Infection Prevention & Control in the Dental Office

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THE DENTAL ADVISOR

Disclosures:
-- Consultant, Hu-Friedy Manufacturing, Inc
-- Consultant, SciCan, Inc
Lessons From the NFL’s MRSA Outbreak: Technology Part of the Team Fight

CA whooping cough outbreak now full-blown epidemic

MERS may be airborne

Contaminated ultrasound gel tied to outbreak of healthcare-associated infections

Survey of EMS Personnel Reveals Lackluster Hand Hygiene Practices
WHY Continue To Be Scrutinized For IC?

- 2007 (NV): Hepatitis C transmission in med practice associated with re-use of multi-dose anesthetic vials
- 2007 (NM): Pt-to-Pt HBV transmission in an O.S. practice
- 2009;2010 (FL, MO): Possible infection transmission to from improperly sterilized med & dent insts in VA hosps
- 2010 (WV): 5 HBV cases following dental tx in free clinic (JADA 10/2013)
- 2011 (OH): VA dental clinic closed – staff DDS IC practices!!
  375 vets tested: 7 HCV & 2 HBV infections
- 2012 (Italy): 1st reported Legionella case from DUWL
- 2012 (CO): Reuse of IV needles on ~ 8,000 pts by oral surgeon
- 2012 (CA): Staph infections to 5 pts during heart surgery from surgeon wearing gloves with hand infection

AND MORE ……
Update on Oklahoma Dental Case  (September, 2013)

Headline:  Dozens of Oklahoma dentist’s patients positive for hepatitis

enuous patient notification letters mailed
4,202 + former pts tested thru pub hlth lab
  89 patients tested hepatitis C +
  5 tested hepatitis B +
  4 HIV+
  > 55% HCV+ pts were older than 50 years (more discussion later)

Documented: 1 case pt-to-pt HCV infection
  -- possible transmission mode: reused needles into anesthetic/medication vials.

How it started: hepatitis C case reported to local health dept
  routine donor; no traditional risk factors
  oral surgery procedure c/in past 6 months - Propofol
Important Recent Infection Control Documents

Updated CDC Guidelines For Infection Control In Dentistry (in progress)

2013 – 2015

Risk of Transmission:
- Surgical smoke
- Burs & endodontic files
- MRSA, CJD, C. difficile

Intervention:
- Double gloves

Equipment:
- Dental unit waterlines
- Sterilization monitoring

Issues To Address
# Infection Control Check-Up

**Pro-Active Office Infection Control Procedures**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are “standard precautions” followed for all patients?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Is there a written infection control program?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Is there a written exposure control plan?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Does the office have an IC and OSHA coordinator assigned?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Have all personnel received training regarding the OSHA Bloodborne Pathogens Standard and protection against infectious agents?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Preventing Transmission of Bloodborne Pathogens**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the HBV vaccination offered and records kept?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are sharps containers and needle recapping devices available?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Is there a needle stick protocol and Post Exposure program?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are exposure records kept confidential?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Contact Dermatitis and Latex Sensitivity**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the initial patient history include inquiries of possible allergies to latex?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are there latex-safe items available for patients and DHCP?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are patients and DHCP made aware of latex sensitivity and consequences?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Program Evaluation**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have all DHCP been trained on Occupational Health and Safety Act (OSHA) requirements?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Does the office/clinic routinely review and evaluate the office infection control program?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Pre - Patient Treatment**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are skin sensitivities &amp; allergies considered when selecting products?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Do DHCP cleanse their hands before treating patients?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Do DHCP use an alcohol hand rub?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are hand hygiene procedures performed for the appropriate times?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are hand lotions available to prevent irritation dermatitis?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

