Safety and Health (NIOSH)-certified particulate-filter respirator (e.g., N95, N99, or N100) should be used (*20*). *N95* refers to the ability to filter 1-µm particles in the unloaded state with a filter efficiency of >95% (i.e., filter leakage <5%), given flow rates of ≤50 L/min (i.e., approximate maximum airflow rate of HCP during breathing). Available data indicate infectious droplet nuclei measure 1--5 µm; therefore, respirators used in health-care settings should be able to efficiently filter the smallest particles in this range.

The majority of surgical masks are not NIOSH-certified as respirators, do not protect the user adequately from exposure to TB, and do not satisfy OSHA requirements for respiratory protection (*174,175*). However, certain surgical masks (i.e., surgical N95 respirator) do meet the requirements and are certified by NIOSH as respirators. The level of protection a respirator provides is determined by the efficiency of the filter material for incoming air and how well the face piece fits or seals to the face (e.g., qualitatively or quantitatively tested in a reliable way to obtain a face-seal leakage of <10% and to fit the different facial sizes and characteristics of HCP).

When respirators are used while treating patients with diseases requiring airborne-transmission precautions (e.g., TB), they should be used in the context of a complete respiratory protection program (*175*). This program should include training and fit testing to ensure an adequate seal between the edges of the respirator and the wearer's face. Detailed information regarding respirator programs, including fit-test procedures are available at http://www.cdc.gov/niosh/99-143.html (*174,176*).

Protective Clothing

Protective clothing and equipment (e.g., gowns, lab coats, gloves, masks, and protective eyewear or face shield) should be worn to prevent contamination of street clothing and to protect the skin of DHCP from exposures to blood and body substances (*2, 7, 10, 11, and 13,137*). OSHA bloodborne pathogens standard requires sleeves to be long enough to protect the forearms when the gown is worn as PPE (i.e., when spatter and spray of blood, saliva, or OPIM to the forearms is anticipated) (*13, 14*). DHCP should change protective clothing when it becomes visibly soiled and as soon as feasible if penetrated by blood or other potentially infectious fluids (*2, 13, and 14,137*). All protective clothing should be removed before leaving the work area (*13*).

Gloves and Gloving

DHCP wear gloves to prevent contamination of their hands when touching mucous membranes, blood, saliva, or OPIM, and also to reduce the likelihood that microorganisms present on the hands of DHCP will be transmitted to patients during surgical or other patient-care procedures (*1,2,7,10*). Medical gloves, both patient examination and surgeon's gloves, are manufactured as single-use disposable items that should be used for only one patient, then discarded. Gloves should be changed between patients and when torn or punctured.

Wearing gloves does not eliminate the need for handwashing. Hand hygiene should be performed immediately before donning gloves. Gloves can have small, unapparent defects or can be torn during use, and hands can become contaminated during glove removal (*122,177--187*). These circumstances increase the risk of operative wound contamination and exposure of the DHCP's hands to microorganisms from patients. In addition, bacteria can multiply rapidly in the moist environments underneath gloves, and thus, the hands should be dried thoroughly before donning gloves and washed again immediately after glove removal.

Types of Gloves

Because gloves are task-specific, their selection should be based on the type of procedure to be performed (e.g., surgery or patient examination) (Table 3). Sterile surgeon's gloves must meet standards for sterility assurance established by FDA and are less likely than patient examination gloves to harbor pathogens that could contaminate an operative wound (*188*). Appropriate gloves in the correct size should be readily accessible (*13*).

Glove Integrity

Limited studies of the penetrability of different glove materials under conditions of use have been conducted in the dental environment. Consistent with observations in clinical medicine, leakage rates vary by glove material (e.g., latex, vinyl, and nitrile), duration of use, and type of procedure performed (*182,184,186,189--191*), as

well as by manufacturer (*192--194*). The frequency of perforations in surgeon's gloves used during outpatient oral surgical procedures has been determined to range from 6% to 16% (*181,185,195,196*).

Studies have demonstrated that HCP and DHCP are frequently unaware of minute tears in gloves that occur during use (*186,190,191,197*). These studies determined that gloves developed defects in 30 minutes--3 hours, depending on type of glove and procedure. Investigators did not determine an optimal time for changing gloves during procedures.

During dental procedures, patient examination and surgeon's gloves commonly contact multiple types of chemicals and materials (e.g., disinfectants and antiseptics, composite resins, and bonding agents) that can compromise the integrity of latex as well as vinyl, nitrile, and other synthetic glove materials (*198--206*). In addition, latex gloves can interfere with the setting of vinyl polysiloxane impression materials (*207--209*), although the setting is apparently not adversely affected by synthetic vinyl gloves (*207,208*). Given the diverse selection of dental materials on the market, dental practitioners should consult glove manufacturers regarding the chemical compatibility of glove materials.

If the integrity of a glove is compromised (e.g., punctured), it should be changed as soon as possible (*13,210,211*). Washing latex gloves with plain soap, chlorhexidine, or alcohol can lead to the formation of glove micropunctures (*177,212,213*) and subsequent hand contamination (*138*). Because this condition, known as wicking, can allow penetration of liquids through undetected holes, washing gloves is not recommended. After a hand rub with alcohol, the hands should be thoroughly dried before gloving, because hands still wet with an alcohol-based hand hygiene product can increase the risk of glove perforation (*192*).

FDA regulates the medical glove industry, which includes gloves marketed as sterile surgeon's and sterile or nonsterile patient examination gloves. General-purpose utility gloves are also used in dental health-care settings but are not regulated by FDA because they are not promoted for medical use. More rigorous standards are applied to surgeon's than to examination gloves. FDA has identified acceptable quality levels (e.g., maximum defects allowed) for glove manufacturers (*214*), but even intact gloves eventually fail with exposure to mechanical (e.g., sharps, fingernails, or jewelry) and chemical (e.g., dimethyacrylates) hazards and over time. These variables can be controlled, ultimately optimizing glove performance, by 1) maintaining short fingernails, 2) minimizing or eliminating hand jewelry, and 3) using engineering and work-practice controls to avoid injuries with sharps.

Sterile Surgeon's Gloves and Double-Gloving During Oral Surgical Procedures

Certain limited studies have determined no difference in postoperative infection rates after routine tooth extractions when surgeons wore either sterile or nonsterile gloves (*215,216*). However, wearing sterile surgeon's gloves during surgical procedures is supported by a strong theoretical rationale (*2, 7, and 137*). Sterile gloves minimize transmission of microorganisms from the hands of surgical DHCP to patients and prevent contamination of the hands of surgical DHCP with the patient's blood and body fluids (*137*). In addition, sterile surgeon's gloves are more rigorously regulated by FDA and therefore might provide an increased level of protection for the provider if exposure to blood is likely.

Although the effectiveness of wearing two pairs of gloves in preventing disease transmission has not been demonstrated, the majority of studies among HCP and DHCP have demonstrated a lower frequency of inner glove perforation and visible blood on the surgeon's hands when double gloves are worn (*181,185,195,196,198,217--219*). In one study evaluating double gloves during oral surgical and dental hygiene procedures, the perforation of outer latex gloves was greater during longer procedures (i.e., >45 minutes), with the highest rate (10%) of perforation occurring during oral surgery procedures (*196*). Based on these studies, double gloving might provide additional protection from occupational blood contact (*220*). Double gloving

does not appear to substantially reduce either manual dexterity or tactile sensitivity (*221*--*223*). Additional protection might also be provided by specialty products (e.g., orthopedic surgical gloves and glove liners) (*224*).

Contact Dermatitis and Latex Hypersensitivity

Occupationally related contact dermatitis can develop from frequent and repeated use of hand hygiene products, exposure to chemicals, and glove use. Contact dermatitis is classified as either irritant or allergic. Irritant contact dermatitis is common, nonallergic, and develops as dry, itchy, irritated areas on the skin around the area of contact. By comparison, allergic contact dermatitis (type IV hypersensitivity) can result from exposure to accelerators and other chemicals used in the manufacture of rubber gloves (e.g., natural rubber latex, nitrile, and neoprene), as well as from other chemicals found in the dental practice setting (e.g., methacrylates and glutaraldehyde). Allergic contact dermatitis often manifests as a rash beginning hours after contact and, similar to irritant dermatitis, is usually confined to the area of contact.

Latex allergy (type I hypersensitivity to latex proteins) can be a more serious systemic allergic reaction, usually beginning within minutes of exposure but sometimes occurring hours later and producing varied symptoms. More common reactions include runny nose, sneezing, itchy eyes, scratchy throat, hives, and itchy burning skin sensations. More severe symptoms include asthma marked by difficult breathing, coughing spells, and wheezing; cardiovascular and gastrointestinal ailments; and in rare cases, anaphylaxis and death (*32*,*225*). The American Dental Association (ADA) began investigating the prevalence of type I latex hypersensitivity among DHCP at the ADA annual meeting in 1994. In 1994 and 1995, approximately 2,000 dentists, hygienists, and assistants volunteered for skin-prick testing. Data demonstrated that 6.2% of those tested were positive for type I latex hypersensitivity (*226*). Data from the subsequent 5 years of this ongoing cross-sectional study indicated a decline in prevalence from 8.5% to 4.3% (*227*). This downward trend is similar to that reported by other studies and might be related to use of latex gloves with lower allergen content (*228*--*230*).

Natural rubber latex proteins responsible for latex allergy are attached to glove powder. When powdered latex gloves are worn, more latex protein reaches the skin. In addition, when powdered latex gloves are donned or removed, latex protein/powder particles become aerosolized and can be inhaled, contacting mucous membranes (*231*). As a result, allergic patients and DHCP can experience cutaneous, respiratory, and conjunctival symptoms related to latex protein exposure. DHCP can become sensitized to latex protein with repeated exposure (*232*--*236*). Work areas where only powder-free, low-allergen latex gloves are used demonstrate low or undetectable amounts of latex allergy-causing proteins (*237*--*239*) and fewer symptoms among HCP related to natural rubber latex allergy. Because of the role of glove powder in exposure to latex protein, NIOSH recommends that if latex gloves are chosen, HCP should be provided with reduced protein, powder-free gloves (*32*). Nonlatex (e.g., nitrile or vinyl) powder-free and low-protein gloves are also available (*31*,*240*). Although rare, potentially life-threatening anaphylactic reactions to latex can occur; dental practices should be appropriately equipped and have procedures in place to respond to such emergencies.

DHCP and dental patients with latex allergy should not have direct contact with latex-containing materials and should be in a latex-safe environment with all latex-containing products removed from their vicinity (*31*). Dental patients with histories of latex allergy can be at risk from dental products (e.g., prophylaxis cups, rubber dams, orthodontic elastics, and medication vials) (*241*). Any latex-containing devices that cannot be removed from the treatment environment should be adequately covered or isolated. Persons might also be allergic to chemicals used in the manufacture of natural rubber latex and synthetic rubber gloves as well as metals, plastics, or other materials used in dental care. Taking thorough health histories for both patients and DHCP, followed by avoidance of contact with potential allergens can minimize the possibility of adverse reactions. Certain common predisposing conditions for latex allergy include previous history of allergies, a history of spina bifida, urogenital anomalies, or allergies to avocados, kiwis, nuts, or bananas. The following precautions should be considered to ensure safe treatment for patients who have possible or documented latex allergy:

- Be aware that latent allergens in the ambient air can cause respiratory or anaphylactic symptoms among persons with latex hypersensitivity. Patients with latex allergy can be scheduled for the first appointment of the day to minimize their inadvertent exposure to airborne latex particles.
- Communicate with other DHCP regarding patients with latex allergy (e.g., by oral instructions, written protocols, and posted signage) to prevent them from bringing latex-containing materials into the treatment area.
- Frequently clean all working areas contaminated with latex powder or dust.
- Have emergency treatment kits with latex-free products available at all times.
- If latex-related complications occur during or after a procedure, manage the reaction and seek emergency assistance as indicated. Follow current medical emergency response recommendations for management of anaphylaxis (*32*).

Sterilization and Disinfection of Patient-Care Items

Patient-care items (dental instruments, devices, and equipment) are categorized as critical, semicritical, or noncritical, depending on the potential risk for infection associated with their intended use (Table 4) (*242*). Critical items used to penetrate soft tissue or bone have the greatest risk of transmitting infection and should be sterilized by heat. Semicritical items touch mucous membranes or nonintact skin and have a lower risk of transmission; because the majority of semicritical items in dentistry are heat-tolerant, they also should be sterilized by using heat. If a semicritical item is heat-sensitive, it should, at a minimum, be processed with high-level disinfection (*2*).

Noncritical patient-care items pose the least risk of transmission of infection, contacting only intact skin, which can serve as an effective barrier to microorganisms. In the majority of cases, cleaning, or if visibly soiled, cleaning followed by disinfection with an EPA-registered hospital disinfectant is adequate. When the item is visibly contaminated with blood or OPIM, an EPA-registered hospital disinfectant with a tuberculocidal claim (i.e., intermediate-level disinfectant) should be used (*2, 243, and 244*). Cleaning or disinfection of certain noncritical patient-care items can be difficult or damage the surfaces; therefore, use of disposable barrier protection of these surfaces might be a preferred alternative.

FDA-cleared sterilant/high-level disinfectants and EPA-registered disinfectants must have clear label claims for intended use, and manufacturer instructions for use must be followed (*245*). A more complete description of the regulatory framework in the United States by which liquid chemical germicides are evaluated and regulated is included (Appendix A).

Three levels of disinfection, high, intermediate, and low, are used for patient-care devices that do not require sterility and two levels, intermediate and low, for environmental surfaces (*242*). The intended use of the patient-care item should determine the recommended level of disinfection. Dental practices should follow the product manufacturer's directions regarding concentrations and exposure time for disinfectant activity relative to the surface to be disinfected (*245*). A summary of sterilization and disinfection methods is included (Appendix C).

Transporting and Processing Contaminated Critical and Semicritical Patient-Care Items

DHCP can be exposed to microorganisms on contaminated instruments and devices through percutaneous injury, contact with nonintact skin on the hands, or contact with mucous membranes of the eyes, nose, or mouth. Contaminated instruments should be handled carefully to prevent exposure to sharp instruments that can cause a percutaneous injury. Instruments should be placed in an appropriate container at the point of use to prevent percutaneous injuries during transport to the instrument processing area (*13*).

Instrument processing requires multiple steps to achieve sterilization or high-level disinfection. Sterilization is a

complex process requiring specialized equipment, adequate space, qualified DHCP who are provided with ongoing training, and regular monitoring for quality assurance (*247*). Correct cleaning, packaging, sterilizer loading procedures, sterilization methods, or high-level disinfection methods should be followed to ensure that an instrument is adequately processed and safe for reuse on patients.

Instrument Processing Area

DHCP should process all instruments in a designated central processing area to more easily control quality and ensure safety (*248*). The central processing area should be divided into sections for 1) receiving, cleaning, and decontamination; 2) preparation and packaging; 3) sterilization; and 4) storage. Ideally, walls or partitions should separate the sections to control traffic flow and contain contaminants generated during processing. When physical separation of these sections cannot be achieved, adequate spatial separation might be satisfactory if the DHCP who process instruments are trained in work practices to prevent contamination of clean areas (*248*). Space should be adequate for the volume of work anticipated and the items to be stored (*248*).

Receiving, Cleaning, and Decontamination

Reusable instruments, supplies, and equipment should be received, sorted, cleaned, and decontaminated in one section of the processing area. Cleaning should precede all disinfection and sterilization processes; it should involve removal of debris as well as organic and inorganic contamination. Removal of debris and contamination is achieved either by scrubbing with a surfactant, detergent, and water, or by an automated process (e.g., ultrasonic cleaner or washer-disinfector) using chemical agents. If visible debris, whether inorganic or organic matter, is not removed, it will interfere with microbial inactivation and can compromise the disinfection or sterilization process (*244*, *249--252*). After cleaning, instruments should be rinsed with water to remove chemical or detergent residue. Splashing should be minimized during cleaning and rinsing (*13*). Before final disinfection or sterilization, instruments should be handled as though contaminated.

Considerations in selecting cleaning methods and equipment include 1) efficacy of the method, process, and equipment; 2) compatibility with items to be cleaned; and 3) occupational health and exposure risks. Use of automated cleaning equipment (e.g., ultrasonic cleaner or washer-disinfector) does not require presoaking or scrubbing of instruments and can increase productivity, improve cleaning effectiveness, and decrease worker exposure to blood and body fluids. Thus, using automated equipment can be safer and more efficient than manually cleaning contaminated instruments (*253*).

If manual cleaning is not performed immediately, placing instruments in a puncture-resistant container and soaking them with detergent, a disinfectant/detergent, or an enzymatic cleaner will prevent drying of patient material and make cleaning easier and less time-consuming. Use of a liquid chemical sterilant/high-level disinfectant (e.g., glutaraldehyde) as a holding solution is not recommended (*244*). Using work-practice controls (e.g., long-handled brush) to keep the scrubbing hand away from sharp instruments is recommended (*14*). To avoid injury from sharp instruments, DHCP should wear puncture-resistant, heavy-duty utility gloves when handling or manually cleaning contaminated instruments and devices (*6*). Employees should not reach into trays or containers holding sharp instruments that cannot be seen (e.g., sinks filled with soapy water in which sharp instruments have been placed). Work-practice controls should include use of a strainer-type basket to hold instruments and forceps to remove the items. Because splashing is likely to occur, a mask, protective eyewear or face shield, and gown or jacket should be worn (*13*).

Preparation and Packaging

In another section of the processing area, cleaned instruments and other dental supplies should be inspected, assembled into sets or trays, and wrapped, packaged, or placed into container systems for sterilization. Hinged instruments should be processed open and unlocked. An internal chemical indicator should be placed in every package. In addition, an external chemical indicator (e.g., chemical indicator tape) should be used when the internal indicator cannot be seen from outside the package. For unwrapped loads, at a minimum, an internal

chemical indicator should be placed in the tray or cassette with items to be sterilized (*254*) (see Sterilization of Unwrapped Instruments). Dental practices should refer to the manufacturer's instructions regarding use and correct placement of chemical indicators (see Sterilization Monitoring). Critical and semicritical instruments that will be stored should be wrapped or placed in containers (e.g., cassettes or organizing trays) designed to maintain sterility during storage (*2*, *247*,*255*--*257*).

Packaging materials (e.g., wraps or container systems) allow penetration of the sterilization agent and maintain sterility of the processed item after sterilization. Materials for maintaining sterility of instruments during transport and storage include wrapped perforated instrument cassettes, peel pouches of plastic or paper, and sterilization wraps (i.e., woven and nonwoven). Packaging materials should be designed for the type of sterilization process being used (*256*--*259*).

Sterilization

The sterilization section of the processing area should include the sterilizers and related supplies, with adequate space for loading, unloading, and cool down. The area can also include incubators for analyzing spore tests and enclosed storage for sterile items and disposable (single-use) items (*260*). Manufacturer and local building code specifications will determine placement and room ventilation requirements.

Sterilization Procedures. Heat-tolerant dental instruments usually are sterilized by 1) steam under pressure (autoclaving), 2) dry heat, or 3) unsaturated chemical vapor. All sterilization should be performed by using medical sterilization equipment cleared by FDA. The sterilization times, temperatures, and other operating parameters recommended by the manufacturer of the equipment used, as well as instructions for correct use of containers, wraps, and chemical or biological indicators, should always be followed (*243*,*247*).

Items to be sterilized should be arranged to permit free circulation of the sterilizing agent (e.g., steam, chemical vapor, or dry heat); manufacturer's instructions for loading the sterilizer should be followed (*248*,*260*). Instrument packs should be allowed to dry inside the sterilizer chamber before removing and handling. Packs should not be touched until they are cool and dry because hot packs act as wicks, absorbing moisture, and hence, bacteria from hands (*247*). The ability of equipment to attain physical parameters required to achieve sterilization should be monitored by mechanical, chemical, and biological indicators. Sterilizers vary in their types of indicators and their ability to provide readings on the mechanical or physical parameters of the sterilization process (e.g., time, temperature, and pressure). Consult with the sterilizer manufacturer regarding selection and use of indicators.

Steam Sterilization. Among sterilization methods, steam sterilization, which is dependable and economical, is the most widely used for wrapped and unwrapped critical and semicritical items that are not sensitive to heat and moisture (*260*). Steam sterilization requires exposure of each item to direct steam contact at a required temperature and pressure for a specified time needed to kill microorganisms. Two basic types of steam sterilizers are the gravity displacement and the high-speed prevacuum sterilizer.

The majority of tabletop sterilizers used in a dental practice are gravity displacement sterilizers, although prevacuum sterilizers are becoming more widely available. In gravity displacement sterilizers, steam is admitted through steam lines, a steam generator, or self-generation of steam within the chamber. Unsaturated air is forced out of the chamber through a vent in the chamber wall. Trapping of air is a concern when using saturated steam under gravity displacement; errors in packaging items or overloading the sterilizer chamber can result in cool air pockets and items not being sterilized.

Prevacuum sterilizers are fitted with a pump to create a vacuum in the chamber and ensure air removal from the sterilizing chamber before the chamber is pressurized with steam. Relative to gravity displacement, this

procedure allows faster and more positive steam penetration throughout the entire load. Prevacuum sterilizers should be tested periodically for adequate air removal, as recommended by the manufacturer. Air not removed from the chamber will interfere with steam contact. If a sterilizer fails the air removal test, it should not be used until inspected by sterilizer maintenance personnel and it passes the test (*243,247*). Manufacturer's instructions, with specific details regarding operation and user maintenance information, should be followed.

Unsaturated Chemical-Vapor Sterilization. Unsaturated chemical-vapor sterilization involves heating a chemical solution of primarily alcohol with 0.23% formaldehyde in a closed pressurized chamber. Unsaturated chemical vapor sterilization of carbon steel instruments (e.g., dental burs) causes less corrosion than steam sterilization because of the low level of water present during the cycle. Instruments should be dry before sterilizing. **State and local authorities should be consulted for hazardous waste disposal requirements for the sterilizing solution.**

Dry-Heat Sterilization. Dry heat is used to sterilize materials that might be damaged by moist heat (e.g., burs and certain orthodontic instruments). Although dry heat has the advantages of low operating cost and being noncorrosive, it is a prolonged process and the high temperatures required are not suitable for certain patient-care items and devices (*261*).

Dry-heat sterilizers used in dentistry include static-air and forced-air types.

- The static-air type is commonly called an oven-type sterilizer. Heating coils in the bottom or sides of the unit cause hot air to rise inside the chamber through natural convection.
- The forced-air type is also known as a rapid heat-transfer sterilizer. Heated air is circulated throughout the chamber at a high velocity, permitting more rapid transfer of energy from the air to the instruments, thereby reducing the time needed for sterilization.

Sterilization of Unwrapped Instruments. An unwrapped cycle (sometimes called *flash sterilization*) is a method for sterilizing unwrapped patient-care items for immediate use. The time required for unwrapped sterilization cycles depends on the type of sterilizer and the type of item (i.e., porous or nonporous) to be sterilized (*243*). The unwrapped cycle in tabletop sterilizers is preprogrammed by the manufacturer to a specific time and temperature setting and can include a drying phase at the end to produce a dry instrument with much of the heat dissipated. If the drying phase requirements are unclear, the operation manual or manufacturer of the sterilizer should be consulted. If the unwrapped sterilization cycle in a steam sterilizer does not include a drying phase, or has only a minimal drying phase, items retrieved from the sterilizer will be hot and wet, making aseptic transport to the point of use more difficult. For dry-heat and chemical-vapor sterilizers, a drying phase is not required.

Unwrapped sterilization should be used only under certain conditions: 1) thorough cleaning and drying of instruments precedes the unwrapped sterilization cycle; 2) mechanical monitors are checked and chemical indicators used for each cycle; 3) care is taken to avoid thermal injury to DHCP or patients; and 4) items are transported aseptically to the point of use to maintain sterility (*134,258,262*). Because all implantable devices should be quarantined after sterilization until the results of biological monitoring are known, unwrapped or flash sterilization of implantable items is not recommended (*134*).

Critical instruments sterilized unwrapped should be transferred immediately by using aseptic technique, from the sterilizer to the actual point of use. Critical instruments should not be stored unwrapped (*260*). Semicritical instruments that are sterilized unwrapped on a tray or in a container system should be used immediately or within a short time. When sterile items are open to the air, they will eventually become contaminated. Storage, even temporary, of unwrapped semicritical instruments is discouraged because it permits exposure to dust,

airborne organisms, and other unnecessary contamination before use on a patient (*260*). A carefully written protocol for minimizing the risk of contaminating unwrapped instruments should be prepared and followed (*260*).

Other Sterilization Methods. Heat-sensitive critical and semicritical instruments and devices can be sterilized by immersing them in liquid chemical germicides registered by FDA as sterilants. When using a liquid chemical germicide for sterilization, certain poststerilization procedures are essential. Items need to be 1) rinsed with sterile water after removal to remove toxic or irritating residues; 2) handled using sterile gloves and dried with sterile towels; and 3) delivered to the point of use in an aseptic manner. If stored before use, the instrument should not be considered sterile and should be sterilized again just before use. In addition, the sterilization process with liquid chemical sterilants cannot be verified with biological indicators (*263*).

Because of these limitations and because liquid chemical sterilants can require approximately 12 hours of complete immersion, they are almost never used to sterilize instruments. Rather, these chemicals are more often used for high-level disinfection (*249*). Shorter immersion times (12--90 minutes) are used to achieve high-level disinfection of semicritical instruments or items. These powerful, sporicidal chemicals (e.g., glutaraldehyde, peracetic acid, and hydrogen peroxide) are highly toxic (*244*, *264*,*265*). Manufacturer instructions (e.g., regarding dilution, immersion time, and temperature) and safety precautions for using chemical sterilants/high-level disinfectants must be followed precisely (*15*,*245*). These chemicals should not be used for applications other than those indicated in their label instructions. Misapplications include use as an environmental surface disinfectant or instrument-holding solution.
When using appropriate precautions (e.g., closed containers to limit vapor release, chemically resistant gloves and aprons, goggles, and face shields), glutaraldehyde-based products can be used without tissue irritation or adverse health effects. However, dermatologic, eye irritation, respiratory effects, and skin sensitization have been reported (*266*--*268*). Because of their lack of chemical resistance to glutaraldehydes, medical gloves are not an effective barrier (*200*,*269*,*270*). Other factors might apply (e.g., room exhaust ventilation or 10 air exchanges/hour) to ensure DHCP safety (*266*,*271*). For all of these reasons, using heat-sensitive semicritical items that must be processed with liquid chemical germicides is discouraged; heat-tolerant or disposable alternatives are available for the majority of such items.

Low-temperature sterilization with ethylene oxide gas (ETO) has been used extensively in larger health-care facilities. Its primary advantage is the ability to sterilize heat- and moisture-sensitive patient-care items with reduced deleterious effects. However, extended sterilization times of 10--48 hours and potential hazards to patients and DHCP requiring stringent health and safety requirements (*272*--*274*) make this method impractical for private-practice settings. Handpieces cannot be effectively sterilized with this method because of decreased penetration of ETO gas flow through a small lumen (*250*,*275*). Other types of low-temperature sterilization (e.g., hydrogen peroxide gas plasma) exist but are not yet practical for dental offices.

Bead sterilizers have been used in dentistry to sterilize small metallic instruments (e.g., endodontic files). FDA has determined that a risk of infection exists with these devices because of their potential failure to sterilize dental instruments and has required their commercial distribution cease unless the manufacturer files a premarket approval application. If a bead sterilizer is employed, DHCP assume the risk of employing a dental device FDA has deemed neither safe nor effective (*276*).

Sterilization Monitoring. Monitoring of sterilization procedures should include a combination of process parameters, including mechanical, chemical, and biological (*247*,*248*,*277*). These parameters evaluate both the sterilizing conditions and the procedure's effectiveness.

Mechanical techniques for monitoring sterilization include assessing cycle time, temperature, and pressure by

observing the gauges or displays on the sterilizer and noting these parameters for each load (*243,248*). Some tabletop sterilizers have recording devices that print out these parameters. Correct readings do not ensure sterilization, but incorrect readings can be the first indication of a problem with the sterilization cycle.

Chemical indicators, internal and external, use sensitive chemicals to assess physical conditions (e.g., time and temperature) during the sterilization process. Although chemical indicators do not prove sterilization has been achieved, they allow detection of certain equipment malfunctions, and they can help identify procedural errors. External indicators applied to the outside of a package (e.g., chemical indicator tape or special markings) change color rapidly when a specific parameter is reached, and they verify that the package has been exposed to the sterilization process. **Internal chemical indicators should be used inside each package to ensure the sterilizing agent has penetrated the packaging material and actually reached the instruments inside.** A single-parameter internal chemical indicator provides information regarding only one sterilization parameter (e.g., time or temperature). Multiparameter internal chemical indicators are designed to react to $\geq$2 parameters (e.g., time and temperature; or time, temperature, and the presence of steam) and can provide a more reliable indication that sterilization conditions have been met (*254*). Multiparameter internal indicators are available only for steam sterilizers (i.e., autoclaves).

Because chemical indicator test results are received when the sterilization cycle is complete, they can provide an early indication of a problem and where in the process the problem might exist. If either mechanical indicators or internal or external chemical indicators indicate inadequate processing, items in the load should not be used until reprocessed (*134*).

Biological indicators (BIs) (i.e., spore tests) are the most accepted method for monitoring the sterilization process (*278,279*) because they assess it directly by killing known highly resistant microorganisms (e.g., *Geobacillus* or *Bacillus* species), rather than merely testing the physical and chemical conditions necessary for sterilization (*243*). Because spores used in BIs are more resistant and present in greater numbers than the common microbial contaminants found on patient-care equipment, an inactivated BI indicates other potential pathogens in the load have been killed (*280*).

Correct functioning of sterilization cycles should be verified for each sterilizer by the periodic use (at least weekly) of BIs (*2, 9,134,243,278,279*). Every load containing implantable devices should be monitored with such indicators (*248*), and the items quarantined until BI results are known. However, in an emergency, placing implantable items in quarantine until spore tests are known to be negative might be impossible.
Manufacturer's directions should determine the placement and location of BI in the sterilizer. A control BI, from the same lot as the test indicator and not processed through the sterilizer, should be incubated with the test BI; the control BI should yield positive results for bacterial growth.

In-office biological monitoring is available; mail-in sterilization monitoring services (e.g., from private companies or dental schools) can also be used to test both the BI and the control. Although some DHCP have expressed concern that delays caused by mailing specimens might cause false-negatives, studies have determined that mail delays have no substantial effect on final test results (*281,282*).

