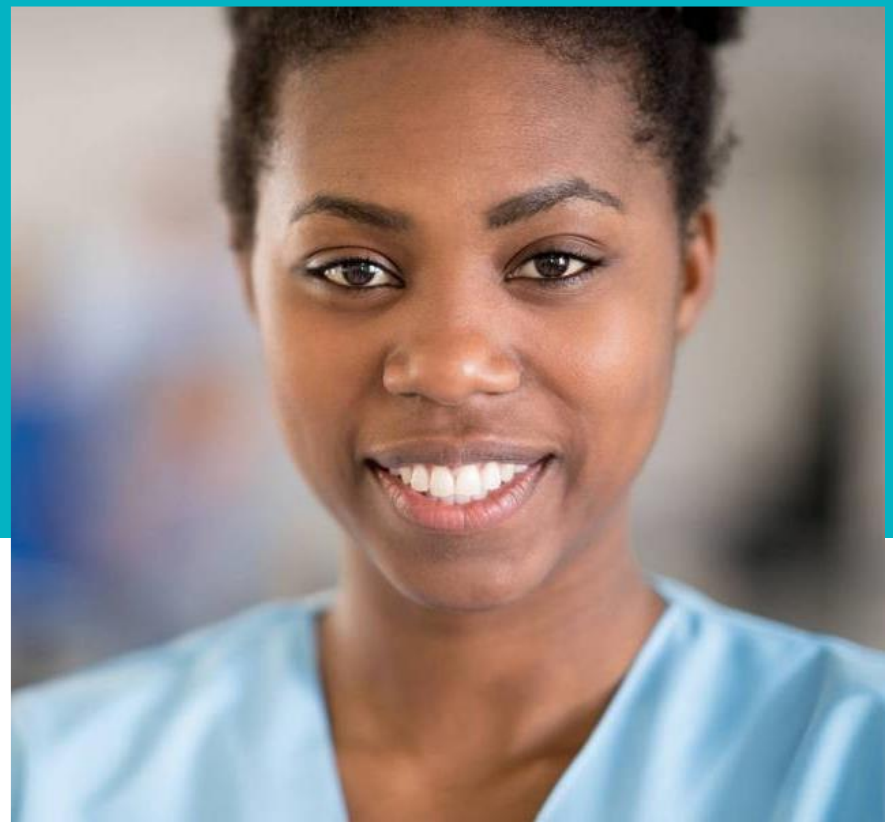
GUIDELINES FOR INFECTION CONTROL IN DENTAL HEALTHCARE SETTINGS

INFECTION CONTROL IN DENTAL HEALTH-CARE SETTINGS: AN OVERVIEW

- Background
- Personnel Health Elements
- Bloodborne Pathogens
- Hand Hygiene
- Personal Protective Equipment
- Sterilization and Disinfection
- Environmental Infection Control
- Dental Unit Waterlines
- Special Considerations
- Program Evaluation