**Sterilization of Patient – Care Items**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there equipment for sterilization; what type(s):</td>
<td></td>
</tr>
<tr>
<td>Are the manufacturer’s guidelines followed for sterilizer maintenance?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Is there a central instrument processing area available for the office?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Does anyone working in this area receive training on how to use the equipment?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Is visible blood and other debris removed before sterilization?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are appropriate gloves used to clean instruments?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are instruments wrapped before sterilization?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Is sterilization equipment properly monitored and records maintained?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>If a spore test comes back positive are all records of mechanical and chemical indicators reviewed, as well as sterilization procedures, to determine if there was operator error?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are implant devices sterilized before use?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Are all sterilized wrapped instrument packages inspected to ensure they have not been compromised?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Patient Treatment</td>
<td>Post - Patient Treatment</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>Personal Protective Equipment</strong></td>
<td><strong>Environmental Surface Asepsis</strong></td>
</tr>
<tr>
<td>□ Y □ N  Do DHCP wear appropriate eye protection?</td>
<td>□ Y □ N  Are surface barriers used to protect clinic contact surfaces, especially those that are difficult to clean?</td>
</tr>
<tr>
<td>□ Y □ N  Do DHCP change masks between patients?</td>
<td>□ Y □ N  Are surface barriers changed between patients?</td>
</tr>
<tr>
<td>□ Y □ N  Do DHCP wear protective clothing and change when necessary?</td>
<td>□ Y □ N  Do DHCP use PPE when cleaning and disinfecting environmental surfaces?</td>
</tr>
<tr>
<td>□ Y □ N  Is protective clothing removed before leaving office, or laundered on site?</td>
<td>□ Y □ N  Is the appropriate contact time used for surface sprays and wipes?</td>
</tr>
<tr>
<td>□ Y □ N  Are gloves, appropriate to treatment, available in sizes required?</td>
<td>□ Y □ N  Are housekeeping surfaces cleaned on a regular basis?</td>
</tr>
<tr>
<td>□ Y □ N  Are gloves removed between patients?</td>
<td></td>
</tr>
<tr>
<td><strong>Parenteral Medications</strong></td>
<td><strong>Dental Unit Waterlines</strong></td>
</tr>
<tr>
<td>□ Y □ N  Are single-dose medications and devices used for one patient only and disposed of appropriately?</td>
<td>□ Y □ N  Are regular waterline maintenance procedures followed to reduce the concentration of microorganisms to meet CDC and ADA water recommendations?</td>
</tr>
<tr>
<td></td>
<td>□ Y □ N  Have the manufacturers’ recommended guidelines been followed?</td>
</tr>
<tr>
<td><strong>Oral Surgical Procedures</strong></td>
<td>□ Y □ N  Is the water and air flushed for 20-30 seconds after each patient?</td>
</tr>
<tr>
<td>□ Y □ N  Do DHCP wear sterile surgeon’s gloves and use sterile irrigation during procedures?</td>
<td></td>
</tr>
<tr>
<td>□ Y □ N  Is sterile water or saline used for invasive procedures?</td>
<td><strong>Dental Handpieces</strong></td>
</tr>
<tr>
<td></td>
<td>□ Y □ N  Are handpieces cleaned, sterilized, and lubricated between patients?</td>
</tr>
<tr>
<td><strong>Biopsy Specimens</strong></td>
<td><strong>Dental Laboratory</strong></td>
</tr>
<tr>
<td>□ Y □ N  Are biopsy specimens placed in a sturdy leak proof container with proper labels?</td>
<td>□ Y □ N  Are DHCP using PPE when handling items received in the laboratory?</td>
</tr>
<tr>
<td></td>
<td>□ Y □ N  Are impressions disinfected before going to the lab?</td>
</tr>
<tr>
<td><strong>Medical Waste and Extracted Teeth</strong></td>
<td></td>
</tr>
</tbody>
</table>
Does your office routinely evaluate the office infection-control program?

- Periodic assessments
- Review and document procedures (SOP)
- Review occupational exposures and prevention strategies

**Purpose:**

1. improve IC program effectiveness & dental practice protocols
2. dental team understanding
3. communicate IC practices to patients
Are single-dose medications and devices used for one patient only and disposed of appropriately?

**Single-dose vials:**
- Preferable
- Discard leftover contents
- Never combine with medications for use on another patient

**Multi-dose vial:**
- Clean diaphragm with 70% alcohol
- Only insert sterile needle into vial
- Discard if sterility is compromised

CDC
The Chain of Transmission

- **Pathogens**
  - Sufficient Virulence, Adequate Numbers
- **Source**
  - Reservoir that Allows Pathogen To Survive And Multiply (e.g., Blood, Saliva)
- **Mode of Transmission**
  - Direct Contact, Indirect Contact, Droplets, Aerosol
- **Route of Entry**
  - Percutaneous, Permucosal, Ocular, Inhalation, Ingestion
- **Susceptible Host**
  - Immune Status
How to Break the Chain

**PATHOGENS**
- Reduce Number & Virulence of Pathogens
- Clean, Disinfect & Sterilize

**SOURCE**
- Recognize Source
- Plan & Take Appropriate Precautions

**MODE OF TRANSMISSION**
- Avoid Transmission
- Control/Limit Contamination
- Using Engineered Safety Devices, Training & Safe Work Practices

**ROUTE OF ENTRY**
- Protect Routes of Entry
- Use PPE & Safe Work Practices

**SUSCEPTIBLE HOST**
- Know & Maximize Immune/Health Status
Aseptic Technique (HH)

Patient Screening

Personal Protection

Vaccination

Instrument Sterilization

Surface Disinfection

Dental Waterlines

Equipment Asepsis

Recognition

What to Do

Science-Based

Professional

Comprehensive

Understand

Why
Critical Importance of Hand Hygiene

- 60-70% nosocomial infections related to improper hand washing & care
- Numerous clinical cases/outbreaks confirming patient-to-patient transmission of pathogens from HCW hands
  - MRSA, *C. difficile*, gram-negatives
- Multiple handwashing & asepsis guidelines since 1975
- New strategies & product types
- CDC 2002 guidelines – most recent & comprehensive
- CDC 2003 IC recommendations for dentistry
- FDA alert & notice (2011)
- Updated CDC dental IC guidelines 2015 – proposed date
Types of Microflora

- **Resident flora** – normal body flora
  - located on skin & in deeper skin layers
  - provide immune protection
  - if disrupted, re-establish at same site

