**Infection Control: All Those Important Things You Never Thought You Would Have to Know!**

South Carolina DHA  September 30, 2016

South Carolina Dental Practic Act:

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

CDC. MMWR 2003;52(No. RR-17)
[http://www.cdc.gov/oralhealth/infectioncontrol/guidelines/index.htm](http://www.cdc.gov/oralhealth/infectioncontrol/guidelines/index.htm)

**CDC Recommendations**

- Improve effectiveness and impact of public health interventions
- Inform clinicians, public health practitioners, and the public
- Developed by advisory committees, ad hoc groups, and CDC staff
- Based on a range of rationale, from systematic reviews to expert opinions

**Why Is Infection Control Important in Dentistry?**

- **Modes of Transmission**
  - Direct Contact with blood or body fluids
  - Indirect contact with a contaminated instrument or surface
  - Contact of mucosa of the eyes, nose or mouth with droplets of spatter
  - Inhalation of airborne microorganisms

**Standard Precautions**

- Apply to all patients
- Integrate and expand Universal Precautions to include organisms spread by blood and also
  - Body fluids, secretions, and excretions except sweat, whether or not they contain blood
  - Non-intact (broken) skin
  - Mucous membranes

**Elements of Standard Precautions**

- Handwashing
- Use of gloves, masks, eye protection, and gowns
- Patient care equipment
- Environmental surfaces
- Injury prevention

**Personnel Health Elements of an Infection Control Program**

- Education and training
- Immunizations
- Exposure prevention and postexposure management
- Medical condition management and work-related illnesses and restrictions
- Health record maintenance

**Preventing Transmission of Bloodborne Pathogens**

Bloodborne viruses such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)
- Are transmissible in health care settings
- Can produce chronic infection
- Are often carried by persons unaware of their infection

Factors Influencing Occupational Risk of Bloodborne Virus Infection
- Frequency of infection among patients
- Risk of transmission after a blood exposure (i.e., type of virus)
- Type and frequency of blood contact

Average Risk of Bloodborne Virus Transmission after Needlestick
- Concentration of HBV in Body Fluids
- Estimated Incidence of HBV Infections Among HCP and General Population, United States, 1985-1999

Hepatitis B Vaccine
- Vaccinate all DHCP who are at risk of exposure to blood
- Provide access to qualified health care professionals for administration and follow-up testing
- Test for anti-HBs 1 to 2 months after 3rd dose

Occupational Risk of HCV Transmission among HCP
- Inefficiently transmitted by occupational exposures
- Three reports of transmission from blood splash to the eye
- Report of simultaneous transmission of HIV and HCV after non-intact skin exposure

HCV Infection in Dental Health Care Settings
- Prevalence of HCV infection among dentists similar to that of general population (~1%-2%)
- No reports of HCV transmission from infected DHCP to patients or from patient to patient
- Risk of HCV transmission appears very low

Transmission of HIV from Infected Dentists to Patients
- Only one documented case of HIV transmission from an infected dentist to patients
- No transmissions documented in the investigation of 63 HIV-infected HCP (including 33 dentists or dental students)

Risk Factors for HIV Transmission after Percutaneous Exposure to HIV-Infected Blood CDC Case-Control Study
- Deep injury
- Visible blood on device
- Needle placed in artery or vein
- Terminal illness in source patient


Characteristics of Percutaneous Injuries among DHCP
- Reported frequency among general dentists has declined
- Caused by burs, syringe needles, other sharps
- Occur outside the patient’s mouth
- Involve small amounts of blood
- Among oral surgeons, occur more frequently during fracture reductions and procedures involving wire
Exposure Prevention Strategies

Engineering Controls
- Isolate or remove the hazard
- Examples:
  - Sharps container
  - Medical devices with injury protection features (e.g., self-sheathing needles)

Work Practice Controls
- Change the manner of performing tasks
- Examples include:
  - Using instruments instead of fingers to retract or palpate tissue
  - One-handed needle recapping

Administrative Controls
- Policies, procedures, and enforcement measures
- Placement in the hierarchy varies by the problem being addressed
  - Placed before engineering controls for airborne precautions (e.g., TB)

Post-exposure Management Program
- Clear policies and procedures
- Education of dental health care personnel (DHCP)
- Rapid access to
  - Clinical care
  - Post-exposure prophylaxis (PEP)
  - Testing of source patients/HCP

Post-exposure Management
- Wound management
- Exposure reporting
- Assessment of infection risk
  - Type and severity of exposure
  - Bloodborne status of source person
  - Susceptibility of exposed person

