

Infection Control & OSHA Update: That Thing You Do

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Disclosures:
Consultant, Hu-Friedy Manufacturing, Inc.
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Waterborne Infection Risk in Flooded TX, FL, & Puerto Rico

Dengue Fever in Hawaii. More than 100 cases

Legionnaires' Deaths in NYC

Contaminated ultrasound gel tied to outbreak of healthcare-associated infections

Ebola vaccine trials successful

MDR-Candida In US Hospitals

MRSA in NFL Mumps in NFL

Calif. whooping cough outbreak now full-blown epidemic

Michigan Hep A Outbreak

The Flu Hunters

Measles Outbreak In Washington State

Chipolte Food Poisoning Cases Continue to Rise

ENTEROVIRUS EV-D68

2017-18 Flu season worst in years

Zika Cases Exploding

Survey of EMS Personnel Reveals inadequate Hand Hygiene Practices

FDA bans powdered gloves

Hospitals Enforce Flu Vaccine Recs

MERS may be airborne

Number of 2019 measles cases surpasses total for 2018

Disneyland Measles Outbreak

Miami, Texas Hit with Zika Cases

Health Department links hepatitis C case to Tulsa dental surgical office

1st confirmed Ebola case in U.S.

Legionella Disease Added to Flint Tragedy

TB Outbreak in Minnesota University

Mobile Phones in Hospital Settings: A Serious Threat to Infection Control

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Representative IC Contamination Events

- ✓ 1989: HPV infections in surgeons from laser plumes
- ✓ 2007 ((NV): HCV with re-use of multi-dose anesthetic vials
- ✓ 2013 (OK): OS office c multiple violations; pt-to-pt HCV
- ✓ 2014-- Measles outbreaks (unvaccinated persons & imported)
- ✓ 2014-2017: Inst reprocessing problems reported in hospitals debris on "sterilized" OR insts
 - mechanical vs. manual cleaning
- ✓ 2011-16: 3 outbreaks in dental pts from DUWL
- ✓ 2016-- Highly resistant *E. coli* & *C. auris* infections in hospitals

↓
more HC inspections, audits, evaluations

OSHA, DPH, Accreditation Agencies, State Med & Dent Boards

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Top 10 OSHA Dental Citations in 2016

1. No or inadequate BBP Training (50%)
2. No or inadequate written Exposure Control Plan (44%)
3. No written HazCom program (41%)
4. Inadequate information and training (41%)
5. Failure to provide hepatitis B vaccination (26%)
6. No signed declination statement (15%)
7. No annual consideration of appropriate & effective safer medical devices* (12%)
8. Did not discard contaminated sharps as soon as feasible (12%)
9. Lack of safety data sheet for each hazardous chemical used (12%)
10. "Lack" of PPE (12%)

97% of all citations were BBP or Haz Com

Ketcham. OSAP Conf (6/2017)

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Representative OSHA Inspection Format

- Walk – around
 - identify hazards & apparent violations (photos)
 - interview employees (private)
 - interview management
 - records & program reviews
 - work observation & possible sampling
 - taking lots of notes
- Closing Conference
- Findings

Ketcham, OSAP Conf (6/2017)

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OSHA FactSheet
OSHA's Bloodborne Pathogens Standard
 Bloodborne pathogens are infectious microorganisms present in blood that can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). The standard is designed to protect workers from occupational exposure to these pathogens.

OSHA FactSheet
December 1st, 2013 Training Requirements for the Revised Hazard Communication Standard
 OSHA revised the Hazard Communication Standard (HCS) to align with the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and to provide for the revised Hazard Regulation of 2012 (30 CFR 1910.1201). The revised HCS is effective as of December 1, 2013. The revised HCS includes changes to the hazard communication elements of the standard, including the use of hazard pictograms, signal words, and hazard statements. The revised HCS also includes changes to the hazard communication elements of the standard, including the use of hazard pictograms, signal words, and hazard statements.

OSHA FactSheet
Bloodborne Pathogen Exposure Incidents
 OSHA's Bloodborne Pathogen Standard (29 CFR 1910.1039) requires employers to establish procedures for the investigation and control of exposure incidents. An exposure incident is defined as a situation in which a worker's blood, other body fluids, or other potentially infectious material (OPIM) is splashed, sprayed, or otherwise comes in contact with the worker's face, body, or clothing.

OSHA FactSheet
Medical Evaluation and Follow-up
 When a worker experiences an exposure incident, the employer must provide medical evaluation and follow-up. The employer must also provide the worker with information about the incident, including the date, time, and location of the incident, and the nature and extent of the exposure. The employer must also provide the worker with information about the employer's exposure control plan and the worker's rights under the standard.

OSHA FactSheet
Exposure Control Plan
 The employer must develop and implement an exposure control plan that identifies the tasks and procedures that involve occupational exposure to blood or other potentially infectious materials (OPIM). The plan must also identify the workers who are exposed to these materials and the methods and frequency of exposure control.

OSHA FactSheet
Personal Protective Equipment (PPE)
 The employer must provide and ensure the use of appropriate PPE to protect workers from occupational exposure to blood or other potentially infectious materials. PPE may include gloves, gowns, masks, and face shields.

OSHA FactSheet
Handwashing
 The employer must provide and ensure the use of appropriate handwashing facilities and procedures to protect workers from occupational exposure to blood or other potentially infectious materials.

OSHA FactSheet
Housekeeping
 The employer must provide and ensure the use of appropriate housekeeping procedures to protect workers from occupational exposure to blood or other potentially infectious materials.

OSHA FactSheet
Regulatory Compliance
 The employer must ensure that the exposure control plan and other measures comply with the requirements of the Bloodborne Pathogens Standard.

OSHA FactSheet
Employee Training
 The employer must provide training to all workers who are exposed to blood or other potentially infectious materials. The training must include information about the standard, the employer's exposure control plan, and the worker's rights and responsibilities.

OSHA FactSheet
Recordkeeping
 The employer must maintain records of exposure incidents, medical evaluations, and other information required by the standard.

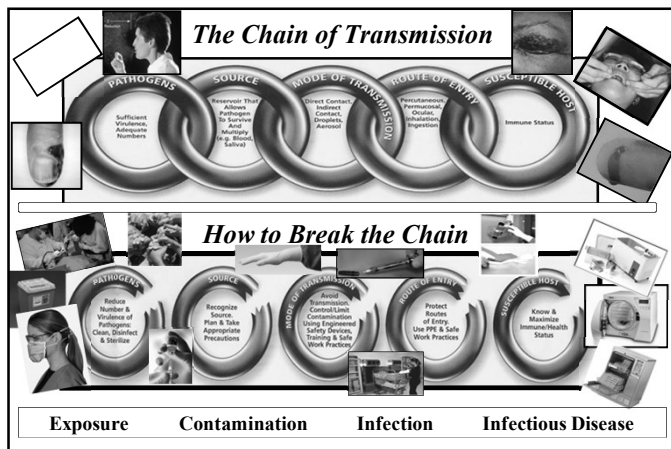
OSHA FactSheet
Enforcement
 OSHA may conduct inspections to ensure that employers are complying with the Bloodborne Pathogens Standard. If OSHA finds a violation, it may issue a citation and impose a penalty.

OSHA FactSheet
Resources
 For more information about the Bloodborne Pathogens Standard, visit the OSHA website at www.osha-slc.gov.