- **Transient flora** – potentially pathogenic
  - Acquired by direct contact
  - Outer skin layers
  - More easily removed
HAND HYGIENE

Multiple Acceptable Choices

• Non-antimicrobial
• Antiseptic
• Alcohol-based
III. Hand Hygiene

A. General Considerations

1. Perform hand hygiene with either a non-microbial 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.

2. For oral surgical procedures, perform surgical hand antisepsis before donning sterile surgeon’s gloves.

## Antimicrobial Spectrum / Characteristics of Hand Hygiene Antiseptic Agents

<table>
<thead>
<tr>
<th>Group</th>
<th>Gram-positive bacteria</th>
<th>Gram-negative bacteria</th>
<th>Mycobacteria</th>
<th>Fungi</th>
<th>Viruses</th>
<th>Speed of action</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohols</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Fast</td>
<td>Optimum concentration 60%–95%; no persistent activity</td>
</tr>
<tr>
<td>Chlorhexidine (2% and 4% aqueous)</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>Intermediate</td>
<td>Persistent activity; rare allergic reactions</td>
</tr>
<tr>
<td>Iodine compounds</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>Intermediate</td>
<td>Causes skin burns; usually too irrititating for hand hygiene</td>
</tr>
<tr>
<td>Iodophors</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>Intermediate</td>
<td>Less irritatin than iodine; acceptance varies</td>
</tr>
<tr>
<td>Phenol derivatives</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Intermediate</td>
<td>Activity neutralized by nonionic surfactants</td>
</tr>
<tr>
<td>Tricolsan</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>—</td>
<td>+++</td>
<td>Intermediate</td>
<td>Acceptability on hands varies</td>
</tr>
<tr>
<td>Quaternary ammonium compounds</td>
<td>+</td>
<td>++</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Slow</td>
<td>Used only in combination with alcohols; ecologic concerns</td>
</tr>
</tbody>
</table>

**Note:** +++ = excellent; ++ = good, but does not include the entire bacterial spectrum; + = fair; — = no activity or not sufficient.

* Hexachlorophene is not included because it is no longer an accepted ingredient of hand disinfectants.
Ability of Hand Hygiene Agents to Reduce Bacteria on Hands

Are products available for hand hygiene manufactured for health care providers?

Handwashing vs. Waterless Alcohol Sanitizers: Pros & Cons

Improved:

• Skin integrity after repeated use
• Compatibility with soaps, alcohol based hand rubs, etc.

Fewer:

• Scents
• Allergenic components

Also consider:

• Consistency (i.e., “feel”)
• Acceptance by HCP
• Accessibility; dispensers
• Cost per use
Important Concept:
Life Is Not Germ-free!

Transient Flora

Normal Flora

Pre – 70% alc. HH

Post – 70% alc. HH
What Do You Think?

A co-worker develops symptoms of dry, itchy, irritated skin on portions of her hands.

1. What are the possible causes of the dermatitis?
2. Could it be caused from a product used outside of the dental office/clinic?
Are appropriate hand lotions or gels available to prevent skin disorders?

Normal, healthy skin

Cracked, scaly skin
Standard Precautions

- Apply to all patients
- Integrate & expand universal precautions for BBP
- Standard precautions for preventing disease transmission include:
  - Hand hygiene
  - Use of personal protective equipment (PPE)
  - Cleaning and decontamination of instruments
  - Cleaning & disinfection of environment surfaces
  - Injury prevention

CDC/JAM
- Major BBP target of IC Precautions
- 6-30% risk from needle stick or cut
- HBV viable on surfaces ~1 week
- HBeAg+ persons more infectious (higher concentration of virus in blood)

### Hepatitis B 2011 Update

<table>
<thead>
<tr>
<th>Reported Acute (New) Cases of Hepatitis B Virus (HBV)</th>
<th>Estimated Actual New Cases of HBV (range) in 2011*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005 2006 2007 2008 2009 2010 2011</td>
<td>2011 (estimated)*</td>
</tr>
<tr>
<td>5,494 4,758 4,519 4,033 3,374 3,350 2,890</td>
<td>18,800(7,400- 86,200)</td>
</tr>
</tbody>
</table>

* Actual acute cases estimated to be 6.5 times the number of reported cases in any year

<table>
<thead>
<tr>
<th>Est. No. of Chronic Cases In the United States</th>
<th>No. of Death Certificates listing HBV as a Cause of Death, 2010*</th>
</tr>
</thead>
<tbody>
<tr>
<td>800,000- 1.4 million</td>
<td>1,792</td>
</tr>
</tbody>
</table>

# Acute cases (2000-2011)
Hepatitis C Virus (HCV)

- RNA virus (family *Flaviviridae*); discovered 1989
- 9,600 nucleotide single-genome polyprotein
  - structural proteins
  - non-structural proteins: viral replication & therapy targets
  - high genetic diversity (“quasispecies”)
  - 7 major genotypes that predict tx response
    - genotype 1: ~70% U.S. infections
- No current vaccine candidates
- New effective drugs for tx
Dramatic decline since mid-1990’s
Est. 4.2 – 5.1 million anti-HCV+ persons in population
Est. 2.7–3.9 million persons living with chronic hepatitis C
HCV prevalence highest among persons born 1945-1965

* Actual acute cases estimated to be 13.4 times the number of reported cases in any year

mean death age 59 yrs
Natural History of HCV Infection

In 20 years, 15-30% progress to cirrhosis. Progression accelerated by HIV, HBV, alcohol use, and fatty liver.