Procedures to follow in the event of a positive spore test have been developed (*243,247*). If the mechanical (e.g., time, temperature, and pressure) and chemical (i.e., internal or external) indicators demonstrate that the sterilizer is functioning correctly, a single positive spore test probably does not indicate sterilizer malfunction. Items other than implantable devices do not necessarily need to be recalled; however the spore test should be repeated immediately after correctly loading the sterilizer and using the same cycle that produced the failure. The sterilizer should be removed from service, and all records reviewed of chemical and mechanical monitoring since the last negative BI test. Also, sterilizer operating procedures should be reviewed, including packaging,

loading, and spore testing, with all persons who work with the sterilizer to determine whether operator error could be responsible (*9,243,247*). Overloading, failure to provide adequate package separation and incorrect or excessive packaging material are all common reasons for a positive BI in the absence of mechanical failure of the sterilizer unit (*260*). A second monitored sterilizer in the office can be used, or a loaner from a sales or repair company obtained, to minimize office disruption while waiting for the repeat BI.
If the repeat test is negative and chemical and mechanical monitoring indicate adequate processing, the sterilizer can be put back into service. If the repeat BI test is positive, and packaging, loading, and operating procedures have been confirmed as performing correctly, the sterilizer should remain out of service until it has been inspected, repaired, and rechallenged with BI tests in three consecutive empty chamber sterilization cycles (*9,243*). When possible, items from suspect loads dating back to the last negative BI should be recalled, rewrapped, and resterilized (*9,283*).

A more conservative approach has been recommended (*247*) in which any positive spore test is assumed to represent sterilizer malfunction and requires that all materials processed in that sterilizer, dating from the sterilization cycle having the last negative biologic indicator to the next cycle indicating satisfactory biologic indicator results, should be considered nonsterile and retrieved, if possible, and reprocessed or held in quarantine until the results of the repeat BI are known. This approach is considered conservative because the margin of safety in steam sterilization is sufficient enough that infection risk, associated with items in a load indicating spore growth, is minimal, particularly if the item was properly cleaned and the temperature was achieved (e.g., as demonstrated by acceptable chemical indicator or temperature chart) (*243*). Published studies are not available that document disease transmission through a nonretrieved surgical instrument after a steam sterilization cycle with a positive biological indicator (*243*). This more conservative approach should always be used for sterilization methods other than steam (e.g., dry heat, unsaturated chemical vapor, ETO, or hydrogen peroxide gas plasma) (*243*).

Results of biological monitoring should be recorded and sterilization monitoring records (i.e., mechanical, chemical, and biological) retained long enough to comply with state and local regulations. Such records are a component of an overall dental infection-control program (see Program Evaluation).

Storage of Sterilized Items and Clean Dental Supplies

The storage area should contain enclosed storage for sterile items and disposable (single-use) items (*173*). Storage practices for wrapped sterilized instruments can be either date- or event-related. Packages containing sterile supplies should be inspected before use to verify barrier integrity and dryness. Although some health-care facilities continue to date every sterilized package and use shelf-life practices, other facilities have switched to event-related practices (*243*). This approach recognizes that the product should remain sterile indefinitely, unless an event causes it to become contaminated (e.g., torn or wet packaging) (*284*). Even for event-related packaging, minimally, the date of sterilization should be placed on the package, and if multiple sterilizers are used in the facility, the sterilizer used should be indicated on the outside of the packaging material to facilitate the retrieval of processed items in the event of a sterilization failure (*247*). If packaging is compromised, the instruments should be recleaned, packaged in new wrap, and sterilized again.

Clean supplies and instruments should be stored in closed or covered cabinets, if possible (*285*). Dental supplies and instruments should not be stored under sinks or in other locations where they might become wet.

Environmental Infection Control

In the dental operatory, environmental surfaces (i.e., a surface or equipment that does not contact patients directly) can become contaminated during patient care. Certain surfaces, especially ones touched frequently (e.g., light handles, unit switches, and drawer knobs) can serve as reservoirs of microbial contamination, although they have not been associated directly with transmission of infection to either DHCP or patients.

Transfer of microorganisms from contaminated environmental surfaces to patients occurs primarily through DHCP hand contact (*286,287*). When these surfaces are touched, microbial agents can be transferred to instruments, other environmental surfaces, or to the nose, mouth, or eyes of workers or patients. Although hand hygiene is key to minimizing this transferal, barrier protection or cleaning and disinfecting of environmental surfaces also protects against health-care--associated infections.

Environmental surfaces can be divided into clinical contact surfaces and housekeeping surfaces (*249*). Because housekeeping surfaces (e.g., floors, walls, and sinks) have limited risk of disease transmission, they can be decontaminated with less rigorous methods than those used on dental patient-care items and clinical contact surfaces (*244*). Strategies for cleaning and disinfecting surfaces in patient-care areas should consider the 1) potential for direct patient contact; 2) degree and frequency of hand contact; and 3) potential contamination of the surface with body substances or environmental sources of microorganisms (e.g., soil, dust, or water).
Cleaning is the necessary first step of any disinfection process. Cleaning is a form of decontamination that renders the environmental surface safe by removing organic matter, salts, and visible soils, all of which interfere with microbial inactivation. The physical action of scrubbing with detergents and surfactants and rinsing with water removes substantial numbers of microorganisms. If a surface is not cleaned first, the success of the disinfection process can be compromised. Removal of all visible blood and inorganic and organic matter can be as critical as the germicidal activity of the disinfecting agent (*249*). When a surface cannot be cleaned adequately, it should be protected with barriers (*2*).

Clinical Contact Surfaces
Clinical contact surfaces can be directly contaminated from patient materials either by direct spray or spatter generated during dental procedures or by contact with DHCP's gloved hands. These surfaces can subsequently contaminate other instruments, devices, hands, or gloves. Examples of such surfaces include

- light handles,
- switches,
- dental radiograph equipment,
- dental chairside computers,
- reusable containers of dental materials,
- drawer handles,
- faucet handles,
- countertops,
- pens,
- telephones, and
- doorknobs.

Barrier protection of surfaces and equipment can prevent contamination of clinical contact surfaces, but is particularly effective for those that are difficult to clean. Barriers include clear plastic wrap, bags, sheets, tubing, and plastic-backed paper or other materials impervious to moisture (*260,288*). Because such coverings can become contaminated, they should be removed and discarded between patients, while DHCP are still gloved. After removing the barrier, examine the surface to make sure it did not become soiled inadvertently. The surface needs to be cleaned and disinfected only if contamination is evident. Otherwise, after removing gloves and performing hand hygiene, DHCP should place clean barriers on these surfaces before the next patient (*1*, *2*, *288*).

If barriers are not used, surfaces should be cleaned and disinfected between patients by using an EPA-registered hospital disinfectant with an HIV, HBV claim (i.e., low-level disinfectant) or a tuberculocidal claim (i.e., intermediate-level disinfectant). Intermediate-level disinfectant should be used when the surface is visibly

contaminated with blood or OPIM (*2*, *244*). Also, general cleaning and disinfection are recommended for clinical contact surfaces, dental unit surfaces, and countertops at the end of daily work activities and are required if surfaces have become contaminated since their last cleaning (*13*). To facilitate daily cleaning, treatment areas should be kept free of unnecessary equipment and supplies.

Manufacturers of dental devices and equipment should provide information regarding material compatibility with liquid chemical germicides, whether equipment can be safely immersed for cleaning, and how it should be decontaminated if servicing is required (*289*). Because of the risks associated with exposure to chemical disinfectants and contaminated surfaces, DHCP who perform environmental cleaning and disinfection should wear gloves and other PPE to prevent occupational exposure to infectious agents and hazardous chemicals. Chemical- and puncture-resistant utility gloves offer more protection than patient examination gloves when using hazardous chemicals.

Housekeeping Surfaces

Evidence does not support that housekeeping surfaces (e.g., floors, walls, and sinks) pose a risk for disease transmission in dental health-care settings. Actual, physical removal of microorganisms and soil by wiping or scrubbing is probably as critical, if not more so, than any antimicrobial effect provided by the agent used (*244*, *290*). The majority of housekeeping surfaces need to be cleaned only with a detergent and water or an EPA-registered hospital disinfectant/detergent, depending on the nature of the surface and the type and degree of contamination. Schedules and methods vary according to the area (e.g., dental operatory, laboratory, bathrooms, or reception rooms), surface, and amount and type of contamination.

Floors should be cleaned regularly, and spills should be cleaned up promptly. An EPA-registered hospital disinfectant/detergent designed for general housekeeping purposes should be used in patient-care areas if uncertainty exists regarding the nature of the soil on the surface (e.g., blood or body fluid contamination versus routine dust or dirt). Unless contamination is reasonably anticipated or apparent, cleaning or disinfecting walls, window drapes, and other vertical surfaces is unnecessary. However, when housekeeping surfaces are visibly contaminated by blood or OPIM, prompt removal and surface disinfection is appropriate infection-control practice and required by OSHA (*13*).

Part of the cleaning strategy is to minimize contamination of cleaning solutions and cleaning tools (e.g., mop heads or cleaning cloths). Mops and cloths should be cleaned after use and allowed to dry before reuse, or single-use, disposable mop heads and cloths should be used to avoid spreading contamination. Cost, safety, product-surface compatibility, and acceptability by housekeepers can be key criteria for selecting a cleaning agent or an EPA-registered hospital disinfectant/detergent. PPE used during cleaning and housekeeping procedures followed should be appropriate to the task.

In the cleaning process, another reservoir for microorganisms can be dilute solutions of detergents or disinfectants, especially if prepared in dirty containers, stored for long periods of time, or prepared incorrectly (*244*). Manufacturers' instructions for preparation and use should be followed. Making fresh cleaning solution each day, discarding any remaining solution, and allowing the container to dry will minimize bacterial contamination. Preferred cleaning methods produce minimal mists and aerosols or dispersion of dust in patient-care areas.

Cleaning and Disinfection Strategies for Blood Spills

The majority of blood contamination events in dentistry result from spatter during dental procedures using rotary or ultrasonic instrumentation. Although no evidence supports that HBV, HCV, or HIV have been transmitted from a housekeeping surface prompt removal and surface disinfection of an area contaminated by either blood or OPIM are appropriate infection-control practices and required by OSHA (*13*,*291*).

Strategies for decontaminating spills of blood and other body fluids differ by setting and volume of the spill (*113*, *244*). Blood spills on either clinical contact or housekeeping surfaces should be contained and managed as quickly as possible to reduce the risk of contact by patients and DHCP (*244*, *292*). The person assigned to clean the spill should wear gloves and other PPE as needed. Visible organic material should be removed with absorbent material (e.g., disposable paper towels discarded in a leak-proof, appropriately labeled container). Nonporous surfaces should be cleaned and then decontaminated with either an EPA-registered hospital disinfectant effective against HBV and HIV or an EPA-registered hospital disinfectant with a tuberculocidal claim (i.e., intermediate-level disinfectant). If sodium hypochlorite is chosen, an EPA-registered sodium hypochlorite product is preferred. However, if such products are unavailable, a 1:100 dilution of sodium hypochlorite (e.g., approximately ¼ cup of 5.25% household chlorine bleach to 1 gallon of water) is an inexpensive and effective disinfecting agent (*113*).

Carpeting and Cloth Furnishings

Carpeting is more difficult to clean than nonporous hard-surface flooring, and it cannot be reliably disinfected, especially after spills of blood and body substances. Studies have documented the presence of diverse microbial populations, primarily bacteria and fungi, in carpeting (*293--295*). Cloth furnishings pose similar contamination risks in areas of direct patient care and places where contaminated materials are managed (e.g., dental operatory, laboratory, or instrument processing areas). For these reasons, use of carpeted flooring and fabric-upholstered furnishings in these areas should be avoided.

Nonregulated and Regulated Medical Waste

Studies have compared microbial load and diversity of microorganisms in residential waste with waste from multiple health-care settings. General waste from hospitals or other health-care facilities (e.g., dental practices or clinical/research laboratories) is no more infective than residential waste (*296*, *297*). The majority of soiled items in dental offices are general medical waste and thus can be disposed of with ordinary waste. Examples include used gloves, masks, gowns, lightly soiled gauze or cotton rolls, and environmental barriers (e.g., plastic sheets or bags) used to cover equipment during treatment (*298*).

Although any item that has had contact with blood, exudates, or secretions might be infective, treating all such waste as infective is neither necessary nor practical (*244*). Infectious waste that carries a substantial risk of causing infection during handling and disposal is regulated medical waste. A complete definition of regulated waste is included in OSHA's bloodborne pathogens standard (*13*).

Regulated medical waste is only a limited subset of waste: 9%--15% of total waste in hospitals and 1%--2% of total waste in dental offices (*298,299*). Regulated medical waste requires special storage, handling, neutralization, and disposal and is covered by federal, state, and local rules and regulations (*6*, *297*, *300,301*). Examples of regulated waste found in dental-practice settings are solid waste soaked or saturated with blood or saliva (e.g., gauze saturated with blood after surgery), extracted teeth, surgically removed hard and soft tissues, and contaminated sharp items (e.g., needles, scalpel blades, and wires) (*13*).

Regulated medical waste requires careful containment for treatment or disposal. A single leak-resistant biohazard bag is usually adequate for containment of nonsharp regulated medical waste, provided the bag is sturdy and the waste can be discarded without contaminating the bag's exterior. Exterior contamination or puncturing of the bag requires placement in a second biohazard bag. All bags should be securely closed for disposal. Puncture-resistant containers with a biohazard label, located at the point of use (i.e., sharps containers), are used as containment for scalpel blades, needles, syringes, and unused sterile sharps (*13*).
Dental health-care facilities should dispose of medical waste regularly to avoid accumulation. Any facility

generating regulated medical waste should have a plan for its management that complies with federal, state, and local regulations to ensure health and environmental safety.

Discharging Blood or Other Body Fluids to Sanitary Sewers or Septic Tanks

All containers with blood or saliva (e.g., suctioned fluids) can be inactivated in accordance with state-approved treatment technologies, or the contents can be carefully poured down a utility sink, drain, or toilet (*6*). Appropriate PPE (e.g., gloves, gown, mask, and protective eyewear) should be worn when performing this task (*13*). No evidence exists that bloodborne diseases have been transmitted from contact with raw or treated sewage. Multiple bloodborne pathogens, particularly viruses, are not stable in the environment for long periods (*302*), and the discharge of limited quantities of blood and other body fluids into the sanitary sewer is considered a safe method for disposing of these waste materials (*6*). State and local regulations vary and dictate whether blood or other body fluids require pretreatment or if they can be discharged into the sanitary sewer and in what volume.

Dental Unit Waterlines, Biofilm, and Water Quality

Studies have demonstrated that dental unit waterlines (i.e., narrow-bore plastic tubing that carries water to the high-speed handpiece, air/water syringe, and ultrasonic scaler) can become colonized with microorganisms, including bacteria, fungi, and protozoa (*303--309*). Protected by a polysaccharide slime layer known as a glycocalyx, these microorganisms colonize and replicate on the interior surfaces of the waterline tubing and form a biofilm, which serves as a reservoir that can amplify the number of free-floating (i.e., planktonic) microorganisms in water used for dental treatment. Although oral flora (*303,310,311*) and human pathogens (e.g., *Pseudomonas aeruginosa* [*303,305,312,313*], *Legionella* species [*303,306,313*], and nontuberculous *Mycobacterium* species [*303,304*]), have been isolated from dental water systems, the majority of organisms recovered from dental waterlines are common heterotrophic water bacteria (*305,314,315*). These exhibit limited pathogenic potential for immunocompetent persons.

Clinical Implications

Certain reports associate waterborne infections with dental water systems, and scientific evidence verifies the potential for transmission of waterborne infections and disease in hospital settings and in the community (*306,312,316*). Infection or colonization caused by *Pseudomonas* species or nontuberculous mycobacteria can occur among susceptible patients through direct contact with water (*317--320*) or after exposure to residual waterborne contamination of inadequately reprocessed medical instruments (*321--323*). Nontuberculous mycobacteria can also be transmitted to patients from tap water aerosols (*324*). Health-care--associated transmission of pathogenic agents (e.g., *Legionella* species) occurs primarily through inhalation of infectious aerosols generated from potable water sources or through use of tap water in respiratory therapy equipment (*325--327*). Disease outbreaks in the community have also been reported from diverse environmental aerosol-producing sources, including whirlpool spas (*328*), swimming pools (*329*), and a grocery store mist machine (*330*). Although the majority of these outbreaks are associated with species of *Legionella* and *Pseudomonas* (*329*), the fungus *Cladosporium* (*331*) has also been implicated.

Researchers have not demonstrated a measurable risk of adverse health effects among DHCP or patients from exposure to dental water. Certain studies determined DHCP had altered nasal flora (*332*) or substantially greater titers of *Legionella* antibodies in comparisons with control populations; however, no cases of legionellosis were identified among exposed DHCP (*333,334*). Contaminated dental water might have been the source for localized *Pseudomonas aeruginosa* infections in two immunocompromised patients (*312*). Although transient carriage of *P. aeruginosa* was observed in 78 healthy patients treated with contaminated dental treatment water, no illness was reported among the group. In this same study, a retrospective review of dental records also failed to identify infections (*312*).

Concentrations of bacterial endotoxin ≤1,000 endotoxin units/mL from gram-negative water bacteria have been detected in water from colonized dental units (*335*). No standards exist for an acceptable level of endotoxin in drinking water, but the maximum level permissible in United States Pharmacopeia (USP) sterile water for irrigation is only 0.25 endotoxin units/mL (*336*). Although the consequences of acute and chronic exposure to aerosolized endotoxin in dental health-care settings have not been investigated, endotoxin has been associated with exacerbation of asthma and onset of hypersensitivity pneumonitis in other occupational settings (*329,337*).

Dental Unit Water Quality

Research has demonstrated that microbial counts can reach ≤200,000 colony-forming units (CFU)/mL within 5 days after installation of new dental unit waterlines (*305*), and levels of microbial contamination ≤10^6 CFU/mL of dental unit water have been documented (*309,338*). These counts can occur because dental unit waterline factors (e.g., system design, flow rates, and materials) promote both bacterial growth and development of biofilm.

Although no epidemiologic evidence indicates a public health problem, the presence of substantial numbers of pathogens in dental unit waterlines generates concern. Exposing patients or DHCP to water of uncertain microbiological quality, despite the lack of documented adverse health effects, is inconsistent with accepted infection-control principles. Thus in 1995, ADA addressed the dental water concern by asking manufacturers to provide equipment with the ability to deliver treatment water with ≤200 CFU/mL of unfiltered output from waterlines (*339*). This threshold was based on the quality assurance standard established for dialysate fluid, to ensure that fluid delivery systems in hemodialysis units have not been colonized by indigenous waterborne organisms (*340*).

Standards also exist for safe drinking water quality as established by EPA, the American Public Health Association (APHA), and the American Water Works Association (AWWA); they have set limits for heterotrophic bacteria of ≤500 CFU/mL of drinking water (*341,342*). Thus, the number of bacteria in water used as a coolant/irrigant for nonsurgical dental procedures should be as low as reasonably achievable and, at a minimum, ≤500 CFU/mL, the regulatory standard for safe drinking water established by EPA and APHA/AWWA.

Strategies To Improve Dental Unit Water Quality

In 1993, CDC recommended that dental waterlines be flushed at the beginning of the clinic day to reduce the microbial load (*2*). However, studies have demonstrated this practice does not affect biofilm in the waterlines or reliably improve the quality of water used during dental treatment (*315,338,343*). Because the recommended value of ≤500 CFU/mL cannot be achieved by using this method, other strategies should be employed. Dental unit water that remains untreated or unfiltered is unlikely to meet drinking water standards (*303--309*).

Commercial devices and procedures designed to improve the quality of water used in dental treatment are available (*316*); **methods demonstrated to be effective include self-contained water systems combined with chemical treatment, in-line microfilters, and combinations of these treatments. Simply using source water containing ≤500 CFU/mL of bacteria (e.g., tap, distilled, or sterile water) in a self-contained water system will not eliminate bacterial contamination in treatment water if biofilms in the water system are not controlled. Removal or inactivation of dental waterline biofilms requires use of chemical germicides.**

Patient material (e.g., oral microorganisms, blood, and saliva) can enter the dental water system during patient treatment (*311,344*). Dental devices that are connected to the dental water system and that enter the patient's mouth (e.g., handpieces, ultrasonic scalers, or air/water syringes) should be operated to discharge water and air for a minimum of 20--30 seconds after each patient (*2*). This procedure is intended to physically flush out patient material that might have entered the turbine, air, or waterlines. The majority of recently manufactured dental units are engineered to prevent retraction of oral fluids, but some older dental units are equipped with

antiretraction valves that require periodic maintenance. Users should consult the owner's manual or contact the manufacturer to determine whether testing or maintenance of antiretraction valves or other devices is required. Even with antiretraction valves, **flushing devices for a minimum of 20--30 seconds after each patient is recommended.**

Maintenance and Monitoring of Dental Unit Water

DHCP should be trained regarding water quality, biofilm formation, water treatment methods, and appropriate maintenance protocols for water delivery systems. Water treatment and monitoring products require strict adherence to maintenance protocols, and noncompliance with treatment regimens has been associated with persistence of microbial contamination in treated systems (*345*). Clinical monitoring of water quality can ensure that procedures are correctly performed and that devices are working in accordance with the manufacturer's previously validated protocol.

Dentists should consult with the manufacturer of their dental unit or water delivery system to determine the best method for maintaining acceptable water quality (i.e., ≤500 CFU/mL) and the recommended frequency of monitoring. Monitoring of dental water quality can be performed by using commercial self-contained test kits or commercial water-testing laboratories. Because methods used to treat dental water systems target the entire biofilm, no rationale exists for routine testing for such specific organisms as *Legionella* or *Pseudomonas*, except when investigating a suspected waterborne disease outbreak (*244*).

Delivery of Sterile Surgical Irrigation

Sterile solutions (e.g., sterile saline or sterile water) should be used as a coolant/irrigation in the performance of oral surgical procedures where a greater opportunity exists for entry of microorganisms, exogenous and endogenous, into the vascular system and other normally sterile areas that support the oral cavity (e.g., bone or subcutaneous tissue) and increased potential exists for localized or systemic infection (see Oral Surgical Procedures). Conventional dental units cannot reliably deliver sterile water even when equipped with independent water reservoirs because the water-bearing pathway cannot be reliably sterilized. Delivery devices (e.g., bulb syringe or sterile, single-use disposable products) should be used to deliver sterile water (*2*, *121*). Oral surgery and implant handpieces, as well as ultrasonic scalers, are commercially available that bypass the dental unit to deliver sterile water or other solutions by using single-use disposable or sterilizable tubing (*316*).

Boil-Water Advisories

A boil-water advisory is a public health announcement that the public should boil tap water before drinking it. When issued, the public should assume the water is unsafe to drink. Advisories can be issued after 1) failure of or substantial interruption in water treatment processes that result in increased turbidity levels or particle counts and mechanical or equipment failure; 2) positive test results for pathogens (e.g., *Cryptosporidium*, *Giardia*, or *Shigella*) in water; 3) violations of the total coliform rule or the turbidity standard of the surface water treatment rule; 4) circumstances that compromise the distribution system (e.g., watermain break) coupled with an indication of a health hazard; or 5) a natural disaster (e.g., flood, hurricane, or earthquake) (*346*). In recent years, increased numbers of boil-water advisories have resulted from contamination of public drinking water systems with waterborne pathogens. Most notable was the outbreak of cryptosporidiosis in Milwaukee, Wisconsin, where the municipal water system was contaminated with the protozoan parasite *Cryptosporidium parvum*. An estimated 403,000 persons became ill (*347*,*348*).

During a boil-water advisory, water should not be delivered to patients through the dental unit, ultrasonic scaler, or other dental equipment that uses the public water system. This restriction does not apply if the water source is isolated from the municipal water system (e.g., a separate water reservoir or other water treatment device cleared for marketing by FDA). Patients should rinse with bottled or distilled water until the boil-water advisory has been cancelled. During these advisory periods, tap water should not be used to dilute germicides or for hand hygiene unless the water has been brought to a rolling boil for ≥1 minute and cooled before use (*346*, *349*--

351). For hand hygiene, antimicrobial products that do not require water (e.g., alcohol-based hand rubs) can be used until the boil-water notice is cancelled. If hands are visibly contaminated, bottled water and soap should be used for handwashing; if bottled water is not immediately available, an antiseptic towelette should be used (*13,122*).

When the advisory is cancelled, the local water utility should provide guidance for flushing of waterlines to reduce residual microbial contamination. All incoming waterlines from the public water system inside the dental office (e.g., faucets, waterlines, and dental equipment) should be flushed. No consensus exists regarding the optimal duration for flushing procedures after cancellation of the advisory; recommendations range from 1 to 5 minutes (*244*, *346,351,352*). The length of time needed can vary with the type and length of the plumbing system leading to the office. After the incoming public water system lines are flushed, dental unit waterlines should be disinfected according to the manufacturer's instructions (*346*).

XXIV. Special Considerations

Dental Handpieces and Other Devices Attached to Air and Waterlines

Multiple semicritical dental devices that touch mucous membranes are attached to the air or waterlines of the dental unit. Among these devices are high- and low-speed handpieces, prophylaxis angles, ultrasonic and sonic scaling tips, air abrasion devices, and air and water syringe tips. Although no epidemiologic evidence implicates these instruments in disease transmission (*353*), studies of high-speed handpieces using dye expulsion have confirmed the potential for retracting oral fluids into internal compartments of the device (*354--358*). This determination indicates that retained patient material can be expelled intraorally during subsequent uses. Studies using laboratory models also indicate the possibility for retention of viral DNA and viable virus inside both high-speed handpieces and prophylaxis angles (*356,357,359*). The potential for contamination of the internal surfaces of other devices (e.g., low-speed handpieces and ultrasonic scalers), has not been studied, but restricted physical access limits their cleaning. Accordingly, any dental device connected to the dental air/water system that enters the patient's mouth should be run to discharge water, air, or a combination for a minimum of 20--30 seconds after each patient (*2*). This procedure is intended to help physically flush out patient material that might have entered the turbine and air and waterlines (*2*, *356,357*).

Heat methods can sterilize dental handpieces and other intraoral devices attached to air or waterlines (*246,275,356, 357,360*). For processing any dental device that can be removed from the dental unit air or waterlines, neither surface disinfection nor immersion in chemical germicides is an acceptable method. Ethylene oxide gas cannot adequately sterilize internal components of handpieces (*250,275*). **In clinical evaluations of high-speed handpieces, cleaning and lubrication were the most critical factors in determining performance and durability (*361--363*). Manufacturer's instructions for cleaning, lubrication, and sterilization should be followed closely to ensure both the effectiveness of the process and the longevity of handpieces.**

Some components of dental instruments are permanently attached to dental unit waterlines and although they do not enter the patient's oral cavity, they are likely to become contaminated with oral fluids during treatment procedures. Such components (e.g., handles or dental unit attachments of saliva ejectors, high-speed air evacuators, and air/water syringes) should be covered with impervious barriers that are changed after each use. If the item becomes visibly contaminated during use, DHCP should clean and disinfect with an EPA-registered hospital disinfectant (intermediate-level) before use on the next patient.

Saliva Ejectors

Backflow from low-volume saliva ejectors occurs when the pressure in the patient's mouth is less than that in the evacuator. Studies have reported that backflow in low-volume suction lines can occur and microorganisms be present in the lines retracted into the patient's mouth when a seal around the saliva ejector is created (e.g., by

a patient closing lips around the tip of the ejector, creating a partial vacuum) (*364--366*). This backflow can be a potential source of cross-contamination; occurrence is variable because the quality of the seal formed varies between patients. Furthermore, studies have demonstrated that gravity pulls fluid back toward the patient's mouth whenever a length of the suction tubing holding the tip is positioned above the patient's mouth, or during simultaneous use of other evacuation (high-volume) equipment (*364--366*). Although no adverse health effects associated with the saliva ejector have been reported, practitioners should be aware that in certain situations, backflow could occur when using a saliva ejector.

Dental Radiology

When taking radiographs, the potential to cross-contaminate equipment and environmental surfaces with blood or saliva is high if aseptic technique is not practiced. Gloves should be worn when taking radiographs and handling contaminated film packets. Other PPE (e.g., mask, protective eyewear, and gowns) should be used if spattering of blood or other body fluids is likely (*11, 13,367*). Heat-tolerant versions of intraoral radiograph accessories are available and these semicritical items (e.g., film-holding and positioning devices) should be heat-sterilized before patient use.

After exposure of the radiograph and before glove removal, the film should be dried with disposable gauze or a paper towel to remove blood or excess saliva and placed in a container (e.g., disposable cup) for transport to the developing area. Alternatively, if FDA-cleared film barrier pouches are used, the film packets should be carefully removed from the pouch to avoid contamination of the outside film packet and placed in the clean container for transport to the developing area.

Various methods have been recommended for aseptic transport of exposed films to the developing area, and for removing the outer film packet before exposing and developing the film. Other information regarding dental radiography infection control is available (*260,367,368*). However, care should be taken to avoid contamination of the developing equipment. Protective barriers should be used, or any surfaces that become contaminated should be cleaned and disinfected with an EPA-registered hospital disinfectant of low- (i.e., HIV and HBV claim) to intermediate-level (i.e., tuberculocidal claim) activity. Radiography equipment (e.g., radiograph tubehead and control panel) should be protected with surface barriers that are changed after each patient. If barriers are not used, equipment that has come into contact with DHCP's gloved hands or contaminated film packets should be cleaned and then disinfected after each patient use.

Digital radiography sensors and other high-technology instruments (e.g., intraoral camera, electronic periodontal probe, occlusal analyzers, and lasers) come into contact with mucous membranes and are considered semicritical devices. They should be cleaned and ideally heat-sterilized or high-level disinfected between patients. However, these items vary by manufacturer or type of device in their ability to be sterilized or high-level disinfected. Semicritical items that cannot be reprocessed by heat sterilization or high-level disinfection should, at a minimum, be barrier protected by using an FDA-cleared barrier to reduce gross contamination during use. Use of a barrier does not always protect from contamination (*369--374*). One study determined that a brand of commercially available plastic barriers used to protect dental digital radiography sensors failed at a substantial rate (44%). This rate dropped to 6% when latex finger cots were used in conjunction with the plastic barrier (*375*). To minimize the potential for device-associated infections, after removing the barrier, the device should be cleaned and disinfected with an EPA-registered hospital disinfectant (intermediate-level) after each patient. Manufacturers should be consulted regarding appropriate barrier and disinfection/sterilization procedures for digital radiography sensors, other high-technology intraoral devices, and computer components.

Aseptic Technique for Parenteral Medications

Safe handling of parenteral medications and fluid infusion systems is required to prevent health-care--

associated infections among patients undergoing conscious sedation. Parenteral medications can be packaged in single-dose ampules, vials or prefilled syringes, usually without bacteriostatic/preservative agents, and intended for use on a single patient. Multidose vials, used for more than one patient, can have a preservative, but both types of containers of medication should be handled with aseptic techniques to prevent contamination.

Single-dose vials should be used for parenteral medications whenever possible (*376,377*). Single-dose vials might pose a risk for contamination if they are punctured repeatedly. The leftover contents of a single-dose vial should be discarded and never combined with medications for use on another patient (*376,377*). Medication from a single-dose syringe should not be administered to multiple patients, even if the needle on the syringe is changed (*378*).