OSHA FactSheet
Figure 1. Pictograms and Hazards

Health Hazard	Flame	Explosion Mark
<ul style="list-style-type: none"> • Carcinogen • Irritant • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Acute Toxicity 	<ul style="list-style-type: none"> • Flammable • Oxidizing • Self Heating • Self Reacting • Corrosive 	<ul style="list-style-type: none"> • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (oral) • Acute Toxicity (inhalation) • Acute Toxicity (water) • Hazardous to the Aquatic Environment • Very Hazardous to the Aquatic Environment
<ul style="list-style-type: none"> • Gas Under Pressure 	<ul style="list-style-type: none"> • Skin Corrosion/Irritation • Eye Damage • Corrosive to Metals 	<ul style="list-style-type: none"> • Explosive • Self Reacting • Organic Peroxide
<ul style="list-style-type: none"> • Flammable (Gases) 	<ul style="list-style-type: none"> • Aquatic Toxicity 	<ul style="list-style-type: none"> • Acute Toxicity (oral or inhaled)

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Current Status of CDC Dental Infection Control Guidelines


- No evidence to support changes to 2003 guidelines
 - Principles of infection prevention have not changed
 - COMPLIANCE issues, not the ineffectiveness of current recommendations
- Summary of basic infection prevention expectations for safe care in all dental settings
 - Based on Standard Precautions
 - Supplements existing CDC recommendations (not a replacement)
 - Provides links to references & additional resources + checklists

MMWR
 Morbidity and Mortality Weekly Report
 Supplement 1: Infection Control in Dental Settings – 2013

Summary of Infection Prevention Practices in Dental Settings
 Basic Expectations for Safe Care

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2916 CDC Dental Infection Control Guidelines



checklist example

Key Recommendations for DENTAL UNIT WATER QUALITY in Dental Settings

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.
2. Consult with the dental unit manufacturer for appropriate methods and equipment to maintain the quality of dental water.
3. Follow recommendations for monitoring water quality provided by the manufacturer of the unit or monitoring treatment product.
4. Use sterile saline or sterile water as a coolant/irrigant when performing surgical procedures.

II.8 Dental Unit Water Quality

Elements To Be Assessed	Assessment	Notes/Areas For Improvement
A. Dental unit waterline treatment products/devices are used to ensure water meets EPA regulatory standards for drinking water (i.e., ≤ 500 CFU/mL of heterotrophic water bacteria) for routine dental treatment output water	<input type="checkbox"/> Yes <input type="checkbox"/> No	
B. Product manufacturer instructions (i.e., waterline treatment product, dental unit manufacturer) are followed for monitoring the water quality	<input type="checkbox"/> Yes <input type="checkbox"/> No	
C. Sterile saline or sterile water is used as a coolant/irrigant when performing surgical procedures	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Note: Use devices specifically designed for delivering sterile irrigating fluids (e.g., sterile bulb syringe, single-use disposable products, and sterilizable tubing).

Note: Examples of surgical procedures include biopsy, periodontal surgery, apical surgery, implant surgery, and surgical extractions of teeth.

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Does Practice Routinely Review & Evaluate Office IC Program?


- Periodic assessments
- Required OSHA and IC updates documented
- Review and document procedures (SOP)
- Training records maintained (federal / state regulations)
- 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

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Critical Importance of Hand Hygiene

- 60-70% HAI related to improper hand washing & care
- MRSA, *C. difficile*, gram-negatives outbreaks pt-to-pt transmission from HCW hands
- Multiple hand washing guidelines since 1975
- New strategies & product types
- CDC 2002 guidelines – most recent & comprehensive
- CDC 2003 IC recommendations for dentistry
- Updated CDC dental IC guidelines (2016)
- Emerging HH issue ⇒ Increasing tolerance of *E. faecium* to handwash alcohol antiseptics



Boyce. Am JIC (2013); JAM. DE (2016); Pidot, et al. Science Trans Med. (2018)

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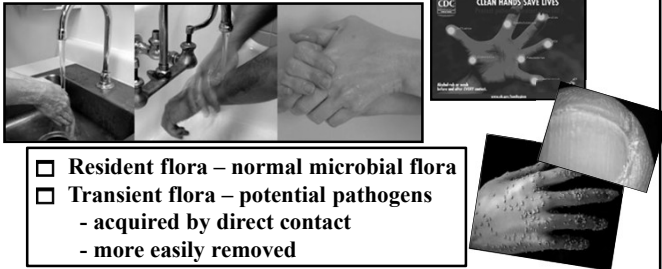
HAND HYGIENE

Multiple Acceptable Choices

- Non-antimicrobial soap
- Antimicrobial (antiseptic) soap
- Alcohol-based antiseptic

3 Hand Hygiene Areas

- ✓ Washing (cleaning)
- ✓ Antisepsis
- ✓ Skin care



- Resident flora – normal microbial flora
- Transient flora – potential pathogens
 - acquired by direct contact
 - more easily removed

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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

MMWR 2003; 52(RR-17):1-66.

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Antimicrobial Spectrum / Characteristics of Hand Hygiene Antiseptic Agents

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

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.

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Alcohol-free, Waterless Hand Hygiene Antiseptics?

Alcohol-based

- ✓ Evaporate quickly on skin
- ✓ Can dry skin c prolonged use; irritation; decreased use?
- ✓ 60-85% ethyl- or isopropyl alcohol

Non-alcohol-based

- ✓ Remain on skin longer
- ✓ Do not dry epithelium c repeated use
- ✓ Benzalkonium chloride often active agent

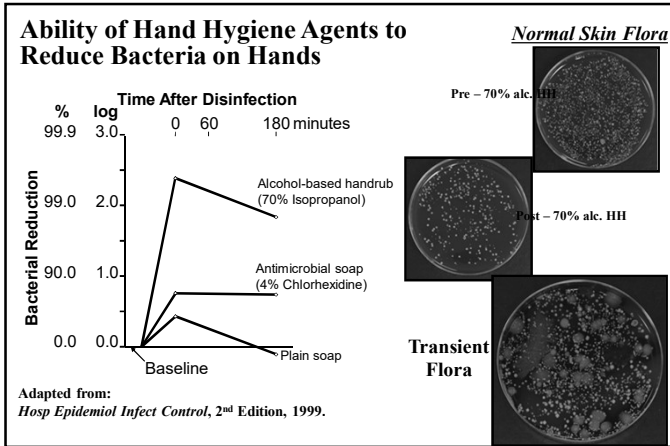
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Hand Hygiene saves lives

- Always wash and rinse when hands are visibly soiled or dirty
- Wash and rinse or use waterless alcohol rub when hands are not visibly soiled
- Initial thorough hand wash at beginning of workday
- Subsequent hand hygiene procedures should last at least 15 seconds or time recommended for the specific preparation
- Do not wear jewelry, long nails, or artificial nails
- Maintain epithelial integrity with frequent hand hygiene procedures
- Skin sensitivities and personnel allergies

Hand Hygiene Considerations

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Available Hand Hygiene Products for HCP: Considerations

Improved:

- Skin integrity after repeated use
- Tissue compatibility with soaps, waterless hand rubs, etc.