Ly KN. Clin Infect Dis (2014); Mahajan R. CID (2014)
Forecasted Annual Deaths Associated with Chronic Hepatitis C Infection

*Mortality Rates = HBV, HCV, HIV listed as cause of death. Because of decedent can have multiple causes of death, a record listing more than 1 type of infection was counted for each type of infection.

Annual HBV, HCV, HIV Deaths: U.S.
Find out if you have Hepatitis C: it could save your life. Some people don’t know how or when they were infected.

People born from 1945-1965 are 5x more likely to be infected with Hepatitis C. 3 out of every 4 people with Hepatitis C were born between these years.

Successful treatments can eliminate the virus from the body.

Knowing you have Hepatitis C can help you make important decisions about your health. Many people can get lifesaving care and treatment.

Tested

Not Tested

60% of people with Hepatitis C will develop serious liver problems. Left untreated, Hepatitis C can cause liver damage & liver failure. Hepatitis C is a leading cause of liver cancer.

MMWR (8/17/2012)
FIGURE. Estimated number of AIDS diagnoses and deaths and estimated number of persons living with AIDS diagnosis* and living with diagnosed or undiagnosed HIV infection† among persons aged ≥13 years — United States, 1981–2008

- AIDS diagnoses
- AIDS deaths
- Living with HIV infection
- Living with AIDS diagnosis

* AIDS surveillance case definition expanded
† Introduction of highly active antiretroviral therapy

No. of AIDS diagnoses/deaths (in thousands)
No. living with AIDS diagnosis/HIV infection (in thousands)

Year


0 10 20 30 40 50 60 70 80 90 100 110 120
Table of Surveillance Case Definition for Human Immunodeficiency Virus (HIV) Infection Among Adults and Adolescents (Aged ≥13 Years) — United States, 2008

<table>
<thead>
<tr>
<th>Stage</th>
<th>Laboratory Evidence</th>
<th>Clinical Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Laboratory confirmation of HIV infection and CD4+ T-lymphocyte count of ≥500 cells/μL or CD4+ T-lymphocyte percentage of ≥29</td>
<td>None required (but no AIDS-defining condition)</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Laboratory confirmation of HIV infection and CD4+ T-lymphocyte count of ≥200-499 cells/μL or CD4+ T-lymphocyte percentage of 14-28</td>
<td>None required (but no AIDS-defining condition)</td>
</tr>
<tr>
<td>Stage 3 (AIDS)</td>
<td>Laboratory confirmation of HIV infection and CD4+ T-lymphocyte count of &lt;200 cells/μL or CD4+ T-lymphocyte percentage of &lt;14</td>
<td>Or documentation of an AIDS-defining condition (with laboratory confirmation of HIV infection)</td>
</tr>
<tr>
<td>Stage Unknown</td>
<td>Laboratory confirmation of HIV infection and no information on CD4+ T-lymphocyte count of percentage</td>
<td>And no information on presence of AIDS-defining conditions</td>
</tr>
</tbody>
</table>

-- more complete presentation of HIV epidemic on population level.
-- “revised” definition: combines separate HIV & AIDS definitions into a single case definition.

MMWR. December 5, 2008 / 57(RR10);1-8
## Potential Transmission Risks To HCWs

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Conc / ml Serum/Plasma</th>
<th>Transmission Rate (Post-Needlestick)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBV</td>
<td>1,000,000 - 100,000,000</td>
<td>6.0 - 30.0 %</td>
</tr>
<tr>
<td>HCV</td>
<td>10 - 1,000,000</td>
<td>2.7 - 6.0 % (1.8% current)</td>
</tr>
<tr>
<td>HIV</td>
<td>10 - 1,000</td>
<td>0.3 % (Blood splash to eye, nose, mouth is 0.1%)</td>
</tr>
</tbody>
</table>

Lamphear. Epid Rev (1994); CDC 2011
Does the practice have a post-exposure management plan?

- Clear written policies and procedures
- Education of dental health care personnel (DHCP)
- Rapid access to:
  - Clinical care
  - Referral mechanisms to qualified HCP
  - Post-exposure prophylaxis (PEP)
  - Testing of source patients/HCP
- Confidentiality!!!
Occupational Exposures to Bloodborne Pathogens

- Percutaneous injury
- Mucous membrane exposure
- Non-intact (broken) skin exposure
- Bites

CDC estimates ~385,000 sharps injuries annually among hospital-based healthcare personnel (>1,000 injuries/day)
many more in other healthcare settings (e.g., emergency services, home care, nursing homes)

Increased risk for bloodborne virus transmission

Costly to personnel and healthcare system
### Healthcare Personnel with Documented and Possible Occupationally Acquired HIV Infection, by Occupation, 1984-2010

