GET SHOCKED!

DENTAL WATER SAFETY

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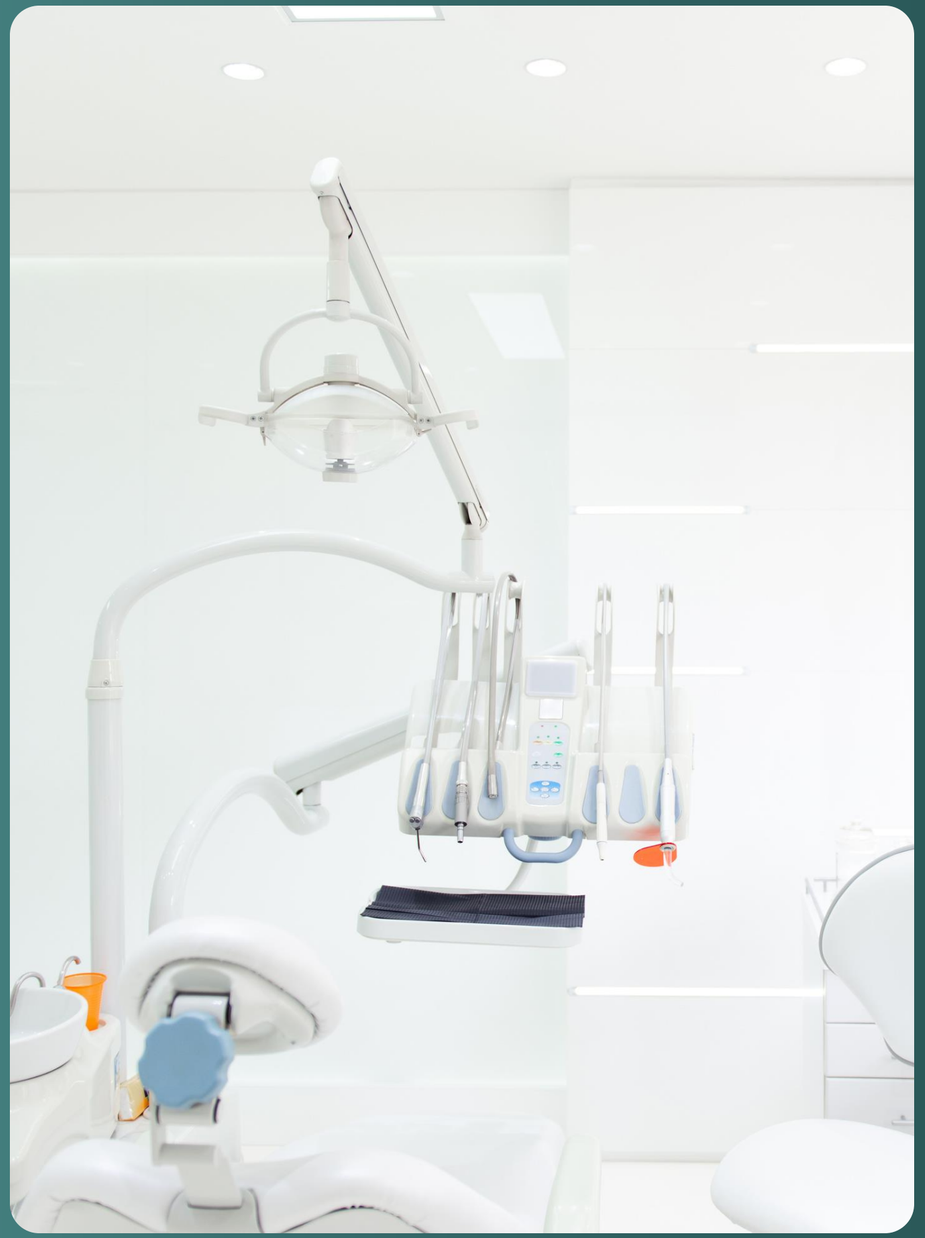
Department of Public Health
CITY OF PHILADELPHIA

OBJECTIVES:

1. Explain the impacts and causes of dental unit waterline (DUWL) biofilm formation

2. Describe the 4 steps to ensure safe dental water:
Treat> Test> Maintain >Monitor

3. Outline requirements for a safe dental water policy with training and compliance monitoring



BACKGROUND

DENTAL WATERLINE FACTS

Contributing Factors to Biofilm Formation

Long, small-diameter tubing with low flow rates carries water to the high-speed handpiece, air/water syringe, and ultrasonic scaler

Backflow of microorganisms from blood and saliva enters the dental water system via handpieces or air/water syringes during treatment

Stagnation occurs when office is closed (nights/weekends) and lines are not emptied or are left unused

Contaminated in-line filters, anti-retraction devices & turbines are not changed

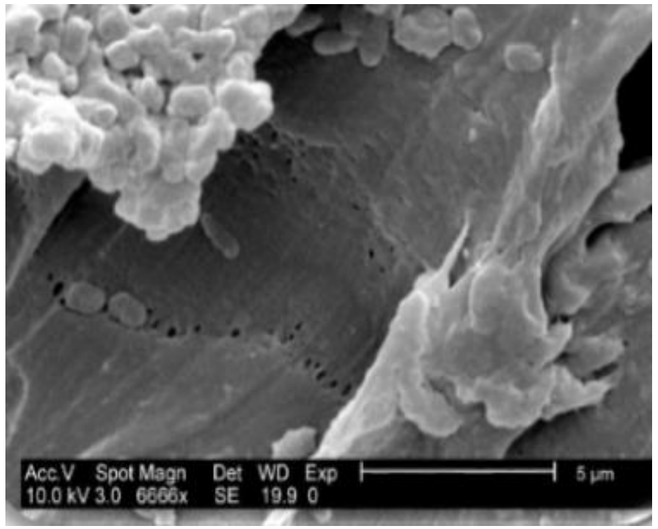
DENTAL WATERLINE BIOFILM

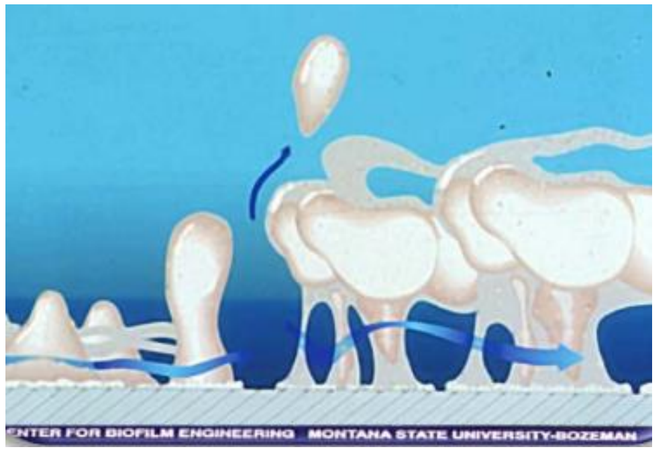
Bacterial slime layer that forms in the plastic tubing or any other plumbing surface, that protects, feeds, and transmits pathogens in water

Resists disinfectants

INSIDIOUS - may or may not smell

Per CDC's 2003
Guidelines for Infection Control in Dental Health-Care Settings,
even brand-new waterlines can reach microbial counts ≤200,000 colony-forming units (CFU)/mL within 5 days





PATHOGENS TRANSMITTED

Legionella pneumophila

Aerosols expose staff and patients due to inhalation or contact with mucous membranes

Pseudomonas aeruginosa

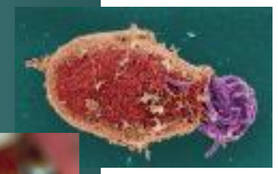
Multi-drug resistant organisms contact blood and mucous membranes

Non-tuberculous mycobacteria (NTM)

Contact with contaminated water or instruments or inhaled

Protozoa & Fungi

Contact with mucous membranes or blood via touch, inhalation or ingestion



https://www.jcvi.org/research/genomics-non-tuberculosis-mycobacteria

https://phil.cdc.gov/QuickSearch.aspxhttps://phil.cdc.gov/QuickSearch.aspx?key=true?key=true