Hand Hygiene

Why Is Hand Hygiene Important?
- Hands are the most common mode of pathogen transmission
- Reduce spread of antimicrobial resistance
- Prevent health care-associated infections

Hands Need to be Cleaned When
- Visibly dirty
- After touching contaminated objects with bare hands
- Before and after patient treatment (before glove placement and after glove removal)

Hand Hygiene Definitions
- Handwashing
  - Washing hands with plain soap and water

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- Antiseptic handwash
  Washing hands with water and soap or other detergents containing an antiseptic agent
- Alcohol-based handrub
  Rubbing hands with an alcohol-containing preparation
- Surgical antisepsis
  Handwashing with an antiseptic soap or an alcohol-based handrub before operations by surgical personnel

**Alcohol-based Preparations**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid and effective antimicrobial action</td>
<td>Cannot be used if hands are visibly soiled</td>
</tr>
<tr>
<td>Improved skin condition</td>
<td>Store away from high temperatures or flames</td>
</tr>
<tr>
<td>More accessible than sinks</td>
<td>Hand softeners and glove powders may “build-up”</td>
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**Special Hand Hygiene Considerations**

- Use hand lotions to prevent skin dryness
- Consider compatibility of hand care products with gloves (e.g., mineral oils and petroleum bases may cause early glove failure)
- Keep fingernails short
- Avoid artificial nails
- Avoid hand jewelry that may tear gloves

**Personal Protective Equipment**

- A major component of Standard Precautions
- Protects the skin and mucous membranes from exposure to infectious materials in spray or spatter
- Should be removed when leaving treatment areas

**Masks, Protective Eyewear, Face Shields**

- Wear a surgical mask and either eye protection with solid side shields or a face shield to protect mucous membranes of the eyes, nose, and mouth
- Change masks between patients
- Clean reusable face protection between patients; if visibly soiled, clean and disinfect

**Protective Clothing**

- Wear gowns, lab coats, or uniforms that cover skin and personal clothing likely to become soiled with blood, saliva, or infectious material
- Change if visibly soiled
- Remove all barriers before leaving the work area

**Gloves**

- Minimize the risk of health care personnel acquiring infections from patients
- Prevent microbial flora from being transmitted from health care personnel to patients
- Reduce contamination of the hands of health care personnel by microbial flora that can be transmitted from one patient to another
- Are not a substitute for handwashing!

**Recommendations for Gloving**

- Wear gloves when contact with blood, saliva, and mucous membranes is possible
- Remove gloves after patient care
• Wear a new pair of gloves for each patient
• Remove gloves that are torn, cut or punctured
• Do not wash, disinfect or sterilize gloves for reuse

Latex Hypersensitivity and Contact Dermatitis
• Latex Allergy
  • Type I hypersensitivity to natural rubber latex proteins
  • Reactions may include nose, eye, and skin reactions
  • More serious reactions may include respiratory distress–rarely shock or death
• Contact Dermatitis
  • Irritant contact dermatitis
    • Not an allergy
    • Dry, itchy, irritated areas
  • Allergic contact dermatitis
    • Type IV delayed hypersensitivity
    • May result from allergy to chemicals used in glove manufacturing

General Recommendations Contact Dermatitis and Latex Allergy
• Educate DHCP about reactions associated with frequent hand hygiene and glove use
• Get a medical diagnosis
• Screen patients for latex allergy
• Ensure a latex-safe environment
• Have latex-free kits available (dental and emergency)

Sterilization and Disinfection of Patient Care Items

Critical Instruments
• Penetrate mucous membranes or contact bone, the bloodstream, or other normally sterile tissues (of the mouth)
• Heat sterilize between uses or use sterile single-use, disposable devices
• Examples include surgical instruments, scalpel blades, periodontal scalers, and surgical dental burs

Semi-critical Instruments
• Contact mucous membranes but do not penetrate soft tissue
• Heat sterilize or high-level disinfect
• Examples: Dental mouth mirrors, amalgam condensers, and dental handpieces

Noncritical Instruments and Devices
• Contact intact skin
• Clean and disinfect using a low to intermediate level disinfectant
• Examples: X-ray heads, facebows, pulse oximeter, blood pressure cuff

Instrument Processing Area
• Use a designated processing area to control quality and ensure safety
• Divide processing area into work areas
  • Receiving, cleaning, and decontamination
  • Preparation and packaging
  • Sterilization
  • Storage

Automated Cleaning

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- Ultrasonic cleaner
- Instrument washer
- Washer-disinfector

Manual Cleaning
- Soak until ready to clean
- Wear heavy-duty utility gloves, mask, eyewear, and protective clothing