The overall risk for extrinsic contamination of multidose vials is probably minimal, although the consequences of contamination might result in life-threatening infection (*379*). If necessary to use a multidose vial, its access diaphragm should be cleansed with 70% alcohol before inserting a sterile device into the vial (*380,381*). A multidose vial should be discarded if sterility is compromised (*380,381*).

Medication vials, syringes, or supplies should not be carried in uniform or clothing pockets. If trays are used to deliver medications to individual patients, they should be cleaned between patients. To further reduce the chance of contamination, all medication vials should be restricted to a centralized medication preparation area separate from the treatment area (*382*).

All fluid infusion and administration sets (e.g., IV bags, tubing, and connections) are single-patient use because sterility cannot be guaranteed when an infusion or administration set is used on multiple patients. Aseptic technique should be used when preparing IV infusion and administration sets, and entry into or breaks in the tubing should be minimized (*378*).

Single-Use or Disposable Devices

A single-use device, also called a disposable device, is designed to be used on one patient and then discarded, not reprocessed for use on another patient (e.g., cleaned, disinfected, or sterilized) (*383*). Single-use devices in dentistry are usually not heat-tolerant and cannot be reliably cleaned. Examples include syringe needles, prophylaxis cups and brushes, and plastic orthodontic brackets. Certain items (e.g., prophylaxis angles, saliva ejectors, high-volume evacuator tips, and air/water syringe tips) are commonly available in a disposable form and should be disposed of appropriately after each use. Single-use devices and items (e.g., cotton rolls, gauze, and irrigating syringes) for use during oral surgical procedures should be sterile at the time of use.

Because of the physical construction of certain devices (e.g., burs, endodontic files, and broaches) cleaning can be difficult. In addition, deterioration can occur on the cutting surfaces of some carbide/diamond burs and endodontic files during processing (*384*) and after repeated processing cycles, leading to potential breakage during patient treatment (*385--388*). These factors, coupled with the knowledge that burs and endodontic instruments exhibit signs of wear during normal use, might make it practical to consider them as single-use devices.

Preprocedural Mouth Rinses

Antimicrobial mouth rinses used by patients before a dental procedure are intended to reduce the number of microorganisms the patient might release in the form of aerosols or spatter that subsequently can contaminate DHCP and equipment operatory surfaces. In addition, preprocedural rinsing can decrease the number of microorganisms introduced in the patient's bloodstream during invasive dental procedures (*389,390*).

No scientific evidence indicates that preprocedural mouth rinsing prevents clinical infections among DHCP or

patients, but studies have demonstrated that a preprocedural rinse with an antimicrobial product (e.g., chlorhexidine gluconate, essential oils, or povidone-iodine) can reduce the level of oral microorganisms in aerosols and spatter generated during routine dental procedures with rotary instruments (e.g., dental handpieces or ultrasonic scalers) (*391--399*). Preprocedural mouth rinses can be most beneficial before a procedure that requires using a prophylaxis cup or ultrasonic scaler because rubber dams cannot be used to minimize aerosol and spatter generation and, unless the provider has an assistant, high-volume evacuation is not commonly used (*173*).

The science is unclear concerning the incidence and nature of bacteremias from oral procedures, the relationship of these bacteremias to disease, and the preventive benefit of antimicrobial rinses. In limited studies, no substantial benefit has been demonstrated for mouth rinsing in terms of reducing oral microorganisms in dental-induced bacteremias (*400,401*). However, the American Heart Association's recommendations regarding preventing infective endocarditis during dental procedures (*402*) provide limited support concerning preprocedural mouth rinsing with an antimicrobial as an adjunct for patients at risk for infective endocarditis. Insufficient data exist to recommend preprocedural mouth rinses to prevent clinical infections among patients or DHCP.

Oral Surgical Procedures

The oral cavity is colonized with numerous microorganisms. Oral surgical procedures present an opportunity for entry of microorganisms (i.e., exogenous and endogenous) into the vascular system and other normally sterile areas of the oral cavity (e.g., bone or subcutaneous tissue); therefore, an increased potential exists for localized or systemic infection. Oral surgical procedures involve the incision, excision, or reflection of tissue that exposes the normally sterile areas of the oral cavity. Examples include biopsy, periodontal surgery, apical surgery, implant surgery, and surgical extractions of teeth (e.g., removal of erupted or nonerupted tooth requiring elevation of mucoperiosteal flap, removal of bone or section of tooth, and suturing if needed) (see Hand Hygiene, PPE, Single Use or Disposable Devices, and Dental Unit Water Quality).

Handling of Biopsy Specimens

To protect persons handling and transporting biopsy specimens, each specimen must be placed in a sturdy, leakproof container with a secure lid for transportation (*13*). Care should be taken when collecting the specimen to avoid contaminating the outside of the container. If the outside of the container becomes visibly contaminated, it should be cleaned and disinfected or placed in an impervious bag (*2, 13*). The container must be labeled with the biohazard symbol during storage, transport, shipment, and disposal (*13, 14*).

Handling of Extracted Teeth

Disposal

Extracted teeth that are being discarded are subject to the containerization and labeling provisions outlined by OSHA's bloodborne pathogens standard (*13*). OSHA considers extracted teeth to be potentially infectious material that should be disposed in medical waste containers. Extracted teeth sent to a dental laboratory for shade or size comparisons should be cleaned, surface-disinfected with an EPA-registered hospital disinfectant with intermediate-level activity (i.e., tuberculocidal claim), and transported in a manner consistent with OSHA regulations. However, extracted teeth can be returned to patients on request, at which time provisions of the standard no longer apply (*14*). **Extracted teeth containing dental amalgam should not be placed in a medical waste container that uses incineration for final disposal. Commercial metal-recycling companies also might accept extracted teeth with metal restorations, including amalgam. State and local regulations should be consulted regarding disposal of the amalgam.**

Educational Settings

Extracted teeth are occasionally collected for use in preclinical educational training. These teeth should be cleaned of visible blood and gross debris and maintained in a hydrated state in a well-constructed closed container during transport. The container should be labeled with the biohazard symbol (*13, 14*). Because these teeth will be autoclaved before clinical exercises or study, use of the most economical storage solution (e.g., water or saline) might be practical. Liquid chemical germicides can also be used but do not reliably disinfect both external surface and interior pulp tissue (*403,404*).

Before being used in an educational setting, the teeth should be heat-sterilized to allow safe handling. Microbial growth can be eliminated by using an autoclave cycle for 40 minutes (*405*), but because preclinical educational exercises simulate clinical experiences, students enrolled in dental programs should still follow standard precautions. Autoclaving teeth for preclinical laboratory exercises does not appear to alter their physical properties sufficiently to compromise the learning experience (*405,406*). However, whether autoclave sterilization of extracted teeth affects dentinal structure to the point that the chemical and microchemical relationship between dental materials and the dentin would be affected for research purposes on dental materials is unknown (*406*).

Use of teeth that do not contain amalgam is preferred in educational settings because they can be safely autoclaved (*403,405*). Extracted teeth containing amalgam restorations should not be heat-sterilized because of the potential health hazard from mercury vaporization and exposure. If extracted teeth containing amalgam restorations are to be used, immersion in 10% formalin solution for 2 weeks should be effective in disinfecting both the internal and external structures of the teeth (*403*). If using formalin, manufacturer MSDS should be reviewed for occupational safety and health concerns and to ensure compliance with OSHA regulations (*15*).

Dental Laboratory

Dental prostheses, appliances, and items used in their fabrication (e.g., impressions, occlusal rims, and bite registrations) are potential sources for cross-contamination and should be handled in a manner that prevents exposure of DHCP, patients, or the office environment to infectious agents. Effective communication and coordination between the laboratory and dental practice will ensure that appropriate cleaning and disinfection procedures are performed in the dental office or laboratory, materials are not damaged or distorted because of disinfectant overexposure, and effective disinfection procedures are not unnecessarily duplicated (*407,408*).
When a laboratory case is sent off-site, DHCP should provide written information regarding the methods (e.g., type of disinfectant and exposure time) used to clean and disinfect the material (e.g., impression, stone model, or appliance) (*2,407,409*). Clinical materials that are not decontaminated are subject to OSHA and U.S. Department of Transportation regulations regarding transportation and shipping of infectious materials (*13,410*).

Appliances and prostheses delivered to the patient should be free of contamination. Communication between the laboratory and the dental practice is also key at this stage to determine which one is responsible for the final disinfection process. If the dental laboratory staff provides the disinfection, an EPA-registered hospital disinfectant (low to intermediate) should be used, written documentation of the disinfection method provided, and the item placed in a tamper-evident container before returning it to the dental office. If such documentation is not provided, the dental office is responsible for final disinfection procedures.

Dental prostheses or impressions brought into the laboratory can be contaminated with bacteria, viruses, and fungi (*411,412*). Dental prostheses, impressions, orthodontic appliances, and other prosthodontic materials (e.g., occlusal rims, temporary prostheses, bite registrations, or extracted teeth) should be thoroughly cleaned (i.e., blood and bioburden removed), disinfected with an EPA-registered hospital disinfectant with a tuberculocidal claim, and thoroughly rinsed before being handled in the in-office laboratory or sent to an off-site laboratory (*2,244,249,407*). The best time to clean and disinfect impressions, prostheses, or appliances is as soon as

possible after removal from the patient's mouth before drying of blood or other bioburden can occur. Specific guidance regarding cleaning and disinfecting techniques for various materials is available (*260*,*413--416*). DHCP are advised to consult with manufacturers regarding the stability of specific materials during disinfection.

In the laboratory, a separate receiving and disinfecting area should be established to reduce contamination in the production area. Bringing untreated items into the laboratory increases chances for cross infection (*260*). If no communication has been received regarding prior cleaning and disinfection of a material, the dental laboratory staff should perform cleaning and disinfection procedures before handling. If during manipulation of a material or appliance a previously undetected area of blood or bioburden becomes apparent, cleaning and disinfection procedures should be repeated. Transfer of oral microorganisms into and onto impressions has been documented (*417--419*). Movement of these organisms onto dental casts has also been demonstrated (*420*). Certain microbes have been demonstrated to remain viable within gypsum cast materials for ≤7 days (*421*). Incorrect handling of contaminated impressions, prostheses, or appliances, therefore, offers an opportunity for transmission of microorganisms (*260*). Whether in the office or laboratory, PPE should be worn until disinfection is completed (*1*, *2*, *7*, *10*, *13*).

If laboratory items (e.g., burs, polishing points, rag wheels, or laboratory knives) are used on contaminated or potentially contaminated appliances, prostheses, or other material, they should be heat-sterilized, disinfected between patients, or discarded (i.e., disposable items should be used) (*260*,*407*). Heat-tolerant items used in the mouth (e.g., metal impression tray or face bow fork) should be heat-sterilized before being used on another patient (*2*, *407*). Items that do not normally contact the patient, prosthetic device, or appliance but frequently become contaminated and cannot withstand heat-sterilization (e.g., articulators, case pans, or lathes) should be cleaned and disinfected between patients and according to the manufacturer's instructions. Pressure pots and water baths are particularly susceptible to contamination with microorganisms and should be cleaned and disinfected between patients (*422*). In the majority of instances, these items can be cleaned and disinfected with an EPA-registered hospital disinfectant. Environmental surfaces should be barrier-protected or cleaned and disinfected in the same manner as in the dental treatment area.
Unless waste generated in the dental laboratory (e.g., disposable trays or impression materials) falls under the category of regulated medical waste, it can be discarded with general waste. Personnel should dispose of sharp items (e.g., burs, disposable blades, and orthodontic wires) in puncture-resistant containers.

Laser/Electrosurgery Plumes or Surgical Smoke

During surgical procedures that use a laser or electrosurgical unit, the thermal destruction of tissue creates a smoke byproduct. Laser plumes or surgical smoke represent another potential risk for DHCP (*423--425*). Lasers transfer electromagnetic energy into tissues, resulting in the release of a heated plume that includes particles, gases (e.g., hydrogen cyanide, benzene, and formaldehyde), tissue debris, viruses, and offensive odors. One concern is that aerosolized infectious material in the laser plume might reach the nasal mucosa of the laser operator and adjacent DHCP. Although certain viruses (e.g., varicella-zoster virus and herpes simplex virus) appear not to aerosolize efficiently (*426*,*427*), other viruses and various bacteria (e.g., human papilloma virus, HIV, coagulase-negative *Staphylococcus*, *Corynebacterium* species, and *Neisseria* species) have been detected in laser plumes (*428--434*). However, the presence of an infectious agent in a laser plume might not be sufficient to cause disease from airborne exposure, especially if the agent's normal mode of transmission is not airborne. No evidence indicates that HIV or HBV have been transmitted through aerosolization and inhalation (*435*). Although continuing studies are needed to evaluate the risk for DHCP of laser plumes and electrosurgery smoke, following NIOSH recommendations (*425*) and practices developed by the Association of periOperative Registered Nurses (AORN) might be practical (*436*). These practices include using 1) standard precautions (e.g., high-filtration surgical masks and possibly full face shields) (*437*); 2) central room suction units with in-line filters to collect particulate matter from minimal plumes; and 3) dedicated mechanical smoke exhaust

systems with a high-efficiency filter to remove substantial amounts of laser plume particles. Local smoke evacuation systems have been recommended by consensus organizations, and these systems can improve the quality of the operating field. Employers should be aware of this emerging problem and advise employees of the potential hazards of laser smoke (*438*). However, this concern remains unresolved in dental practice and no recommendation is provided here.

M. tuberculosis

Patients infected with *M. tuberculosis* occasionally seek urgent dental treatment at outpatient dental settings. Understanding the pathogenesis of the development of TB will help DHCP determine how to manage such patients.

M. tuberculosis is a bacterium carried in airborne infective droplet nuclei that can be generated when persons with pulmonary or laryngeal TB sneeze, cough, speak, or sing (*439*). These small particles (1--5 µm) can stay suspended in the air for hours (*440*). Infection occurs when a susceptible person inhales droplet nuclei containing *M. tuberculosis*, which then travel to the alveoli of the lungs. Usually within 2--12 weeks after initial infection with *M. tuberculosis*, immune response prevents further spread of the TB bacteria, although they can remain alive in the lungs for years, a condition termed latent TB infection. Persons with latent TB infection usually exhibit a reactive tuberculin skin test (TST), have no symptoms of active disease, and are not infectious. However, they can develop active disease later in life if they do not receive treatment for their latent infection.

Approximately 5% of persons who have been recently infected and not treated for latent TB infection will progress from infection to active disease during the first 1--2 years after infection; another 5% will develop active disease later in life. Thus, approximately 90% of U.S. persons with latent TB infection do not progress to active TB disease. Although both latent TB infection and active TB disease are described as TB, only the person with active disease is contagious and presents a risk of transmission. Symptoms of active TB disease include a productive cough, night sweats, fatigue, malaise, fever, and unexplained weight loss. Certain immunocompromising medical conditions (e.g., HIV) increase the risk that TB infection will progress to active disease at a faster rate (*441*).

Overall, the risk borne by DHCP for exposure to a patient with active TB disease is probably low (*20*, *21*). Only one report exists of TB transmission in a dental office (*442*), and TST conversions among DHCP are also low (*443*, *444*). However, in certain cases, DHCP or the community served by the dental facility might be at relatively high risk for exposure to TB.

Surgical masks do not prevent inhalation of *M. tuberculosis* droplet nuclei, and therefore, standard precautions are not sufficient to prevent transmission of this organism. Recommendations for expanded precautions to prevent transmission of *M. tuberculosis* and other organisms that can be spread by airborne, droplet, or contact routes have been detailed in other guidelines (*5*, *11*, *20*).

TB transmission is controlled through a hierarchy of measures, including administrative controls, environmental controls, and personal respiratory protection. The main administrative goals of a TB infection-control program are early detection of a person with active TB disease and prompt isolation from susceptible persons to reduce the risk of transmission. Although DHCP are not responsible for diagnosis and treatment of TB, they should be trained to recognize signs and symptoms to help with prompt detection. Because potential for transmission of *M. tuberculosis* exists in outpatient settings, dental practices should develop a TB control program appropriate for their level of risk (*20*, *21*).

- A community risk assessment should be conducted periodically, and TB infection-control policies for

each dental setting should be based on the risk assessment. The policies should include provisions for detection and referral of patients who might have undiagnosed active TB; management of patients with active TB who require urgent dental care; and DHCP education, counseling, and TST screening.

- DHCP who have contact with patients should have a baseline TST, preferably by using a two-step test at the beginning of employment. The facility's level of TB risk will determine the need for routine follow-up TST.
- While taking patients' initial medical histories and at periodic updates, dental DHCP should routinely ask all patients whether they have a history of TB disease or symptoms indicative of TB.
- Patients with a medical history or symptoms indicative of undiagnosed active TB should be referred promptly for medical evaluation to determine possible infectiousness. Such patients should not remain in the dental-care facility any longer than required to evaluate their dental condition and arrange a referral. While in the dental health-care facility, the patient should be isolated from other patients and DHCP, wear a surgical mask when not being evaluated, or be instructed to cover their mouth and nose when coughing or sneezing.
- Elective dental treatment should be deferred until a physician confirms that a patient does not have infectious TB, or if the patient is diagnosed with active TB disease, until confirmed the patient is no longer infectious.
- If urgent dental care is provided for a patient who has, or is suspected of having active TB disease, the care should be provided in a facility (e.g., hospital) that provides airborne infection isolation (i.e., using such engineering controls as TB isolation rooms, negatively pressured relative to the corridors, with air either exhausted to the outside or HEPA-filtered if recirculation is necessary). Standard surgical face masks do not protect against TB transmission; DHCP should use respiratory protection (e.g., fit-tested, disposable N-95 respirators).
- Settings that do not require use of respiratory protection because they do not treat active TB patients and do not perform cough-inducing procedures on potential active TB patients do not need to develop a written respiratory protection program.
- Any DHCP with a persistent cough (i.e., lasting >3 weeks), especially in the presence of other signs or symptoms compatible with active TB (e.g., weight loss, night sweats, fatigue, bloody sputum, anorexia, or fever), should be evaluated
- promptly. The DHCP should not return to the workplace until a diagnosis of TB has been excluded or the DHCP is on therapy and a physician has determined that the DHCP is noninfectious.

Creutzfeldt-Jakob Disease and Other Prion Diseases

Creutzfeldt-Jakob disease (CJD) belongs to a group of rapidly progressive, invariably fatal, degenerative neurological disorders, transmissible spongiform encephalopathies (TSEs) that affect both humans and animals and are thought to be caused by infection with an unusual pathogen called a prion. Prions are isoforms of a normal protein, capable of self-propagation although they lack nucleic acid. Prion diseases have an incubation period of years and are usually fatal within 1 year of diagnosis.

Among humans, TSEs include CJD, Gerstmann-Straussler-Scheinker syndrome, fatal familial insomnia, kuru, and variant CJD (vCJD). Occurring in sporadic, familial, and acquired (i.e., iatrogenic) forms, CJD has an annual incidence in the United States and other countries of approximately 1 case/million population (*445*--*448*). In approximately 85% of affected patients, CJD occurs as a sporadic disease with no recognizable pattern of transmission. A smaller proportion of patients (5%--15%) experience familial CJD because of inherited mutations of the prion protein gene (*448*).

vCJD is distinguishable clinically and neuropathologically from classic CJD, and strong epidemiologic and laboratory evidence indicates a causal relationship with bovine spongiform encephalopathy (BSE), a

progressive neurological disorder of cattle commonly known as *mad cow disease* (*449--451*). vCJD, was reported first in the United Kingdom in 1996 (*449*) and subsequently in other European countries (*452*). Only one case of vCJD has been reported in the United States, in an immigrant from the United Kingdom (*453*). Compared with CJD patients, those with vCJD are younger (28 years versus 68 years median age at death), and have a longer duration of illness (13 months versus 4.5 months). Also, vCJD patients characteristically exhibit sensory and psychiatric symptoms that are uncommon with CJD. Another difference includes the ease with which the presence of prions is consistently demonstrated in lymphoreticular tissues (e.g., tonsil) in vCJD patients by immunohistochemistry (*454*).

CJD and vCJD are transmissible diseases, but not through the air or casual contact. All known cases of iatrogenic CJD have resulted from exposure to infected central nervous tissue (e.g., brain and dura mater), pituitary, or eye tissue. Studies in experimental animals have determined that other tissues have low or no detectable infectivity (*243,455,456*). Limited experimental studies have demonstrated that scrapie (a TSE in sheep) can be transmitted to healthy hamsters and mice by exposing oral tissues to infectious homogenate (*457,458*). These animal models and experimental designs might not be directly applicable to human transmission and clinical dentistry, but they indicate a theoretical risk of transmitting prion diseases through perioral exposures.
According to published reports, iatrogenic transmission of CJD has occurred in humans under three circumstances: after use of contaminated electroencephalography depth electrodes and neurosurgical equipment (*459*); after use of extracted pituitary hormones (*460,461*); and after implant of contaminated corneal (*462*) and dura mater grafts (*463,464*) from humans. The equipment-related cases occurred before the routine implementation of sterilization procedures used in health-care facilities.

Case-control studies have found no evidence that dental procedures increase the risk of iatrogenic transmission of TSEs among humans. In these studies, CJD transmission was not associated with dental procedures (e.g., root canals or extractions), with convincing evidence of prion detection in human blood, saliva, or oral tissues, or with DHCP becoming occupationally infected with CJD (*465--467*). In 2000, prions were not found in the dental pulps of eight patients with neuropathologically confirmed sporadic CJD by using electrophoresis and a Western blot technique (*468*).

Prions exhibit unusual resistance to conventional chemical and physical decontamination procedures. Considering this resistance and the invariably fatal outcome of CJD, procedures for disinfecting and sterilizing instruments potentially contaminated with the CJD prion have been controversial for years. Scientific data indicate the risk, if any, of sporadic CJD transmission during dental and oral surgical procedures is low to nil. Until additional information exists regarding the transmissibility of CJD or vCJD, special precautions in addition to standard precautions might be indicated when treating known CJD or vCJD patients; the following list of precautions is provided for consideration without recommendation (*243,249,277,469*):

- Use single-use disposable items and equipment whenever possible.
- Consider items difficult to clean (e.g., endodontic files, broaches, and carbide and diamond burs) as single-use disposables and discard after one use.
- To minimize drying of tissues and body fluids on a device, keep the instrument moist until cleaned and decontaminated.
- Clean instruments thoroughly and steam-autoclave at 134°C for 18 minutes. This is the least stringent of sterilization methods offered by the World Health Organization. The complete list (*469*) is available at http://www.who.int/emc-documents/tse/whocdscsraph2003c.html.
- Do not use flash sterilization for processing instruments or devices.

Potential infectivity of oral tissues in CJD or vCJD patients is an unresolved concern. CDC maintains an active

surveillance program on CJD. Additional information and resources are available at http://www.cdc.gov/ncidod/diseases/cjd/cjd.htm.

Program Evaluation

The goal of a dental infection-control program is to provide a safe working environment that will reduce the risk of health-care--associated infections among patients and occupational exposures among DHCP. Medical errors are caused by faulty systems, processes, and conditions that lead persons to make mistakes or fail to prevent errors being made by others (*470*). Effective program evaluation is a systematic way to ensure procedures are useful, feasible, ethical, and accurate. Program evaluation is an essential organizational practice; however, such evaluation is not practiced consistently across program areas, nor is it sufficiently well-integrated into the day-to-day management of the majority of programs (*471*).

A successful infection-control program depends on developing standard operating procedures, evaluating practices, routinely documenting adverse outcomes (e.g., occupational exposures to blood) and work-related illnesses in DHCP, and monitoring health-care--associated infections in patients. Strategies and tools to evaluate the infection-control program can include periodic observational assessments, checklists to document procedures, and routine review of occupational exposures to bloodborne pathogens. Evaluation offers an opportunity to improve the effectiveness of both the infection-control program and dental-practice protocols. If deficiencies or problems in the implementation of infection-control procedures are identified, further evaluation is needed to eliminate the problems. Examples of infection-control program evaluation activities are provided (Table 5).

Infection-Control Research Considerations

Although the number of published studies concerning dental infection control has increased in recent years, questions regarding infection-control practices and their effectiveness remain unanswered. Multiple concerns were identified by the working group for this report, as well as by others during the public comment period (Box. This list is not exhaustive and does not represent a CDC research agenda, but rather is an effort to identify certain concerns, stimulate discussion, and provide direction for determining future action by clinical, basic science, and epidemiologic investigators, as well as health and professional organizations, clinicians, and policy makers.

XXV. Recommendations

Each recommendation is categorized on the basis of existing scientific data, theoretical rationale, and applicability. Rankings are based on the system used by CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) to categorize recommendations:

Category IA. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.

Category IB. Strongly recommended for implementation and supported by experimental, clinical, or epidemiologic studies and a strong theoretical rationale.

Category IC. Required for implementation as mandated by federal or state regulation or standard. When IC is used, a second rating can be included to provide the basis of existing scientific data, theoretical rationale, and applicability. Because of state differences, the reader should not assume that the absence of an IC implies the absence of state regulations.

Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.

Unresolved issue. No recommendation. Insufficient evidence or no consensus regarding efficacy exists.

I. Personnel Health Elements of an Infection-Control Program

A. General Recommendations

1. Develop a written health program for DHCP that includes policies, procedures, and guidelines for education and training; immunizations; exposure prevention and postexposure management; medical conditions, work-related illness, and associated work restrictions; contact dermatitis and latex hypersensitivity; and maintenance of records, data management, and confidentiality (IB) (*5,16--18,22*).

2. Establish referral arrangements with qualified health-care professionals to ensure prompt and appropriate provision of preventive services, occupationally related medical services, and postexposure management with medical follow-up (IB, IC) (*5,13,19,22*).

B. Education and Training

1. Provide DHCP 1) on initial employment, 2) when new tasks or procedures affect the employee's occupational exposure, and 3) at a minimum, annually, with education and training regarding occupational exposure to potentially infectious agents and infection-control procedures/protocols appropriate for and specific to their assigned duties (IB, IC) (*5,11,13, 14,16,19,22*).

2. Provide educational information appropriate in content and vocabulary to the educational level, literacy, and language of DHCP (IB, IC) (*5, 13*).

C. Immunization Programs

1. Develop a written comprehensive policy regarding immunizing DHCP, including a list of all required and recommended immunizations (IB) (*5,17,18*).

2. Refer DHCP to a prearranged qualified health-care professional or to their own health-care professional to receive all appropriate immunizations based on the latest recommendations as well as their medical history and risk for occupational exposure (IB) (*5,17*).

D. Exposure Prevention and Postexposure Management

1. Develop a comprehensive postexposure management and medical follow-up program (IB, IC) (*5,13,14,19*).

   a. Include policies and procedures for prompt reporting, evaluation, counseling, treatment, and medical follow-up of occupational exposures.

   b. Establish mechanisms for referral to a qualified health-care professional for medical evaluation and follow-up.

   c. Conduct a baseline TST, preferably by using a two-step test, for all DHCP who might have contact with persons with suspected or confirmed infectious TB, regardless of the risk classification of the setting (IB) (*20*).

E. Medical Conditions, Work-Related Illness, and Work Restrictions

1. Develop and have readily available to all DHCP comprehensive written policies regarding work restriction and exclusion that include a statement of authority defining who can implement such policies (IB) (*5,22*).

2. Develop policies for work restriction and exclusion that encourage DHCP to seek appropriate preventive and curative care and report their illnesses, medical conditions, or treatments that can render them more susceptible to opportunistic infection or exposures; do not penalize DHCP with loss of wages, benefits, or job status (IB) (*5,22*).

3. Develop policies and procedures for evaluation, diagnosis, and management of DHCP with

suspected or known occupational contact dermatitis (IB) (*32*).

4. Seek definitive diagnosis by a qualified health-care professional for any DHCP with suspected latex allergy to carefully determine its specific etiology and appropriate treatment as well as work restrictions and accommodations (IB) (*32*).

F. Records Maintenance, Data Management, and Confidentiality

1. Establish and maintain confidential medical records (e.g., immunization records and documentation of tests received as a result of occupational exposure) for all DHCP (IB, IC) (*5*,*13*).

2. Ensure that the practice complies with all applicable federal, state, and local laws regarding medical recordkeeping and confidentiality (IC) (*13*,*34*).

II. Preventing Transmission of Bloodborne Pathogens

A. HBV Vaccination

1. Offer the HBV vaccination series to all DHCP with potential occupational exposure to blood or other potentially infectious material (IA, IC) (*2*,*13*,*14*,*19*).

2. Always follow U.S. Public Health Service/CDC recommendations for hepatitis B vaccination, serologic testing, follow-up, and booster dosing (IA, IC) (*13*,*14*,*19*).

3. Test DHCP for anti-HBs 1--2 months after completion of the 3-dose vaccination series (IA, IC) (*14*,*19*).

4. DHCP should complete a second 3-dose vaccine series or be evaluated to determine if they are HBsAg-positive if no antibody response occurs to the primary vaccine series (IA, IC) (*14*,*19*).

5. Retest for anti-HBs at the completion of the second vaccine series. If no response to the second 3-dose series occurs, nonresponders should be tested for HBsAg (IC) (*14*,*19*).

6. Counsel nonresponders to vaccination who are HBsAg-negative regarding their susceptibility to HBV infection and precautions to take (IA, IC) (*14*,*19*).

7. Provide employees appropriate education regarding the risks of HBV transmission and the availability of the vaccine. Employees who decline the vaccination should sign a declination form to be kept on file with the employer (IC) (*13*).

B. Preventing Exposures to Blood and OPIM

1. General recommendations

   a. Use standard precautions (OSHA's bloodborne pathogen standard retains the term universal precautions) for all patient encounters (IA, IC) (*11*,*13*,*19*,*53*).

   b. Consider sharp items (e.g., needles, scalers, burs, lab knives, and wires) that are contaminated with patient blood and saliva as potentially infective and establish engineering controls and work practices to prevent injuries (IB, IC) (*6*,*13*,*113*).

   c. Implement a written, comprehensive program designed to minimize and manage DHCP exposures to blood and body fluids (IB, IC). (*13*,*14*,*19*,*97*).

2. Engineering and work-practice controls

   a. Identify, evaluate, and select devices with engineered safety features at least annually and as they become available on the market (e.g., safer anesthetic syringes, blunt suture needle, retractable scalpel, or needleless IV systems) (IC) (*13*,*97*,*110*--*112*).

   b. Place used disposable syringes and needles, scalpel blades, and other sharp items in appropriate puncture-resistant containers located as close as feasible to the area in which the items are used (IA, IC) (*2*,*7*,*13*,*19*,*113*, *115*).

   c. Do not recap used needles by using both hands or any other technique that involves directing the point of a needle toward any part of the body. Do not bend, break, or remove needles before disposal (IA, IC) (*2*,*7*,*8*,*13*,*97*,*113*).

d. Use either a one-handed scoop technique or a mechanical device designed for holding the needle cap when recapping needles (e.g., between multiple injections and before removing from a nondisposable aspirating syringe) (IA, IC) (*2,7,8,13,14,113*).