Fewer:

- Scents
- Allergenic components – (HCW c sensitive skin)

Also consider:

- Consistency (i.e., “feel”) Accessibility
- Acceptance by HCP Dispenser systems
- Cost per use

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HCW hands & irritation problems

e

Frequent hand hygiene procedures

HCP history of skin problems

Improper wash technique

Incomplete rinsing skin antiseptics

Using hot water for wash procedures

Excessive perspiration while wearing gloves

Glove powder
banned by FDA 1/2017

Failure to dry hands completely

Multiple water-based products available

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Hand Hygiene Considerations Summary

- Professional vs. personal hand products
- Concentration of emollients in waterless products: lubricates & reduces drying action of alcohol on skin
- Emollient accumulation on skin: seen with product repeated use - soap & water removal
- Supplemental hand lotions/creams: frequent handwashing can cause dermatitis water-based vs. petroleum- based lotions
- ☞ Epithelial integrity: prevent / minimize dermatitis & skin infections JAM

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Bloodborne Pathogens & Infectious Disease Updates

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Viral Hepatitis Overview + CDC Hepatitis Table

Hepatitis A (HAV) – vaccine since 1995

- # reported hepatitis A cases declined by 90.8%;
13,397 (2000) to 1,239 (2014); more unreported U.S. cases each year
- 10,000,000 new cases reported globally every year
- recent outbreaks and deaths reported

Hepatitis B (HBV) -- vaccine since 1982

- est. 19,200 new US infections; 2,953 reported cases (2014)
- ~850,000 – 2.2 million people c chronic HBV infection in U.S.
- 1,000 deaths a year in U. S. from HBV-related liver cancer

Hepatitis C (HCV) – no vaccine

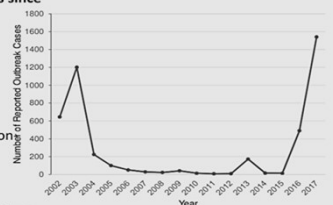
- est. > 30,000 new U.S. cases each year
- 2.7 - 3.9 million people in the US chronically infected
- 9,000 deaths a year in U. S. from HCV-related liver disease

Hlth Commun (10/2014); CDC (2016)

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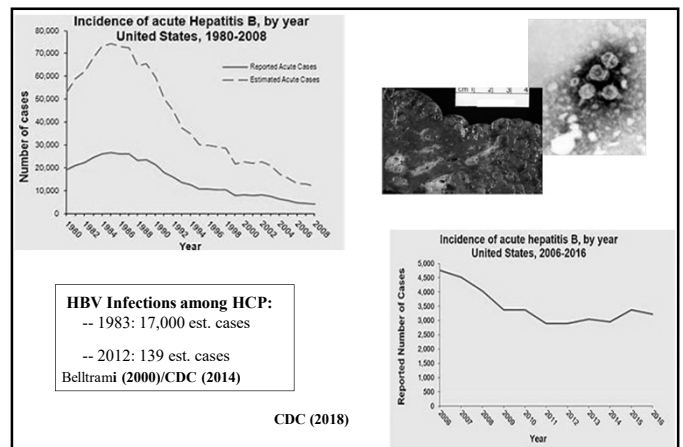
HAV Outbreaks: U.S. (2016-2018)

- CDC has assisted in multiple HAV outbreaks since July 1, 2016
 - Foodborne Transmission
 - Hawaii-Frozen Scallops
 - Multistate- Frozen Strawberries
 - Person-to-Person Transmission
 - Homeless individuals and injection/non-injection drug users
 - Men who have sex with men (MSM)
- >8,000 outbreak associated cases reported since July 1, 2016

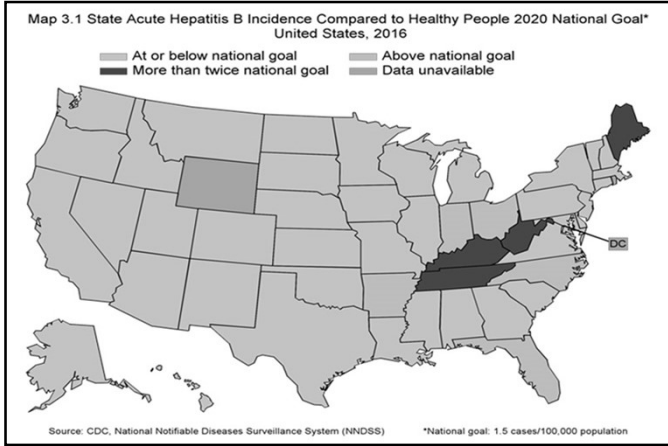


HAV Foodborne Illnesses
Hepatitis A Outbreaks Spread Across the United States
Tainted Strawberries Spread Hepatitis A
Outbreaks of hepatitis A in multiple states among people who use drugs and/or people who are homeless

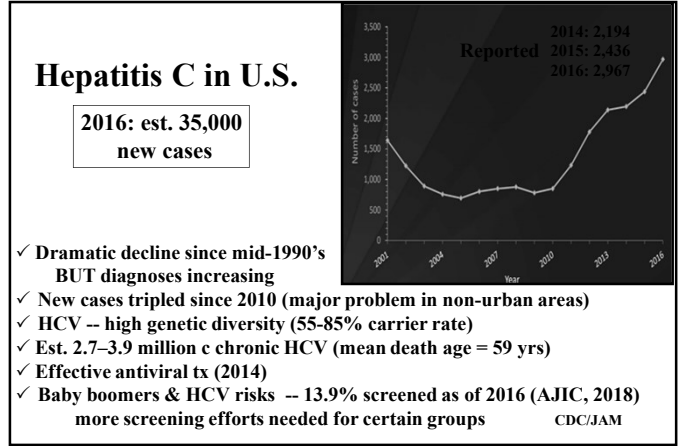
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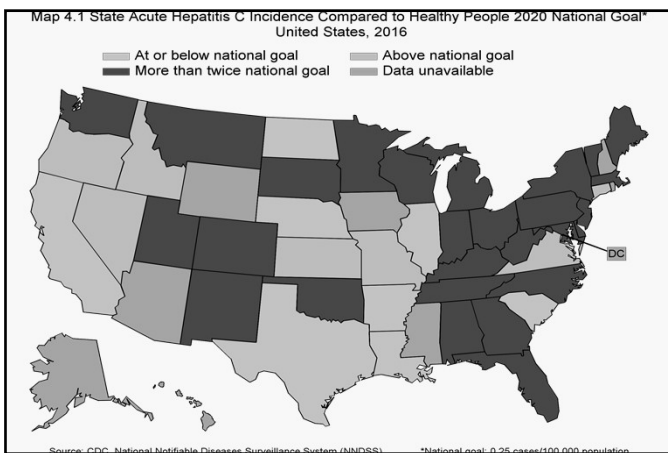
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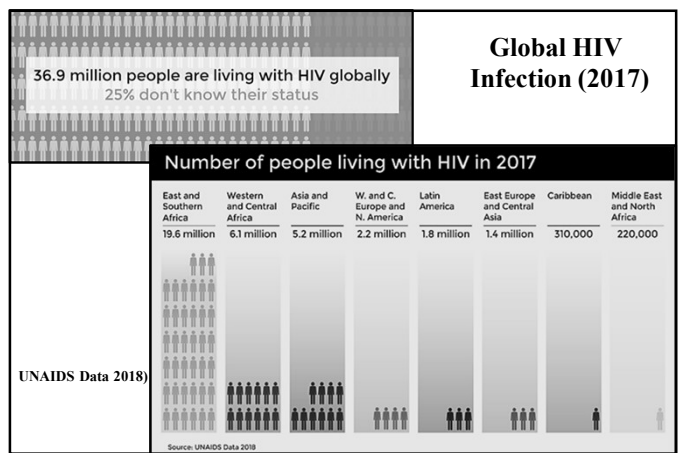
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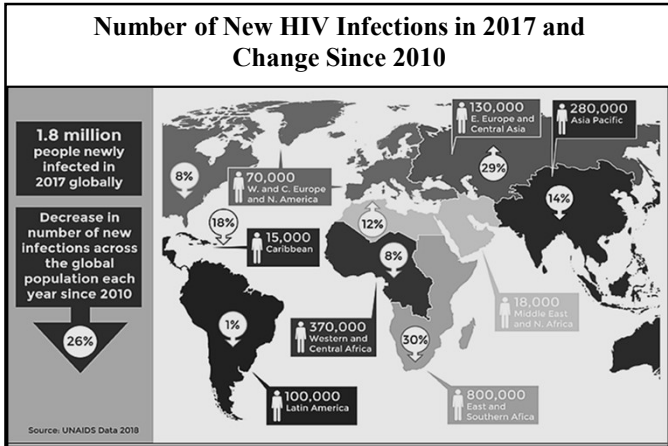
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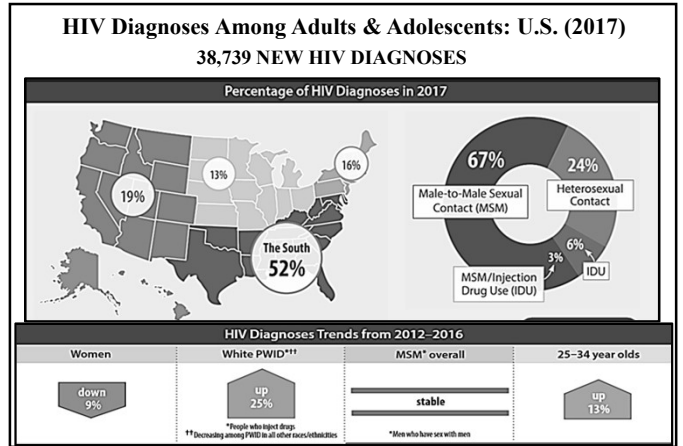
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Potential Transmission Risks To HCWs