Preparation and Packaging
- Critical and semi-critical items that will be stored should be wrapped or placed in containers before heat sterilization
- Hinged instruments opened and unlocked
- Place a chemical indicator inside the pack
- Wear heavy-duty, puncture-resistant utility gloves

Heat-Based Sterilization
- Steam under pressure (autoclaving)
  - Gravity displacement
  - Pre-vacuum
- Dry heat
- Unsaturated chemical vapor

Liquid Chemical Sterilant/Disinfectants
- Only for heat-sensitive critical and semi-critical devices
- Powerful, toxic chemicals raise safety concerns
- Heat tolerant or disposable alternatives are available

Sterilization Monitoring
  Types of Indicators
  - Mechanical
    - Measure time, temperature, pressure
  - Chemical
    - Change in color when physical parameter is reached
  - Biological (spore tests)
    - Use biological spores to assess the sterilization process directly

Storage of Sterile and Clean Items and Supplies
- Use date- or event-related shelf-life practices
- Examine wrapped items carefully prior to use
- When packaging of sterile items is damaged, re-clean, re-wrap, and re-sterilize
- Store clean items in dry, closed, or covered containment

**Environmental Infection Control**

Environmental Surfaces
- May become contaminated
- Not directly involved in infectious disease transmission
- Do not require as stringent decontamination procedures

Categories of Environmental Surfaces

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• Clinical contact surfaces
  • High potential for direct contamination from spray or spatter or by contact with DHCP’s gloved hand
• Housekeeping surfaces
  • Do not come into contact with patients or devices
  • Limited risk of disease transmission

General Cleaning Recommendations
• Use barrier precautions (e.g., heavy-duty utility gloves, masks, protective eyewear) when cleaning and disinfecting environmental surfaces
• Physical removal of microorganisms by cleaning is as important as the disinfection process
• Follow manufacturer’s instructions for proper use of EPA-registered hospital disinfectants
• Do not use sterilant/high-level disinfectants on environmental surfaces

Cleaning Clinical Contact Surfaces
• Risk of transmitting infections greater than for housekeeping surfaces
• Surface barriers can be used and changed between patients
  OR
• Clean then disinfect using an EPA-registered low- (HIV/HBV claim) to intermediate-level (tuberculocidal claim) hospital disinfectant

Cleaning Housekeeping Surfaces
• Routinely clean with soap and water or an EPA-registered detergent/hospital disinfectant routinely
• Clean mops and cloths and allow to dry thoroughly before re-using
• Prepare fresh cleaning and disinfecting solutions daily and per manufacturer recommendations

Medical Waste
• Medical Waste: Not considered infectious, thus can be discarded in regular trash
• Regulated Medical Waste: Poses a potential risk of infection during handling and disposal

Regulated Medical Waste Management
• Properly labeled containment to prevent injuries and leakage
• Medical wastes are “treated” in accordance with state and local EPA regulations
• Processes for regulated waste include autoclaving and incineration

Dental Unit Waterlines, Biofilm, and Water Quality
• Dental Unit Waterlines and Biofilm
  • Microbial biofilms form in small bore tubing of dental units
  • Biofilms serve as a microbial reservoir
  • Primary source of microorganisms is municipal water supply

Dental Unit Water Quality
• Using water of uncertain quality is inconsistent with infection control principles
• Colony counts in water from untreated systems can exceed 1,000,000 CFU/mL
• Untreated dental units cannot reliably produce water that meets drinking water standards
• For routine dental treatment, meet regulatory standards for drinking water.
  * <500 CFU/mL of heterotrophic water bacteria

Available DUWL Technology
• Independent reservoirs
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• Chemical treatment
• Filtration
• Combinations
• Sterile water delivery systems

Monitoring Options
• Water testing laboratory
• In-office testing with self-contained kits
• Follow recommendations provided by the manufacturer of the dental unit or waterline treatment product for monitoring water quality

Sterile Irrigating Solutions
• Use sterile saline or sterile water as a coolant/irrigator when performing surgical procedures
• Use devices designed for the delivery of sterile irrigating fluids

Special Considerations
Dental handpieces and other devices attached to air and waterlines
Dental radiology
Creutzfeldt-Jacob Disease (CJD) and other prion-related diseases
Aseptic technique for parenteral medications
Single-use (disposable) Devices
Oral surgical procedures
Handling extracted teeth
Mycobacterium tuberculosis

Dental Handpieces and Other Devices Attached to Air and Waterlines
• Clean and heat sterilize intraoral devices that can be removed from air and waterlines
• Follow manufacturer’s instructions for cleaning, lubrication, and sterilization
• Do not use liquid germicides or ethylene oxide