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Documented</th>
<th>Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>24</td>
<td>36</td>
</tr>
<tr>
<td>Laboratory worker, clinical</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Physician, nonsurgical</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Laboratory technician, nonclinical</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Housekeeper/maintenance worker</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Technician, surgical</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Embalmer/morgue technician</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Health aide/attendant</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Respiratory therapist</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Technician, dialysis</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Dental worker, including dentist</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Emergency medical technician/paramedic</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Physician, surgical</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Other technician/therapist</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Other healthcare occupation</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57</strong></td>
<td><strong>143</strong></td>
</tr>
</tbody>
</table>

* Also 0 occupational HIV cases in world

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CDC Surveillance as of Dec. 2010

Updated May 23, 2011
Health Care Workers with Documented Occupationally - Acquired HIV/AIDS as of 12/2006
(Yr of Occupational Exposure / Injury)

Risk Factors:
- Deep injury
- Visible blood on device
- Needle placed in artery or vein
- Terminal illness in source patient
Characteristics of Percutaneous Injuries Among DHCP

- Declining frequency
  -- improved awareness & precautions
- Most incidents: burs, other solid sharps, & NOT hollow-bore needles
- Most occur outside patient’s mouth
- Small amounts of blood
- Needles – 25, 26, 27, 30 gauge vs. larger medical needles
Personal Protective Equipment

✓ A major component of Standard Precautions
✓ Protects skin & mucous membranes from exposure to infectious materials in spray or spatter
✓ Proven effectiveness against microbial pathogens
✓ Should be removed when leaving treatment areas  

CDC/JAM
Gloves: Types

☑ Patient exam: non-sterile
☑ Sterile surgeon’s: tactility, comfort, dexterity
☑ Non-medical (utility): thick, reusable
☑ Latex: “Gold” standard
☑ Vinyl: early high failure rates -- improving
☑ Nitrile, chloroprene, polyurethane, etc.
☑ Ambidextrous vs. right/left fitted

☑ gloves removed & changed between patients?

☑ FDA cracks down on “latex-free” items (3/2013)
Are Your Hands Hurting When Wearing Gloves?

The Choice:
Ambidextrous vs. Right-Left Fitted
Are Gloves Infallible?

- Cardiovascular surgeon with inflammation on hands transmitted *Staphylococcus epidermidis* infection to 5 pts
- Hospl surgeries involved heart valve replacements
- Long procedures same pair gloves – “microscopic tears” allowed bacteria to pass into pts
  - valve surgery requires use of thick sutures and >100 knots tied -- can cause extra stress on the gloves
- Same *S. epidermidis* strains traced to surgeon’s hands

(12/2012)
Protective Eyewear

- Meets/exceeds ANSI standards
- High impact resistance
- Side shields
- Sufficient size to cover and protect eyes
- Desirable: no fogging, scratch resistant, anti-static
- Face shields effective – must still use mask
- Disposable eyewear available
Do clinic personnel wear appropriate eye protection appropriately?
Dental Aerosol & Spatter
(1977 Microbiology Textbook)
Representative Occupational Respiratory Infections

人の職業に関する呼吸系感染症

- "Classic" Respiratory Risks
  - Tuberculosis
  - Influenza
  - Bacterial Pneumonia
  - Pertussis
  - Common Cold

- "New "Emerging" Diseases"
  - MERS-CoV
  - A(H7N9) Influenza
  - Legionellosis

- Future Threats
  - SARS
  - A(H5N1) Bird Flu
### ASTM F2100-11 Standards

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FLUID RESISTANCE, mmHg</strong></td>
<td>80</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td><strong>BFE</strong></td>
<td>≥95%</td>
<td>≥98%</td>
<td>≥98%</td>
</tr>
<tr>
<td><strong>PFE, @ 0.1 micron</strong></td>
<td>≥95%</td>
<td>&gt; 98%</td>
<td>&gt; 98%</td>
</tr>
<tr>
<td><strong>DELTA P, mm H₂O/cm²</strong></td>
<td>&lt; 4.0</td>
<td>&lt; 5.0</td>
<td>&lt; 5.0</td>
</tr>
<tr>
<td><strong>FLAME SPREAD</strong></td>
<td>Class 1</td>
<td>Class 1</td>
<td>Class 1</td>
</tr>
</tbody>
</table>

**FLUID RESISTANCE** represents the mask’s resistance to penetration by synthetic blood under pressure (mmHg). It measures the ability of a mask’s material construction to minimize fluids from traveling through the material and potentially coming into contact with the wearer. The higher the fluid resistance (filtration), the better the protection.

**BFE** (Bacterial Filtration Efficiency) represents the percentage of bacteria filtered out at a spore size of 1-5 microns. It is the measure of the efficiency of the mask in filtering bacteria passing through it.

**PFE** (Particulate Filtration Efficiency) represents the percentage of particles filtered out at a spore size of 0.1-1.0 microns. PFE is the measure of the efficiency of the mask in filtering particles passing through it. The size of the particles filtered is critical.

**DELTA P** (Differential Pressure) represents the pressure drop across the mask or resistance to airflow in mmH₂O/cm². This determines breathing resistance—the higher the Delta P, the less the breathability, but the better the filtration.