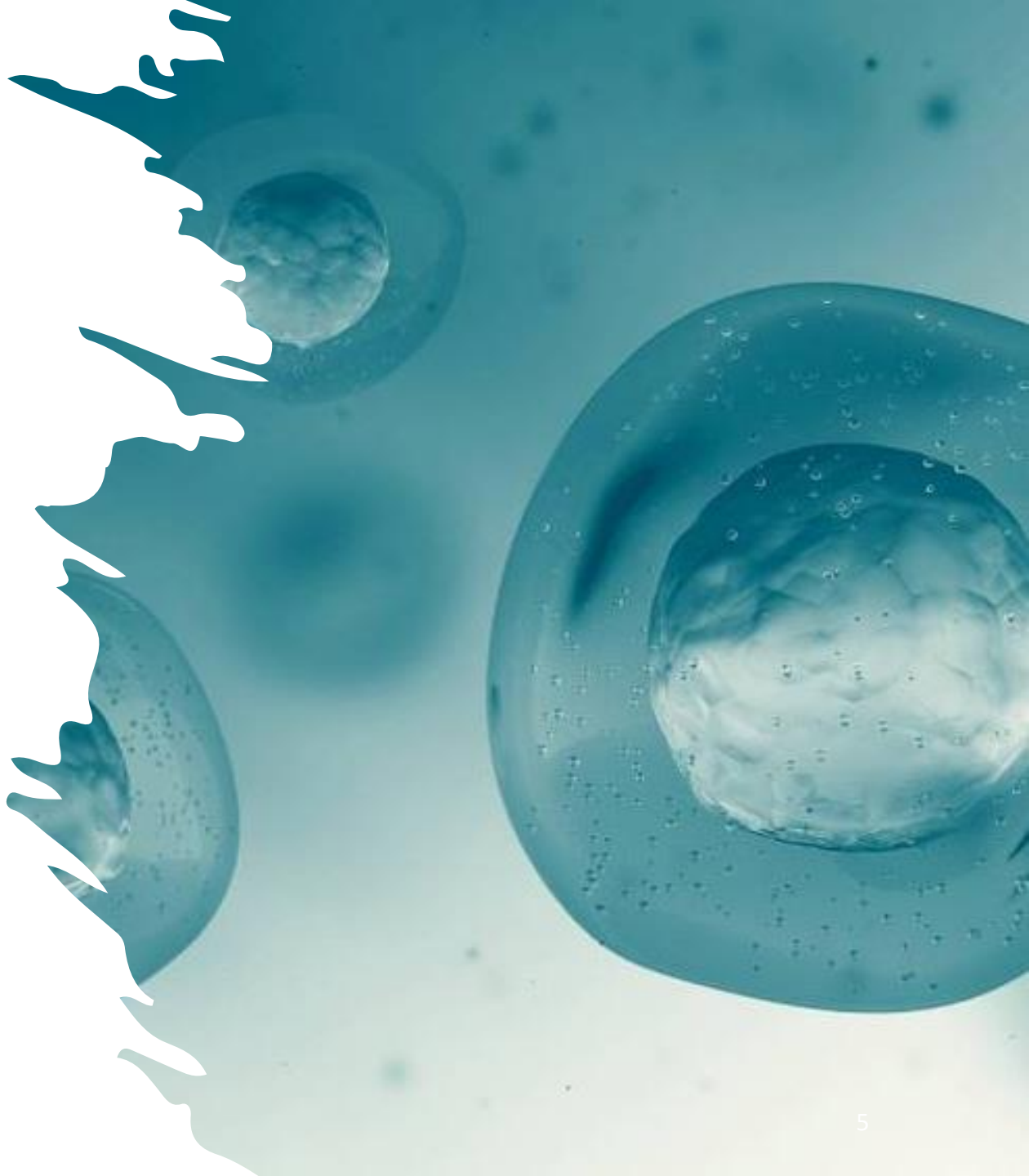
GUIDELINES FROM THE FOLLOWING

- CENTERS FOR DISEASE CONTROL AND PREVENTION
- OSAP DENTAL INFECTION PREVENTION & SAFETY ASSOCIATION
- THE JOINT COMMISSION


BACKGROUND

WHY IS INFECTION CONTROL IMPORTANT IN DENTISTRY?