Components of Devices Permanently Attached to Air and Waterlines
• Do not enter patient’s mouth but may become contaminated
• Use barriers and change between uses
• Clean and intermediate-level disinfect the surface of devices if visibly contaminated

Saliva Ejectors
• Previously suctioned fluids might be retracted into the patient’s mouth when a seal is created
• Do not advise patients to close their lips tightly around the tip of the saliva ejector

Dental Radiology
• Wear gloves and other appropriate personal protective equipment as necessary
• Heat sterilize heat-tolerant radiographic accessories
• Transport and handle exposed radiographs so that they will not become contaminated
• Avoid contamination of developing equipment

Single-Use (Disposable) Devices
• Intended for use on one patient during a single procedure
• Usually not heat-tolerant
• Cannot be reliably cleaned
• Examples: Syringe needles, prophylaxis cups, and plastic orthodontic brackets
Preprocedural Mouth Rinses
- Antimicrobial mouth rinses prior to a dental procedure
  - Reduce number of microorganisms in aerosols/spatter
  - Decrease the number of microorganisms introduced into the bloodstream
- Unresolved issue—no evidence that infections are prevented

Oral Surgical Procedures
- Present a risk for microorganisms to enter the body
- Involve the incision, excision, or reflection of tissue that exposes normally sterile areas of the oral cavity
- Examples include biopsy, periodontal surgery, implant surgery, apical surgery and surgical extractions of teeth.

Handling Biopsy Specimens
- Place biopsy in sturdy, leakproof container
- Avoid contaminating the outside of the container
- Label with a biohazard symbol

Extracted Teeth
- Considered regulated medical waste
  - Do not incinerate extracted teeth containing amalgam
  - Clean and disinfect before sending to lab for shade comparison
- Can be given back to patient

Handling Extracted Teeth in Educational Settings
- Remove visible blood and debris
- Maintain hydration
- Autoclave (teeth with no amalgam)
- Use Standard Precautions

Laser/Electrosurgery Plumes and Surgical Smoke
- Destruction of tissue creates smoke that may contain harmful by-products
- Infectious materials (HSV, HPV) may contact mucous membranes of nose
- No evidence of HIV/HBV transmission
- Need further studies

Dental Laboratory
- Dental prostheses, appliances, and items used in their making are potential sources of contamination
- Handle in a manner that protects patients and DHCP from exposure to microorganisms
- Clean and disinfect prostheses and impressions
- Wear appropriate PPE until disinfection has been completed
- Clean and heat sterilize heat-tolerant items used in the mouth
- Communicate specific information about disinfection procedures

Transmission of Mycobacterium tuberculosis
- Spread by droplet nuclei
- Immune system usually prevents spread
- Bacteria can remain alive in the lungs for many years (latent TB infection)
Risk of TB Transmission in Dentistry
- Risk in dental settings is low
- Only one documented case of transmission
- Tuberculin skin test conversions among DHP are rare

Preventing Transmission of TB in Dental Settings
- Assess patients for history of TB
- Defer elective dental treatment
- If patient must be treated:
  - DHCP should wear face mask
  - Separate patient from others/mask/tissue
  - Refer to facility with proper TB infection control precautions

Program Evaluation
- “Systematic way to improve (infection control) procedures so they are useful, feasible, ethical, and accurate”
  - Develop standard operating procedures
  - Evaluate infection control practices
  - Document adverse outcomes
  - Document work-related illnesses
  - Monitor health care-associated infections

Infection Control Program Goals
- Provide a safe working environment
  - Reduce health care-associated infections
  - Reduce occupational exposures

“Program evaluation provides an opportunity to identify and change inappropriate practices, thereby improving the effectiveness of your infection control program.”

Program Evaluation
- Strategies and Tools
  - Periodic observational assessments
  - Checklists to document procedures
  - Routine review of occupational exposures to bloodborne pathogens

Resources:
Centers For Disease Control and Prevention www.cdc.gov
http://www.cdc.gov/oralhealth/infectioncontrol/guidelines/

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Appendix A: Regulatory Framework for Disinfectants and Sterilants; includes Figure: Decreasing Order of Resistance of Micro-organisms to Germicidal Chemicals

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

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

Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care [PDF 1MB]
Infection Prevention Checklist for Dental Settings (Print-Friendly) [PDF 825 KB]
Infection Prevention Checklist for Dental Settings (Fillable Form) [PDF 884 KB]
Recommendations from the Guidelines for Infection Control in Dental Health-Care Settings, 2003 [PDF 766 KB]

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