3. Postexposure management and prophylaxis

a. Follow CDC recommendations after percutaneous, mucous membrane, or nonintact skin exposure to blood or other potentially infectious material (IA, IC) (*13,14,19*).

III. Hand Hygiene

A. General Considerations

1. Perform hand hygiene with, either a nonantimicrobial or antimicrobial soap, and water when hands are visibly dirty or contaminated with blood or other potentially infectious material. If hands are not visibly soiled, an alcohol-based hand rub can also be used. Follow the manufacturer's instructions (IA) (*123*).

2.Indications for hand hygiene include

a. when hands are visibly soiled (IA, IC);

b. after barehanded touching of inanimate objects likely to be contaminated by blood, saliva, or respiratory secretions, (IA, IC);

c. before and after treating each patient (IB);

d. before donning gloves (IB); and

e. immediately after removing gloves (IB, IC) (*7--9,11,13,113,120--123,125,126,138*).

3. For oral surgical procedures, perform surgical hand antisepsis before donning sterile surgeon's gloves. Follow the manufacturer's instructions by using either an antimicrobial soap and water, or soap and water followed by drying hands and application of an alcohol-based surgical hand-scrub product with persistent activity (IB) (*121--123,127--133,144,145*).

4. Store liquid hand-care products in either disposable closed containers or closed containers that can be washed and dried before refilling. Do not add soap or lotion to (i.e., top off) a partially empty dispenser (IA) (*9,120,122,149,150*).

B. Special Considerations for Hand Hygiene and Glove Use

1. Use hand lotions to prevent skin dryness associated with handwashing (IA) (*153,154*).

2. Consider the compatibility of lotion and antiseptic products and the effect of petroleum or other oil emollients on the integrity of gloves during product selection and glove use (IB) (*2,14,122,155*).

3. Keep fingernails short with smooth, filed edges to allow thorough cleaning and prevent glove tears (II) (*122,123,156*).

4. Do not wear artificial fingernails or extenders when having direct contact with patients at high risk (e.g., those in intensive care units or operating rooms) (IA) (*123,157--160*).

5. Use of artificial fingernails is usually not recommended (II) (*157--160*).

6. Do not wear hand or nail jewelry if it makes donning gloves more difficult or compromises the fit and integrity of the glove (II) (*123,142, 143*).

IV. PPE

A. Masks, Protective Eyewear, and Face Shields

1. Wear a surgical mask and eye protection with solid side shields or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures likely to generate splashing or spattering of blood or other body fluids (IB, IC) (*1,2,7,8,11,13,137*).

2. Change masks between patients or during patient treatment if the mask becomes wet (IB) (*2*).

3. Clean with soap and water, or if visibly soiled, clean and disinfect reusable facial protective equipment (e.g., clinician and patient protective eyewear or face shields) between patients (II)

(*2*).

B. Protective Clothing

1. Wear protective clothing (e.g., reusable or disposable gown, laboratory coat, or uniform) that covers personal clothing and skin (e.g., forearms) likely to be soiled with blood, saliva, or OPIM (IB, IC) (*7*,*8*,*11*,*13*,*137*).
2. Change protective clothing if visibly soiled (*134*); change immediately or as soon as feasible if penetrated by blood or other potentially infectious fluids (IB, IC) (*13*).
3. Remove barrier protection, including gloves, mask, eyewear, and gown before departing work area (e.g., dental patient care, instrument processing, or laboratory areas) (IC) (*13*).

C. Gloves

1. Wear medical gloves when a potential exists for contacting blood, saliva, OPIM, or mucous membranes (IB, IC) (*1*,*2*,*7*,*8*,*13*).
2. Wear a new pair of medical gloves for each patient, remove them promptly after use, and wash hands immediately to avoid transfer of microorganisms to other patients or environments (IB) (*1*,*7*,*8*,*123*).
3. Remove gloves that are torn, cut, or punctured as soon as feasible and wash hands before regloving (IB, IC) (*13*,*210*,*211*).
4. Do not wash surgeon's or patient examination gloves before use or wash, disinfect, or sterilize gloves for reuse (IB, IC) (*13*,*138*,*177*,*212*,*213*).
5. Ensure that appropriate gloves in the correct size are readily accessible (IC) (*13*).
6. Use appropriate gloves (e.g., puncture- and chemical-resistant utility gloves) when cleaning instruments and performing housekeeping tasks involving contact with blood or OPIM (IB, IC) (*7*,*13*,*15*).
7. Consult with glove manufacturers regarding the chemical compatibility of glove material and dental materials used (II).

D. Sterile Surgeon's Gloves and Double Gloving During Oral Surgical Procedures

1. Wear sterile surgeon's gloves when performing oral surgical procedures (IB) (*2*,*8*,*137*).
2. No recommendation is offered regarding the effectiveness of wearing two pairs of gloves to prevent disease transmission during oral surgical procedures. The majority of studies among HCP and DHCP have demonstrated a lower frequency of inner glove perforation and visible blood on the surgeon's hands when double gloves are worn; however, the effectiveness of wearing two pairs of gloves in preventing disease transmission has not been demonstrated (Unresolved issue).

V. Contact Dermatitis and Latex Hypersensitivity

A. General Recommendations

1. Educate DHCP regarding the signs, symptoms, and diagnoses of skin reactions associated with frequent hand hygiene and glove use (IB) (*5*,*31*,*32*).
2. Screen all patients for latex allergy (e.g., take health history and refer for medical consultation when latex allergy is suspected) (IB) (*32*).
3. Ensure a latex-safe environment for patients and DHCP with latex allergy (IB) (*32*).
4. Have emergency treatment kits with latex-free products available at all times (II) (*32*).

VI. Sterilization and Disinfection of Patient-Care Items

A. General Recommendations

1. Use only FDA-cleared medical devices for sterilization and follow the manufacturer's

instructions for correct use (IB) (*248*).
2. Clean and heat-sterilize critical dental instruments before each use (IA) (*2,137,243,244, 246,249,407*).
3. Clean and heat-sterilize semicritical items before each use (IB) (*2,249,260,407*).
4. Allow packages to dry in the sterilizer before they are handled to avoid contamination (IB) (*247*).
5. Use of heat-stable semicritical alternatives is encouraged (IB) (*2*).
6. Reprocess heat-sensitive critical and semi-critical instruments by using FDA-cleared sterilant/high-level disinfectants or an FDA-cleared low-temperature sterilization method (e.g., ethylene oxide). Follow manufacturer's instructions for use of chemical sterilants/high-level disinfectants (IB) (*243*).
7. Single-use disposable instruments are acceptable alternatives if they are used only once and disposed of correctly (IB, IC) (*243,383*).
8. Do not use liquid chemical sterilants/high-level disinfectants for environmental surface disinfection or as holding solutions (IB, IC) (*243,245*).
9. Ensure that noncritical patient-care items are barrier-protected or cleaned, or if visibly soiled, cleaned and disinfected after each use with an EPA-registered hospital disinfectant. If visibly contaminated with blood, use an EPA-registered hospital disinfectant with a tuberculocidal claim (i.e., intermediate level) (IB) (*2,243,244*).
10. Inform DHCP of all OSHA guidelines for exposure to chemical agents used for disinfection and sterilization. Using this report, identify areas and tasks that have potential for exposure (IC) (*15*).

B. Instrument Processing Area

1. Designate a central processing area. Divide the instrument processing area, physically or, at a minimum, spatially, into distinct areas for 1) receiving, cleaning, and decontamination; 2) preparation and packaging; 3) sterilization; and 4) storage. Do not store instruments in an area where contaminated instruments are held or cleaned (II) (*173,247,248*).
2. Train DHCP to employ work practices that prevent contamination of clean areas (II).

C. Receiving, Cleaning, and Decontamination Work Area

1. Minimize handling of loose contaminated instruments during transport to the instrument processing area. Use work-practice controls (e.g., carry instruments in a covered container) to minimize exposure potential (II). Clean all visible blood and other contamination from dental instruments and devices before sterilization or disinfection procedures (IA) (*243,249--252*).
2. Use automated cleaning equipment (e.g., ultrasonic cleaner or washer-disinfector) to remove debris to improve cleaning effectiveness and decrease worker exposure to blood (IB) (*2,253*).
3. Use work-practice controls that minimize contact with sharp instruments if manual cleaning is necessary (e.g., long-handled brush) (IC) (*14*).
4. Wear puncture- and chemical-resistant/heavy-duty utility gloves for instrument cleaning and decontamination procedures (IB) (*7*).
5. Wear appropriate PPE (e.g., mask, protective eyewear, and gown) when splashing or spraying is anticipated during cleaning (IC) (*13*).

D. Preparation and Packaging

1. Use an internal chemical indicator in each package. If the internal indicator cannot be seen from outside the package, also use an external indicator (II) (*243,254,257*).
2. Use a container system or wrapping compatible with the type of sterilization process used and that has received FDA clearance (IB) (*243,247, 256*).

3. Before sterilization of critical and semicritical instruments, inspect instruments for cleanliness, then wrap or place them in containers designed to maintain sterility during storage (e.g., cassettes and organizing trays) (IA) (*2*,*247*,*255*,*256*).

E. Sterilization of Unwrapped Instruments

1. Clean and dry instruments before the unwrapped sterilization cycle (IB) (*248*).
2. Use mechanical and chemical indicators for each unwrapped sterilization cycle (**i.e., place an internal chemical indicator among the instruments or items to be sterilized) (IB) (*243*,*258*).**
3. Allow unwrapped instruments to dry and cool in the sterilizer before they are handled to avoid contamination and thermal injury (II) (*260*).
4. Semicritical instruments that will be used immediately or within a short time can be sterilized unwrapped on a tray or in a container system, provided that the instruments are handled aseptically during removal from the sterilizer and transport to the point of use (II).
5. Critical instruments intended for immediate reuse can be sterilized unwrapped if the instruments are maintained sterile during removal from the sterilizer and transport to the point of use (e.g., transported in a sterile covered container) (IB) (*258*).
6. Do not sterilize implantable devices unwrapped (IB) (*243*,*247*).
7. Do not store critical instruments unwrapped (IB) (*248*).

F. Sterilization Monitoring

1. Use mechanical, chemical, and biological monitors according to the manufacturer's instructions to ensure the effectiveness of the sterilization process (IB) (*248*,*278*,*279*).
2. Monitor each load with mechanical (e.g., time, temperature, and pressure) and chemical indicators (II) (*243*,*248*).
3. Place a chemical indicator on the inside of each package. If the internal indicator is not visible from the outside, also place an exterior chemical indicator on the package (II) (*243*,*254*,*257*).
4. Place items/packages correctly and loosely into the sterilizer so as not to impede penetration of the sterilant (IB) (*243*).
5. Do not use instrument packs if mechanical or chemical indicators indicate inadequate processing (IB) (*243*,*247*,*248*).
6. Monitor sterilizers at least weekly by using a biological indicator with a matching control (i.e., biological indicator and control from same lot number) (IB) (*2*,*9*,*243*,*247*,*278*,*279*).
7. Use a biological indicator for every sterilizer load that contains an implantable device. Verify results before using the implantable device, whenever possible (IB) (*243*,*248*).
8. The following are recommended in the case of a positive spore test:
    a. Remove the sterilizer from service and review sterilization procedures (e.g., work practices and use of mechanical and chemical indicators) to determine whether operator error could be responsible (II) (*8*).
    b. Retest the sterilizer by using biological, mechanical, and chemical indicators after correcting any identified procedural problems (II).
    c. If the repeat spore test is negative, and mechanical and chemical indicators are within normal limits, put the sterilizer back in service (II) (*9*,*243*).
9. The following are recommended if the repeat spore test is positive:
    a. Do not use the sterilizer until it has been inspected or repaired or the exact reason for the positive test has been determined (II) (*9*,*243*).
    b. Recall, to the extent possible, and reprocess all items processed since the last negative spore test (II) (*9*,*243*,*283*).
    c. Before placing the sterilizer back in service, rechallenge the sterilizer with biological indicator tests in three consecutive empty chamber sterilization cycles after the cause

of the sterilizer failure has been determined and corrected (II) (*9*,*243*,*283*).

10. Maintain sterilization records (i.e., mechanical, chemical, and biological) in compliance with state and local regulations (IB) (*243*).

G. Storage Area for Sterilized Items and Clean Dental Supplies

1. Implement practices on the basis of date- or event-related shelf-life for storage of wrapped, sterilized instruments and devices (IB) (*243*, *284*).
2. Even for event-related packaging, at a minimum, **place the date of sterilization**, and if multiple sterilizers are used in the facility, the sterilizer used, on the outside of the packaging material to facilitate the retrieval of processed items in the event of a sterilization failure (IB) (*243*,*247*).
3. Examine wrapped packages of sterilized instruments before opening them to ensure the barrier wrap has not been compromised during storage (II) (*243*,*284*).
4. Reclean, repack, and resterilize any instrument package that has been compromised (II).
5. Store sterile items and dental supplies in covered or closed cabinets, if possible (II) (*285*).

VII. Environmental Infection Control

A. General Recommendations

1. Follow the manufacturers' instructions for correct use of cleaning and EPA-registered hospital disinfecting products (IB, IC) (*243--245*).
2. Do not use liquid chemical sterilants/high-level disinfectants for disinfection of environmental surfaces (clinical contact or housekeeping) (IB, IC) (*243--245*).
3. Use PPE, as appropriate, when cleaning and disinfecting environmental surfaces. Such equipment might include gloves (e.g., puncture- and chemical-resistant utility), protective clothing (e.g., gown, jacket, or lab coat), and protective eyewear/face shield, and mask (IC) (*13*,*15*).

B. Clinical Contact Surfaces

1. Use surface barriers to protect clinical contact surfaces, particularly those that are difficult to clean (e.g., switches on dental chairs) and change surface barriers between patients (II) (*1*,*2*,*260*, *288*).
2. Clean and disinfect clinical contact surfaces that are not barrier-protected, by using an EPA-registered hospital disinfectant with a low- (i.e., HIV and HBV label claims) to intermediate-level (i.e., tuberculocidal claim) activity after each patient. Use an intermediate-level disinfectant if visibly contaminated with blood (IB) (*2*,*243*,*244*).

C. Housekeeping Surfaces

1. Clean housekeeping surfaces (e.g., floors, walls, and sinks) with a detergent and water or an EPA-registered hospital disinfectant/detergent on a routine basis, depending on the nature of the surface and type and degree of contamination, and as appropriate, based on the location in the facility, and when visibly soiled (IB) (*243*,*244*).
2. Clean mops and cloths after use and allow to dry before reuse; or use single-use, disposable mop heads or cloths (II) (*243*,*244*).
3. Prepare fresh cleaning or EPA-registered disinfecting solutions daily and as instructed by the manufacturer. (II) (*243*,*244*).
4. Clean walls, blinds, and window curtains in patient-care areas when they are visibly dusty or soiled (II) (*9*,*244*).

D. Spills of Blood and Body Substances

1. Clean spills of blood or OPIM and decontaminate surface with an EPA-registered hospital disinfectant with low- (i.e., HBV and HIV label claims) to intermediate-level (i.e., tuberculocidal claim) activity, depending on size of spill and surface porosity (IB, IC) (*13,113*).

E. Carpet and Cloth Furnishings

1. Avoid using carpeting and cloth-upholstered furnishings in dental operatories, laboratories, and instrument processing areas (II) (*9,293--295*).

F. Regulated Medical Waste

1. General Recommendations

a.Develop a medical waste management program. Disposal of regulated medical waste must follow federal, state, and local regulations (IC) (*13,301*).

b. Ensure that DHCP who handle and dispose of regulated medical waste are trained in appropriate handling and disposal methods and informed of the possible health and safety hazards (IC) (*13*).

2. Management of Regulated Medical Waste in Dental Health-Care Facilities

a.Use a color-coded or labeled container that prevents leakage (e.g., biohazard bag) to contain nonsharp regulated medical waste (IC) (*13*).

b. Place sharp items (e.g., needles, scalpel blades, orthodontic bands, broken metal instruments, and burs) in an appropriate sharps container (e.g., puncture resistant, color-coded, and leakproof). Close container immediately before removal or replacement to prevent spillage or protrusion of contents during handling, storage, transport, or shipping (IC) (*2,8,13,113,115*).

c. Pour blood, suctioned fluids or other liquid waste carefully into a drain connected to a sanitary sewer system, if local sewage discharge requirements are met and the state has declared this an acceptable method of disposal. Wear appropriate PPE while performing this task (IC) (*7,9,13*).

VIII. Dental Unit Waterlines, Biofilm, and Water Quality

A. General Recommendations

1. Use water that meets EPA regulatory standards for drinking water (i.e., ≤500 CFU/mL of heterotrophic water bacteria) for routine dental treatment output water (IB, IC) (*341,342*).

2. Consult with the dental unit manufacturer for appropriate methods and equipment to maintain the recommended quality of dental water (II) (*339*).

3. **Follow recommendations for monitoring water quality provided by the manufacturer of the unit or waterline treatment product (II).**

4. Discharge water and air for a minimum of 20--30 seconds after each patient, from any device connected to the dental water system that enters the patient's mouth (e.g., handpieces, ultrasonic scalers, and air/water syringes) (II) (*2,311,344*).

5. Consult with the dental unit manufacturer on the need for periodic maintenance of antiretraction mechanisms (IB) (*2,311*).

B. Boil-Water Advisories

1. The following apply while a boil-water advisory is in effect:

a. Do not deliver water from the public water system to the patient through the dental operative unit, ultrasonic scaler, or other dental equipment that uses the public water system (IB, IC) (*341,342,346,349,350*).

b. Do not use water from the public water system for dental treatment, patient rinsing, or handwashing (IB, IC) (*341,342,346,349, 350*).

c. For handwashing, use antimicrobial-containing products that do not require water for use (e.g., alcohol-based hand rubs). If hands are visibly contaminated, use bottled water, if available, and soap for handwashing or an antiseptic towelette (IB, IC) (*13,122*).

2. The following apply when the boil-water advisory is cancelled:

a. Follow guidance given by the local water utility regarding adequate flushing of waterlines. If no guidance is provided, flush dental waterlines and faucets for 1--5 minutes before using for patient care (IC) (*244,346, 351,352*).

b. Disinfect dental waterlines as recommended by the dental unit manufacturer (II).

IX. Special Considerations

A. Dental Handpieces and Other Devices Attached to Air and Waterlines

1. **Clean and heat-sterilize handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units between patients (IB, IC)** (*2,246,275,356,357,360,407*).

2. **Follow the manufacturer's instructions for cleaning, lubrication, and sterilization of handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units (IB) (*361--363*).**

3. **Do not surface-disinfect, use liquid chemical sterilants, or ethylene oxide on handpieces and other intraoral instruments that can be removed from the air and waterlines of dental units (IC)** (*2,246,250,275*).

4. Do not advise patients to close their lips tightly around the tip of the saliva ejector to evacuate oral fluids (II) (*364--366*).

B. Dental Radiology

1. Wear gloves when exposing radiographs and handling contaminated film packets. Use other PPE (e.g., protective eyewear, mask, and gown) as appropriate if spattering of blood or other body fluids is likely (IA, IC) (*11,13*).

2. Use heat-tolerant or disposable intraoral devices whenever possible (e.g., film-holding and positioning devices). Clean and heat-sterilize heat-tolerant devices between patients. At a minimum, high-level disinfect semicritical heat-sensitive devices, according to manufacturer's instructions (IB) (*243*).

3. Transport and handle exposed radiographs in an aseptic manner to prevent contamination of developing equipment (II).

4. The following apply for digital radiography sensors:

a. Use FDA-cleared barriers (IB) (*243*).

b. Clean and heat-sterilize, or high-level disinfect, between patients, barrier-protected semicritical items. If the item cannot tolerate these procedures then, at a minimum, protect with an FDA-cleared barrier and clean and disinfect with an EPA-registered hospital disinfectant with intermediate-level (i.e., tuberculocidal claim) activity, between patients. Consult with the manufacturer for methods of disinfection and sterilization of digital radiology sensors and for protection of associated computer hardware (IB) (*243*).

C. Aseptic Technique for Parenteral Medications

1. Do not administer medication from a syringe to multiple patients, even if the needle on the syringe is changed (IA) (*378*). 2. Use single-dose vials for parenteral medications when possible (II) (*376,377*).

3. Do not combine the leftover contents of single-use vials for later use (IA) (*376,377*).

4. The following apply if multidose vials are used:

a. Cleanse the access diaphragm with 70% alcohol before inserting a device into the vial

(IA) (*380,381*).

b. Use a sterile device to access a multiple-dose vial and avoid touching the access diaphragm. Both the needle and syringe used to access the multidose vial should be sterile. Do not reuse a syringe even if the needle is changed (IA) (*380,381*).

c. Keep multidose vials away from the immediate patient treatment area to prevent inadvertent contamination by spray or spatter (II).

d. Discard the multidose vial if sterility is compromised (IA) (*380,381*).

5. Use fluid infusion and administration sets (i.e., IV bags, tubings and connections) for one patient only and dispose of appropriately (IB) (*378*).

D. Single-Use (Disposable) Devices

1. Use single-use devices for one patient only and dispose of them appropriately (IC) (*383*).

E. Preprocedural Mouth Rinses

1. No recommendation is offered regarding use of preprocedural antimicrobial mouth rinses to prevent clinical infections among DHCP or patients. Although studies have demonstrated that a preprocedural antimicrobial rinse (e.g., chlorhexidine gluconate, essential oils, or povidone-iodine) can reduce the level of oral microorganisms in aerosols and spatter generated during routine dental procedures and can decrease the number of microorganisms introduced in the patient's bloodstream during invasive dental procedures (*391--399*), the scientific evidence is inconclusive that using these rinses prevents clinical infections among DHCP or patients (see discussion, Preprocedural Mouth Rinses) (Unresolved issue).

F. Oral Surgical Procedures

1. The following apply when performing oral surgical procedures:

a. Perform surgical hand antisepsis by using an antimicrobial product (e.g., antimicrobial soap and water, or soap and water followed by alcohol-based hand scrub with persistent activity) before donning sterile surgeon's gloves (IB) (*127--132,137*). b. Use sterile surgeon's gloves (IB) (*2,7,121,* *123,137*).

c. Use sterile saline or sterile water as a coolant/irrigatant when performing oral surgical procedures. Use devices specifically designed for delivering sterile irrigating fluids (e.g., bulb syringe, single-use disposable products, and sterilizable tubing) (IB) (*2,121*).

G. Handling of Biopsy Specimens

1. During transport, place biopsy specimens in a sturdy, leakproof container labeled with the biohazard symbol (IC) (*2,13,14*).

2. If a biopsy specimen container is visibly contaminated, clean and disinfect the outside of a container or place it in an impervious bag labeled with the biohazard symbol, (IC) (*2,13*).

H. Handling of Extracted Teeth

1. Dispose of extracted teeth as regulated medical waste unless returned to the patient (IC) (*13,14*).

2. Do not dispose of extracted teeth containing amalgam in regulated medical waste intended for incineration (II).

3. Clean and place extracted teeth in a leakproof container, labeled with a biohazard symbol, and maintain hydration for transport to educational institutions or a dental laboratory (IC) (*13,14*).

4. Heat-sterilize teeth that do not contain amalgam before they are used for educational purposes (IB) (*403,405,406*).

I. Dental Laboratory

1. Use PPE when handling items received in the laboratory until they have been decontaminated (IA, IC) (*2,7,11,13,113*). 2. Before they are handled in the laboratory, clean, disinfect, and rinse all dental prostheses and prosthodontic materials (e.g., impressions, bite registrations, occlusal rims, and extracted teeth) by using an EPA-registered hospital disinfectant having at least an intermediate-level (i.e., tuberculocidal claim) activity (IB) (*2,249,252,407*).

3. Consult with manufacturers regarding the stability of specific materials (e.g., impression materials) relative to disinfection procedures (II).

4. Include specific information regarding disinfection techniques used (e.g., solution used and duration), when laboratory cases are sent off-site and on their return (II) (*2,407,409*).

5. Clean and heat-sterilize heat-tolerant items used in the mouth (e.g., metal impression trays and face-bow forks) (IB) (*2,407*).

6. Follow manufacturers' instructions for cleaning and sterilizing or disinfecting items that become contaminated but do not normally contact the patient (e.g., burs, polishing points, rag wheels, articulators, case pans, and lathes). If manufacturer instructions are unavailable, clean and heat-sterilize heat-tolerant items or clean and disinfect with an EPA-registered hospital disinfectant with low- (HIV, HBV effectiveness claim) to intermediate-level (tuberculocidal claim) activity, depending on the degree of contamination (II).

J. Laser/Electrosurgery Plumes/Surgical Smoke

1. No recommendation is offered regarding practices to reduce DHCP exposure to laser plumes/surgical smoke when using lasers in dental practice. Practices to reduce HCP exposure to laser plumes/surgical smoke have been suggested, including use of a) standard precautions (e.g., high-filtration surgical masks and possibly full face shields) (*437*); b) central room suction units with in-line filters to collect particulate matter from minimal plumes; and c) dedicated mechanical smoke exhaust systems with a high-efficiency filter to remove substantial amounts of laser-plume particles. The effect of the exposure (e.g., disease transmission or adverse respiratory effects) on DHCP from dental applications of lasers has not been adequately evaluated (see previous discussion, Laser/Electrosurgery Plumes or Surgical Smoke) (Unresolved issue).

K. Mycobacterium tuberculosis

1. General Recommendations

   a. Educate all DHCP regarding the recognition of signs, symptoms, and transmission of TB (IB) (*20,21*).

   b. Conduct a baseline TST, preferably by using a two-step test, for all DHCP who might have contact with persons with suspected or confirmed active TB, regardless of the risk classification of the setting (IB) (*20*).

   c. Assess each patient for a history of TB as well as symptoms indicative of TB and document on the medical history form (IB) (*20,21*).

   d. Follow CDC recommendations for 1) developing, maintaining, and implementing a written TB infection-control plan; 2) managing a patient with suspected or active TB; 3) completing a community risk-assessment to guide employee TSTs and follow-up; and 4) managing DHCP with TB disease (IB) (*2,21*).

2. The following apply for patients known or suspected to have active TB:

   a. Evaluate the patient away from other patients and DHCP. When not being evaluated, the patient should wear a surgical mask or be instructed to cover mouth and nose when coughing or sneezing (IB) (*20,21*).

   b. Defer elective dental treatment until the patient is noninfectious (IB) (*20,21*).

c. Refer patients requiring urgent dental treatment to a previously identified facility with TB engineering controls and a respiratory protection program (IB) (*20*,*21*).

L. Creutzfeldt-Jakob Disease (CJD) and Other Prion Diseases

1. No recommendation is offered regarding use of special precautions in addition to standard precautions when treating known CJD or vCJD patients. Potential infectivity of oral tissues in CJD or vCJD patients is an unresolved issue. Scientific data indicate the risk, if any, of sporadic CJD transmission during dental and oral surgical procedures is low to nil. Until additional information exists regarding the transmissibility of CJD or vCJD during dental procedures, special precautions in addition to standard precautions might be indicated when treating known CJD or vCJD patients; a list of such precautions is provided for consideration without recommendation (see Creutzfeldt-Jakob Disease and Other Prion Diseases) (Unresolved issue).

M. Program Evaluation

1. Establish routine evaluation of the infection-control program, including evaluation of performance indicators, at an established frequency (II) (*470-471*).

XXVI. Infection-Control Internet Resources

Advisory Committee on Immunization Practices
http://www.cdc.gov/nip/ACIP/default.htm
American Dental Association
http://www.ada.org
American Institute of Architects Academy of Architecture for Health
http://www.aahaia.org
American Society of Heating, Refrigeration, Air-conditioning Engineers
http://www.ashrae.org
Association for Professionals in Infection Control and Epidemiology, Inc.
http://www.apic.org/resc/guidlist.cfm
CDC, Division of Healthcare Quality Promotion
http://www.cdc.gov/ncidod/hip
CDC, Division of Oral Health, Infection Control
http://www.cdc.gov/OralHealth/infectioncontrol/index.htm
CDC, *Morbidity and Mortality Weekly Report*
http://www.cdc.gov/mmwr
CDC, NIOSH
http://www.cdc.gov/niosh/homepage.html
CDC Recommends, Prevention Guidelines System
http://www.phppo.cdc.gov/cdcRecommends/AdvSearchV.asp
EPA, Antimicrobial Chemicals
http://www.epa.gov/oppad001/chemregindex.htm
FDA
http://www.fda.gov
Immunization Action Coalition
http://www.immunize.org/acip
Infectious Diseases Society of America
http://www.idsociety.org/PG/toc.htm

OSHA, Dentistry, Bloodborne Pathogens
http://www.osha.gov/SLTC/dentistry/index.html
http://www.osha.gov/SLTC/bloodbornepathogens/index.html

Organization for Safety and Asepsis Procedures
http://www.osap.org
Society for Healthcare Epidemiology of America, Inc., Position Papers
http://www.shea-online.org/PositionPapers.html

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XXVIII. References

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TABLE 1. Suggested work restrictions for health-care personnel infected with or exposed to major infectious diseases in health-care settings, in the absence of state and local regulations*

Disease/problem	Work restriction	Duration
Conjunctivitis	Restrict from patient contact and contact with patient's environment.	Until discharge ceases
Cytomegalovirus infection	No restriction	
Diarrheal disease		
Acute stage (diarrhea with other symptoms)	Restrict from patient contact, contact with patient's environment, and food-handling.	Until symptoms resolve
Convalescent stage, *Salmonella* species	Restrict from care of patients at high risk.	Until symptoms resolve; consult with local and state health authorities regarding need for negative stool cultures
Enteroviral infection	Restrict from care of infants, neonates, and immunocompromised patients and their environments.	Until symptoms resolve
Hepatitis A	Restrict from patient contact, contact with patient's environment, and food-handling.	Until 7 days after onset of jaundice
Hepatitis B		
Personnel with acute or chronic hepatitis B surface antigenemia who do not perform exposure-prone procedures	No restriction†; refer to state regulations. Standard precautions should always be followed.	
Personnel with acute or chronic hepatitis B e antigenemia who perform exposure-prone procedures	Do not perform exposure-prone invasive procedures until counsel from a review panel has been sought; panel should review and recommend procedures that personnel can perform, taking into account specific procedures as well as skill and technique. Standard precautions should always be observed. Refer to state and local regulations or recommendations.	Until hepatitis B e antigen is negative
Hepatitis C	No restrictions on professional activity.† HCV-positive health-care personnel should follow aseptic technique and standard precautions.	
Herpes simplex		
Genital	No restriction	
Hands (herpetic whitlow)	Restrict from patient contact and contact with patient's environment.	Until lesions heal
Orofacial	Evaluate need to restrict from care of patients at high risk.	
Human immunodeficiency virus; personnel who perform exposure-prone procedures	Do not perform exposure-prone invasive procedures until counsel from an expert review panel has been sought; panel should review and recommend procedures that personnel can perform, taking into account specific procedures as well as skill and technique. Standard precautions should always be observed. Refer to state and local regulations or recommendations.	
Measles		
Active	Exclude from duty	Until 7 days after the rash appears
Postexposure (susceptible personnel)	Exclude from duty	From fifth day after first exposure through twenty-first day after last exposure, or 4 days after rash appears
Meningococcal infection	Exclude from duty	Until 24 hours after start of effective therapy
Mumps		
Active	Exclude from duty	Until 9 days after onset of parotitis
Postexposure (susceptible personnel)	Exclude from duty	From twelfth day after first exposure through twenty-sixth day after last exposure, or until 9 days after onset of parotitis

Source: Adapted from Bolyard EA, Hospital Infection Control Practices Advisory Committee. Guidelines for infection control in health care personnel, 1998. Am J Infect Control 1998;26:289–354.