**FLAME SPREAD** measures flame spread of the mask material.
Is your face mask providing adequate respiratory protection?

Do clinic personnel change masks between patients?
## AVAILABLE STERILIZATION METHODS

- Steam under pressure
- Prolonged dry heat
- Rapid heat transfer
- Unsaturated chemical vapor
- Ethylene oxide
- Chemical (cold) sterilization

<table>
<thead>
<tr>
<th>Heat – stable items</th>
<th>Heat – labile items</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAM</td>
<td></td>
</tr>
</tbody>
</table>
Gravity Steam Sterilizers

- **Steam**
- **Air**
- **Drain**

- **10 to 25 minutes exposure time at 132° - 135°C (270°F to 275°F)**
- **15 to 30 minutes exposure time at 121° - 123°C (250°F to 254°F)**
- **Drying times vary according to load configuration, materials, contents**
Pre- & Post-vacuum Steam Sterilizers

Steam sterilization involves:
- Removing air before steam enters the chamber.
- 3 to 4 min at 132 – 135°C (270 – 275°F) for effective sterilization.
- Evacuating the chamber during the cycle to enhance steam penetration.
- Evacuating the chamber post-sterilization to enhance drying.

Additional benefits:
- More effective sterilization of handpieces & wrapped items.
- Decreased corrosion of high-carbon steel.
Steam Injection & Positive Pressure Pulse Displacement Autoclave
External Chemical Indicator: Autoclave Tape

Representative External & Internal Chemical Indicators & Integrators
Is sterilization equipment properly monitored and records maintained?

CDC recommends weekly biological monitoring

- In case of a positive spore test
  - Remove the sterilizer from service
  - Do not use the sterilizer until inspected and working properly
Value of Biological Monitoring Systems

They Test:

- Packaging material
- Packaging procedures
- Sterilizer loading
- Sterilizer use
- Sterilizer functioning
- Sterilizer maintenance

Person In Charge

Most common sterilization cycle failure: OVERLOADING
Single-Use Disposable Devices

- Introduced in 1960’s -- promoted as convenient & easy to use
- Designed for use on 1 patient only
- Not intended to be cleaned & sterilized for reuse on another patient
- Not heat tolerant & cannot be reliably cleaned
- Numerous single-use & disposable examples
- More recyclables & biodegradables available

Harte/Molinari
Viable bacteria cultured from the lumens of 4/40 (10%) metal tips used 100x’s
Heat - sterilized between uses.
Particulate material also visually observed after sterile TSB aseptically forced thru 5/40 (12.5%) AWS tip lumens

Conclusion: unable to clean lumens -- provides support for routine use of disposable AWS tips.
## Spaulding Classification

**TABLE 11-1 Categories of Patient-Care Items**

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
<th>Examples in Dentistry</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>Penetrate soft tissue, contact bone, enter into or contact the bloodstream or other normally sterile tissue.</td>
<td>Surgical instruments, periodontal scalers, scalpels, surgical dental burs</td>
<td>Have the greatest risk of transmitting infection—clean and heat sterilize.</td>
</tr>
<tr>
<td>Semicritical</td>
<td>Contact mucous membranes or nonintact skin, but will not penetrate soft tissue, contact bone, or enter into or contact the bloodstream or other normally sterile tissue.</td>
<td>Dental mouth mirror, amalgam condenser, reusable dental impression trays, dental handpieces.*</td>
<td>Have a lower risk of transmission—clean and heat sterilize. If a semicritical item is heat-sensitive, it should, at a minimum, be processed with high-level disinfection.</td>
</tr>
<tr>
<td>Noncritical</td>
<td>Contact with intact skin.</td>
<td>Radiograph head/cone, blood pressure cuff, facebow, pulse oximeter.</td>
<td>Pose the least risk of transmission of infection—clean and disinfect or use disposable barrier protection.</td>
</tr>
</tbody>
</table>

*Although dental handpieces are “by definition” considered a semicritical item, they should always be heat-sterilized between uses and not high-level disinfected.

**Holding Solutions or Foam Sprays (optional step)**

- Goal: avoid drying of debris prior to cleaning & sterilization
  - loosen debris
  - helps to decrease contaminant MO’s
  - minimize instrument handling

- soap & water  --  ultrasonic cleaning soln
- foam sprays  c  enzymes available

- NEVER, EVER use glutaraldehydes!
Cleaning Instruments: Options

“Cleaning is the first step in every decontamination process” (CDC)

- Ultrasonics
- Mechanical (Hand Scrubbing)
- Inst Washer / Disinfectors
If hand scrubbing is performed, is long handled brush utilized & utility gloves worn?