OUTBREAKS

Where & When

- 2015 Georgia - 24 cases
- 2016 California - 71 cases

Who

- Children aged 4-8
- Received pulpotomies in pediatric dental clinics

What & How

- *Mycobacterium abscessus* (NTM) infections
- Dental treatment water contained high levels of bacteria

Outcomes

- Delayed signs of disease transmission
- Serious harm (loss of hearing and jaw)
- Death

Reference: Outbreaks of Nontuberculous Mycobacteria Infections Highlight Importance of Maintaining and Monitoring Dental Waterlines | CDC Archive

DISEASE PREVENTION

SAFE WATER REGULATIONS

&

GUIDANCE

DENTAL WATER QUALITY REGULATIONS

Environmental Protection Agency (EPA) standards for drinking water:

≤500 Colony Forming Units (CFU)/mL of heterotrophic water bacteria for routine dental treatment output water

DUWL Regulations FDA

- DUWL are considered medical devices by the U.S. Food and Drug Administration (FDA) under the 1976 Medical Devices Amendment to the Food, Drug, and Cosmetic Act
- FDA approves any medical devices used to deliver safe dental water and manufacturer's instructions for use, including recommended germicidal products and disinfection processes
- FDA also regulates chemical germicides used on critical and semi critical medical devices

Dental Unit Waterlines | FDA

CDC DUWL GUIDELINES

CDC recommends that all dental unit waterlines be treated regularly with FDA approved germicides to maintain the EPA minimum water quality standard

Consult with the dental unit manufacturer for appropriate methods and equipment to maintain the quality of dental water

Follow recommendations for monitoring water quality provided by the manufacturer of the unit or waterline treatment product

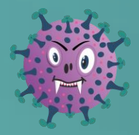
Use sterile saline or sterile water as a coolant/irrigant when performing surgical procedures