* Modified from recommendations of the Advisory Committee on Immunization Practices (ACIP).

† Unless epidemiologically linked to transmission of infection.

§ Those susceptible to varicella and who are at increased risk of complications of varicella (e.g., neonates and immunocompromised persons of any age).

¶ Patients at high risk as defined by ACIP for complications of influenza.

TABLE 1. (*Continued*) Suggested work restrictions for health-care personnel infected with or exposed to major infectious diseases in health-care settings, in the absence of state and local regulations*

Disease/problem	Work restriction	Duration
Pediculosis	Restrict from patient contact	Until treated and observed to be free of adult and immature lice
Pertussis		
Active	Exclude from duty	From beginning of catarrhal stage through third week after onset of paroxysms, or until 5 days after start of effective antibiotic therapy
Postexposure (asymptomatic personnel)	No restriction, prophylaxis recommended	
Postexposure (symptomatic personnel)	Exclude from duty	Until 5 days after start of effective antibiotic therapy
Rubella		
Active	Exclude from duty	Until 5 days after rash appears
Postexposure (susceptible personnel)	Exclude from duty	From seventh day after first exposure through twenty-first day after last exposure
Staphylococcus aureus infection		
Active, draining skin lesions	Restrict from contact with patients and patient's environment or food handling.	Until lesions have resolved
Carrier state	No restriction unless personnel are epidemiologically linked to transmission of the organism	
Streptococcal infection, group A	Restrict from patient care, contact with patient's environment, and food-handling.	Until 24 hours after adequate treatment started
Tuberculosis		
Active disease	Exclude from duty	Until proved noninfectious
PPD converter	No restriction	
Varicella (chicken pox)		
Active	Exclude from duty	Until all lesions dry and crust
Postexposure (susceptible personnel)	Exclude from duty	From tenth day after first exposure through twenty-first day (twenty-eighth day if varicella-zoster immune globulin [VZIG] administered) after last exposure.
Zoster (shingles)		
Localized, in healthy person	Cover lesions, restrict from care of patients§ at high risk	Until all lesions dry and crust
Generalized or localized in immunosuppressed person	Restrict from patient contact	Until all lesions dry and crust
Postexposure (susceptible personnel)	Restrict from patient contact	From tenth day after first exposure through twenty-first day (twenty-eighth day if VZIG administered) after last exposure; or, if varicella occurs, when lesions crust and dry
Viral respiratory infection, acute febrile	Consider excluding from the care of patients at high risk¶ or contact with such patients' environments during community outbreak of respiratory syncytial virus and influenza	Until acute symptoms resolve

Source: Adapted from Bolyard EA, Hospital Infection Control Practices Advisory Committee. Guidelines for infection control in health care personnel, 1998. Am J Infect Control 1998;26:289–354.

* Modified from recommendations of the Advisory Committee on Immunization Practices (ACIP).

† Unless epidemiologically linked to transmission of infection.

§ Those susceptible to varicella and who are at increased risk of complications of varicella (e.g., neonates and immunocompromised persons of any age).

¶ Patients at high risk as defined by ACIP for complications of influenza.

TABLE 2. Hand-hygiene methods and indications

Method	Agent	Purpose	Duration (minimum)	Indication*
Routine handwash	Water and nonantimicrobial soap (e.g., plain soap†)	Remove soil and transient microorganisms	15 seconds§	Before and after treating each patient (e.g., before glove placement and after glove removal). After barehanded touching of inanimate objects likely to be contaminated by blood or saliva. Before leaving the dental operatory or the dental laboratory. When visibly soiled.¶ Before regloving after removing gloves that are torn, cut, or punctured.
Antiseptic handwash	Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident flora	15 seconds§	
Antiseptic hand rub	Alcohol-based hand rub¶	Remove or destroy transient microorganisms and reduce resident flora	Rub hands until the agent is dry¶	
Surgical antisepsis	Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan) Water and non-antimicrobial soap (e.g., plain soap†) followed by an alcohol-based surgical hand-scrub product with persistent activity	Remove or destroy transient microorganisms and reduce resident flora (persistent effect)	2–6 minutes Follow manufacturer instructions for surgical hand-scrub product with persistent activity¶**	Before donning sterile surgeon's gloves for surgical procedures††

* (*7,9,11,13,113,120–123,125,126,136–138*).

† Pathogenic organisms have been found on or around bar soap during and after use (*139*). Use of liquid soap with hands-free dispensing controls is preferable.

§ Time reported as effective in removing most transient flora from the skin. For most procedures, a vigorous rubbing together of all surfaces of premoistened lathered hands and fingers for ≥15 seconds, followed by rinsing under a stream of cool or tepid water is recommended (*9,120,123,140,141*). Hands should always be dried thoroughly before donning gloves.

¶ Alcohol-based hand rubs should contain 60%–95% ethanol or isopropanol and should not be used in the presence of visible soil or organic material. If using an alcohol-based hand rub, apply adequate amount to palm of one hand and rub hands together, covering all surfaces of the hands and fingers, until hands are dry. Follow manufacturer's recommendations regarding the volume of product to use. If hands feel dry after rubbing them together for 10–15 seconds, an insufficient volume of product likely was applied. The drying effect of alcohol can be reduced or eliminated by adding 1%–3% glycerol or other skin-conditioning agents (*123*).

** After application of alcohol-based surgical hand-scrub product with persistent activity as recommended, allow hands and forearms to dry thoroughly and immediately don sterile surgeon's gloves (*144,145*). Follow manufacturer instructions (*122,123,137,146*).

†† Before beginning surgical hand scrub, remove all arm jewelry and any hand jewelry that may make donning gloves more difficult, cause gloves to tear more readily (*142,143*), or interfere with glove usage (e.g., ability to wear the correct-sized glove or altered glove integrity).

TABLE 3. Glove types and indications

Glove	Indication	Comment	Commercially available glove materials*	
			Material	Attributes†
Patient examination gloves§	Patient care, examinations, other nonsurgical procedures involving contact with mucous membranes, and laboratory procedures	Medical device regulated by the Food and Drug Administration (FDA). Nonsterile and sterile single-use disposable. Use for one patient and discard appropriately.	Natural-rubber latex (NRL) Nitrile Nitrile and chloroprene (neoprene) blends Nitrile & NRL blends Butadiene methyl methacrylate Polyvinyl chloride (PVC, vinyl) Polyurethane Styrene-based copolymer	1, 2 2, 3 2, 3 1, 2, 3 2, 3 4 4 4, 5
Surgeon's gloves§	Surgical procedures	Medical device regulated by the FDA. Sterile and single-use disposable. Use for one patient and discard appropriately.	NRL Nitrile Chloroprene (neoprene) NRL and nitrile or chloroprene blends Synthetic polyisoprene Styrene-based copolymer Polyurethane	1, 2 2, 3 2, 3 2, 3 2 4, 5 4
Nonmedical gloves	Housekeeping procedures (e.g., cleaning and disinfection) Handling contaminated sharps or chemicals Not for use during patient care	Not a medical device regulated by the FDA. Commonly referred to as utility, industrial, or general purpose gloves. Should be puncture- or chemical-resistant, depending on the task. Latex gloves do not provide adequate chemical protection. Sanitize after use.	NRL and nitrile or chloroprene blends Chloroprene (neoprene) Nitrile Butyl rubber Fluoroelastomer Polyethylene and ethylene vinyl alcohol copolymer	2, 3 2, 3 2, 3 2, 3 3, 4, 6 3, 4, 6

* Physical properties can vary by material, manufacturer, and protein and chemical composition.

† 1 contains allergenic NRL proteins.
2 vulcanized rubber, contains allergenic rubber processing chemicals.
3 likely to have enhanced chemical or puncture resistance.
4 nonvulcanized and does not contain rubber processing chemicals.
5 inappropriate for use with methacrylates.
6 resistant to most methacrylates.

§ Medical or dental gloves include patient-examination gloves and surgeon's (i.e., surgical) gloves and are medical devices regulated by the FDA. Only FDA-cleared medical or dental patient-examination gloves and surgical gloves can be used for patient care.

TABLE 4. Infection-control categories of patient-care instruments

Category	Definition	Dental instrument or item
Critical	Penetrates soft tissue, contacts bone, enters into or contacts the bloodstream or other normally sterile tissue.	Surgical instruments, periodontal scalers, scalpel blades, surgical dental burs
Semicritical	Contacts mucous membranes or nonintact skin; will not penetrate soft tissue, contact bone, enter into or contact the bloodstream or other normally sterile tissue.	Dental mouth mirror, amalgam condenser, reusable dental impression trays, dental handpieces*
Noncritical	Contacts intact skin.	Radiograph head/cone, blood pressure cuff, facebow, pulse oximeter

* Although dental handpieces are considered a semicritical item, they should always be heat-sterilized between uses and not high-level disinfected (*246*). See Dental Handpieces and Other Devices Attached to Air or Waterlines for detailed information.

TABLE 5. Examples of methods for evaluating infection-control programs

Program element	Evaluation activity
Appropriate immunization of dental health-care personnel (DHCP).	Conduct annual review of personnel records to ensure up-to-date immunizations.
Assessment of occupational exposures to infectious agents.	Report occupational exposures to infectious agents. Document the steps that occurred around the exposure and plan how such exposure can be prevented in the future.
Comprehensive postexposure management plan and medical follow-up program after occupational exposures to infectious agents.	Ensure the postexposure management plan is clear, complete, and available at all times to all DHCP. All staff should understand the plan, which should include toll-free phone numbers for access to additional information.
Adherence to hand hygiene before and after patient care.	Observe and document circumstances of appropriate or inappropriate handwashing. Review findings in a staff meeting.
Proper use of personal protective equipment to prevent occupational exposures to infectious agents.	Observe and document the use of barrier precautions and careful handling of sharps. Review findings in a staff meeting.
Routine and appropriate sterilization of instruments using a biologic monitoring system.	Monitor paper log of steam cycle and temperature strip with each sterilization load, and examine results of weekly biologic monitoring. Take appropriate action when failure of sterilization process is noted.
Evaluation and implementation of safer medical devices.	Conduct an annual review of the exposure control plan and consider new developments in safer medical devices.
Compliance of water in routine dental procedures with current drinking U.S. Environmental Protection Agency water standards (fewer than 500 CFU of heterotrophic water bacteria).	Monitor dental water quality as recommended by the equipment manufacturer, using commercial self-contained test kits, or commercial water-testing laboratories.
Proper handling and disposal of medical waste.	Observe the safe disposal of regulated and nonregulated medical waste and take preventive measures if hazardous situations occur.
Health-care–associated infections.	Assess the unscheduled return of patients after procedures and evaluate them for an infectious process. A trend might require formal evaluation.

BOX. Dental infection-control research considerations

Education and promotion

- Design strategies to communicate, to the public and providers, the risk of disease transmission in dentistry.
- Promote use of protocols for recommended postexposure management and follow-up.
- Educate and train dental health-care personnel (DHCP) to screen and evaluate safer dental devices by using tested design and performance criteria.

Laboratory-based research

- Develop animal models to determine the risk of transmitting organisms through inhalation of contaminated aerosols (e.g., influenza) produced from rotary dental instruments.
- Conduct studies to determine the effectiveness of gloves (i.e., material compatibility and duration of use).
- Develop devices with passive safety features to prevent percutaneous injuries.
- Study the effect of alcohol-based hand-hygiene products on retention of latex proteins and other dental allergens (e.g., methylmethacrylate, glutaraldehyde, thiurams) on the hands of DHCP after latex glove use.
- Investigate the applicability of other types of sterilization procedures (e.g., hydrogen peroxide gas plasma) in dentistry.
- Encourage manufacturers to determine optimal methods and frequency for testing dental-unit waterlines and maintaining dental-unit water-quality standards.
- Determine the potential for internal contamination of low-speed handpieces, including the motor, and other devices connected to dental air and water supplies, as well as more efficient ways to clean, lubricate, and sterilize handpieces and other devices attached to air or waterlines.
- Investigate the infectivity of oral tissues in Creutzfeldt-Jakob disease (CJD) or variant CJD patients.
- Determine the most effective methods to disinfect dental impression materials.
- Investigate the viability of pathogenic organisms on dental materials (e.g., impression materials, acrylic resin, or gypsum materials) and dental laboratory equipment.
- Determine the most effective methods for sterilization or disinfection of digital radiology equipment.
- Evaluate the effects of repetitive reprocessing cycles on burs and endodontic files.
- Investigate the potential infectivity of vapors generated from the various lasers used for oral procedures.

Clinical and population-based epidemiologic research and development

- Continue to characterize the epidemiology of blood contacts, particularly percutaneous injuries, and the effectiveness of prevention measures.
- Further assess the effectiveness of double gloving in preventing blood contact during routine and surgical dental procedures.
- Continue to assess the stress placed on gloves during dental procedures and the potential for developing defects during different procedures.
- Develop methods for evaluating the effectiveness and cost-effectiveness of infection-control interventions.
- Determine how infection-control guidelines affect the knowledge, attitudes, and practices of DHCP.

Appendix A
Regulatory Framework for Disinfectants and Sterilants

When using the guidance provided in this report regarding use of liquid chemical disinfectants and sterilants, dental health-care personnel (DHCP) should be aware of federal laws and regulations that govern the sale, distribution, and use of these products. In particular, DHCPs should know what requirements pertain to them when such products are used. Finally, DHCP should understand the relative roles of the U.S. Environmental Protection Agency (EPA), the U.S. Food and Drug Administration (FDA), the Occupational Safety and Health Administration (OSHA) and CDC.

The choice of specific cleaning or disinfecting agents is largely a matter of judgment, guided by product label claims and instructions and government regulations. A single liquid chemical germicide might not satisfy all disinfection requirements in a given dental practice or facility. Realistic use of liquid chemical germicides depends on consideration of multiple factors, including the degree of microbial killing required; the nature and composition of the surface, item, or device to be treated; and the cost, safety, and ease of use of the available agents. Selecting one appropriate product with a higher degree of potency to cover all situations might be more convenient.

In the United States, liquid chemical germicides (disinfectants) are regulated by EPA and FDA (*A-1--A-3*). In health-care settings, EPA regulates disinfectants that are used on environmental surfaces (housekeeping and clinical contact surfaces), and FDA regulates liquid chemical sterilants/high-level disinfectants (e.g., glutaraldehyde, hydrogen peroxide, and peracetic acid) used on critical and semicritical patient-care devices. Disinfectants intended for use on clinical contact surfaces (e.g., light handles, radiographic-ray heads, or drawer knobs) or housekeeping surfaces (e.g., floors, walls, or sinks) are regulated in interstate commerce by the Antimicrobials Division, Office of Pesticide Programs, EPA, under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, as amended in 1996 (*A-4*). Under FIFRA, any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any pest, including microorganisms but excluding those in or on living man or animals, must be registered before sale or distribution. To obtain a registration, a manufacturer must submit specific data regarding the safety and the effectiveness of each product.

EPA requires manufacturers to test formulations by using accepted methods for microbicidal activity, stability, and toxicity to animals and humans. Manufacturers submit these data to EPA with proposed labeling. If EPA concludes a product may be used without causing unreasonable adverse effects, the product and its labeling are given an EPA registration number, and the manufacturer may then sell and distribute the product in the United States. FIFRA requires users of products to follow the labeling directions on each product explicitly. The following statement appears on all EPA-registered product labels under the Directions for Use heading: "It is a violation of federal law to use this product inconsistent with its labeling." This means that DHCP must follow the safety precautions and use directions on the labeling of each registered product. Not following the specified dilution, contact time, method of application, or any other condition of use is considered misuse of the product.

FDA, under the authority of the 1976 Medical Devices Amendment to the Food, Drug, and Cosmetic Act, regulates chemical germicides if they are advertised and marketed for use on specific medical devices (e.g., dental unit waterline or flexible endoscope). A liquid chemical germicide marketed for use on a specific device is considered, for regulatory purposes, a medical device itself when used to disinfect that specific medical device. Also, this FDA regulatory authority over a particular instrument or device dictates that the manufacturer is obligated to provide the user with adequate instructions for the safe and effective use of that

device. These instructions must include methods to clean and disinfect or sterilize the item if it is to be marketed as a reusable medical device.

OSHA develops workplace standards to help ensure safe and healthful working conditions in places of employment. OSHA is authorized under Pub. L. 95-251, and as amended, to enforce these workplace standards. In 1991, OSHA published Occupational Exposure to Bloodborne Pathogens; final rule [29 CFR Part 1910.1030] (*A-5*). This standard is designed to help prevent occupational exposures to blood or other potentially infectious substances. Under this standard, OSHA has interpreted that, to decontaminate contaminated work surfaces, either an EPA-registered hospital tuberculocidal disinfectant or an EPA-registered hospital disinfectant labeled as effective against human immunodeficiency virus (HIV) and hepatitis B virus (HBV) is appropriate. Hospital disinfectants with such HIV and HBV claims can be used, provided surfaces are not contaminated with agents or concentration of agents for which higher level (i.e., intermediate-level) disinfection is recommended. In addition, as with all disinfectants, effectiveness is governed by strict adherence to the label instructions for intended use of the product.

CDC is not a regulatory agency and does not test, evaluate, or otherwise recommend specific brand-name products of chemical germicides. This report is intended to provide overall guidance for providers to select general classifications of products based on certain infection-control principles. In this report, CDC provides guidance to practitioners regarding appropriate application of EPA- and FDA-registered liquid chemical disinfectants and sterilants in dental health-care settings.

CDC recommends disinfecting environmental surfaces or sterilizing or disinfecting medical equipment, and DHCP should use products approved by EPA and FDA unless no such products are available for use against certain microorganisms or sites. However, if no registered or approved products are available for a specific pathogen or use situation, DHCP are advised to follow the specific guidance regarding unregistered or unapproved (e.g., off-label) uses for various chemical germicides. For example, no antimicrobial products are registered for use specifically against certain emerging pathogens (e.g., Norwalk virus), potential terrorism agents (e.g., variola major or *Yersinia pestis*), or Creutzfeldt-Jakob disease agents.

One point of clarification is the difference in how EPA and FDA classify disinfectants. FDA adopted the same basic terminology and classification scheme as CDC to categorize medical devices (i.e., critical, semicritical, and noncritical) and to define antimicrobial potency for processing surfaces (i.e., sterilization, and high-, intermediate- and low-level disinfection) (*A-6*). EPA registers environmental surface disinfectants based on the manufacturer's microbiological activity claims when registering its disinfectant. This difference has led to confusion on the part of users because the EPA does not use the terms intermediate- and low-level disinfectants as used in CDC guidelines.

CDC designates any EPA-registered hospital disinfectant without a tuberculocidal claim as a low-level disinfectant and any EPA-registered hospital disinfectant with a tuberculocidal claim as an intermediate-level disinfectant. To understand this comparison, one needs to know how EPA registers disinfectants. First, to be labeled as an EPA hospital disinfectant, the product must pass Association of Official Analytical Chemists (AOAC) effectiveness tests against three target organisms: *Salmonella choleraesuis* for effectiveness against gram-negative bacteria; *Staphylococcus aureus* for effectiveness against gram-positive bacteria; and *Pseudomonas aeruginosa* for effectiveness against a primarily nosocomial pathogen. Substantiated label claims of effectiveness of a disinfectant against specific microorganisms other than the test microorganisms are permitted, but not required, provided that the test microorganisms are likely to be present in or on the recommended use areas and surfaces. Therefore, manufacturers might also test specifically against organisms of known concern in health-care practices (e.g., HIV, HBV, hepatitis C virus [HCV], and herpes) although it is considered likely that any product satisfying AOAC tests for hospital disinfectant designation will also be

effective against these relatively fragile organisms when the product is used as directed by the manufacturer.

Potency against *Mycobacterium tuberculosis* has been recognized as a substantial benchmark. However, the tuberculocidal claim is used only as a benchmark to measure germicidal potency. Tuberculosis is not transmitted via environmental surfaces but rather by the airborne route. Accordingly, use of such products on environmental surfaces plays no role in preventing the spread of tuberculosis. However, because mycobacteria have among the highest intrinsic levels of resistance among the vegetative bacteria, viruses, and fungi, any germicide with a tuberculocidal claim on the label is considered capable of inactivating a broad spectrum of pathogens, including such less-resistant organisms as bloodborne pathogens (e.g., HBV, HCV, and HIV). It is this broad-spectrum capability, rather than the product's specific potency against mycobacteria, that is the basis for protocols and regulations dictating use of tuberculocidal chemicals for surface disinfection.

EPA also lists disinfectant products according to their labeled use against these organisms of interest as follows:

- List B. Tuberculocide products effective against *Mycobacterium* species.
- List C. Products effective against human HIV-1 virus.
- List D. Products effective against human HIV-1 virus and HBV.
- List E. Products effective against *Mycobacterium* species, human HIV-1 virus, and HBV.
- List F. Products effective against HCV.

Microorganisms vary in their resistance to disinfection and sterilization, enabling CDC's designation of disinfectants as high-, intermediate-, and low-level, when compared with EPA's designated organism spectrum (Figure). However, exceptions to this general guide exist, and manufacturer's label claims and instructions should always be followed.

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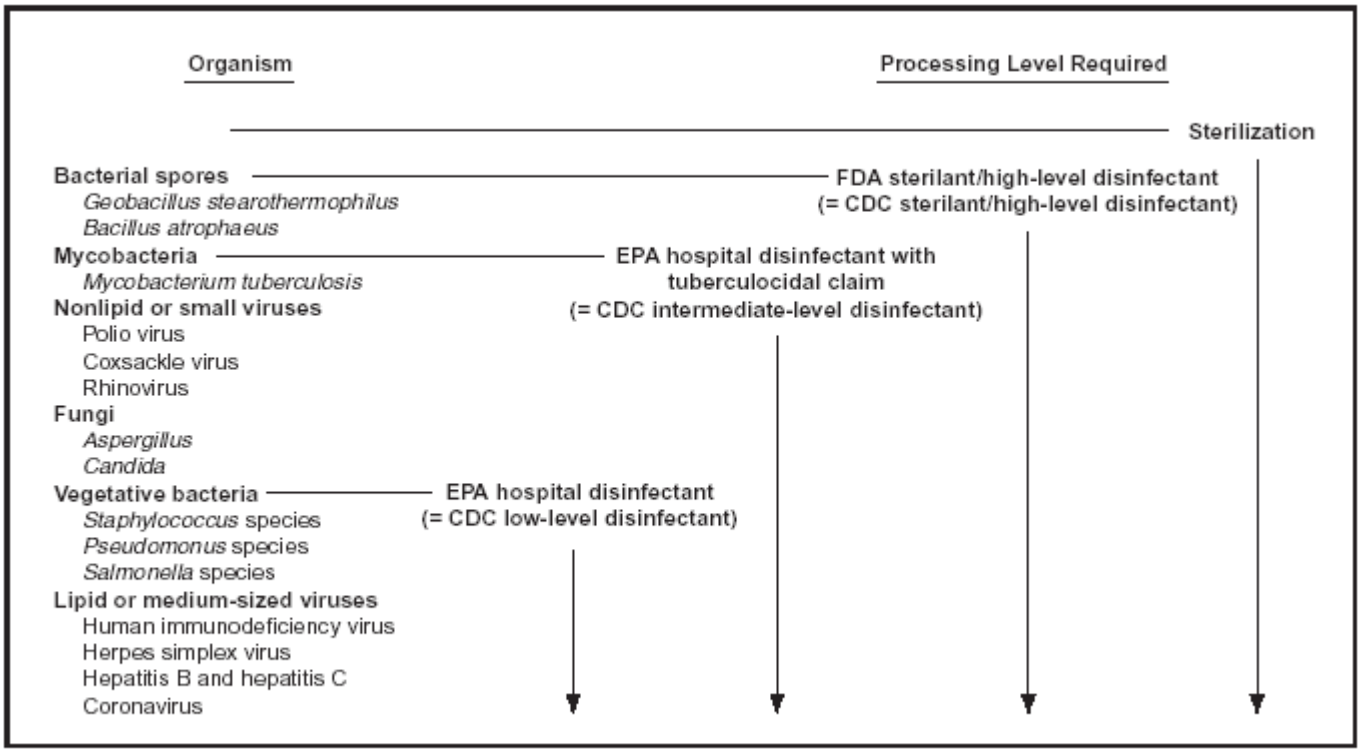
Figure

FIGURE. Decreasing order of resistance of microorganisms to germicidal chemicals



Source: Adapted from Bond WW, Ott BJ, Franke K, McCracken JE. Effective use of liquid chemical germicides on medical devices; instrument design problems. In: Block SS, ed. Disinfection, sterilization and preservation. 4th ed. Philadelphia, PA: Lea & Gebiger, 1991:1100.

Appendix B
Immunizations Strongly Recommended for Health-Care Personnel (HCP)

Vaccine	Dose schedule	Indications	Major precautions and contraindications	Special considerations
Hepatitis B recombinant vaccine*	Three-dose schedule administered intramuscularly (IM) in the deltoid; 0,1,6 - second dose administered 1 month after first dose; third dose administered 4 months after second. Booster doses are not necessary for persons who have developed adequate antibodies to hepatitis B surface antigen (anti-HBs).	Health-care personnel (HCP) at risk for exposure to blood and body fluids.	History of anaphylactic reaction to common baker's yeast. Pregnancy is not a contraindication.	No therapeutic or adverse effects on hepatitis B virus (HBV)-infected persons; cost-effectiveness of prevaccination screening for susceptibility to HBV depends on costs of vaccination and antibody testing and prevalence of immunity in the group of potential vaccinees; health-care personnel who have ongoing contact with patients or blood should be tested 1–2 months after completing the vaccination series to determine serologic response. If vaccination does not induce adequate anti-HBs (>10 mIU/mL), a second vaccine series should be administered.
Influenza vaccine (inactivated)¶	Annual single-dose vaccination IM with current vaccine.	HCP who have contact with patients at high risk or who work in chronic-care facilities; HCP aged ≥50 years or who have high-risk medical conditions.	History of anaphylactic hypersensitivity to eggs or to other components of the vaccine.	Recommended for women who will be in the second or third trimesters of pregnancy during the influenza season and women in any stage of pregnancy who have chronic medical conditions that are associated with an increased risk of influenza.§
Measles live-virus vaccine	One dose administered subcutaneously (SC); second dose ≥4 weeks later.	HCP who were born during or after 1957 without documentation of 1) receipt of 2 doses of live vaccine on or after their first birthday, 2) physician-diagnosed measles, or 3) laboratory evidence of immunity. Vaccine should also be considered for all HCP who have no proof of immunity, including those born before 1957.	Pregnancy; immunocompromised† state (including human immunodeficiency virus [HIV]-infected persons with severe immunosuppression); history of anaphylactic reactions after gelatin ingestion or receipt of neomycin; or recent receipt of antibody-containing blood products.	Measles, mumps, rubella (MMR) is the recommended vaccine, if recipients are also likely to be susceptible to rubella or mumps; persons vaccinated during 1963–1967 with 1) measles killed-virus vaccine alone, 2) killed-virus vaccine followed by live-virus vaccine, or 3) a vaccine of unknown type, should be revaccinated with two doses of live-virus measles vaccine.
Mumps live-virus vaccine	One dose SC; no booster.	HCP believed susceptible can be vaccinated; adults born before 1957 can be considered immune.	Pregnancy; immunocompromised† state; history of anaphylactic reaction after gelatin ingestion or receipt of neomycin.	MMR is the recommended vaccine.
Rubella live-virus vaccine	One dose SC; no booster.	HCP, both male and female, who lack documentation of receipt of live vaccine on or after their first birthday, or lack of laboratory evidence of immunity can be vaccinated. Adults born before 1957 can be considered immune, except women of childbearing age.	Pregnancy; immunocompromised† state; history of anaphylactic reaction after receipt of neomycin.	Women pregnant when vaccinated or who become pregnant within 4 weeks of vaccination should be counseled regarding theoretic risks to the fetus; however, the risk of rubella vaccine-associated malformations among these women is negligible. MMR is the recommended vaccine.
Varicella-zoster live-virus vaccine	Two 0.5 mL doses SC 4–8 weeks apart if aged ≥13 years.	HCP without reliable history of varicella or laboratory evidence of varicella immunity.	Pregnancy; immunocompromised† state; history of anaphylactic reaction after receipt of neomycin or gelatin; recent receipt of antibody-containing blood products; salicylate use should be avoided for 6 weeks after vaccination.	Because 71%–93% of U.S.-born persons without a history of varicella are immune, serologic testing before vaccination might be cost-effective.

Sources: Adapted from Bolyard EA, Hospital Infection Control Practices Advisory Committee. Guidelines for infection control in health care personnel, 1998. Am J Infect Control 1998;26:289–354.

CDC. Immunization of health-care workers: recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC). MMWR 1997;46(No. RR-18).

CDC. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2003;52:1-34.

CDC. Using live, attenuated influenza vaccine for prevention and control of influenza: supplemental recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2003;52(No. RR-13).

* A federal standard issued in December 1991 under the Occupational Safety and Health Act mandates that hepatitis B vaccine be made available at the employer's expense to all HCP occupationally exposed to blood or other potentially infectious materials. The Occupational Safety and Health Administration requires that employers make available hepatitis B vaccinations, evaluations, and follow-up procedures in accordance with current CDC recommendations.

† Persons immunocompromised because of immune deficiencies, HIV infection, leukemia, lymphoma, generalized malignancy; or persons receiving immunosuppressive therapy with corticosteroids, alkylating drugs, antimetabolites; or persons receiving radiation.

§ Vaccination of pregnant women after the first trimester might be preferred to avoid coincidental association with spontaneous abortions, which are most common during the first trimester. However, no adverse fetal effects have been associated with influenza vaccination.

¶ A live attenuated influenza vaccine (LAIV) is FDA-approved for healthy persons aged 5-49 years. Because of the possibility of transmission of vaccine viruses from recipients of LAIV to other persons and in the absence of data on the risk of illness and among immunocompromised persons infected with LAIV viruses, the inactivated influenza vaccine is preferred for HCP who have close contact with immunocompromised persons.