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

Lamphear. Epid Rev (1994); CDC 2011

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Healthcare Personnel with Documented and Possible Occupationally Acquired HIV Infection, by Occupation, 1984-2013


Occupation	Documented	Possible
Nurse	24	36
Laboratory worker, clinical	16	17
Physician, nonsurgical	6	13
Laboratory technician, nonclinical	3	-
Housekeeper/maintenance worker	2	14
Technician, surgical	2	2
Embalmer/morgue technician	1	2
Health aide/attendant	1	15
Respiratory therapist	1	2
Technician, dialysis	1	3
Dental worker, including dentist *	-	6
Emergency medical technician/paramedic	-	12
Physician, surgical	-	6
Other technician/therapist	-	9
Other healthcare occupation	-	6
Total	57	150

* Also 0 occupational HIV cases in world

CDC Surveillance as of Dec. 2013 CDC.11/7/2016

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Occupational Exposures to Bloodborne Pathogens



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

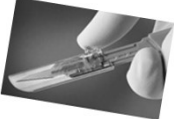
- CDC estimates ~385,000 sharps injuries annually among hospital-based healthcare personnel (>1,000 injuries/day)
- many more in other healthcare settings (e.g., emergency services, home care, nursing homes)
- Increased risk for bloodborne virus transmission
- Costly to personnel and healthcare system

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Needlestick Safety and Prevention Act (2000)

Federal OSHA standard requires:

- Use of engineering & work practice controls
- Recordkeeping on a Sharps Injury Log
- Written Exposure Control Plan
- Must reflect changes in technology use for prevention
- Document annual evaluation of safer sharps devices
- Employers required to solicit input from direct patient care personnel regarding identification & selection of engineering & work practice controls.



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Sample Evaluation Forms

SAFETY NEEDLE/SYRINGE EVALUATION (1 of 2 Pages)

Name: _____ Occupation/Title: _____
 Dept/Unit: _____ Today's Date: _____
 Product Number if of times used: _____

Please circle the most appropriate answer for each question. Not applicable (N/A), may be used if the question does not apply to the particular product.

Product/Performance Issues	Yes	No	N/A	How important is this issue? (Circle one)
1. Is the product/packaging easy to store?				1 2 3 4 5
2. Is the packaging easy to open?				1 2 3 4 5
3. Did the syringe function properly for its intended purpose?				1 2 3 4 5
4. Is this product available in the size needed?				1 2 3 4 5
5. Are the needles smooth/compatible?				1 2 3 4 5
6. Is the device simple and self-evident to operate?				1 2 3 4 5
7. Did you need extensive training to use this product effectively?				1 2 3 4 5
8. Can the safety feature be actuated with one hand?				1 2 3 4 5
9. Is the device compatible with other devices it may have to be used for or attached with?				1 2 3 4 5
10. Did the safety feature work reliably?				1 2 3 4 5
11. Do both hands remain behind the needle during shearing?				1 2 3 4 5
12. Does the safety feature interfere with normal use of this product?				1 2 3 4 5
13. Does the product require more time to use than a non-safety product?				1 2 3 4 5
14. Does the product have an unmistakable indicator that the safety feature is activated?				1 2 3 4 5
15. Does this product cause more patient pain than usual?				1 2 3 4 5
16. Is this product equally satisfactory for different or diverse patient populations?				1 2 3 4 5
17. Are you confident that the dosage you drew was accurately delivered to the patient?				1 2 3 4 5
18. Was dosage stability adequate with this device?				1 2 3 4 5
19. Do you have to aspirate/withdraw syringe completely prior to safety feature use?				1 2 3 4 5
20. Do you think the device increases the risk of spillage?				1 2 3 4 5
21. Was the exposed sharp blunted or covered once it was used?				1 2 3 4 5
22. Did this product require compulsory use of the safety feature?				1 2 3 4 5

Form 15

(Safety Needle/Syringe Evaluation, page 2 of 2)

What percentage of clinical procedures does this device address? _____

List the functions the device was not suitable for: _____

About how many times did you use this product before you were comfortable using it? _____

Did you have any needles/needles using this device? yes no
 If yes, describe: _____

Do you think this device will protect you from needles/needles? yes no
 If no, why: _____



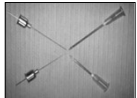
Based on your evaluation, which device would you rather use (check one):
 The one we currently use
 This device
 Another device (specify alternative if known: _____)

Are there any additional design features or other performance considerations you would like to see in a safety needle/syringe that have not been mentioned? Any additional comments you have?

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Characteristics of Percutaneous Injuries Among DHCP

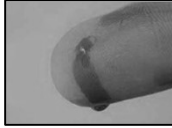
- Declining frequency
 - improved awareness & precautions
 - increased cassette use
- Most incidents: burs, other solid sharps, & **NOT** hollow-bore needles
- Most occur outside patient's mouth
- Small amounts of blood
- Needles – 25, 26, 27, 30 gauge vs. larger medical needles

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Does Practice Have A Post-Exposure Management Plan?

- Clear written policies and procedures
- Who will manage post-exposure process
 - Employee Health
 - Occupational Medicine
 - Emergency depts. / Urgent Care
- 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
 - Payment of services
 - Wait times to be evaluated
 - Availability of HBIG, HBV vaccine, & HIV PEP
 - Confidentiality!!!



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Hepatitis Vaccines (1982-2017)

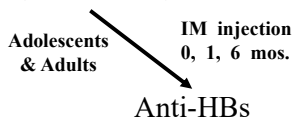
- **Heptavax B:** licensed in 1981; available in 1982
- **Recombivax HB; Engerix B:** recombinant vaccines available in 1986
- **Safe:** possible allergic rxs in yeast-sensitive persons
- **Immunogenic & Effective: decline of HBV infections among HCP:**
 - 1983: 17,000 cases estimated
 - 2012: 139 cases estimated
- **Generally administered as 3-dose series**
 - Recombivax® licensed for 2-dose schedule (adolescents 11-15 yrs; 4-dose series available (e.g., combination vaccine, compressed schedule for travel, dialysis))
- **Protection lasts >30 years**
 - no current recommendation for booster doses
 - **people with declining anti-HBs titers still protected against infection & chronic disease**

Beltrami (2000)/CDC (2014); Bryce. JID (2016); Schillie. CDC (2/2018)

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ORIGINAL HBV VACCINATION SCHEDULE