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

STEPS TO SAFE DENTAL WATER

1

TREAT BY SHOCK



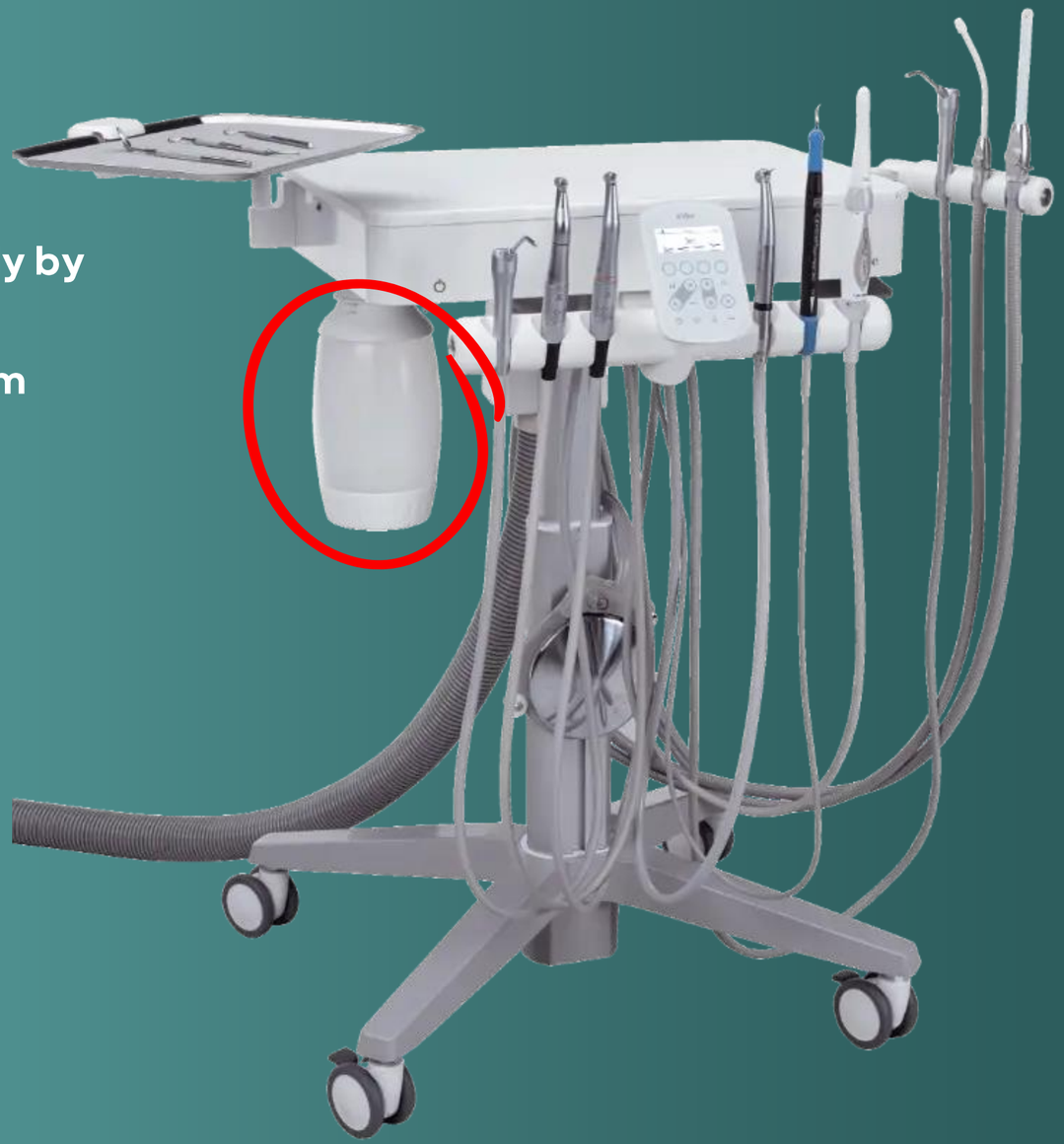
BEFORE YOU SHOCK

Separate dental lines from the municipal water supply by

- ❖ Adding a filter at the waterline starting point
- ❖ Completely disconnect by using a bottle system

Using municipal water alone in the bottle system after shocking will not prevent biofilm regrowth. Follow the IFU for the recommended type of water and water treatment products.

When preparing to shock, have the recommended PPE available per the chemical safety data sheet e.g., heavy-duty gloves, eyewear & mask



SHOCK CLEAR!

Drain Lines Completely

Disconnect all devices & filters to remove existing water or chemicals & prevent damage

Mix Shock Solution

Mix ONLY the products specified by DUWL IFU (e.g., diluted chlorine, Liquid Ultra, Citrisil)

Don’t use household cleaners or disinfectants

Fill with Shock

Apply product in all new and existing water delivery lines for IFU specified interval

While shocking, place “CHAIR OUT OF USE” SIGNS

Flush Lines

Empty shock into buckets or sinks- NOT suction lines

Run recommended water to clear all chemicals and biofilm

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

2

TEST THE WATER

Types of Testing

In Office Testing

- Can be used more frequently
- 48–72-hour response time
- Help ensure staff compliance with protocols
- Provide early warning of problems with biofilm control

Contracted Laboratory Testing

- Standard agar plate test methods
- Provides more accurate counts and baseline measures
- 1-7 day turnaround time
- External validation of in-office monitoring program

Both

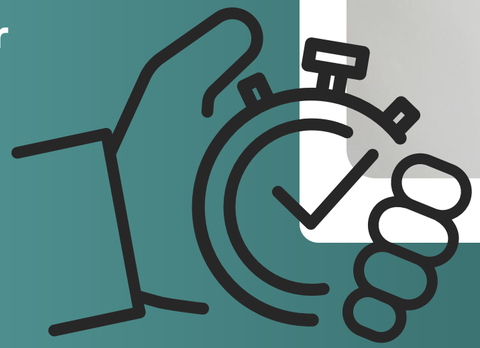
Either or a combination may be used to obtain baseline measures and ensure effective treatment and maintenance

Follow laboratory or test kit instructions for aseptic collection, germicide neutralization and shipping/transport of samples

dental-unit-water-quality-organization-for-safety-asepsis-and-prevention-white-paper-and-recommendations-2018.pdf

Test Preparation

1. Neutralize any chemicals in water that will interfere with sample growth, per test kit IFU (sodium thiosulfate is one type of neutralizer)
2. Remove handpieces, filters, & water dispensers
3. Wash hands before collecting a sample
4. When testing in-house, be sure to use proper sampling media, incubation times, and temperatures.