Appendix C
Methods for Sterilizing and Disinfecting Patient-Care Items and Environmental Surfaces*

Process	Result	Method	Examples	Health-care application: Type of patient-care item	Health-care application: Environmental surfaces
Sterilization	Destroys all microorganisms, including bacterial spores.	Heat-automated			Not applicable
		High temperature	Steam, dry heat, unsaturated chemical vapor	Heat-tolerant critical and semicritical	
		Low temperature	Ethylene oxide gas, plasma sterilization	Heat-sensitive critical and semicritical	
		Liquid immersion†	**Chemical sterilants.** Glutaraldehyde, glutaraldehydes with phenol, hydrogen peroxide, hydrogen peroxide with peracetic acid, peracetic acid	Heat-sensitive critical and semicritical	
High-level disinfection	Destroys all microorganisms, but not necessarily high numbers of bacterial spores.	Heat-automated	Washer-disinfector	Heat-sensitive semicritical	Not applicable
		Liquid immersion†	**Chemical sterilants/high-level disinfectants.** Glutaraldehyde, glutaraldehyde with phenol, hydrogen peroxide, hydrogen peroxide with peracetic acid, ortho-phthalaldehyde		
Intermediate-level disinfection	Destroys vegetative bacteria and the majority of fungi and viruses. Inactivates *Mycobacterium bovis*.§ Not necessarily capable of killing bacterial spores.	Liquid contact	U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant with label claim of tuberculocidal activity (e.g., chlorine-containing products, quaternary ammonium compounds with alcohol, phenolics, iodophors, EPA-registered chlorine-based product¶)	Noncritical with visible blood	Clinical contact surfaces; blood spills on housekeeping surfaces
Low-level disinfection	Destroys the majority of vegetative bacteria, certain fungi, and viruses. Does not inactivate *Mycobacterium bovis* .§	Liquid contact	EPA-registered hospital disinfectant with no label claim regarding tuberculocidal activity.** The Occupational Safety and Health Administration also requires label claims of human immunodeficiency virus (HIV) and hepatitis B virus (HBV) potency for clinical contact surfaces (e.g., quaternary ammonium compounds, some phenolics, some iodophors)	Noncritical without visible blood	Clinical contact surfaces; housekeeping surfaces

* EPA and the Food and Drug Administration (FDA) regulate chemical germicides used in health-care settings. FDA regulates chemical sterilants used on critical and semicritical medical devices, and the EPA regulates gaseous sterilants and liquid chemical disinfectants used on noncritical surfaces. FDA also regulates medical devices, including sterilizers. More information is available at 1) http://www.epa.gov/oppad001/chemregindex.htm, 2) http://www.fda.gov/cdrh/index.html, and 3) http://www.fda.gov/cdrh/ode/germlab.html.

† Contact time is the single critical variable distinguishing the sterilization process from high-level disinfection with FDA-cleared liquid chemical sterilants. FDA defines a high-level disinfectant as a sterilant used under the same contact conditions as sterilization except for a shorter immersion time (*C-1*).

§ The tuberculocidal claim is used as a benchmark to measure germicidal potency. Tuberculosis (TB) is transmitted via the airborne route rather than by environmental surfaces and, accordingly, use of such products on environmental surfaces plays no role in preventing the spread of TB. Because mycobacteria have among the highest intrinsic levels of resistance among vegetative bacteria, viruses, and fungi, any germicide with a tuberculocidal claim on the label (i.e., an intermediate-level disinfectant) is considered capable of inactivating a broad spectrum of pathogens, including much less resistant organisms, including bloodborne pathogens (e.g., HBV, hepatitis C virus [HCV], and HIV). It is this broad-spectrum capability, rather than the product's specific potency against mycobacteria, that is the basis for protocols and regulations dictating use of tuberculocidal chemicals for surface disinfection.

¶ Chlorine-based products that are EPA-registered as intermediate-level disinfectants are available commercially. In the absence of an EPA-registered chlorine-based product, a fresh solution of sodium hypochlorite (e.g., household bleach) is an inexpensive and effective intermediate-level germicide. Concentrations ranging from 500 ppm to 800 ppm of chlorine (1:100 dilution of 5.25% bleach and tap water, or approximately ¼ cup of 5.25% bleach to 1 gallon of water) are effective on environmental surfaces that have been cleaned of visible contamination. Appropriate personal protective equipment (e.g., gloves and goggles) should be worn when preparing hypochlorite solutions (*C-2,C-3*). Caution should be exercised, because chlorine solutions are corrosive to metals, especially aluminum.

** Germicides labeled as "hospital disinfectant" without a tuberculocidal claim pass potency tests for activity against three representative microorganisms: *Pseudomonas aeruginosa, Staphylococcus aureus,* and *Salmonella choleraesuis*.

XXX. References

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C-3. CDC. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR 2003;52(No. RR-10).

SECTION 6

ADDITIONAL RECOMMENDATIONS AND GUIDELINES

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

GUIDELINES FOR INJECTABLE DENTAL ANESTHETICS

For the dental patient, the prevention of pain, aids in relieving anxiety and reduces the probability of stress during dental treatment. For the dentist, dental procedures can be accomplished more efficiently. Appropriate selection and use of local anesthetics is one of the foundations for success in control of pain. The local anesthetics listed in this section are the most commonly used for most dental procedures, and they provide safe, effective, and dependable anesthesia.

Local anesthetics are, as a rule, exceptionally well tolerated by the tissues; however, they may produce a variety of local tissue changes. Repeated injections into the same site over a prolonged period should be avoided. Vasoconstrictors in anesthetic solutions effectively restrict blood flow and increase oxygen consumption of the tissues, which may lead to tissue anoxia, delayed healing, edema, and necrosis at the injection site. The selection of a vasoconstrictor with the local anesthetic must be based on the length of the procedure to be performed, the patient's medical status (epinephrine is contraindicated for patients with uncontrolled hyperthyroidism), and the need for hemorrhage control.

Most systemic reactions to local anesthetics occur when plasma concentrations reach a critical minimum level. This primarily results from relative overdosage, but it may be due to inadvertent intravascular injection or rapid absorption. Anaphylactic reactions to local anesthetics are extremely rare. Systemic toxic reactions to local anesthetics occur more frequently in small children, elderly patients, and adults with impaired drug metabolism. In addition, certain individuals exhibit idiosyncratic reactions to extremely low doses of local anesthetics. The most conspicuous sign of local anesthetic toxicity is convulsions. This is usually due to inadvertent intravascular injection followed by high blood levels of the anesthetic. Systemic reactions usually occur rapidly but may be delayed for as much as 30 minutes after the injection. Administration of oxygen is the most effective treatment.

Unfavorable reactions to local anesthetic solutions can be minimized by the following precautions:

- **Aspiration must always be carried out prior to deposing a volume of local anesthetic at any site. This minimizes the possibility of an intravascular injection.**
- **Inject the solution ***slowly*****. (1 ml of anesthetic solution in at least 60 seconds)**
- **Use the smallest quantity of solution and lowest concentration of vasoconstrictor that will produce satisfactory anesthesia.**
- **If the patient is known to have a tendency to react unfavorably to a particular anesthetic, choose another anesthetic with a different chemical structure.**
- **Observe the patient for unusual reactions after the injection.**
- **Do not use Articaine/ Septocaine on children under 4 yrs.**

Although local anesthetics are remarkably safe in therapeutic usage, the importance of their systemic toxicity cannot be ignored. The relative toxicity of agents used for dental injection can be appreciated by considering the maximum adult dosage for these agents. It should be noted that these recommendations do not imply that these dosages are either safe or maximal in all instances. Adequate regional anesthesia can usually be obtained by injection of the contents of one dental carpule (1.8 ml) or less. One should always use the lowest dose that results in effective anesthesia.

Table 1
Dental Anesthetics
Average Duration and Onset of Action by Route

Agent	Formulation	Onset of Action		Duration	
		Maxillary Infiltration	Inferior Alveolar Block	Pulpal	Soft Tissue
Bupivacaine (Marcaine)	**0.5% with 1:200,000 epi**	**6-10 min.**	**6-10 min.**	**240 min(MB) 40 min(IN)**	**440 min(MB) 340 min (IN)**
Lidocaine HCL (Xylocaine)	**2% Plain**	**2-3 min**	**2-3 min**	**5-10 min(MB) 5 min (IN)**	**60-120 min**
Lidocaine HCL (Xylocaine)	**2% with 1:50,000**	**2-3 min**	**2-3 min**	**85 min(MB) 60 min (IN)**	**190min(MB) 170min(IN)**
Lidocaine (Xylocaine)	**2% with 1:100,000 epi**	**2-3 min.**	**2-3 min.**	**85 min(MB) 60 min (IN)**	**190min(MB) 170 min(IN)**
Mepivacaine (Carbocaine 3%)	**3% Plain**	**30 sec.-2 min.**	**1-4 min.**	**40 min. (MB) 25 min. (IN)**	**165min(MB) 90 min(IN)**
Mepivacaine	**2% with 1:20,000 levonordefrin**	**30 sec -2 min.**	**1-4 min.**	**75 min (MB) 50 min (IN)**	**185 min(MB) 130 min(IN)**
Mepivacaine (Scandonest)	**2% with 1 :200,000 epi**	**30 sec– 2 min**	**1-4 min**	**85 min (MB) 60 min(IN)**	**190min(MB) 170min(IN)**
Prilocaine (Citanest 4%)	**4% Plain**	**2-4 min.**	**2-4 min.**	**55 min (MB) 20 min. (IN)**	**190min(MB) 105min (IN)**
Prilocaine (Citanest Forte)	**4% with 1:200,000 epi**	**2-4 min.**	**2-4 min.**	**60 min(MB) 40 min(IN)**	**220min(MB) 140min(IN)**
Articaine (Septocaine)	**4% with 1:100,000 epi**	**1-2 min.**	**2-2.5 min**	**90 min(MB) 60 min(IN)**	**230min (MB) 190min (IN)**

- MB – Mandibluar Block
- IN – Maxillary Infiltration

Table 2
Dental Anesthetics
Maximum Dose Recommended for Dental Therapy

Agent	Formulation	Adult MRD*	mg/ml	mg/carpule ~	Max. # Carpules∫	
					Adult§	Child^^
Bupivacaine	**0.5% with 1:200,000 epi**	**90 mg**	**5**	**9**	**10.0**	**¢**
Lidocaine	**2% plain**	**300 mg**	**20**	**36**	**8.3**	**1.5**
Lidocaine	**2% with 1:50,000**	**300 mg**	**20**	**36**	**8.3**	**2.5**
Lidocaine	**2% with 1:100,000 epi**	**300 mg**	**20**	**36**	**8.3**	**2.5**
Mepivacaine	**3% plain**	**300 mg**	**30**	**54**	**5.5**	**1.75**
Mepivacaine	**2% with levonordefrin**	**300 mg**	**20**	**36**	**8.3**	**2.5**
Prilocaine	**4% plain**	**400 mg**	**40**	**72**	**5.5**	**1.5**
Prilocaine	**4% with 1:200,000 epi**	**400 mg**	**40**	**72**	**5.5**	**1.5**
Articaine	**4% with 1:100,000 epi**	**500mg**	**40**	**72**	**6.9**	**1.5©**

* Maximum Recommended Dose
~ 1.8 ml/carpule
¢ Not recommended in children under 12 years of age.
© Not recommended in children 4 and under.
§ Assuming a healthy 150 lb. adult
^^ Assuming a healthy 50 lb. Child

The selection of dental therapeutic agents for local anesthesia is usually straightforward. In the case of a pregnant patient, the dentist must determine if the potential benefits of the dental therapy required for her care outweigh the risks. Most local anesthetics have not been shown to be teratogenic in humans and are considered to be relatively safe for use during pregnancy. Because all local anesthetics can cross the placenta, limiting the dose to the minimum required for effective pain control is advisable. Epinephrine stimulates cardiovascular function, therefore, its administration requires careful technique and proper dosing.

Table 3
Dental Anesthetics
Recommendations for Pregnant Patients[§]

Agent	Pregnancy Risk Category	Possible Negative Pregnancy Outcome
Bupivacaine	**C[¶]**	**Fetal bradycardia**
Lidocaine	**B***	**Enters breast milk/compatible**
Lidocaine Plain	**B-Manufacturer C- Expert Analysis**	**Enters breast milk/ use caution**
Mepivacaine	**C**	**Fetal bradycardia**
Prilocaine	**B**	
Prilocaine with epi	**C**	
Articaine Septocaine	**C**	**Unknown if Articaine is excreted in breast milk/use caution**

* Category B: Either animal –reproductive studies have not demonstrated a fetal risk but there are no controlled studies in pregnant women, or animal-reproduction studies have shown an adverse effect (other than a decrease in fertility) that was not confirmed in controlled studies in women in the first trimester and there is no evidence of a risk in later trimesters.

[¶] Category C: Either studies in animals have revealed adverse effects on the fetus (teratogenic or embryocidal effects or other) and there are no controlled studies in women, or studies in women and animals are not available. Drugs should be given only if the potential benefits justify the potential risk to the fetus.

[§] Source: Drug Information Handbook for Dentistry, 12 th ED,
Richard L.Wynn, BSPharm, PHD
Timothy F. Meiller, DDS, PhD
Harold L. Crossley, DDS, PhD

Table 4
Common Drugs used in Dentistry
Recommendations for Pregnant Patients

Drugs	FDA Category	Use in Pregnancy	Use in Nursing	Possible Side Effects
Analgesics				
Acetaminophen	B	Yes	Yes	Not reported
Aspirin	C/D*	Not in 3rd trimester	No	Postpartum hemorrhage
Ibuprofen	C/D	Not in 3rd trimester	Yes	Delayed labor
Naproxen	C/D	Not in 2nd ½ of pregnancy	No	Delayed labor
Codeine	B/D	With caution	Yes	Multiple birth defects
Oxycodone	C/D	With caution	With caution	NRD**
Hydrocodone	B	With caution	With caution	NRD
Morphine	C/D	Yes	Yes	Respiratory depression
Propoxyphene	C/D	With caution	Yes	Not reported
Meperidine	C/D	Yes	Yes	Respiratory depression
Pentazocine	C/D	With caution	With caution	Not reported
Antibiotics				
Amoxicillin	B	Yes	Yes	Not reported
Metronidazole	B	Yes	Yes	Not reported
Erythromycin	B	Yes	With caution	Not reported
Penicillin V	B	Yes	Yes	Not reported
Cephalosporins	B	Yes	Yes	Not reported
Gentamycin	C	Yes	Yes	Fetal ototoxicity
Clindamycin	B	Yes	Yes	Not reported
Tetracycline	D	No	No	Discoloration of teeth
Chloramphenicol	C	No	No	Maternal toxicity/fetal death
Chlorhexidine	B	No data	No data	Not reported
Antifungals				
Nystatin	B/C	Yes	Yes	Not reported
Clotrimazole	B	Yes	Yes	Not reported
Fluconazole	C	With caution	No	Not reported
Ketoconazole	C	With caution	No	Fetal toxicity
Corticosteroids				
Prednisolone	C	Yes	With caution	Not reported
Sedative/Hypnotics				
Nitrous Oxide	Not assigned	Not in 1st trimester **	Yes	Spontaneous abortions
Barbiturate	D	Avoid	No	NRD
Benzodiazepines	D	No	No	Cleft lip/palate

* D indicates caution: if used for prolonged period of time, or high doses

** NRD: Neonatal respiratory depression

FDA PREGNANCY CATEGORIES

Category A: Controlled studies in pregnant women fail to demonstrate a risk to the fetus in the first trimester with no evidence of risk in later trimesters. The possibility of fetal harm appears remote.

Category B: Either animal –reproductive studies have not demonstrated a fetal risk but there are no controlled studies in pregnant women, or animal-reproduction studies have shown an adverse effect (other than a decrease in fertility) that was not confirmed in controlled studies in women in the first trimester and there is no evidence of a risk in later trimesters.

Category C: Either studies in animals have revealed adverse effects on the fetus (teratogenic or embryocidal effects or other) and there are no controlled studies in women, or studies in women and animals are not available. Drugs should be given only if the potential benefits justify the potential risk to the fetus.

Category D: There is positive evidence of human fetal risk, but the benefits from use in pregnant women may be acceptable despite the risk (e.g, if the drug is needed in a life-threatening situation or for a serious disease for which safer drugs cannot be used or are ineffective).

Category X: Studies in animals or human beings have demonstrated fetal abnormalities or there is evidence of fetal risk based on human experience, or both, and the risk of the use of the drug in pregnant women clearly outweighs any possible benefit. The drug is contraindicated in women who are or may become pregnant.

[§] Source: Drug Information Handbook for Dentistry, 12th ED,
Richard L.Wynn, BSPharm, PHD
Timothy F. Meiller, DDS, PhD
Harold L. Crossley, DDS, PhD

Insert on Guidelines on Oral Health Care for the Pregnant Adolescent

From the American Academy of Pediatric Dentistry

PREVENTION OF INFECTIVE ENDOCARDITIS (IE)
RECOMMENDATIONS OF THE AMERICAN HEART ASSOCIATION

Infective endocarditis is an uncommon but life threathening infection. Substantial morbidity and mortality result from this infection, despite improvements in outcome due to advances in antimicrobial therapy and enhanced ability to diagnose and treat complications. Primary prevention of endocarditis whenever possible is therefore very important.

Endocarditis is an infection of the lining of the heart's chambers or the heart's valves. It can be caused by bacteria, fungi or other microorganisms that enter your bloodstream. Some surgical and dental procedures can cause this to happen. For most people this poses no problem but, if one of the heart's valves is damaged, immune cells, platelets and fibrin are sent to the area to help heal it. If any microorganisms in the bloodstream become trapped under the layers of these cells,"clumps" of tissue within the heart and on the heart's valves can form and cause endocarditis. Although bacteremia is common following many invasive procedures, only certain bacteria commonly cause endocarditis. Endocarditis is more common in people older than 50, and men are more affected than women.

The incidence of endocarditis following most procedures in patients with underlying cardiac disease is low. A reasonable approach for endocarditis prophylaxis should consider the degree to which the patient's underlying condition creates a risk of endocarditis; the apparent risk of bacteremia with the procedure (as defined in these recommendations); the potential adverse reactions of the prophylactic antimicrobial agent to be used; and the cost-benefit aspects of the recommended prophylactic regimen.

The new American Heart Association (AHA) recommendations for the prevention of Infective Endocarditis represent a substantial departure from past guidelines. The new recommendations reflect a better understanding of the disease and its potential prevention. Major changes involve indications for prophylaxis, antibiotic choice, and dosing.

Previously, the American Heart Association recommended that patients with certain heart conditions take antibiotics prior to dental treatment. The AHA's latest guidelines were published in its scientific journal in April 2007. The new guidelines recommend that most of these patients no longer need short-term antibiotics as a preventive measure before their dental treatment.

The American Heart Association Changes for Dental are:

- Bacteremia resulting from daily activities (i.e. brushing & flossing) is much more likely to cause Infective Endocarditis than bacteremia associated with a dental procedure.
- Only an extremely small number of cases of IE might be prevented by antibiotic prophylaxis even if prophylaxis is 100% effective.
- Antibiotic prophylaxis is not recommended based solely on an increased lifetime risk of acquiring IE.

- Antibiotic prophylaxis is only recommended for those conditions listed below. (See Table 1)
- Antibiotic prophylaxis is recommended for all dental procedures that involve manipulation of gingival tissues or periapical region of teeth or perforation of oral mucosa only for patients with underlying cardiac conditions associated the highest risk of adverse outcome from IE.
- The guidelines say patients who have taken prophylactic antibiotics routinely in the past but no longer need them are people who have:
    - Mitral valve prolapse
    - Rheumatic heart disease
    - Bicuspid valve disease
    - Calcified aortic stenosis
    - Congenital heart conditions such as ventricular septal defect, atrial septic defect and hypertrophic cardiomyopathy.
- The new guidelines are aimed at patients who would have the greatest danger of a bad outcome if they developed a heart infection.

Source: JADA 2007; 138(4):458-74

Table 1

CARDIAC CONDITIONS ASSOCIATED WITH THE HIGHEST RISK OF ADVERSE OUTCOME FROM ENDOCARDITIS FOR WHICH PROPHYLAXIS WITH DENTAL PROCEDURES IS RECOMMENDED

- Prosthetic Cardiac Valve
- Previous Infective Endocarditis
- Congenital Heart Disease*
    - Unrepaired Cyanotic CHD, including palliative shunts and conduits
    - Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first six months after the procedure**
    - Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic device (which inhibit endothelialization)
- Cardiac transplantation recipients who develop cardiac valvulopathy

* Except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD

** Prophylaxis is recommended because endothelialization of prosthetic material occurs within 6 months after the procedure

DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS RECOMMENDED FOR THE ABOVE CONDITIONS

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or performation of the oral mucosa* (i.e. biopsies, suture removal & placement of orthodontic bands.)

DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS NOT RECOMMENDED

*** The following procedures and events do not need prophylaxis**

- Routine anesthetic injections through noninfected tissue
- Taking dental radiographs
- Placement of removable prosthodontic or orthodontic appliances
- Adjustment of orthodontic appliances
- Placement of orthodontic brackets
- Shedding of deciduous teeth
- Bleeding from trauma to the lips or oral mucosa

Source: JADA 2007; 138(4):458-74

Table 2: Regimens for a Dental Procedure — Regimen: Single Dose 30 to 60 minutes Before Procedure

Situation	Agent	Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin	2 g IM or IV	50 mg/kg IM or IV
	or		
	Cefazolin or Ceftriaxone	1 g IM or IV	50 mg/kg IM or IV
Allergic to Pencillins or Ampicillin - Oral	Cephalexin * †	2 g	50 mg/kg
	or		
	Clindamycin	600 mg	20 mg/kg
	or		
	Azithromycin or Clarithromycin	500 mg	15 mg/kg
Allergic to Pencillins or Ampicillin and unable to take oral medication	Cefazolin or Ceftriaxone†	1 g IM or IV	50 mg/kg IM or IV
	or		
	Clindamycin	600 mg IM or IV	20 mg/kg IM or IV

IM indicates intramuscular; IV, intravenous

* Or other first or second – generation oral cephalosporin in equivalent adult or pediatric dosage.

† Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema or uticaria with pencillins or ampicillin.

Source: JADA 2007; 138(4):458-74

ANTIBIOTIC PROPHYLAXIS FOR DENTAL PATIENTS WITH TOTAL JOINT REPLACEMENT

See Advisory Statement from the American Dental Association and the American Academy of Orthopaedic Surgeons

On the next page

Guideline on Prevention of Infective Endocarditis in Pediatric Dental Patients at Risk

Originating Council
Council on Clinical Affairs

Adopted
2007

Purpose

The American Academy of Pediatric Dentistry (AAPD) intends this guideline to help practitioners make clinical decisions concerning appropriate antibiotic prophylaxis for pediatric dental patients at risk for infective endocarditis (IE).

Methods

The American Heart Association (AHA) has promoted antibiotic prophylaxis for patients at risk for IE since 1955. In 2007, the AHA released its tenth iteration of such guidelines.[1] The AAPD, acknowledging the AHA's expertise and efforts to produce evidenced-based recommendations, continues to endorse the AHA guidelines for antibiotic prophylaxis, now entitled "Prevention of Infective Endocarditis".[2]

Background

Transient bacteremia commonly follows mucosal trauma associated with dental procedures. Because procedure-induced bacteremias may result in a potentially fatal infective endocarditis, the AHA long has promoted antibiotic prophylaxis for dental patients with certain underlying cardiac conditions. The rationale for such recommendations was based largely on expert opinion.[1] During review of relevant literature and studies, and in consultation with national and international experts, the AHA was compelled in 2007 to revise its guideline on prevention of IE. The primary reasons for the revision include:

- "IE is much more likely to result from frequent exposure to random bacteremias associated with daily activities than from bacteremia caused by a dental, GI tract, or GU tract procedure.
- Prophylaxis may prevent an exceedingly small number of cases of IE, if any, in individuals who undergo a dental, GI tract, or GU tract procedure.
- The risk of antibiotic-associated adverse events exceeds the benefit, if any, from prophylactic antibiotic therapy.
- Maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE."[1]

The recent revision of the AHA guideline was intended to clarify when antibiotic prophylaxis is/is not recommended and to provide more uniform global recommendations. Major changes from the 1997 version[2] include:

> "(1) The Committee concluded that only an extremely small number of cases of infective endocarditis might be prevented by antibiotic prophylaxis for dental procedures even if such prophylactic therapy were 100% effective.
> (2) Infective endocarditis prophylaxis for dental procedures should be recommended only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from infective endocarditis.
> (3) For patients with these underlying cardiac conditions, prophylaxis is recommended for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa.
> (4) Prophylaxis is not recommended based solely on an increased lifetime risk of acquisition of infective endocarditis."[1]

Recommendations

Dental practitioners should consider carefully prophylactic measures to minimize the risk of IE in patients with underlying cardiac conditions. These patients should be educated and motivated to maintain personal oral hygiene through daily plaque removal, including flossing. Professional preventive strategies should be based upon the individual's assessed risk for caries and periodontal disease.

Specific recommendations from the 2007 AHA guideline on prevention of IE are included in the following tables. The AHA recommends antibiotic prophylaxis only for those whose underlying cardiac conditions are associated with the highest risk of adverse outcome (see Table 1).[1] Consultation with the patient's physician may be necessary to determine susceptibility to bacteremia-induced infections. Antibiotics are recommended for "all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa"[1] (see table 2). Specific antibiotic regimens can be found in Table 3. Practitioners and patients/parents can review the entire AHA guideline (http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.106.183095) for additional background information as well as discussion of special circumstances (eg, patients already receiving antibiotic therapy, patients on anticoagulant therapy).

References

1. Wilson W, Taubert KA , Gewitz M, et al. Prevention of infective endocarditis: Guidelines from the American Heart Association. Circulation e-published April 19,2007. http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA. 106.183095. Accessed May 10, 2007.

2. Dajani AS, Taubert KA , Wilson W, et al. Prevention of bacterial endocarditis: Recommendations by the AmericanHeart Association. JAMA 1997;227:1974-801

Table 1. CARDIAC CONDITIONS ASSOCIATED WITH THE HIGHEST RISK OF ADVERSE OUTCOME FROM ENDOCARDITIS FOR WHICH PROPHYLAXIS WITH DENTAL PROCEDURES IS RECOMMENDED
Prosthetic cardiac valve
Previous IE
Congenital heart disease (CHD)*
Unrepaired cyanotic CHD, including palliative shunts and conduits
Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure+
Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
Cardiac Transplantation recipients who develop cardiac valvulopathy

* Except for the conditions listed above, antibiotic prophylaxis no longer recommended for any other form of CHD.
\+ Prophylaxis is recommended because endothelialization of prosphetic material occurs within 6 months after the procedure.

Table 2. DENTAL PROCEDURES FOR WHICH ENDOCARDITIS PROPHYLAXIS IS RECOMMENDED FOR PATIENTS IN TABLE 1
All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa*
* The following procedures and events do not need prophylaxis: routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, adjustment of orthodontic appliances, placement of orthodontic brackets, shedding of deciduous teeth, and bleeding from trauma to the lips or oral mucosa.

Table 3. REGIMENS FOR A DENTAL PROCEDURE

	REGIMEN: SINGLE DOSE 30 to 60 Minutes Before Procedure		
SITUATION	**AGENT**	**ADULTS**	**CHILDREN**
Oral	Amoxicillin	2g	50mg/kg
Unable to take oral medication	Ampicillin	2g IM or IV	50 mg/kg IM or IV
	or		
	Cefazolin or Ceftriaxone	1g IM or IV	50 mg/kg IM or IV
Allergic to Pencillins or Ampicillin-oral	Cephalexin*^	2g	50 mg/kg
	or		
	Clindamycin	600 mg	20mg/kg IM or IV
	or		
	Azithromycin or clarithromycin	500 mg	15mg/kg
Allergic to pencillin or ampicillin and unable to take oral medication	Cefazolin or ceftriaxone^	1g IM or IV	50 mg/kg IM or IV
	or		
	Clindamycin	600 mg IM or IV	20 mg/kg IM or IV

IM indicates intramuscular; IV, intravenous
*Or other first-or second-generation oral cephalosporin in equivalent adult or pediatric dosage.
^Cephalosporings should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillins or ampicillin.

Insert of Guidelines on Antibiotic Prophylaxis for Dental Patients at Risk for Infection

From the American Academy of Pediatric Dentistry

TUBERCULOSIS INFECTION CONTROL RECOMMENDATIONS - CONSIDERATIONS FOR DENTISTRY

Tuberculosis (TB) is a respiratory disease caused by the bacteria *Mycobacterium tuberculosis.* The disease is spread when a susceptible individual inhales airborne particles (droplet nuclei containing TB bacilli) produced when an infected individual coughs, sneezes, laughs, or sings.

In 2005, there were 299 cases of pulmonary TB in Tennessee, compared with 279 cases in 2006 and 234 cases in 2007. TB Infection Control measures recommended by the CDC in 1994 were implemented in health-care facilities nationwide. As a result, a decrease has occurred in the number of TB outbreaks in health-care settings reported to CDC and health-care—associated transmission of *M. tuberculosis* to patients and health-care workers. Despite the decline in rates for 2006 and 2007, Foreign-born persons and racial/ethnic minorities continue to bear a disproportionate burden of TB in the U.S. The threat of multi-drug resistant strain (MDR) TB is slowly declining and the transmission of *M. tuberculosis* in health-care settings continues to decrease because of implementation of infection-control measures and reductions in community rates of TB. Patients diagnosed with active TB are initially treated with four antibiotics including: Isoniazid, Rifampin, Pyrazinamide, and Ethambutol. Patients who are resistant to Isoniazid and Rifampin, Fluoroquinolone and resistance to at least one second-line injectable drug are considered to have a multi-drug resistant strain of TB (MDR-TB) and may transmit this strain to others. Individuals with MDR-TB have a higher mortality rate than those with nonresistant strains.

CDC determined the guidelines in this report after consulting with experts in TB, infection control, environmental control, respiratory protection and occupational health. The 2005 report replaces all previous CDC guidelines for TB infection control in health-care settings. The following changes differentiate this report from previous guidelines:

- The risk assessment process includes the assessment of additional aspects of infection control.
- The term "tuberculin skin tests" (TST's) is used instead of purified protein derivative (PPD).
- The frequency of TB screening for HCW's has been decreased in various settings, and the criteria for determination of screening frequency have been changed.
- The scope of settings in which the guidelines apply has been broadened to include laboratories and additional outpatient and nontraditional facility based settings.
- Criteria for serial testing for *M. tuberculosis* infection of HCW's are more clearly defined. In certain settings, this change will decrease the number of HCW’s who need serial TB screening.
- These recommendations usually apply to an entire health-care setting rather than areas within a setting.
- New terms, airborne infection precautions (airborne precautions) and airborne infection isolation room (AII room), are introduced.
- Recommendations for annual respirator training, initial respirator fit testing, and periodic respirator fit testing have been added.
- The evidence of the need for respirator fit testing is summarized.
- Information on ultraviolet germicidal irradiation (UVGI) and room-air recirculation units has been expanded.
- Additional information regarding MDR TB and HIV infection has been included.