- **Use work-practice controls that minimize contact with sharp insts if manual cleaning is necessary (e.g. long-handled brush).** CDC (2003)
- Not as efficient as ultrasonic cleaners
- Dangerous – increased potential for sharps exposure when scrubbing instruments
- Wear utility gloves & other PPE
- Use of cassettes – manual cleaning not necessary
Ultrasonic Cleaners

- Wear PPE – Utility gloves, mask, glasses, gown
- Sound waves cause bubbles to implode, loosening debris
- Use only correct solution, change daily
- Never overload
- Rinse instruments after cycle
- Dry before placing in pouches / wraps
- Keep lid on during use
- Periodic foil test for unit efficacy
Ultrasonic Unit Testing
Automated Instrument Cleaning

effective
efficiency
↓ exposure to blood & body fluids
↓ exposure to sharps

instrument washers
NOT
dish washers!
Advantages of Cassettes

- Safe transport
- Safe instrument cleaning
- Ease of instrument set-up
- Cannot overload sterilizer
- Ease of storage
- And....
Is the sterilizer loaded such that sterilant may reach all surfaces of the package?
What Do You Think?

Paper Side Up?

Paper Side Down?
Sterilized Wrapped Instruments

Keeping Instruments Wrapped Until Patient Treatment

The Pay-off: Patients Note Sterile Packages (Perception & Reality)
Are wrapped instrument packages inspected to insure they are intact?

Event- vs. Date-related sterilization:
- Date & maintain as sterile until use
- Stored in clean, dry location in manner to prevent contamination during storage
- Inspect packages for integrity & dryness before opening
- If compromised, clean, package, re-sterilize
Evolution of Dental Handpiece Infection Control

1978: 1st ADA recommendations:
“until handpieces can be replaced with models that can be routinely sterilized, scrubbing them in detergent solutions and wiping with alcohol is an alternative”

1986: 1st CDC recommendations:
“routine sterilization of handpieces is desirable, however not all handpieces can be sterilized”

1990: HIV transmission to a dental patient (Acer-Bergalis case)

1992: Published study re: microbial contamination of internal surfaces

1992: FDA letter to dentists “recommends... reusable dental handpieces & related instruments .... be sterilized between each patient use”

1993 & 2003: CDC recommendations

2008: CDC reaffirmed sterilization between uses & “handpieces that cannot be sterilized should NOT be used.”

JAM (2012)
Is the water flushed after each patient?

Includes:
- Handpieces
- Ultrasonic scalers
- Air/water syringes

Recommended to flush:
- 1-2 minutes in morning
- 20-30 seconds after each patient
Are handpieces cleaned, disinfected, lubricated, and sterilized between patients?

1. Flush air/water lines 20-30 sec. (bur in place)
2. Clean and dry handpiece
3. Lubricate
4. Expel excess lubricants (prevents “gumming”)
5. Clean fiber optics
6. Package and heat sterilize
Environmental Surface Asepsis

-- Cleaning
-- Sanitization
-- Disinfection
-- Sterilization

Emerging Issue: Role of Hospital Surfaces in HAI
## Microbial Persistence on Dry Inanimate Surfaces

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Duration of Persistence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em>, incl. MRSA</td>
<td>7 days – 7 mos.</td>
</tr>
<tr>
<td><em>Mycobacterium tuberculosis</em></td>
<td>2 days – 4 mos.</td>
</tr>
<tr>
<td><em>Bordetella pertussis</em></td>
<td>3 – 5 days</td>
</tr>
<tr>
<td><em>Enterococcus sp.</em> (incl. VRE)</td>
<td>5 days – 4 mos.</td>
</tr>
<tr>
<td><em>Clostridium difficile</em> spores</td>
<td>up to 2 yrs.</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>1.5 hrs. – 16 months</td>
</tr>
<tr>
<td>Influenza viruses</td>
<td>1 – 2 days</td>
</tr>
<tr>
<td>Rhinoviruses</td>
<td>2 hrs – 7 days</td>
</tr>
<tr>
<td><em>Herpes simplex viruses</em> (HSV)</td>
<td>4 hrs. – 8 wks.</td>
</tr>
<tr>
<td><em>Hepatitis B Virus</em> (HBV)</td>
<td>&gt; 1 wk. (in blood)</td>
</tr>
<tr>
<td><em>Hepatitis C Virus</em> (HCV)</td>
<td>16 hrs. – 6 wks. (in blood)</td>
</tr>
<tr>
<td><em>Hepatitis A Virus</em> (HAV)</td>
<td>2 hrs. – 2 mos.</td>
</tr>
<tr>
<td>Human Immunodeficiency Virus (HIV)</td>
<td>few min. – 7 days</td>
</tr>
</tbody>
</table>
Categories of Patient Items

-- Critical
-- Semi-Critical
-- Noncritical

Categories of Environmental Surfaces

-- Clinic Contact Surfaces: (light handles, switches, tray) may be touched frequently with gloved hand during pt care, or may become contaminated with blood / OPIM

-- Housekeeping Surfaces: (floors, walls, sinks) do not come into contact with devices used in dental procedures
Surface Covers: changed between patients

Advantages
1. Prevents contamination
2. Protects difficult-to-clean surfaces
3. Less time consuming
4. Reduces chemical use
5. More eco-friendly choices

Disadvantages
1. Need varied sizes / types
2. Non-biogradable plastics
3. Esthetically undesirable?
4. Additional costs over chemical sprays?
Properties of an IDEAL Surface Disinfectant