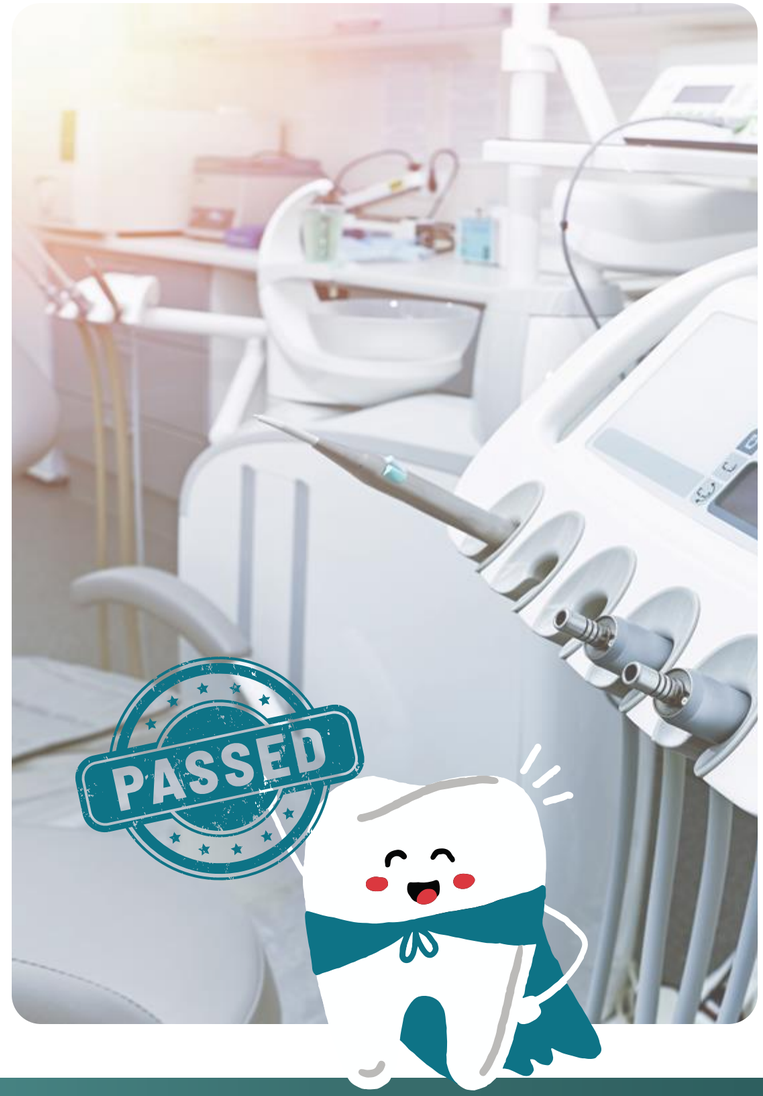
Initial Testing

- Scientific literature suggests that in-office testing results are less reliable than those performed in a qualified water testing laboratory
- Follow the test manufacturer’s or test lab’s directions for collection, storage and transportation to testing facility
- Perform testing before maintenance program is implemented to ensure effective initial shock treatment

https://jamanetwork.com/journals/jama/fullarticle/187234

Successful Result

- If ≤ 500 CFU/ml water quality is achieved, resume use of DUWL
- Retest again in 7 days, then monthly for one year, and then at least quarterly



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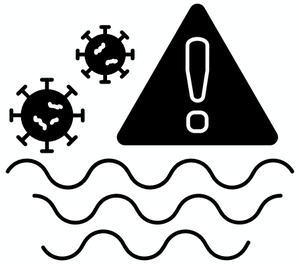
Failed Test:
Check Systems & Reshock



Techniques

Operator error: failure of initial "shock" treatment via improper dilution or chemical mixing

Measures

Use timers and measuring devices for accuracy

Failure to purge

Many intermittent chemical treatment protocols are more effective when water is removed from the lines both before and after introduction of chemical solutions.

Contamination

Disinfect bottles and/or replace filters and check for untreated areas

Topics - DUWL - Putting it All Together – Checklist for Dental Unit Water Quality Improvement | ADS

3

AFTER SHOCK!