The 1994 CDC guidelines were primarily aimed at hospital-based facilities. The 2005 guidelines have been expanded to address a broader concept. Setting is now being used instead of "facility", to expand the scope of potential places for which these guidelines apply. "Setting" describes any situation in which Health Care Workers (HCW's) might share air space with persons with TB disease or in which HCW's might be in contact with clinical specimens. Healthcare settings include inpatient settings, outpatient settings and nontraditional facility based settings.

- Inpatient settings include patient rooms, emergency departments, intensive care units, surgical suites, laboratories, laboratory procedure areas, autopsy suites and embalming rooms.
- Outpatient settings include TB treatment facilities, medical offices, ambulatory-care settings, dialysis units, and **dental-care** settings.
- Nontraditional facility based settings include emergency medical service(EMS), medical settings in correctional facilities, home-based health-care and outreach settings, long-term—care settings and homeless shelters.

Individuals who are at higher risk for exposure to and infection with TB include:

- Foreign-born, including children who have arrived in the U.S within 5 years after moving from geographic areas with a high incidence of TB disease(e.g., Africa, Asia, Eastern Europe, Latin America and Russia).
- Residents and employees of congregate settings that are high risk (e.g., correctional facilities, long-term- -care facilities and homeless shelters).
- Health Care Workers (HCW's) who serve patients who are at high risk.
- Health Care Workers with unprotected exposure to a patient with TB disease before the identification and correct airborne precautions of the patient.
- Certain populations who are medically underserved and who have low income, as defined locally.
- Populations at high risk who are defined locally as having an increased incidence of TB disease, such as HIV patients, illegal drug users and alcoholics.
- Infants, children and adolescents exposed to adults in high-risk categories. Persons listed as close contacts should be top priority.

As described in the Bureau of Health Services Policy 8.2.a., all employees, including part-time, contractual, and volunteers who have patient contact and are at risk of effective exposure must be screened for TB. Employees should receive a tuberculin skin test (tuberculin skin test – TST) at the time of their employment or when assigned to an area where they will have patient contact, which could result in effective exposure. If the employee so chooses, the skin test can be given at the health department at no cost to the employee.

Employees identified as positive reactors at the time of employment or assignment to an area where they will have patient contact should receive a chest x-ray and be considered for preventive therapy. Employees who have patient contact and have a negative tuberculin test must have a tuberculin test at least annually as long as the skin test remains negative. The TB control physician must evaluate employees who convert from negative to positive at any time after the initial test. If treatment of disease or preventive therapy is indicated, it should be prescribed and monitored as with any other patient.

For further information, dental public health staff should refer to the CDC published *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Settings, 2005* (MMWR 2005;54,(RR-17);1-141).This can be found on the CDC's website at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm
The guidelines from this CDC publication that are applicable to dental settings are as follows:

> In general, the symptoms for which patients seek treatment in a dental care setting are not likely to be caused by infectious TB. Unless a patient requiring dental care coincidentally has TB, it is unlikely that infectious TB will be encountered in the dental setting. Furthermore, generation of droplet nuclei containing *M. tuberculosis* during dental procedures has not been demonstrated. Therefore, the risk for transmission of *M. tuberculosis* in most dental settings is probably quite low. Nevertheless, during dental procedures, patients and dental workers share the same air for varying periods of time. Coughing may be stimulated occasionally by oral manipulations, although no specific dental procedures have been classified as "cough-inducing". In some instances, the population served by a dental care facility, or the HCWs in the facility, may be at relatively high risk for TB. Because the potential exists for transmission of *M. tuberculosis* in dental settings, the following recommendations should be followed:
>
> - A risk assessment should be done periodically, and TB infection control policies for each dental setting should be based on the TB risk assessment. The policies should include provisions for detection and referral of patients who may have undiagnosed active TB; management of patients with active TB, relative to provision of urgent dental care; and employer-sponsored DHCW education, counseling, and screening for latent tuberculosis infection (LTBI) and TB disease.
>
> - While taking patients' initial medical histories and at periodic updates, DHCWs should routinely ask all patients whether they have a history of TB disease and symptoms suggestive of TB and document any findings.
>
> - Patients with a medical history or symptoms suggestive of undiagnosed active TB should be referred promptly for medical evaluation of possible infectiousness. Such patients should not remain in the dental care facility any longer than required to arrange a referral. While in the dental care facility, they should wear surgical masks and should be instructed to cover their mouth and noses when coughing or sneezing.
>
> - Elective dental treatment should be deferred until a physician confirms that the patient does not have infectious TB. If the patient is diagnosed as having active TB, elective dental treatment should be deferred until the patient is no longer infectious.
>
> - If urgent dental care must be provided for a patient with TB or suspected of having TB, care should be provided in a setting that meets the requirements for an AII room (a single patient room in which environmental factors and entry of visitors & HCW's are controlled to minimize transmission of M. tuberculosis), all HCW's entering an AII room should wear at least a N95

disposable respirator which should be used while performing procedures on such patients.

- Any DHCW who has a persistent cough (i.e., a cough lasting ≥3 weeks), especially in the presence of other signs or symptoms compatible with active TB (e.g., weight loss, night sweats, bloody sputum, anorexia, and fever), should be evaluated promptly for TB. The HCW should not return to the workplace until a diagnosis of TB has been excluded or until the HCW is on therapy and a determination has been made that the HCW is noninfectious.

- In dental care facilities that provide care to populations at high risk for active TB, it may be appropriate to use engineering controls similar to those used in general-use areas (e.g., waiting rooms) of medical facilities that have a similar risk profile.

NEW CPR GUIDELINES EFFECTIVE 2005

OLD CPR Cards should be maintained for a period of 3 years. If you are audited by the Board of Dentistry, they will require you to have proof of CPR for the prior three years.
Summary of BLS ABCD Maneuvers for Adults, Children and Infants.

HCP = Health Care Providers

MANEUVER	ADULT HCP: Adolescent & older	CHILD HCP: 1 year to adolescent	Infant: Under 1 year of age
ACTIVATE	If asphyxial arrest likely, call after 5 cycles (2 minutes) of CPR	Activate after performing 5 cycles of CPR	Activate after performing 5 cycles of CPR
Airway	Head tilt-chin lift, for suspected trauma use jaw thrust	Head tilt-chin lift, for suspected trauma use jaw thrust	Head tilt-chin lift, for suspected trauma use jaw thrust
Breaths Initial	2 breaths at 1 second/ breath	2 effective breaths at 1 second/ breath	2 effective breaths at 1 second/breath
HCP: Rescue Breathing without chest compressions	10-12 breaths/min (Approx. 1 breath every 3-5 seconds)	12-20 breaths/min (approx. 1 breath every 3-5 sec)	12-20 breaths/min (approx. 1 breath every 3-5 sec)
HCP: Rescue breaths for CPR with advanced airway	8-10 breaths/min (Approx. 1 breath every 6-8 seconds)	8-10 breaths/min (Approx. 1 breath every 6-8 seconds)	8-10 breaths/min (Approx. 1 breath every 6-8 seconds)
Foreign – body Airway Obstruction	Abdominal Thrusts	Abdominal Thrusts	Back slaps & chest thrusts
Circulation HCP: Pulse check (<10 sec)	Carotid: HCP can use femoral in child	Carotid: HCP can use femoral in child	Brachial or femoral
Compression Landmarks	In the center of the chest, between nipples	In the center of the chest, between nipples	Just below nipple line
Compression method Push hard and fast, Allow complete recoil	**2 Hands:** Heel of 1 hand, second hand on top	**2 Hands:** Heel of 1 hand with second on top or **1 Hand:** Heel of 1 hand only	1 rescuer: 2 fingers, HCP: 2 rescuers. 2 thumb-encircling hands
Compression depth	1 ½ to 2 inches	About 1/3 to ½ the depth of the chest	About 1/3 to ½ the depth of the chest
Compression rate	About 100/min	About 100/min	About 100/min
Compression-Ventilation ratio	30:2 1 or 2 rescuers	30:2 single rescuer, 15:2 – 2 rescuers	30:2 single rescuer, 15:2 – 2 rescuers
Defibrillation	Use adult pads. Do not use child pads/child system	Use after 5 cycles of CPR Use child pads/ system for child 1 to 8 years if available. If not use adult AED & pads.	No recommendations for infants <1 Year of age.
AED			

Insert on Hands-Only (Compression Only) Cardiopulmonary Resuscitation

From the American Heart Association

CLINICAL GUIDELINES ON APPROPRIATE USE OF NITROUS OXIDE FOR PEDIATRIC DENTAL PATIENTS

Patient Selection
Indications for use of nitrous oxide/oxygen analgesia/anxiolysis include:

1. A fearful, anxious, or obstreperous patient
2. Certain mentally, physically, or medically compromised patients
3. A patient whose gag reflex interferes with dental care
4. A patient for whom profound local anesthesia cannot be obtained
5. A cooperative child undergoing a lengthy dental procedure

Review of the patient's medical history should be performed prior to the decision to use nitrous oxide/oxygen analgesia/anxiolysis. This assessment should include:

1. Allergies and previous allergic or adverse drug reactions
2. Current medications including dose, time, route, and site of administration
3. Diseases, disorders, or physical abnormalities and pregnancy status
4. Previous hospitalization to include the date and purpose

Contraindications for use of nitrous oxide/oxygen inhalation may include:

1. Some chronic obstructive pulmonary diseases
2. Severe emotional disturbances or drug-related dependencies
3. First trimester of pregnancy
4. Treatment with bleomycin sulfate

Whenever possible, appropriate medical specialists should be consulted before administering analgesic/anxiolytic agents to patients with significant underlying medical conditions (e.g., severe obstructive pulmonary disease, congestive heart failure, sickle cell disease, acute otitis media, or recent tympanic membrane graft).

Technique of Nitrous Oxide/Oxygen Administration

- Nitrous oxide/oxygen must be administered only by appropriately licensed individuals, or under the direct supervision thereof, according to state law.
- The practitioner responsible for the treatment of the patient and/or the administration of analgesic/anxiolytic agents must be trained in the use of such agents and techniques and appropriate emergency response.
- Selection of an appropriately-sized nasal hood should be made.
- A flow rate of 5 to 6 liters/minute generally is acceptable to most patients. The flow rate can be adjusted after observation of the reservoir bag. The bag should pulsate gently with each breath and should not be either over- or underinflated.
- Introduction of 100% oxygen for 1 to 2 minutes followed by titration of nitrous oxide in 10% intervals is recommended.
- During nitrous oxide/oxygen analgesia/anxiolysis, the concentration of nitrous oxide should not routinely exceed 50%. Nitrous oxide concentration may be decreased during easier procedures (e.g., restorations) and increased during more stimulating ones (e.g., extraction, injection of local anesthetic).

- During treatment, it is important to continue the visual monitoring of the patient's respiratory rate and level of consciousness.
- The effects of nitrous oxide largely are dependent on psychological reassurance. Therefore, it is important to continue traditional behavior guidance techniques during treatment.
- Once the nitrous oxide flow is terminated, 100% oxygen should be delivered for 3 to 5 minutes. The patient must return to pre-treatment responsiveness before discharge.

Monitoring

The response of patients to commands during procedures performed with anxiolysis/analgesia serves as a guide to their level of consciousness. Clinical observation of the patient must be done during any dental procedure. During nitrous oxide/oxygen analgesia/anxiolysis, continual clinical observation of the patient's responsiveness, color, and respiratory rate and rhythm must be performed. Spoken responses provide an indication that the patient is breathing. If any other pharmacologic agent is used in addition to nitrous oxide/oxygen and a local anesthetic, monitoring guidelines for the appropriate level of sedation must be followed.

Adverse Effects of Nitrous Oxide/Oxygen Inhalation

Nitrous oxide/oxygen analgesia/anxiolysis has an excellent safety record. When administered by trained personnel on carefully selected patients with appropriate equipment and technique, nitrous oxide is a safe and effective agent for providing pharmacological guidance of behavior in children. Acute and chronic adverse effects of nitrous oxide on the patient are rare. Nausea and vomiting are the most common adverse effects, occurring in 1 to 10% of patients. A higher incidence is noted with longer administration of nitrous oxide/oxygen, fluctuations in nitrous oxide levels, and increased concentrations of nitrous oxide. Fasting is not required for patients undergoing nitrous oxide analgesia/anxiolysis. However, the practitioner may recommend that only a light meal be consumed in the 2 hours prior to the administration of nitrous oxide. Diffusion hypoxia can occur as a result of rapid release of nitrous oxide from the blood stream into the alveoli, diluting the concentration of oxygen. This may lead to headache and disorientation and can be avoided by administering 100% oxygen after nitrous oxide has been discontinued.

Documentation

Informed consent must be obtained from the parent and documented in the patient's record prior to administration of nitrous oxide/oxygen. The practitioner should provide instructions to the parent regarding pre-treatment dietary precautions, if indicated. In addition, the patient's record must include indication for use of nitrous oxide/oxygen inhalation, nitrous oxide dosage (i.e., percent nitrous oxide/oxygen and/or flow rate), duration of the procedure, and post-treatment oxygenation procedure.

Facilities/Personnel/Equipment

All newly installed facilities for delivering nitrous oxide/oxygen must be checked for proper gas delivery and fail-safe function prior to use. Inhalation equipment must have the capacity for delivering 100%, and never less than 30%, oxygen concentration at a flow rate appropriate to the child's size, and must have a fail-safe system that is checked and calibrated regularly according to the practitioner's state laws and regulations. If nitrous oxide/oxygen delivery equipment capable of delivering more than 70% nitrous oxide and less than 30% oxygen is used, an in-line oxygen analyzer must be used. The equipment must have an appropriate scavenging system.

The practitioner who utilizes nitrous oxide/oxygen analgesia/anxiolysis for a pediatric dental patient shall possess appropriate training and skills and have available the proper facilities, personnel, and equipment to manage any reasonably foreseeable emergency. Training and certification in basic life support (BLS) are required for all clinical personnel. These individuals should participate in periodic review of the office's emergency protocol, the emergency drug cart, and simulated exercises to assure proper emergency management response.
An emergency cart (kit) must be readily accessible. Emergency equipment must be able to accommodate children of all ages and sizes. It should include equipment to resuscitate a non-breathing, unconscious patient and provide continuous support until trained emergency personnel arrive. A positive pressure oxygen delivery system capable of administering >90% oxygen at a 10 liters/minute flow for at least 60 minutes (650 liters, "E" cylinder) must be available. When a self-inflating bag valve mask device is used for delivering positive pressure oxygen, a 15 liters/minute flow is recommended. There should be documentation that all emergency equipment and drugs are checked and maintained on a regularly scheduled basis. Where state law mandates equipment and facilities, such statutes should supersede this guideline.

Occupational Safety
In an effort to reduce occupational health hazards associated with nitrous oxide, the American Academy of Pediatric Dentistry (AAPD) recommends exposure to ambient nitrous oxide be minimized through use of effective scavenging systems and periodic evaluation and maintenance of the delivery and scavenging systems.

POTENTIAL BENEFITS

- Reduction or elimination of anxiety
- Reduction of untoward movement and reaction to dental treatment
- Enhancement of communication and patient cooperation
- Raising of the pain reaction threshold
- Increasing the tolerance for longer appointments
- Aiding in the treatment of the mentally/physically disabled or medically compromised patient
- Reduction of gagging
- Potentiate the effect of other sedatives

POTENTIAL HARMS

- For some patients the feeling of "losing control" with nitrous oxide may be troubling, and claustrophobic patients may find the nasal hood confining and unpleasant.
- Side effects of nitrous oxide include nausea, vomiting, headache, and disorientation.
- Lack of potency of nitrous oxide/oxygen inhalation
- Interference of the nasal hood with injection to anterior maxillary region
- Nitrous oxide pollution and potential occupational exposure health hazards

CONTRAINDICATIONS
Contraindications for use of nitrous oxide/oxygen inhalation may include:

- Some chronic obstructive pulmonary diseases
- Severe emotional disturbances or drug-related dependencies
- First trimester of pregnancy

- Treatment with bleomycin sulfate

SECTION 7

AMERICAN DENTAL ASSOCIATION POSITION STATEMENTS

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

AMERICAN DENTAL ASSOCIATION STATEMENT ON DENTAL UNIT WATERLINES

Adopted by the American Dental Association Board of Trustees, December 13, 1995, and ADA Council on Scientific Affairs, September 28, 1995

Background

Organized dentistry has traditionally assumed responsibility for assessing and improving the quality of dental care provided to patients. The widespread adoption of enhanced infection control methodologies by dental practitioners is just one example of the profession's commitment to high quality patient care.

This statement was in response to scientific evidence that the microbiologic quality of water used in dental treatment could be improved; and called for the design of dental equipment so that, by the year 2000, water delivered to patients during nonsurgical dental procedures consistently contained no more than 200 colony-forming units per milliliter (cfu/ml) of aerobic mesophilic heterotrophic bacteria at any point in time in the unfiltered output of the dental unit. Since 1995, technological advances have made this goal possible. In addition, the CDC now recommends that coolant water used in non-surgical dental procedures meet EPA regulatory standards for drinking water, which is less than or equal to 500 colony forming units of heterotrophic bacteria per milliliter of water. This CDC recommendation was published in their Guidelines for Infection Control in Dental Health-Care Settings – 2003 (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5217a1.htm) (CDC has different guidelines about water used in oral surgical procedures). Considering these developments, this statement updates the 1995 ADA statement on dental unit waterlines.

The Council is sensitive to heavy regulatory burden imposed on dentists in recent years by various federal, state and local government agencies. In some cases, the regulations have been based on limited science. The Council reaffirms its strong belief that both the profession and the public are served when recommendations affecting dental practice are based on sound science and take into account their cost in light of their expected benefit. The recommendations that follow are made in light of these considerations.

Dental unit waterlines must be maintained regularly to deliver water of an optimal microbiologic quality. Although there is no evidence of a public health risk due to microbial contamination of waterlines, it has been shown that the level of microorganisms in untreated dental unit waterlines is greater than 500 CFU/mL, which exceeds the drinking water standard. Colonization of microorganisms within the waterlines—while it may not be a concern to healthy individuals—might place immunocompromised patients at unnecessary risk. Dental unit waterlines (the tubes that connect the high-speed handpiece, air/water syringe and ultrasonic scaler to the water supply) have been shown to harbor, in significant numbers, a wide variety of microorganisms including bacteria, fungi, and protozoans. These microorganisms colonize and replicate on the interior surfaces of the waterline tubing, inevitably resulting in adherent heterogenous microbial

accumulations termed "biofilms". Biofilms, once formed, serve as a reservoir significantly amplifying the numbers of free-floating microorganisms in the water exiting the waterlines. It

has been suggested that heating dental unit water to increase patient comfort, as is the practice in some dental offices, may further augment biofilm formation. In dental unit waterline systems that are not maintained, these microbial accumulations can contribute to occasional objectionable odors and visible particles of biofilm material exiting the system.

Water Quality Improvement

Dental unit water systems designed for general dental practice must be regularly maintained in order to deliver water of an optimal microbiologic quality. Manufacturers of dental equipment are encouraged to continue to develop accessory components that can be retrofitted to dental units currently in use, whatever the water source (public or independent), to aid in achieving this goal. Further, the ADA urges industry to continue to ensure that all dental units manufactured and marketed in the U.S.A. in the future have the capability to be equipped with a separate water reservoir independent of the public water supply. In this way, dentists not only will have better control over the quality of the source water used in patient care, but also will be able to avoid interruptions in dental care when "boil water" notices are issued by local health authorities.

In 1993, CDC recommended that dental waterlines be flushed at the beginning of the clinic day to reduce the microbial load. However, studies have demonstrated this practice does not affect biofilm in the waterlines or reliably improve the quality of water used during dental treatment. Dental unit water that remains untreated or unfiltered is unlikely to meet drinking water standards, <500 CFU/mL, therefore, one or more commercial devices and procedures designed to improve the quality of water should be employed. At the present time, commercially available options for improving dental unit water quality include the use of:

- Independent water reservoirs
- Chemical treatment regimens
- Source water treatment systems
- Daily draining and air purging regimens
- Point-of-use filters

Additionally, strict adherence to maintenance protocols is required to sustain the quality of dental unit water. Industry and independent researchers are strongly encouraged to continue to explore the possible alternatives and adjuncts to the above listed options. Dental practitioners should always consult with the manufacturer of their dental units before initiating any waterline treatment protocol.

Water Quality Monitoring

It is important that waterline treatment schedules include water quality monitoring. Simple and inexpensive methods to estimate the number of free-floating heterotrophic bacteria in dental unit water are available. A well-designed water quality indicator should be self-contained and easy to use in-office; accurately detect a wide concentration range and type of aerobic mesophilic heterotrophic waterborne bacteria within a reasonable incubation time at room temperature; and be relatively inexpensive to use. In addition to in-office testing kits, laboratories across the U.S. also offer mail-in testing services (http://www.ada.org/prof/resources/topics/waterlines/art_cleaning_waterlines.pdf).

Delivery of Sterile Surgical Irrigation

According to the 2003 CDC Recommendations, "Sterile solutions such as sterile saline or sterile water should be used as a coolant/irrigation in the performance of oral surgical procedures. Oral surgical procedures involve the incision, excision, or reflection of tissue that exposes the normally sterile areas of the oral cavity including biopsy, periodontal surgery, apical surgery, implant surgery, and surgical extractions of teeth (removal of erupted or nonerupted tooth requiring elevation of mucoperiosteal flap). Conventional dental units cannot reliably deliver sterile water even when equipped with independent water reservoirs because the water-bearing pathway cannot be reliably sterilized. Delivery devices (e.g., bulb syringe or sterile, single-use disposable products) should be used to deliver sterile water. Oral surgery and implant handpieces, as well as ultrasonic scalers, are commercially available that bypass the dental unit to deliver sterile water or other solutions by using single-use disposable or sterilizable tubing."

Training and Education

The ADA has resources available to educate dental practitioners regarding microbial contamination and biofilm formation in dental unit waterlines, and improving the quality of water delivered to patients. Additionally, manufacturers should be active in training and educating the profession in the proper use and maintenance of their systems.

In summary, the Council recognizes that the scientific literature supports the need for improvement in dental unit water quality. The Council will continue to work with industry and the research community to address research and development needs that will allow the delivery of water of an optimal microbiological quality to the dental patient. The Council recommends dissemination of this information to dentists as part of the ADA's on-going service to the profession and the public.

July 2004

AMERICAN DENTAL ASSOCIATION STATEMENT ON BACKFLOW PREVENTION AND THE DENTAL OFFICE

Adopted by the American Dental Association Board of Trustees, April 24, 1996, and ADA Council on Scientific Affairs, April 21, 1996

The American Dental Association (ADA) has received a growing number of reports from dentists, as well as their constituent and component dental societies, of regulatory activity mandating the installation of backflow prevention devices in dental offices. Such activity has primarily arisen through state and local health and environmental departments as well as certain public water utilities.

The purpose advanced for this requirement centers on the supposed need to protect cross-connected water systems from potential aspiration of oral fluids through the high-speed dental handpiece, air/water syringe, and cuspidor. Such aspiration, which has been hypothesized might occur during a sudden drop in water pressure (e.g., during a break in a water main), has apparently resulted in concern about bloodborne diseases (e.g., HIV, HBV) being transmitted via water systems cross-connected to the dental unit.

It is important to note that the transmission of bloodborne disease has never been associated with the use of any type of water source. Viruses are unable to reproduce outside their living host and are, therefore, unable to multiply in water. If, in the unlikely event that backsiphonage did result in aspiration of oral fluids, the volume of fluid involved would be minuscule, and the dilution factor on entering the public water supply would be so great as to render any bloodborne viruses non-infectious.

The only dental unit attachments with possible cross-connections to water systems are the cuspidor, high-speed handpiece and air/water syringe. Today, most dental offices do not use cuspidors, and those currently manufactured include an air-gap that serves as an effective backflow preventer. The risk of backsiphonage from the high-speed handpiece or air/water syringe is virtually nonexistent because:

- neither device is intended nor designed to ever be immersed in oral fluids; and
- if water flow is disrupted for any reason, such as in the event of a backsiphonage, the dental worker would automatically discontinue use of the instrument and attempt to resolve the problem.

Additionally, the ADA is currently working with the scientific community and industry to develop technology that will allow dentists, in the provision of dental care, to provide water of a higher microbiological standard than drinking water. This technology will include the use of dental units with contained water systems (not connected to the public water supply). Such systems are already available in the marketplace, and technology to allow the retrofitting of mains-connected dental units to contained water systems is also available.

The ADA agrees with the American Water Works Association that the installation of backflow prevention devices should be consistent with the degree of hazard. However, the ADA believes

that in evaluating the degree of hazard, disciplined and systematic analyses of available information must be conducted before a balanced assessment of the degree of hazard can be attained. Because isolated pieces of information, such as that from the mass media, may distort the reality underlying a given risk, all information should be critically evaluated.

Although a theoretical possibility of contamination resulting from backflow from the dental unit exists, the ADA believes this risk to be nearly zero. While theoretical risks should always be analyzed, responsible risk management demands that they should be considered in light of any realistic benefit the public may receive from eliminating them and the cost to society, as well as to individuals, of any proposed action. In the case of dentistry, the social cost involves reduced access to dental care that results when increased overhead costs, including the cost of regulation, are passed to the patient in the form of higher fees for dental services.

In summary, the Association believes that regulatory intervention requiring the installation of testable backflow prevention devices in dental offices is unjustified because:

- the Centers for Disease Control and Prevention has not identified any evidence of a public health risk due to this theoretical phenomenon;
- bloodborne viruses cannot reproduce outside their living host and therefore, unlike bacteria and fungi, cannot multiply in water systems;
- the amount of fluid that could theoretically be aspirated is minuscule, and would be quickly diluted in the public water supply;
- most dental offices do not use cuspidors, and cuspidors currently manufactured include an air-gap;
- dental instruments with cross connections to water systems are neither designed nor intended to ever be immersed in patient fluids;
- if water flow is disrupted for any reason, such as in the event of a backsiphonage, the dental worker would automatically discontinue use of the instrument and attempt to resolve the problem;
- current trends within the dental profession are towards dental units with contained water systems (not connected to the public water system); and
- cost benefit analyses demonstrate that the expected returns (net increase in healthful life) from these safety requirements are negligible when weighed against the cost; much greater returns could be achieved by directing scarce resources elsewhere.

The ADA is aware of the importance of maintaining the quality of dental unit water as well as the quality of the public water system. The Association has already taken major steps in this direction by issuing a position paper setting a goal for dental unit water to be of a higher microbiological standard than drinking water. The ADA will continue to work with dental manufacturers and the scientific community to assure it achieves this goal.

AMERICAN DENTAL ASSOCIATION STATEMENT ON BISPHENOL A AND DENTAL MATERIALS

CHICAGO (November 2008)—Bisphenol A (BPA) is widely used in the manufacture of many consumer plastic products. Some laboratory testing has suggested that BPA may affect reproduction and development in animals by mimicking the effects of the female hormone estrogen, thereby raising concerns about its safety. To date, these effects have not been observed in humans and are questionable at the exposure levels resulting from consumer products.

The food industry uses BPA when manufacturing the epoxy resins that coat cans and polycarbonate bottles intended to hold foods and beverages. Bisphenol A also is found in some children's toys, plastic tableware and infant bottles. The release of industrial and household wastes into the environment also exposes humans to BPA. There is also evidence that some dental sealants, and to a lesser extent dental composites, may contribute to very low-level BPA exposure.

BPA can become part of dental composites or sealants in three ways: as a direct ingredient, as a by-product of other ingredients in dental composites or sealants that may have degraded, and as a trace material left-over from the manufacture of other ingredients used in dental composites or sealants.

As a direct ingredient: ADA research, confirmed by direct communications from dental manufacturers, indicates that BPA is rarely used as a formula ingredient in dental products.

As a product of the degradation of the material in the oral cavity: Composite resins are formulated from a mixture of monomers that are commonly based on bisphenol A glycidyl methacrylate (bis-GMA). Some composite resins may contain other monomers, in addition to bis-GMA, that are added to modify the properties of the resin. An example is bisphenol A dimethacrylate (bis-DMA). Bis-DMA-containing materials can release very small quantities of BPA because bis-DMA is subject to degradation by salivary enzymes.

As a trace material: BPA may be used in the production of other ingredients found in some dental composites and sealants. Bis-DMA and bis-GMA are both produced using BPA as a starting ingredient, so residual trace amounts of BPA may be present in the final product.

To put the exposure from dental materials into perspective, consider the exposure that occurs from the placement of six dental sealants containing bis-GMA in a child (7 to 14 years of age). The estimated one time exposure (upon sealant placement) for a male child of average body weight (23 kg to 51 kg) [2] is approximately 5.5 micrograms,[3] which is two to five times lower than the estimated daily exposure from food and environmental sources.[1]

According to the CDC, dental caries remains the most common chronic disease of children aged 5 to 17 years—5 times more common than asthma (59% versus 11%).[4] Untreated cavities can cause pain, dysfunction, absence from school, and poor appearance—problems that can greatly affect a child's quality of life. The utility of composite resin materials for both restoring dental health and preventing caries is well established, while any health risks from their use are not. The ADA fully supports continued research into the safety of BPA; but, based on current evidence, the ADA does not believe there is a basis for health concerns relative to BPA exposure from any

dental material.

The ADA looks to the U.S. Department of Health and Human Services (HHS) to provide scientific guidance on issues that affect the health of Americans. The Association also looks to the U.S. Food and Drug Administration (FDA) for advice and recommendations on dental product safety. In 2007, HHS stated that, "Dental sealant exposure to bisphenol A occurs primarily with use of dental sealants [containing] bisphenol A dimethacrylate. This exposure is considered an acute and infrequent event with little relevance to estimating general population exposures."[1]

This year the FDA released the following statement, "Based on our ongoing review, we believe there is a large body of evidence that indicates that FDA-regulated products containing BPA currently on the market are safe and that exposure levels to BPA from food contact materials, including for infants and children, are below those that may cause health effects. However, we will continue to consider new research and information as they become available."[5] Based on this conclusion, the FDA does not require testing of dental materials for BPA at this time.

The ADA is a professional association of dentists committed to the public's oral health. As such, the ADA supports ongoing research on the safety of existing dental materials and in the development of new materials. Based on current research the Association agrees with the authoritative government agencies that the low-level of BPA exposure that may result from dental sealants and composites poses no known health threat.