HBsAg + Alum Adjuvant



Responses: after 1 dose: 30%-55%
 after 2 doses: 75%
 after 3 doses: ≥90%

Lower 3-dose seroprotection: advanced age, diabetes, renal disease/dialysis, obesity, chronic illness, smoking, diabetes (31.3%-94.4%)
 dialysis: (10%-83.5%)

Schillie, et al. Diab Care (2012); Sit, et al. World J Hepat (2015); CDC (2/2018)

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For People Who Do Not Respond to HBV Vaccination

Results of Additional Injections:

<u>Injection</u>	<u>% Responding</u>
4 th	25 %
5 th	40 %
6 th	50 %

IF recipient negative after 6 injections:

- ⇒ genetic hepatitis B vaccine non-responder.
- ⇒ active hepatitis B virus infection: prodromal or icteric disease phase
- ⇒ hepatitis B carrier (HBsAg +): vaccine ineffective

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HEPLISAV-B

- ▶ FDA licensed 11/9/2017
- ▶ Protection against all HBV subtypes in persons \geq 18 yrs old
- ▶ Vaccine series: 2 doses, separated by 1 month
- ▶ Uses 018 adjuvant to stimulate directed response to HBsAg
- ▶ Clinical studies demonstrated high rates of seroprotection:
 - ✦ 90.0%-100.0% HEPLISAV-B recipients vs. 70.5%-90.2% recipients comparison group
 - ✦ Type 2 diabetes mellitus: 90.0% (HEPLISAV-B) vs. 65.1% (comparator)

Halperin. et al. Vaccine (2012); Janssen et al. Vaccine 2013; HEPLISAV-B package insert 11/2017

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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



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Are Appropriate Gloves Available?

Considerations	Examples
Material	- latex, vinyl, nitrile, chloroprene
Skin sensitivity	- allergies to latex or nitrile - hand perspiration
Size	- proper size, lightweight & pliable - snug fit without hand constriction - appropriate finger length - fits palm without compression - ambidextrous vs. right- & left-fitted
Tactile sensation	- grip - glove thickness - slipperiness of material when wet
Function	- non-sterile gloves for most procedures - sterile gloves for surgical procedures - utility gloves reprocessing & clean-up - FDA bans powdered medial gloves beginning on 1/19/2017

Molinari & Nelson. TDA (2/2015)

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Are Hands Hurting When Wearing Gloves?

Hand & Wrist Risk Factors Associated with Dentistry


- ✓ Repetitive hand movements
- ✓ Awkward wrist positions
- ✓ Mechanical stresses to digital nerves (i.e. sustained grasping on instrument handles)
- ✓ Forceful treatment procedures in confined, small space
- ✓ Extended vibratory instrument use (i.e. handpieces, ultrasonic scalers)



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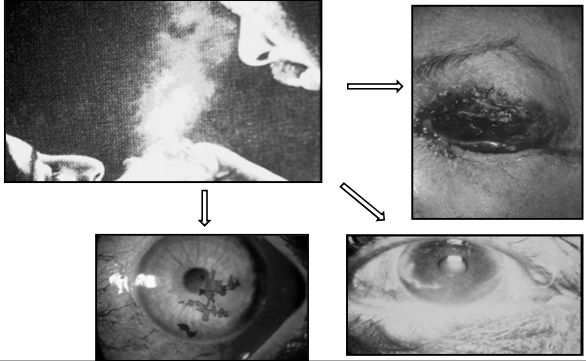
Protective Eyewear

- 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



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Aerosols and Spatter: Rationale for Occupational Eye Protection



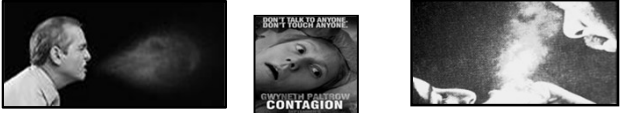
46

Do clinic personnel wear appropriate eye protection appropriately?



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Representative Occupational Respiratory Infections



DISEASE	CAUSATIVE AGENT	TRANSMISSION
Tuberculosis	<i>Mycobacterium tuberculosis</i>	Droplet nuclei expelled by patient from coughing
Common cold	<i>Rhinoviruses, Adenoviruses</i> (most frequently)	Coughing and sneezing; contaminated environmental surfaces
Influenza	Influenza viruses	Spatter and aerosols associated with coughing; contaminated environmental surfaces
Severe Acute Respiratory Syndrome	SARS Coronavirus	Close person-to-person contact via aerosolized droplets and indirect contact from contaminated surfaces
Pertussis (whooping cough)	<i>Bordetella pertussis</i>	Coughing and sneezing
Legionnaires' Disease	<i>Legionella pneumophila</i>	Breathing in mist or vapor (small droplets of water in the air) containing the bacteria; not spread from person-to-person
Rubeola (measles)	Rubeola virus	Droplets from airborne secretions of infectious persons

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ASTM F2100 Medical Face Mask Material Requirements by Performance Level

	ASTM Level 1	ASTM Level 2	ASTM Level 3
FLUID RESISTANCE, mmHg	80	120	160
BFE	≥95%	≥98%	≥98%
PFE, @ 0.1 micron	≥95%	> 98%	> 98%
DELTA P, mm H ₂ O/cm ²	< 4.0	< 5.0	< 5.0
FLAME SPREAD	Class 1	Class 1	Class 1

FLUID RESISTANCE:

- Represents mask's resistance to penetration by synthetic blood under pressure (mmHg)
- Measures ability of mask's 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 percentage of bacteria filtered out at pore size of 1 – 5 microns
- The measure of efficiency of the mask filtering bacteria through it

PFE (Particulate Filtration Efficiency):

- Represents percentage of particles filtered out at a pore size of 0.1 – 1.0 microns
- 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 air flow in mmH₂O/cm²
- Determines breathing resistance
- Higher the Delta P, the less breathability, but the better the filtration

FLAME SPREAD:

- Measures flame spread of the mask material

Source: The American Society for Testing and Materials. Standard specification for performance of materials used in medical face masks. F2100-11 Standard

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Masks: What to Wear & When

Molinari & Nelson. TDA (2014)

LEVEL:		
1	ASTM Low Barrier: For procedures where fluid, spatter, and/or aerosols are produced in low concentrations.	Procedures: - Patient Exams - Operatory Cleaning/Maintenance - Impressions - Lab Trimming, Finishing & Polishing - Orthodontics
2	ASTM Moderate Barrier: For procedures where generation of fluid, spatter and/or aerosols is moderate.	Procedures: - Restorative/Composites - Endodontics - Prophylaxis - Sealants - Scaling & Root Planning - Limited Oral Surgery
3	ASTM High Barrier: For procedures where heavy to moderate levels of fluid, spatter and/or aerosols are produced.	Procedures: - Crown Preparation - Implant Placement - Use of Ultrasonic Scaler - Use of Piezo Scaler with Water or Medicaments - Periodontal Surgery - Complex Oral Surgery Laser use

<http://www.dentaladvisor.com/publications/translating-the-science/index.html>

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N – 95 Respirators: NIOSH-approved particulate respirator mask (PRM)



- For: HCW working in close contact c pts with respiratory symptoms, influenza, or influenza-like illness
- More efficient than masks used for routine pt treatment
- Work best when fitted properly - employers to ensure
- Difficulty breathing for some people ---- greater perceived discomfort
- More recommendations for N-95 in medicine when using lasers

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Is Face Mask Providing Adequate Respiratory Protection ?