MAINTAIN QUALITY

Physical Maintenance of Water Systems

Empty unit waterlines (hit “purge button”) every night and when out of service to prevent stagnation

Empty, clean, and disinfect unit bottles daily, per IFU

Flush all lines at the start of day for minimum 2 minutes

Flush water and air lines for 20–30 seconds after each patient to flush out free floating bacteria

Assess water & lines for damage, contamination, musty odor, cloudiness, or particulates

Replace damaged lines as directed by the manufacturer

Change filters and maintain anti-retraction devices regularly per IFU

Use a new disposable air/water tip for every patient

Remember, waterline maintenance will not eradicate or completely prevent biofilm!

Chemical Maintenance of Water Systems

Use FDA approved low level germicidal & microbiocidal agents daily with self-contained bottle systems

Maintenance chemicals are ONLY effective after a successful shock (straws, tablets, or in-line cartridges)

Use only fresh distilled, filtered, or commercial drinking water

Follow IFU on products and chair & keep them readily available for staff reference

Types of Chemical Delivery

TABLETS

Insert tablets in dental unit water bottles. Often, 2 tabs at each bottle refill.

Discard all water, rinse bottle, refill water, & then insert tablets to dissolve before use.

STRAW METHOD

Insert chemically treated straw that slowly releases germicide into unit bottle. Often, lasts for months.

PLUMBED IN-LINE

Cartridge attaches to plumbing system and releases metered doses to water as it enters dental unit (vendor manages)

4

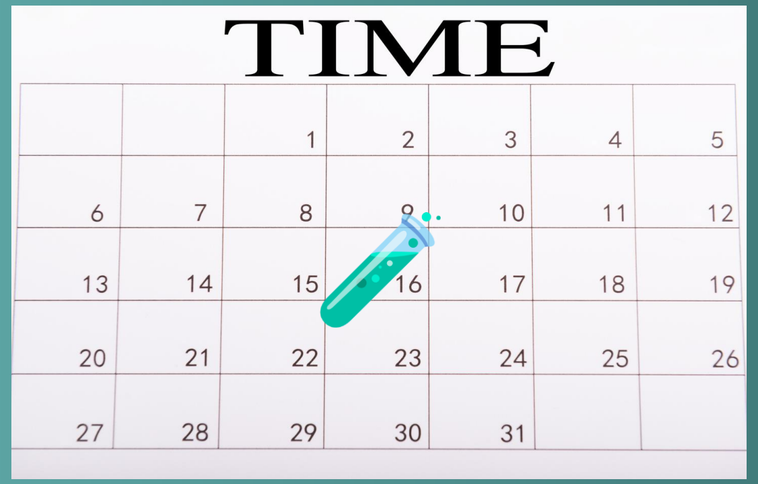
MONITOR QUALITY

TESTING INTERVAL

If dental water quality meets EPA standard

of ≤500 CFU monthly for 1 year,

testing can occur quarterly



DOCUMENT EVERY TEST

Date

Name of staff testing

Location (chair & operatory numbers)

Specific Line Tested (Air/H20 syringe, handpiece, Cavitron & unused lines)

Results

Product names/lot number

TEST ALL LINES

DUWL TEST LOG EXAMPLE

SAMPLE DATE	TESTER'S NAME	DENTAL UNIT/ LOCATION (Room/Chair/ Operatory)	DEVICE SAMPLED	DATE OF RESULTS	MICROBIAL COUNT (Refer to colony counting chart)	CORRECTIVE ACTIONS TAKEN (See chart above)
			☐ AW Syringe ☐ Source Water ☐ Scaler ☐ Handpiece ☐ Combined			
			☐ AW Syringe ☐ Source Water ☐ Scaler ☐ Handpiece ☐ Combined			
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https://proedgedental.com/wp-content/uploads/2022/10/quickpass-log-two-page-v06.pdf

SPECIAL WATER MONITORING CONSIDERATIONS

Surgical Requirements

- Use ONLY sterile water OR saline irrigant for procedures that enter the bloodstream (root canals, surgeries, and extractions)
- Use sterilizable or disposable sterile tubing or a syringe
- Date water/saline when opened and discard bottles within 24 hours
- Reprocess devices and tubing used, per IFU, or use disposable items

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Invasive Surgical Procedures

- Biopsy
- Periodontal surgery and soft tissue debridement
- Apical surgery or Implant surgery
- Surgical extraction of teeth, such as removal of an erupted or nonerupted tooth that requires elevation of a mucoperiosteal flap, removal of bone or section of tooth, and suturing if needed

Responding to Boil Water Advisories

Water should not be delivered to patients through the dental unit, ultrasonic scaler, or other water dependent dental equipment that uses the public water system

Patients should rinse with bottled or distilled water until the boil-water advisory has been cancelled.