Footnotes

[1] Center for the Evaluation of Risks to Human Reproduction. National Toxicology Program U.S. Department of Health and Human Services. NTP-CERHR Expert Panel Report on the Reproductive and Developmental Toxicity of Bisphenol A. November 26, 2007.(http://cerhr.niehs.nih.gov/chemicals/bisphenol/BPAFinalEPVF112607.pdf accessed November 30, 2007)
[2] Joskow R, Boyd Barr D, Barr JR, Calafat AM, Needham LL, Rubin C. Exposure to bisphenol A from bis-glycidyl dimethacrylate-based dental sealants. J Am Dent Assoc. 2006;137:353-62.
[3] Centers for Disease Control and Prevention. Growth Charts 2 to 20 years: Boys (http://www.cdc.gov/nchs/data/nhanes/growthcharts/set1clinical/cj41l021.pdf accessed November 17, 2008)
[4] Centers for Disease Control and Prevention. Chronic Disease Prevention and Health Promotion: Preventing Dental Caries. (http://www.cdc.gov/nccdphp/publications/factsheets/Prevention/oh.htm accessed November 17, 2008)
[5] U.S. Food and Drug Administration. Bisphenol A (BPA). (http://www.fda.gov/oc/opacom/hottopics/bpa.html accessed April 30, 2008

Page Posted: November 20, 2008

AMERICAN DENTAL ASSOCIATION STATEMENT ON DENTAL AMALGAM

Dental amalgam is considered a safe, affordable and durable material that has been used to restore the teeth of more than 100 million Americans. It contains a mixture of metals such as silver, copper and tin, in addition to mercury, which binds these components into a hard, stable and safe substance. Dental amalgam has been studied and reviewed extensively, and has established a record of safety and effectiveness.

Issued in late 1997, the FDI World Dental Federation and the World Health Organization consensus statement on dental amalgam[i] stated, "No controlled studies have been published demonstrating systemic adverse effects from amalgam restorations." The document also states that, aside from rare instances of local side effects of allergic reactions, "the small amount of mercury released from amalgam restorations, especially during placement and removal, has not been shown to cause any … adverse health effects."

The ADA's Council on Scientific Affairs' 1998[ii] report on its review of the recent scientific literature on amalgam states: "The Council concludes that, based on available scientific information, amalgam continues to be a safe and effective restorative material." The Council's report also states, "There currently appears to be no justification for discontinuing the use of dental amalgam."

In an article[iii] published in the February 1999 issue of the *Journal of the American Dental Association*, researchers report finding "no significant association of Alzheimer's Disease with the number, surface area or history of having dental amalgam restorations" and "no statistically significant differences in brain mercury levels between subjects with Alzheimer's Disease and control subjects."

A 2003 paper published in the *New England Journal of Medicine*[iv] states, "Patients who have questions about the potential relation between mercury and degenerative diseases can be assured that the available evidence shows no connection."

In 2004, an expert panel reviewed the peer-reviewed, scientific literature published from 1996 to December 2003 on potential adverse human health effects caused by dental amalgam and published a report. The review was conducted by the Life Sciences Research Office (LSRO) and funded by the National Institutes of Dental and Craniofacial Research, National Institutes of Health and the Centers for Devices and Radiological Health, U.S.Food and Drug Administration (FDA). The resulting report states that, "The current data are insufficient to support an association between mercury release from dental amalgam and the various complaints that have been attributed to this restoration material. These complaints are broad and nonspecific compared to the well-defined set of effects that have been documented for occupational and accidental elemental mercury exposures. Individuals with dental amalgam-attributed complaints had neither elevated urinary mercury nor increased prevalence of hypersensitivity to dental amalgam or mercury when compared with controls." The full report is available from LSRO (www.lsro.org). A summary of the review is published in *Toxicological Reviews*[v].

In 2006, the *Journal of the American Medical Association* (JAMA) and *Environmental Health Perspectives* published the results of two independent clinical trials designed to examine the effects of mercury release from amalgam on the central and peripheral nervous systems and kidney function. The authors concluded that "there were no statistically significant differences in adverse neuropsychological or renal effects observed over the 5-year period in children whose caries are restored using dental amalgam or composite materials";[vi,vii] and "children who received dental restorative treatment with amalgam did not, on average, have statistically significant differences in neurobehavioral assessments or in nerve conduction velocity when compared with children who received resin composite materials without amalgam. These finding, combined with the trend of higher treatment need later among those receiving composite, suggest that amalgam should remain a viable dental restorative option for children."[viii]

The U.S. Food and Drug Administration (FDA) is actively considering the reclassification of dental amalgam, based on a review of the scientific literature on amalgam safety, and has requested comments. The ADA supports this review of the literature and FDA's proposal to reclassify dental amalgam. After the ADA's comprehensive evaluation of the peer-reviewed scientific literature, the ADA submitted comments to the FDA reflecting its conclusion that the current evidence does not support a link between dental amalgam and systemic diseases or risks to children, pregnant women or developing fetuses.

In May 2008, a scientific Committee of the European Commission addressed safety concerns for patients, professionals, and the use of alternative restorative materials.[ix] The committee concluded that dental amalgams are effective and safe, both for patients and dental personnel and also noted that alternative materials are not without clinical limitations and toxicological hazards.

The ADA supports ongoing research in the development of new materials. However, the ADA continues to believe that amalgam is a valuable, viable and safe choice for dental patients.

Footnotes

i. FDI Policy Statement/WHO Consensus Statement on Dental Amalgam. September 1997. (accessed March 8, 2007)
ii. ADA Council on Scientific Affairs. Dental Amalgam: Update on Safety Concerns. J Am Dent Assoc. 1998; 129:494-503.
iii. Saxe SR et al. Alzheimer's disease, dental amalgam and mercury. J Am Dent Assoc. 1999;130:191-9.
iv. Clarkson TW, Magos L, Myers GJ. The toxicology of mercury – Current exposures and clinical manifestations. N Engl J Med. 2003; 349:1731-7.
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vi. Bellinger DC, Trachtenberg F, Barregard L, Tavares M, Cernichiari E, Daniel D, McKinlay S. Neuropsychological and Renal Effects of Dental Amalgam in Children: A Randomized Clinical Trial. JAMA 2006; 295:1775-83.

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ix. European Commission: Scientific Committee on Emerging and Newly Identified Health Risks. The safety of Dental Amalgam and Alternative Dental Restoration Materials for Patients and Users. May 8, 2008 (accessed June 17, 2008).

Updated: July 14, 2008

AMERICAN DENTAL ASSOCIATION STATEMENT ON THE SAFETY AND EFFECTIVENESS OF TOOTH WHITENING PRODUCTS

For more than a decade, the ADA Council on Scientific Affairs has monitored the development and the increasing numbers of whitening oral hygiene products. As the market for these products grew, the Association recognized a need for uniform definitions when discussing whiteners.

For example, "whitening" is any process that will make teeth appear whiter. This can be achieved in two ways. A product can bleach the tooth, which means that it actually changes the natural tooth color. Bleaching products contain peroxide(s) that help remove deep (intrinsic) and surface (extrinsic) stains. By contrast, non-bleaching whitening products contain agents that work by physical or chemical action to help remove surface stains only.

Whitening products may be administered or dispensed by dentists or purchased over-the-counter (OTC) and can be categorized into two major groups:

- Peroxide-containing whiteners or bleaching agents; and
- Whitening toothpastes (dentifrices).

Peroxide-containing whiteners or bleaching agents

Dentist-dispensed and OTC home-use products

Dentist dispenssed and OTC home-use tooth whitening bleaches are eligible for the ADA Seal of Acceptance. The products in this category that currently bear the ADA Seal ance contain 10 percent carbamide peroxide; however, participation in the program is not limited to products of this concentration or type of bleach. There are many whitening options currently available to consumers both from the dentist as well as from retail outlets. The ADA recommends that if you choose to use a bleaching product you should only do so after consultation with a dentist.

In a water-based solution, carbamide peroxide breaks down into hydrogen peroxide and urea, with hydrogen peroxide being the active bleaching agent. Other ingredients of peroxide-containing tooth whiteners may include glycerin, carbopol, sodium hydroxide and flavoring agents.

Accumulated clinical data on neutral pH, 10 percent carbamide peroxide continue to support both the safety and effectiveness of this kind of tooth-whitening agent. The most commonly observed side effects to hydrogen or carbamide peroxide are tooth sensitivity and occasional irritation of the soft tissues in the mouth (oral mucosa), particularly the gums. Tooth sensitivity often occurs during early stages of bleaching treatment. Tissue irritation, in most cases, results from an ill-fitting tray rather than the tooth-bleaching agents. Both of these conditions usually are temporary and stop after the treatment.

Professionally applied bleach whiteners

There are many professionally applied tooth whitening bleach products. These products use hydrogen peroxide in concentrations ranging from 15 percent to 35 percent and are sometimes used together with a light or laser, which reportedly accelerates the whitening process. Prior to application of professional products, gum tissues are isolated either with a rubber dam or a protective gel. Whereas home-use products are intended for use over a two-to-four week period, the professional procedure is usually completed in about one hour. Currently, all of the professionally applied whiteners that have the ADA Seal contain 35 percent hydrogen peroxide, although this concentration is not a requirement of the program.

As with the 10 percent home-use carbamide peroxide bleach products, the most commonly observed side effects of professionally applied hydrogen peroxide products are temporary tooth sensitivity and occasional irritation of oral tissues. On rare occasions, irreversible tooth damage has been reported. Due to the discontinuation of the professional component of the Seal Program on December 31, 2007, professionally applied bleach whiteners are not eligible for the ADA Seal.

The ADA advises patients to consult with their dentists to determine the most appropriate treatment. This is especially important for patients with many fillings, crowns, and extremely dark stains. A thorough oral examination, performed by a licensed dentist, is essential to determine if bleaching is an appropriate course of treatment. The dentist then supervises the use of bleaching agents within the context of a comprehensive, appropriately sequenced treatment plan.

Whitening toothpastes

Whitening toothpastes (dentifrices) in the ADA Seal of Acceptance program contain polishing or chemical agents to improve tooth appearance by removing surface stains through gentle polishing, chemical chelation, or some other non-bleaching action. Several whitening toothpastes that are available OTC have received the ADA Seal of Acceptance.

February 2008
Page Updated: February 11, 2008

AMERICAN DENTAL ASSOCIATION STATEMENT ON INTRAORAL/PERIORAL PIERCING & TONGUE SPLITTING

As adopted by the ADA House of Delegates October, 1998 and amended October, 2004

Introduction

Piercing is becoming a more prevalent form of body art and self-expression in today's society. However, oral piercings, which involve the tongue (the most common site), lips, cheeks, uvula or a combination of sites, have been implicated in a number of adverse oral and systemic conditions.

Patients typically undergo piercing procedures without anesthetic. In tongue piercing, for example, a barbell-shaped piece of jewelry typically is placed to transverse the thickness of the tongue at the midline in its anterior one-third using a needle. Initially, a temporary device longer than the jewelry of choice is placed to accommodate postpiercing swelling. The free end of the barbell stem then is inserted into the hole in a ventral-dorsal direction. The recipient grasps the free end of the shank between the maxillary and mandibular anterior teeth and screws the ball onto the stem. The barbell also can be placed laterally, with the studs on the dorsolateral lingual surface. In the absence of complications, healing takes four to six weeks.

Tongue splitting is considered by some to be a form of body art. The process literally splits a person's tongue into two pieces, creating a "forked" appearance. Reports in the public press indicate that various primitive techniques are used by lay people for splitting tongues. For example, without anesthesia, a scalpel may be used followed by a cauterizing pen, or fishing line may be threaded through the pierced tongue and pulled forward, severing the anterior aspect. Individuals regularly pull the two tongue pieces apart to maintain the split so it does not "heal" back together. Once healed, additional surgery may be required to repair the "split" should the individual decide reversal is desired.

In lip or cheek piercing, jewelry position (usually a labrette) is determined primarily by aesthetics with consideration to where the jewelry will rest intraorally. Once position is determined, a cork is usually placed inside the mouth to support the tissue as it is pierced with a needle. The needle is inserted through the tissue and into the cork backing. The needle then is replaced with the labrette stud, and the disc backing is screwed into place. Healing time can range from weeks to months.

Common symptoms following piercing and tongue splitting include pain, swelling, infection and increased salivary flow. Potential complications of intraoral and perioral piercings are numerous, although available scientific literature is rather limited and consists mainly of case reports. Possible adverse outcomes secondary to oral piercing include increased salivary flow; gingival injury or recession; damage to teeth, restorations and fixed porcelain prostheses; interference with speech, mastication or deglutition; scar-tissue formation; and development of metal hypersensitivities. Because of the tongue's vascular nature, prolonged bleeding can result if vessels are punctured during the piercing procedure. In addition, the technique for inserting tongue jewelry may abrade or fracture anterior dentition, and digital manipulation of the jewelry can significantly increase the potential for infection. Airway obstruction due to pronounced edema or aspiration of jewelry poses another risk, and aspirated or ingested jewelry could present a hazard to respiratory or digestive organs. In addition, oral ornaments can compromise

dental diagnosis by obscuring anatomy and defects in x-rays. It also has been speculated that galvanic currents from stainless-steel oral jewelry in contact with other intraoral metals could result in pulpal sensitivity.

The National Institutes of Health has identified piercing as a possible vector for bloodborne hepatitis (hepatitis B, C, D and G) transmission. Disease transmission (e.g., hepatitis B, tetanus, localized tuberculosis) has been associated with ear piercing, and cases of endocarditis have been linked to both nose and ear piercing.

Secondary infection from oral piercing can be serious. A recent article in the *British Dental Journal* reported a case of Ludwig's angina, a rapidly spreading cellulitis involving the submandibular, sublingual and submental fascial spaces bilaterally that manifested four days after the 25-year-old patient had her tongue pierced. Intubation was necessary to secure the airway. When antibiotic therapy failed to resolve the condition, surgical intervention was required to remove the barbell-shaped jewelry and decompress the swelling in the floor of the mouth.

Although reports describing the morbidity and mortality associated with tongue splitting are currently not available in the literature, the risk of complications secondary to surgical procedures is well known. Therefore, the Association recommends that its members discourage patients who request the procedure by educating them of the risks associated with this surgery.

Because of its potential for numerous negative sequelae, the American Dental Association opposes the practice of intraoral/perioral piercing and tongue splitting.

AMERICAN DENTAL ASSOCIATION STATEMENT ON BLOODBORNE PATHOGENS, INFECTION CONTROL, AND THE PRACTICE OF DENTISTRY

As adopted by the ADA House of Delegates October, 1999 and amended October, 2004

Introduction

The dental office is a safe place to provide and receive dental care. Current and generally accepted epidemiological information supports the conclusion that there is no significant risk of contracting bloodborne diseases through the provision of dental treatment when appropriate infection control procedures are followed.

The dental profession in the United States has a long tradition of providing appropriate and compassionate care to the public, including individuals with special needs. The American Dental Association (ADA) believes that it has the responsibility to articulate a clear position on issues related to bloodborne pathogens and diseases and to formulate policy based on current and generally accepted scientific knowledge and accepted moral, ethical and legal imperatives.

This policy statement, addressing bloodborne pathogens, infection control and the practice of dentistry, will be reviewed on a regular basis and may be modified as scientific knowledge of bloodborne pathogen transmission and prevention in heath care settings evolves. The Association urges dentists, other dental workers who may participate or assist in dental procedures, and dental laboratories to follow all ADA policies that deal with bloodborne pathogens.

A key element of infection control is the concept of *standard precautions*, introduced by the Centers for Disease Control and Prevention (CDC) as a means to reduce the risk of bloodborne pathogen transmission (e.g., the Human Immunodeficiency Virus [HIV], Hepatitis B Virus [HBV] and others) in healthcare settings. The primary principle behind standard precautions centers on the premise that medical history and examination cannot reliably identify all patients infected with bloodborne pathogens. All patients, therefore, must be regarded as potentially infectious. As such, applying standard precautions requires that infection control procedures (e.g., HBV vaccination, routine handwashing, use of protective barriers and care in the use and disposal of needles and other sharp instruments) are used for every patient.

Most studies suggest that the prevalence of HCV infection among dentists is similar to that among the general population. Furthermore data historically indicate a higher HBV seroprevalence rate among dentists than the general population, however, declining overall seroprevalence rates and significantly lower rates among dentists under age 40 reaffirm the safety and efficacy of currently recommended infection control measures with respect to bloodborne pathogens. The dental profession, therefore, is strongly urged to continue to adhere to current infection control recommendations as set forth by the ADA and the CDC.

Since the implementation of standard precautions in the United States as a main element of infection control, and with the exception of the Florida case-cluster where HIV may have been transmitted from a dentist to six patients, there have been no documented cases of HIV transmission from dentist to patient, patient to dentist, or patient to patient as a result of dental treatment. Similarly, since 1987 and the implementation of standard precautions, there have been no documented outbreaks of HBV or HCV associated with the practice of dentistry.

Patient Issues

I**nfection Control:** Patients infected with bloodborne pathogens can be safely treated in the private dental office. Current epidemiological evidence indicates that there is no significant risk of contracting bloodborne diseases through the provision of dental treatment when standard precautions are routinely followed. The practice of standard precautions is an effective means of reducing blood contacts that can result in bloodborne pathogen transmission, minimizing even further the already low risk of disease transmission in the dental office.

Vaccination: The Association urges dentists and other dental workers who may be at reasonable risk for infection to take advantage of the hepatitis B vaccine, and other vaccines, to protect themselves and patients from infectious organisms. In addition, the Association supports having all dental, advanced dental and allied dental education programs encourage the vaccination of students, faculty and staff against infectious organisms.

Referral for Medical Evaluation: Dentists should be alert to signs and symptoms of bloodborne disease that may be identified during the provision of dental care. Patients with medical histories or conditions possibly indicative of infection should be referred to their physicians for diagnostic procedures, counseling and medical follow-up.

Patient Disclosure: The Association believes that all patients infected with a bloodborne pathogen(s) should disclose their bloodborne pathogen status as part of their medical history; dentists, like physicians, need to know every patient's medical history in order to make appropriate treatment decisions that are in the best interests of the patient.

Access to Care: The Association believes that individuals infected with a bloodborne pathogen(s) should be treated with compassion and dignity and should have access to dental treatment. Treatment considerations should be based on current and generally accepted scientific knowledge. A dentist should not refuse to provide oral health care that is within the dentist's current realm of competence solely because the patient is infected with a bloodborne pathogen. Furthermore, the ADA's *Principles of Ethics and Code of Professional Conduct* states that a dentist has the general obligation to provide care to those in need. A decision not to provide treatment to an individual based solely on the fact that the individual is infected with a bloodborne pathogen is unethical.

Professional Judgment: The ADA supports the right and responsibility of each dentist to exercise his or her best professional judgment, based on current and generally accepted scientific knowledge and the ethics of the profession, in all situations regarding when and how to treat and whether to refer each patient.

Exposure Incidents: The Association recommends that dentists be familiar with current CDC postexposure protocols for the management of occupational exposures to bloodborne pathogens and that dentists institute office policies to ensure appropriate and efficient management of exposure incidents. The ADA recommends that the costs associated with postexposure prophylaxis and exposure sequelae be a benefit of Workers' Compensation insurance coverage.

Confidentiality: The Association urges dentists to maintain strict confidentiality of a patient's bloodborne pathogen status and medical condition. Under the Association's *Principles of Ethics and Code of Professional Conduct,* dentists are ethically obligated to safeguard the

confidentiality of patient records and to maintain patient records in a manner consistent with the protection of the welfare of the patient. This does not prevent dentists from sharing information about the patient's bloodborne pathogen status and medical condition with the patient's other health care providers when allowed by state or federal law. Dentists are encouraged to have an office protocol, in accordance with applicable laws, for the confidential handling of information about patients infected with a bloodborne pathogen(s).

Provider Issues
Practice Restrictions/Disclosure: The ADA affirms that dentists infected with bloodborne pathogens can safely provide dental care, and that bloodborne pathogen infection alone does not justify the limiting of professional duties or automatically mandate disclosure provided proper infection control procedures are implemented. Infected dental health care workers must practice in compliance with CDC or equivalent infection-control recommendations, as required by applicable law.

If the government mandates testing for bloodborne pathogen infection and disclosure for health care workers who test positive, the ADA Council on Government Affairs will investigate and pursue national legislative possibilities of a government-sponsored insurance program that would guarantee reasonable financial compensation to health care workers who may be discriminated against upon disclosure of their disease status.

Infection Control: Current epidemiological evidence indicates that there is no significant risk of contracting bloodborne diseases through the provision of dental treatment when standard precautions and recommended infection control procedures are routinely followed. Practicing standard precautions is an effective means of reducing blood contacts that can result in bloodborne pathogen transmission, minimizing even further the already low risk of disease transmission in the dental office.

However, because the foremost concern of the dental profession must continue to be protection of the patient, the Association strongly encourages all dental health care workers to undergo personal evaluation and assess their need to determine their bloodborne pathogen status. Furthermore, dental health care workers who believe they are at risk for bloodborne pathogen infection should regularly monitor their status. All dental health care workers testing positive for a bloodborne pathogen must practice only in strict compliance with the current infection-control recommendations of the CDC for infected providers or their equivalent, as required by applicable law; this includes submitting to, and adhering to any objective and appropriate restrictions imposed by expert review panels with competent jurisdiction, as outlined by the CDC.

The high ethical standards of the dental profession establish the welfare of the patient as the dentist's primary ethical obligation. The Association's Council on Ethics, Bylaws and Judicial Affairs has stated in an advisory opinion to the ADA *Principles of Ethics and Code of Professional Conduct* that a dentist who contracts any disease or becomes impaired in any way that might endanger patients or dental staff shall, with consultation and advice from a qualified physician or other authority, limit the activities of practice to those areas that do not endanger patients or other health care providers.

Exposure Incidents: The Association's *Principles of Ethics and Code of Professional Conduct* requires that all dentists, regardless of their known bloodborne pathogen status, have an ethical obligation to immediately inform any patient they suspect may have been exposed to blood or

other potentially infectious material in the dental office of the need for postexposure evaluation and follow-up and to refer the patient, as needed, to a qualified healthcare practitioner who can provide postexposure services. The dentist's ethical obligation in the event of an exposure incident extends to providing information concerning the dentist's own bloodborne pathogen status to the evaluating health care practitioner, if the dentist is the source individual, and submitting to testing that will assist in the evaluation of the patient. If a staff member or other third person is the source individual, the dentist should encourage that person to cooperate as needed for the patient's evaluation. Dentists should document in the patient's record the actions they have taken in response to a patient's exposure to blood or other potentially infectious material. Care should be taken not to include in the patient record confidential medical information about the dentist or a staff member, to avoid unauthorized disclosure of this information with the patient record.

Insurance Coverage: If a dentist infected with a bloodborne pathogen discontinues the practice of dentistry because of a legal requirement to disclose his/her bloodborne pathogen status to patients, the Association believes the dentist to be totally disabled with respect to the practice of dentistry. The ADA will assist and support infected dentists in sustaining meaningful professional careers and will encourage insurance carriers to provide disability benefits for such dentists.

Education

Public Information and Education: Appropriate agencies of the Association should continue efforts to educate the public about both the efficacy of standard precautions and the absence of a significant epidemiological risk of contracting bloodborne diseases through the provision of dental treatment when recommended infection control procedures are routinely followed.

The healthcare and communications communities also should work together, in consultation with government agencies, to develop public service announcements and other educational messages regarding bloodborne diseases. Public education to increase awareness of how bloodborne diseases are transmitted should include information aimed at diminishing irrational fears about transmission of such diseases through dental treatment.

Professional Education: The *Principles of Ethics and Code of Professional Conduct* of the ADA states that the privilege of dentists to be accorded professional status rests primarily in the knowledge, skill and experience with which they serve their patients and society. All dentists, therefore, have the obligation of keeping their knowledge and skill current.

The Association recommends the development of national educational programs for the dental team that address infection control recommendations for preventing bloodborne pathogen transmission in health care settings as well as programs that address the management of the oral and systemic implications of bloodborne diseases. The Association further recommends that dental schools, dental auxiliary schools and advanced dental education programs incorporate these programs in curriculum content and clinical activities. The Association will further assist the profession in addressing bloodborne disease issues by assuring the widespread dissemination of current infection-control recommendations and information on bloodborne diseases to the dental community through Association publications, conferences and videotapes.

Legal and Legislative Issues

Antidiscrimination: The ADA supports clarifying or amending antidiscrimination laws and regulations, either legislatively or through the courts, in consideration of the rights of the patient to be free from acts of prejudice and the rights of others to be protected against an unreasonable risk of disease.

The Association also strongly supports state and federal legislation that protects a dentist from charges of discrimination if a dentist, in a sincere effort to protect a patient's health, elects to refrain from performing a dental procedure on a patient who fails to disclose medical information that, in the dentist's professional judgment and based on current and generally accepted scientific knowledge, may significantly impact the patient's treatment. The Association further strongly supports state and federal legislation that gives an infected patient's health care providers the right to share, when medically indicated, knowledge of the patient's bloodborne pathogen status and current medical condition without risking a violation of state or federal antidiscrimination laws and confidentiality laws.

Professional Judgment: The Association, where appropriate, will pursue legal and legislative means to effect changes to existing statutes, regulations, guidelines and interpretations which impose inappropriate restraint on the exercise of the dentist's professional judgment in the treatment of persons with disabilities and/or infectious diseases.

Classification of Bloodborne Pathogens: The ADA supports the classification of bloodborne pathogens as infectious and communicable disease agents and, as such, will take every appropriate opportunity to publicly support such classification.

National Policies: The Association supports initiatives to develop national policies on bloodborne disease/infection that can become the basis for coordinated efforts by the public and private sectors. The oral health aspects of bloodborne disease/infection and issues related to the practice of dentistry should be included in national policies.

Mandatory Testing: The ADA opposes any laws or regulations that require mandatory testing of dentists and other health care workers to determine their bloodborne pathogen status.

Enforcement of Infection Control Guidelines: Enforcement of CDC or equivalent infection-control guidelines should be assigned to state boards of dentistry.

Statement on Infection Control Standards of Care and Compliance: The ADA encourages and supports infection control standards of care, provided those standards are based on and justified by scientific research, and advocates and pursues fair systems of compliance as well as appropriate penalties for noncompliance.

AMERICAN DENTAL ASSOCIATION STATEMENT ON INTERIM GUIDANCE ON FLUORIDE INTAKE FOR INFANTS AND YOUNG CHILDREN

Recent studies cited in the report of the National Research Council (NRC), "Fluoride in Drinking Water: A Scientific Review of EPA's Standards," have raised the possibility that infants could receive a greater than optimal amount of fluoride through liquid concentrate or powdered baby formula that has been mixed with water containing fluoride during a time that their developing teeth may be susceptible to enamel fluorosis.

The appropriate amount of fluoride is essential to prevent tooth decay. But fluoride intake above optimal amounts can create a risk for enamel fluorosis in teeth during their development before eruption through the gums.

Enamel fluorosis is not a disease but rather affects the way that teeth look. Most cases of fluorosis result in faint white lines or streaks on tooth enamel that are not readily apparent to the affected individual or the casual observer.

While more research is needed before definitive recommendations can be made on fluoride intake by bottle-fed infants, the American Dental Association (ADA) issues this interim guidance because we know that parents and other caregivers are understandably cautious about what is best for their children.

ADA Interim Guidance: Infant Formula

The ADA offers these recommendations so parents, caregivers and health care professionals who are concerned have some simple and effective ways to reduce fluoride intake from reconstituted infant formula.

- Breast milk is widely acknowledged as the most complete form of nutrition for infants. The American Academy of Pediatrics recommends human milk for all infants (except for the few for whom breastfeeding is determined to be harmful).

- For infants who get most of their nutrition from formula during the first 12 months, ready-to-feed formula is preferred to help ensure that infants do not exceed the optimal amount of fluoride intake.

- If liquid concentrate or powdered infant formula is the primary source of nutrition, it can be mixed with water that is fluoride free or contains low levels of fluoride to reduce the risk of fluorosis. Examples are water that is labeled purified, demineralized, deionized, distilled or reverse osmosis filtered water. Many grocery stores sell these types of drinking water for less than $1 per gallon.

- The occasional use of water containing optimal levels of fluoride should not appreciably increase a child's risk for fluorosis.

Parents and caregivers should consult with their pediatrician, family physician or dentist on the most appropriate water to use in their area to reconstitute infant formula. Ask your pediatrician or family physician whether water used in infant formula should be sterilized first (sterilization, however, will not remove fluoride).

ADA Guidance: Other Sources of Fluoride for Young Children

The ADA offers this additional guidance on other sources of fluoride for young children, each of which is beneficial under the circumstances described below:

- **Fluoride Toothpaste**
  Parents and caregivers should ensure that young children use an appropriate size toothbrush with a small brushing surface and only a pea-sized amount of fluoride toothpaste at each brushing. Young children should always be supervised while brushing and taught to spit out rather than swallow toothpaste. Many children under age six have not fully developed their swallowing reflex and may be more likely to inadvertently swallow fluoride toothpaste. Unless advised to do so by a dentist or other health professional, parents should not use fluoride toothpaste for children less than two years of age.

- **Fluoride Mouthrinse**
  Fluoride mouthrinses have been shown to help prevent tooth decay for both children and adults. However, the ADA does not recommend use of fluoride mouthrinses for children under six years of age, unless recommended by a dentist or other health professional. Children under age six may be more likely to inadvertently swallow fluoride mouthrinse.

- **Dietary Fluoride Supplements**
  Children should only receive dietary supplemental fluoride tablets or drops as prescribed by their physician or dentist based on the dietary fluoride supplement schedule approved by the ADA, the American Academy of Pediatrics and the American Academy of Pediatric Dentistry. Supplements are not recommended for children under six months of age.

- **Naturally Occurring Fluoride in Water**
  The optimal fluoride level in drinking water is 0.7 – 1.2 parts per million, an amount which has been proven beneficial in reducing tooth decay. Naturally occurring fluoride may be below or above these levels in some areas. Under the Safe Drinking Water Act, the U.S. Environmental Protection Agency requires notification by the water supplier if the fluoride level exceeds 2 parts per million. People living in areas where naturally occurring fluoride levels in drinking water exceed 2 parts per million should consider an alternative water source or home water treatments to reduce the risk of fluorosis for young children.

ADA Supports Community Water Fluoridation

The ADA supports community water fluoridation as the single most effective public health measure to prevent tooth decay. It is a powerful strategy to reduce disparities in tooth decay among different populations and is more cost-effective than other forms of fluoride treatments or applications. Fluoridation is endorsed by the Centers for Disease Control and Prevention, which has listed community water fluoridation as one of 10 great public health achievements of the 20th century.

As the leader of a science-based profession, the ADA continually reviews new information about fluoride's impact on health. As part of its ongoing assessment, the ADA will convene workshops with government and other professional organizations involved in this issue to determine the best way to evaluate the scientific literature on this topic and formulate more definitive recommendations on fluoride intake, including intake by infants and young children. The ADA also is pursuing other ways to address appropriate fluoride intake with medical, public health and other dental organizations.

November 8, 2006

SECTION 8

RULES OF THE TENNESSEE BOARD OF DENTISTRY

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION

SECTION 9

TENNESSEE DENTAL PRACTICE ACT

TENNESSEE DEPARTMENT OF HEALTH
BUREAU OF HEALTH SERVICES
ORAL HEALTH SERVICES SECTION