Also:



- ☞ Remember: masks become saturated from both sides
- ☞ “Wicking” of fluids through wet mask
- ☞ 20 min. routine use-life
- ☞ Face shield may lengthen use-life
- ☞ Position mask to “stand out” from face




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AVAILABLE STERILIZATION METHODS

- Steam under pressure (autoclaves)
 - Gravity Displacement (P-C OCM; Tuttenaur)
 - Steam Flush Pressure Pulse (M-11)
 - Fractionated Vacuum (Bravo; Statclave)
 - Steam Injection Pressure Pulse (Statim; M-3)
- Prolonged dry heat
- Plasma Sterilization
- Unsaturated chemical vapor
- Ethylene oxide
- Chemical (cold) sterilization

Heat – stable items



Heat – labile items




JAM

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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



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Monitoring Indicators & Integrators

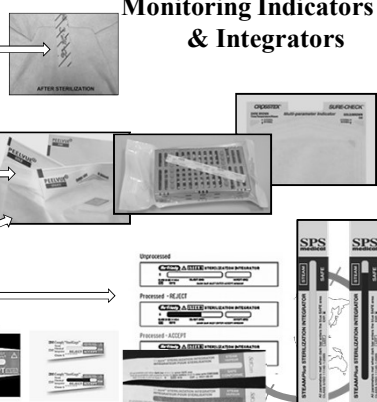
Class I (Process Indicators)

Class II (Bowie-Dick Indicators)

Class III (Temperature Specific Indicators)

Class IV (Multi-Parameter Indicators)

Class V (Type) (Integrating Indicators)




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Air Removal Test (pre-vacuum sterilizers) (Bowie – Dick Test)


Daily Test Procedure – every day sterilizer is used

1. Shortened cycle (no dry time) to heat up sterilizer
2. Place a Bowie-Dick type test pack in the sterilizer, flat on the lowest shelf over the drain without a load
3. Run a 134°C/273°F for 3.5 minutes cycle with little or no dry time
4. Remove the test pack & examine chemical indicator sheet
5. The sterilizer passes the air removal test if the indicator sheet has a uniform color change (i.e. the center of the sheet is the same color as the edges)


unprocessed



passed



failed



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Monitoring Indicators & Integrators

Class I (Process Indicators)

Class II (Bowie-Dick Indicators)

Class III (Temperature Specific Indicators)

Class IV (Multi-Parameter Indicators)

Class V (Type) (Integrating Indicators)

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Error	Problem
Improper instrument cleaning and potentially compromise the sterilization process	Biological and other debris can shield adherent microbes and potentially compromise the sterilization process
Improper packaging	Examples: wrong type material for method; too many items in package; excessive amounts of wrap material
Overloaded sterilizer	Can prevent thorough contact of sterilizing agent with all items in unit
Inadequate Maintenance	Critical area; example issues include worn gaskets and seals
Improper sterilization equipment	Use of non-FDA approved equipment

Sterilization Process Problems

Person in Charge !!

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Single-Use Disposable Devices

- Introduced in 1960's --convenient & easy to use
- Designed for use on 1 patient & then discarded
- Not intended to be cleaned & sterilized for reuse on another patient
- Not heat tolerant & cannot be reliably cleaned
- More recyclables and biodegradables available
- Manufacturers required to document reprocessing reusable items – no reuse for single use devices!

Harte & Molinari; CDC (2003); RCDSO

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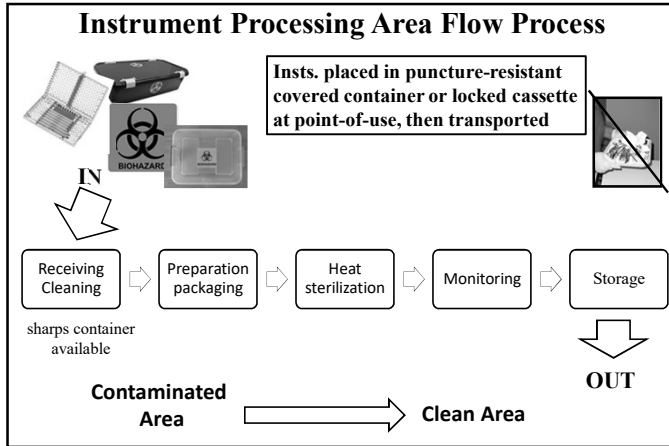
Instrument Reprocessing

→??→

Category	Definition	Examples in Dentistry	Comments
Critical	Penetrate soft tissue, contact bone, enter into or contact the bloodstream or other normally sterile tissue.	Surgical instruments, periodontal scalars, scalps, surgical dental bars	Have the greatest risk of transmitting infection—clean and heat sterilize.
Semicritical	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.	Dental mouth mirror, amalgam condenser, reusable dental impression trays, dental handpieces.*	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.
Noncritical	Contact with intact skin.	Radiograph head/cone, blood pressure cuff, facebow, pulse oximeter.	Pose the least risk of transmission of infection—clean and disinfect or use disposable barrier protection.

*Although dental handpieces are "by definition" considered a semicritical item, they should always be heat-sterilized between uses and not high-level disinfected. Adapted from CDC. Guidelines for infection control in dental healthcare settings—2003. MMWR 2003;52(16):17-20.

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Cleaning Instruments: Options

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

Ultrasonics

Mechanical (Hand Scrubbing)

Inst Washer / Disinfectors

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Holding Solutions or Foam Sprays (optional step)

- Goal: avoid drying of debris prior to cleaning & sterilization
 - when cleaning will be delayed
 - loosen debris
 - helps to decrease contaminant MO's
 - minimizes instrument handling
- soap & water - ultrasonic cleaning soln
- foam sprays c enzymes available
- NEVER, EVER use glutaraldehydes !

JAM

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If hand scrubbing is performed, is long handled brush utilized and utility gloves worn?

- ✓ 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

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Ultrasonic Cleaners

- Wear PPE – utility gloves, mask, glasses, clinical attire
- Sound waves cause bubbles to implode, loosening debris
- Dual enzymatic & detergent solns
- Remove of gross debris before ultrasonics
- Use only correct solution, change daily, or more frequently
- Never overload; lid on during use
- Rinse/dry insts before placing in pouches / wraps
- Test for cleaning cycle efficacy
 - foil test
 - artificial soil monitors



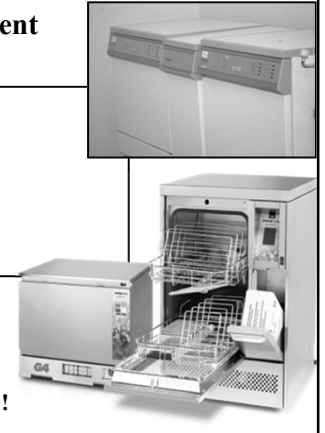
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Automated Instrument Cleaning

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



dish washers are NOT instrument washers !



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COMMON CLEANING PROCESS FAILURES

Washer-Disinfector

- Cycle used (i.e. “Rinse-Hold”)
- Inadequate water spray due to spray impingement
- Clogged spray arms
- Pump/line clog or malfunction
- Overloading
- Instrument shadowing
- Inadequate detergent dosing

Ultrasonic

- Insufficient time
- Detergent concentration
- Ineffective cavitation
- Inappropriate soln temperature
- Overloading

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When ultrasonic is utilized, is periodic testing performed?



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Cleaning Monitors

□ Used to monitor the efficiency of the cleaning process

Molinari & Nelson. TDA (2016)

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Cassette Advantages

Time Savings	One cassette holds all instruments for a specific procedure together from chairside procedure through reprocessing while eliminating certain manual steps from the process.
Improved Safety	Minimized handling of contaminated instruments during processing for re-use, which decreases chances of sharps injuries.
Better Organization	Standardized procedures that are color coded for easy identification and organization.
Decreased Contamination Potential	Proper spacing of instruments during reprocessing provides optimal environment for cleaning and sterilization.
Streamlined Workflow	Promotes proper flow of dirty to clean during instrument reprocessing. Easy break down after patient appointment and simple patient prep.
Increased Instrument Longevity	Protects instruments from damage during reprocessing while keeping them in place from chairside to storage to reduce the possibility of misplaced instruments.