Alcohol-based hand rubs (ABHR) can be used until the boil-water notice is cancelled. If hands are visibly contaminated, bottled water and soap should be used for handwashing. If bottled water is not immediately available, an antiseptic towelette should be used.

Tap water should not be used to dilute germicides or for hand hygiene unless the water has been brought to a rolling boil for >1 minute and cooled before use.

Afterward, dental unit waterlines should be flushed & chemically treated according to the manufacturer's instructions.

2003 Dental Infection Control Guidelines - Boil Water Advisories

IMPLEMENT A SAFE DENTAL WATER POLICY

Create a Written Policy

Write policies and standard operating procedures (SOP) based on manufacturers' IFU for the dental chair, it's waterlines and required products, based on current best practices and all government regulations

INCLUDE

Hand hygiene

Proper PPE use when using shock and disinfectant products

Dental unit waterline treatment, testing, maintenance, and monitoring instructions

Use of sterile water with sterile delivery devices for invasive treatments

Educate Staff

Hand hygiene

Performing shock treatment, testing, maintenance, and monitoring

Proper PPE use for shock and disinfectant products

Using signage until shock is flushed entirely to prevent patient injury

Assess failures and retreat - test in 1 week and retreat if needed

Use of sterile water & delivery devices for invasive care

Monitoring and responding to boil water advisories

Ensure competency & monitor for compliance

Summary:

1. DUWL biofilm treatment and maintenance is essential for preventing patient harm
2. There are 4 steps required to ensure safe dental water: Treat> Test> Maintain>Monitor
3. Create dental water policies & procedures guided by IFU, CDC, and regulatory body guidance
4. Train all staff who perform DUWL tasks & monitor compliance

REFERENCES

Centers for Disease Control and Prevention (CDC)
Guidelines for Infection Control in Dental Health-Care Settings – 2003
Appendix A - Regulatory Framework for Disinfectants and Sterilants
Appendix C - Methods for Sterilizing and Disinfecting Patient-Care Items and Environmental Surfaces
Infection Prevention & Control in Dental Settings
Infection Prevention Checklist for Dental Settings Basic Expectations for Safe Care
Dental Unit Water Quality
Best Practices for Dental Unit Water Quality | Dental Infection Prevention and Control | CDC
HAN - October 31, 2022 - Outbreaks of Nontuberculous Mycobacteria Infections Highlight Importance of Maintaining and Monitoring Dental Waterlines
Mycobacterium abscessus in Healthcare Settings
Association for Dental Safety (ADS), formerly known as the Organization for Safety, Asepsis and Prevention (OSAP)
Dental Unit Water Quality: Organization for Safety, Asepsis and Prevention White Paper and Recommendations– 2018
Dental Unit Waterlines: ADS Recommendations to Clinicians
Questions to Help Guide Selection of Dental Waterline Devices and Chemical Treatment Options
Troubleshooting Dental Water Quality Problems
Dental Unit Waterlines
Dental Unit Waterline Fact Sheet
Center for Biofilm Engineering | Montana State University
Biofilm Basics
BiofilmConceptsPoster_2010-K_wiRefs.indd
FDA and EPA
Dental Unit Waterlines | FDA
Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling - Guidance for Industry and Food and Drug Administration Staff
Dental Effluent Guidelines
Other references:
Are Physicians' Office Laboratory Results of Comparable Quality to Those Produced in Other Laboratory Settings?
Dental Unit Waterlines: Disinfection and Management
Multiparametric analysis of waterline contamination in dental units

QUESTIONS?

Department of
Public Health
CITY OF PHILADELPHIA

Thank you!

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