-- broad antimicrobial spectrum
-- rapid, lethal action on all vegetative forms
-- not affected by physical factors (i.e. active in presence of organic matter)
-- non-toxic; non-allergenic; easy to use
-- surface compatibility: should not compromise integrity of equipment & metallic surfaces
-- residual effect on treated surfaces (reactivation of agent when moistened)
- odorless
-- eco-friendly (does not add “damaging” chemicals to environment)
Surface Sprays: Pros and Cons

Pros:
1. May be less expensive than covers
2. Does not change esthetic appearance of office
3. Does not add plastic to environment
4. Eco-friendly choices becoming available

Cons:
1. More time-consuming than replacing covers (?)
2. Cannot pre-clean some surfaces
3. Chemical & equipment compatibility issues
4. Chemical SDS required
5. Need to label chemical containers
6. May need to periodically prepare use dilutions
7. Must dispose chemical according to environmental laws
Disinfectant Wipes: Pros and Cons

Advantages:
- Tuberculocidal (most)
- less chemical sprays in environment
- less HCW toxicity reactions due to aerosolized disinfectants
- more “equipment friendly”
- Multiple chemicals available -- high- & low- alcohols; phenolics; \( \text{H}_2\text{O}_2 \); sodium hypochlorite; quaternary ammoniums (low-level disinfectants)

Disadvantages:
- 2 wipes needed for cleaning and disinfection (most products)
- May need more for large clinical contact areas
- May evaporate quickly (alcohols)
- Potential for misuse by HCW
- More expensive than liquid
General Cleaning Recommendations

- Use PPE precautions (e.g., heavy-duty utility gloves, masks, protective eyewear) when cleaning and disinfecting environmental surfaces

- Follow manufacturer’s instructions for disinfectant use – Do Not Make Your Own Wipes From Disinfectants Approved As Sprays Only !!

- Do not use sterilant/high-level disinfectants on environmental surfaces

- Physical removal of microorganisms by cleaning is as important as the disinfection process

CDC/JAM (2003,2010)
Environmental Surface Asepsis

- cleaning
- disinfection
- clinical contact surfaces
- housekeeping surfaces
- high-level disinfectant
- intermediate-level disinfectant
- low-level disinfectant
- tuberculocidal
- disinfectant use life & shelf life

JAM
Potential Surface Disinfectant Problems

1. Surface stains after switching surface disinfectants
   - most common going from sprays to wipes
   - accumulated disinfectant ➔ chemical rxs
   - clean surfaces before new disinfectant use

2. Unpleasant odor when using surface disinfectant
   - sulphur in gloves reacting with chemical
   - not present in most gloves; sulphur can be removed
Dental Unit Waterline (DUWL) Asepsis

- Sanitized, Potable, Drinking Water (PH Standards): 500 CFU/ml of heterotrophic bacteria
- Most untreated dental unit water samples: 1,000 to 10,000 CFU (some DUWL > 1,000,000 CFU documented)

- **CDC Recommendation (2003):**
  Use water that meets regulatory standards for drinking water (fewer than 500 CFU/ml of heterotrophic water bacteria) for routine dental treatment output water.
Biofilm formation:

<table>
<thead>
<tr>
<th>Attachment</th>
<th>Colonization</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planktonic cells</td>
<td>Kolonization</td>
<td>BULK FLUID</td>
</tr>
<tr>
<td>Sessile cells</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tubing Wall

Dislodged Biofilm
Representative Isolated DUWL Microbes
Potential Effects on Health

- waterborne infections & disease in hospital /public health settings.
- many involve medical devices (nebulizers, endoscopes, hemodialysis units).
- most DUWL MO’s from public water supply, & do not pose high disease risk for HEALTHY persons.
- increasing # of immune compromised dental pts – common waterborne bacteria involved as increased infection / illness risks.
- dental evidence:
  -- higher Ab titers against *Legionella sp.* in dental personnel compared to other control populations (2 studies)
  
  no *Legionella* disease documented in DHCW
  
  -- DUWL implicated as source for localized Pseudomonas infections in 2 immune comp pts, carriage of same strain in 78 other persons

JAM
Recent DUWL Developments

Waterborne infection is a major public health concern and Unacceptable to use highly colonized water for any kind of dental treatment
1st Reported Case of *Legionella* From DUWL

- LANCET (February 18, 2012)
- 82 yr. old woman died from Legionnaires disease
- During *Legionella* incubation period, only left house for 2 dental visits
- No underlying disease or other obvious *Legionella* risks
- *L. pneumophila* serogroup 1 isolated from bronchial aspirate & DUWL
- Dental office tests: $4 \times 10^3$ CFU/mL from DUWL; $6.2 \times 10^4$ CFU/mL from high speed handpiece turbine
- “Benidorm” *L. pneumophila* subgroup isolated from aspirate & DUWL: same rare sequence type (ST 593) found in both one of most virulent *L. pneumophila* subgroups
- No other Legionnaires’ Disease or Pontiac Fever cases found among dental staff or practice pts identified by epidemiological investigation

Representative DUWL Products
How does your practice rate on compliance?
Thank You
Any Questions?

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