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THE DENTAL JOURNAL

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Is sterilizer loaded such that sterilant may reach all surfaces of the package?

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Sterilized Wrapped Instruments

Keeping Instruments Wrapped Until Patient Treatment

The Pay – off : Patients Note Sterile Packages (Perception & Reality)

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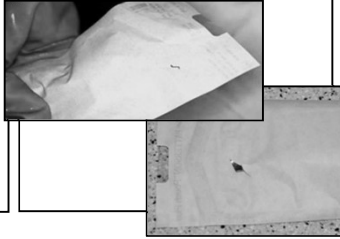
Package Labeling & Inspection Before Use

Event-related storage

- “contents sterile unless package is opened or damaged, please check before using.”
- Stored in clean, dry location in manner to prevent contamination during storage
- Relies on proper storage and handling of packs
- Inspect packages for integrity & dryness before opening
- If compromised, clean, package, re-sterilize
- Most commonly recommended

Time (Date)-related storage

- Package expiration date
- Establishes time limit for sterile storage
 - Based on manufacturer IFU



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CDC IC Recommendations for Handpieces

- Semi-critical devices; internal components can become contaminated with patient materials during use.
- Follow manufacturers’ IFUs for reprocessing!
- “Dental handpieces and associated attachments, including low-speed motors and reusable prophylaxis angles, should always be heat sterilized between patients and not high-level or surface disinfected.” (CDC, 2016)



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Are Clinical Contact Surfaces Covered or Cleaned & Disinfected Between Patients?

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



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Environmental Surface Asepsis: Role of Hospital Surfaces in HAI

- Surface contamination plays important role in MO transmission
- Well-established for MRSA & VRE
- New evidence for noroviruses, *C. difficile*, & *Acinetobacter*
- Extent of pt-to-pt transmission proportional to level of environmental contamination
- HBV & HCV transmission via contact with environmental surfaces; outbreaks among patients & staff of hemodialysis units.

Weber, Rutala, et al. Am J Inf Cont (2010) Bond, et al. Lancet (1981); Kamili, et al. Inf Con Hosp Epid (2007); Paintsil. JID (2014)

76

Microbial Persistence on Dry Inanimate Surfaces

Microorganism	Duration of Persistence
□ <i>Staphylococcus aureus</i> , incl. MRSA	7 days – 7 months
□ <i>Mycobacterium tuberculosis</i>	2 days – 4 months
□ <i>Bordetella pertussis</i>	3 – 5 days
□ <i>Enterococcus sp.</i> (incl. VRE)	5 days – 4 months
□ <i>Clostridium difficile</i> spores	up to 2 yrs.
□ <i>Escherichia coli</i>	1.5 hrs. – 16 months
□ <i>Candida auris</i>	> 1 month
□ Influenza viruses	1 – 2 days
□ Rhinoviruses	2 hrs – 7 days
□ Herpes simplex viruses (HSV)	4 hrs. – 8 wks.
□ Hepatitis B Virus (HBV)	> 1 wk. (in blood)
□ Hepatitis C Virus (HCV)	16 hrs. – 6 wks. (in blood)
□ Hepatitis A Virus (HAV)	2 hrs. – 2 months
□ Human Immunodeficiency Virus (HIV)	few min. – 7 days**

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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; cleaned on regular basis

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Surface Covers:

- a. Use appropriate disposable cover materials
- b. Change 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- biodegradable plastics
3. Esthetically undesirable?
4. Additional costs over chemical sprays ?



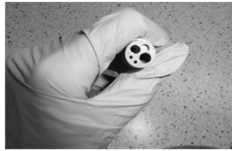
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Properties of an IDEAL Surface Disinfectant

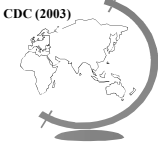
- broad antimicrobial spectrum
- rapid, lethal action on all vegetative forms
- not affected by physical factors (i.e. active in presence of organic matter)
- non-toxic; non-allergenic; easy to use
- surface compatibility: should not compromise integrity of equipment & metallic surfaces
- residual effect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

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Does the dental unit water meet EPA regulatory standards for drinking water?



- ❑ Use water that meets regulatory standards for drinking water (< 500 CFU/ml of heterotrophic water bacteria) for routine dental treatment output water.
- ❑ Most untreated dental unit water samples: 1,000 to 10,000 CFU (some DUWL > 1,000,000 CFU documented)

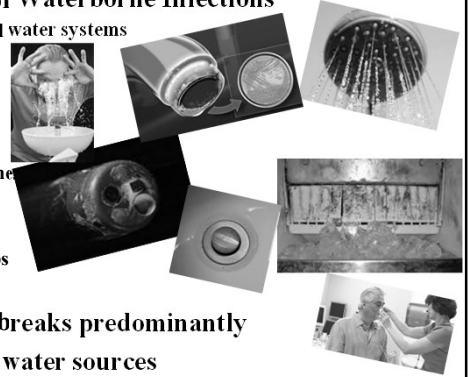


CDC (2003)

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Health Facility Reservoirs as Potential Sources of Waterborne Infections

- ❑ Potable & hospital water systems
- ❑ Showers
- ❑ Sinks
- ❑ Faucet aerators
- ❑ Nebulizers
- ❑ Ice and ice machines
- ❑ Eyewash stations
- ❑ Dialysis water
- ❑ Hydrotherapy tubs
- ❑ Endoscopes



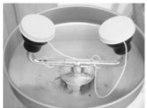
hospitals outbreaks predominantly linked to water sources

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Eyewash Stations

Health Effects from Contaminated Water in Eyewash Stations

Eyewash stations used in workplaces must be maintained to prevent injury and illness to workers. This InfoSheet provides updated information on eyewash station hazards.



- Improper maintenance contain MO's
- Activated weekly (15 mins)
- Reduce microbial contamination
- Follow manufacturer's IFUs

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Key HC Waterborne Notes

- ❑ Many HC-associated infections linked to contaminated potable/tap water & hospital water systems,
- ❑ Major risks: immunocompromised & severely ill patients
- ❑ Common pathogens: gram-negative bacilli (eg, *Pseudomonas*, *Stenotrophomonas*, *Legionella*) & NTM
- ❑ **All** water, except for sterile water & filtered water, is contaminated c microbes (eg, potable water, tap water, showers, and ice).
- ❑ **What is "safe" microbial level in HC water supplies/systems?**

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Significance of Waterborne Microorganisms

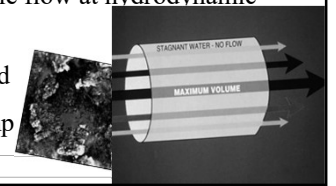
Widespread in nature → lakes, streams
 Water distribution systems → cooling units
 Industry & health care → piping, tubing
 Water supplies → potable, municipal, distilled
 Health care → catheters, scopes, IUD
 Human infections → endocarditis, respiratory, periodontitis

Environmental Disease Outbreaks
Legionella, *Pseudomonas*, *Cryptosporidium*, Nontuberculous Mycobacteria (NTM)

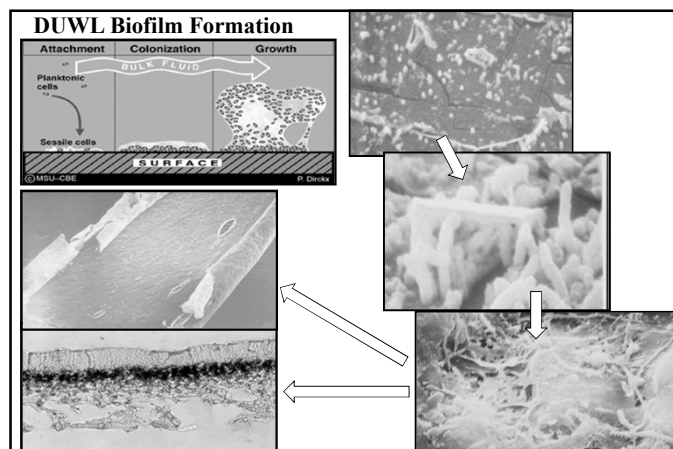
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Rapid Growth of Microbes in DUWL Biofilm caused by:

- Small diameters of waterlines
- Surface-to-volume ratio: smaller cylinder diameter; larger the surface area available for colonization by same volume of water
- Slow water flow: very little flow at hydrodynamic boundary
- Low volume of water used
- Water warms to room temp
- Low usage



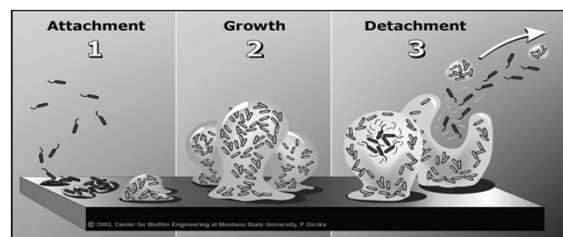
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Biofilm Characteristics

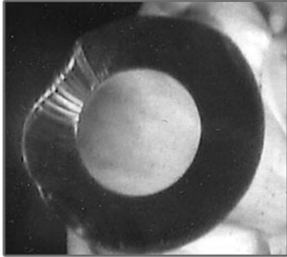
- Highly complex microbial structural entity
- Organisms provide nutrients to each other
- Exists in all environments, including water and solids
- Microorganisms grow very well in stagnant water



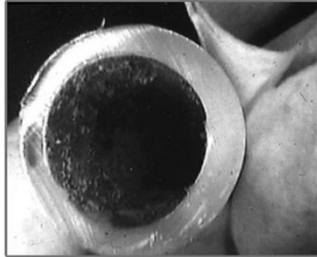
Source: Molinari J, Harte J, *Practical Infection Control In Dentistry* (2010)

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How Fast Can Biofilms Grow?



New Waterline tubing.
Smooth, clean internal walls.

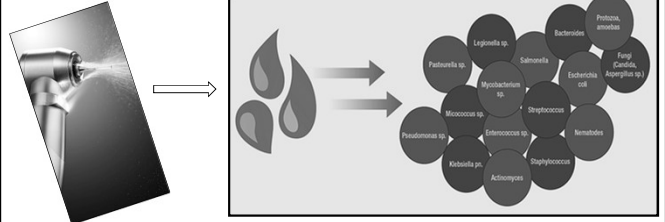


Waterline tubing after 3 weeks.
Thick, contaminated biofilm build-up.

photos permission of Hu-Friedy & J. Chandler (2018)

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Representative Isolated DUWL Microbes



- ◊ waterborne infections & disease in hospital /public health settings
- ◊ many involve medical devices (nebulizers, endoscopes)
- ✦ most DUWL MO's from public water supply; not high risk for healthy persons
- ✦ however, increasing # of immune compromised dental pts "opportunistic pathogens" from waterborne MO's

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DUWL Concerns & Challenges

Water coming into dental offices from city supplies contain bacteria and nutrients that support their growth

Dental unit waterlines contain long lumens, with a high surface area for biofilms to develop

Biofilms thrive in moist and warm environments, making the dental unit waterline a perfect environment

Untreated dental units cannot reliably produce water that meets drinking water standards

Microbial counts can be > 200,000 cfu/ml within 5 days of DUWL installation

Dental water exiting unit can be 100's to 1000's times more contaminated than incoming tap water

Waterline contamination consists of slime-producing bacteria, fungi and protozoans

Immune compromised patients are at a greater risk of opportunistic infections

In their natural habitat, 99.9% of all bacteria live as a community and attach to surfaces as biofilms

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Recent DUWL Developments

~~No current definable public health problem~~

Waterborne infection is a major public health concern and

Unacceptable to use highly colonized water for any kind of dental treatment

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Reports of Infectious Agent Spread in Dental Settings (2001-2016)				
Setting	Year	Pathogen	# Inf.	Comments
OMS Practice	2001	HBV	1	Pt-to-Pt
Dental clinic in school gym	2009	HBV	5	5 cases: 3 pts/2 volunteers; multiple IC breaches identified
OMS Practice	2013	HCV	1	Pt-to Pt; multiple breaches identified including injection safety
General Dental	2010	<i>M. tuberculosis</i>	1	DHCP-to-DHCP; Misdiagnosis of TB disease
General Dental	2011	<i>L. pneumophila</i>	1	82 yr old woman; DUWL; unknown if waterlines were treated
Pediatric Dental Clinic	2015	<i>M. abscessus</i>	20+ ?	Children; potentially linked to untreated DUWL
Pediatric Dental Clinic	2016	<i>M. abscessus/chelonae</i> group	72+ ?	Children; ongoing investigation; treated water for DUWL kept in holding tank before put in bottles (?)
Cleveland. OSAP (2015); Junger. OSAP(2016); Zahn. OSAP (2017); JAM. (2017)				
2014 ----: Dental practices closed in many states for serious IC violations &/or pt infections				

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DUWL Infection Control

- Progress in developing reliable methods to control biofilm formation
- FDA-cleared & FDA-registered products available
- When used **properly** can provide high-quality water for patient care
- Choices include:
 - EPA-registered chemical germicides or antimicrobial surface tx's
 - independent water reservoirs (isolate units from municipal water)
 - automated germicide metering devices with microfiltration technology (can be used with independent reservoirs or municipal water connections)
 - sterile water delivery systems
- System in place for periodic monitoring of bacterial levels


Mills, et al. OSAP (2017)

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Treating Dental Unit Waterlines

Complete DUWL systems include use of antimicrobial cleaner + maintenance product


- **CLEANING** with registered antimicrobial is KEY to remove microbial deposits
- **MAINTENANCE** product prevents waterborne organisms from attaching, colonizing, proliferating in tubing



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DUWL Filtration Devices

- Reverse Osmosis (RO or hyperfiltration)
- Deionization
- Distillation



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IC for Dental Unit Waterlines (DUWL)

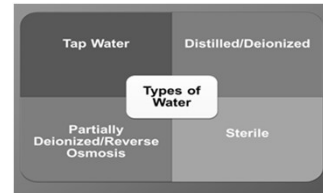
- Follow manufacturer's IFUs for daily and weekly maintenance
- Do not use waterline heaters
- When recommended, shock all waterlines periodically c strong chemical to remove biofilm
- Removal of handpieces, A/W tips, ultrasonic scalers from waterlines before flushing
- Flushing beginning/end of day for at least 2-3 minutes
- Handpieces flushed 20-30 seconds after pt care
- Sterile water/saline when irrigating open surgical sites and when cutting bone during surgical procedures



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Waterline management factors necessary for controlling contamination & insuring good test results:

- Insure that source water is clean – common problem?



- Do not confuse “shocking” with “flushing” processes.
- Test waterlines consistently to confirm maintenance protocol effectiveness and determine proper shock frequency.



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Monitoring Options

- Recommended by ADA to monitor effectiveness of tx's
- Water testing laboratory (multiple commercial choices)
- In-office testing with self-contained kits
- Follow recommendations provided by manufacturer of DUWL treatment product for monitoring water quality (i.e. IFU)



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Infection Control: Past, Present, & Future

- not a single event
- or an occasional decision
- a commitment
- a mindset
- an attitude
- an ongoing process

Pollack-Simon/ JAM

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