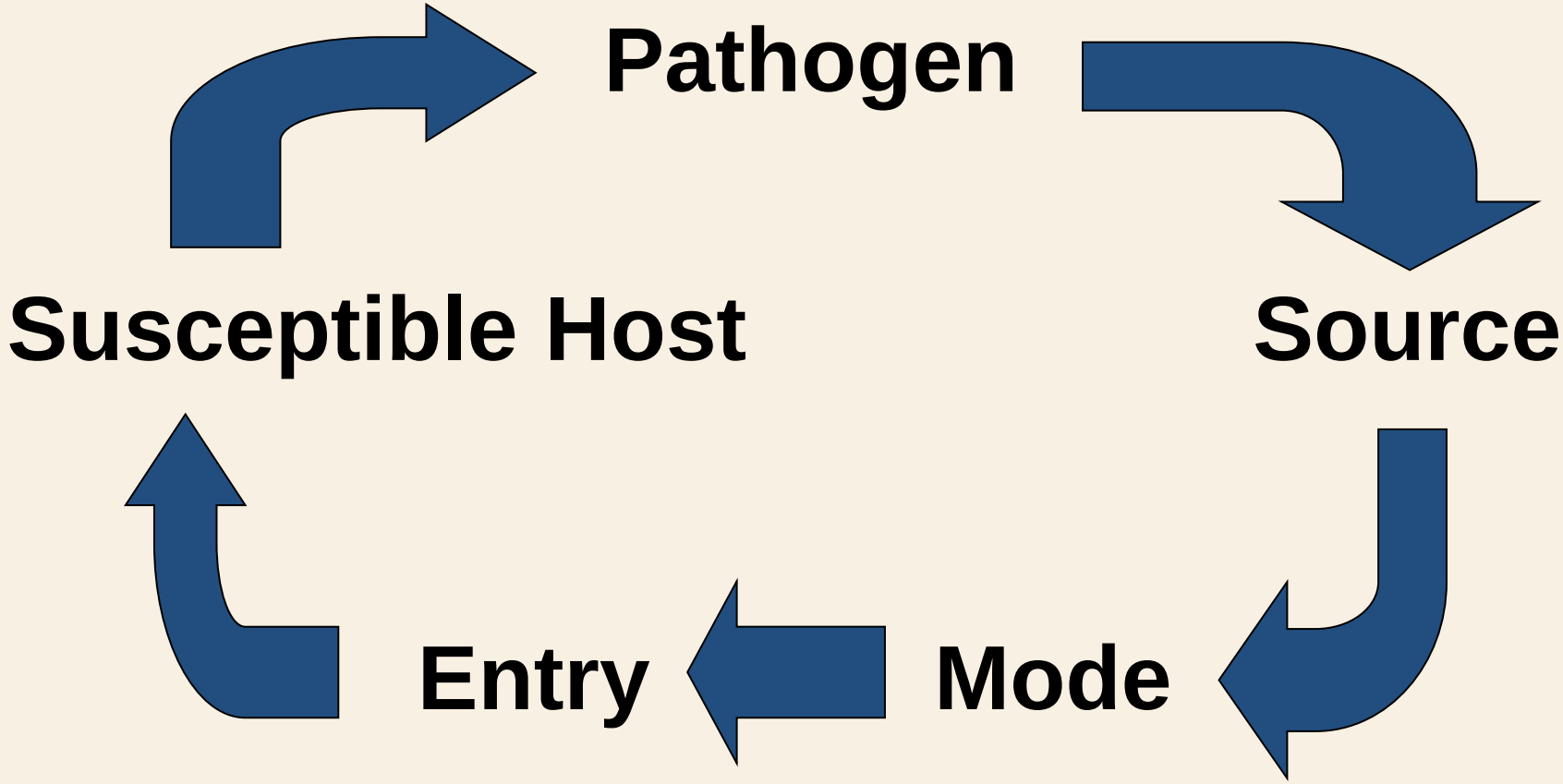
- BOTH PATIENTS AND DENTAL HEALTH CARE PERSONNEL (DHCP) CAN BE EXPOSED TO PATHOGENS
- CONTACT WITH BLOOD, ORAL AND RESPIRATORY SECRETIONS, AND CONTAMINATED EQUIPMENT OCCURS
- PROPER PROCEDURES CAN PREVENT TRANSMISSION OF INFECTIONS AMONG PATIENTS AND DHCP



MODES OF TRANSMISSION

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

Chain of Infection



STANDARD PRECAUTIONS

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

ELEMENTS OF STANDARD PRECAUTIONS

01

Handwashing

02

Use of gloves, masks, eye protection with side shields, and gowns

03

Patient care equipment

04

Environmental surfaces

05

Injury prevention

PERSONNEL HEALTH ELEMENTS

Personnel Health Elements of an Infection Control Program

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

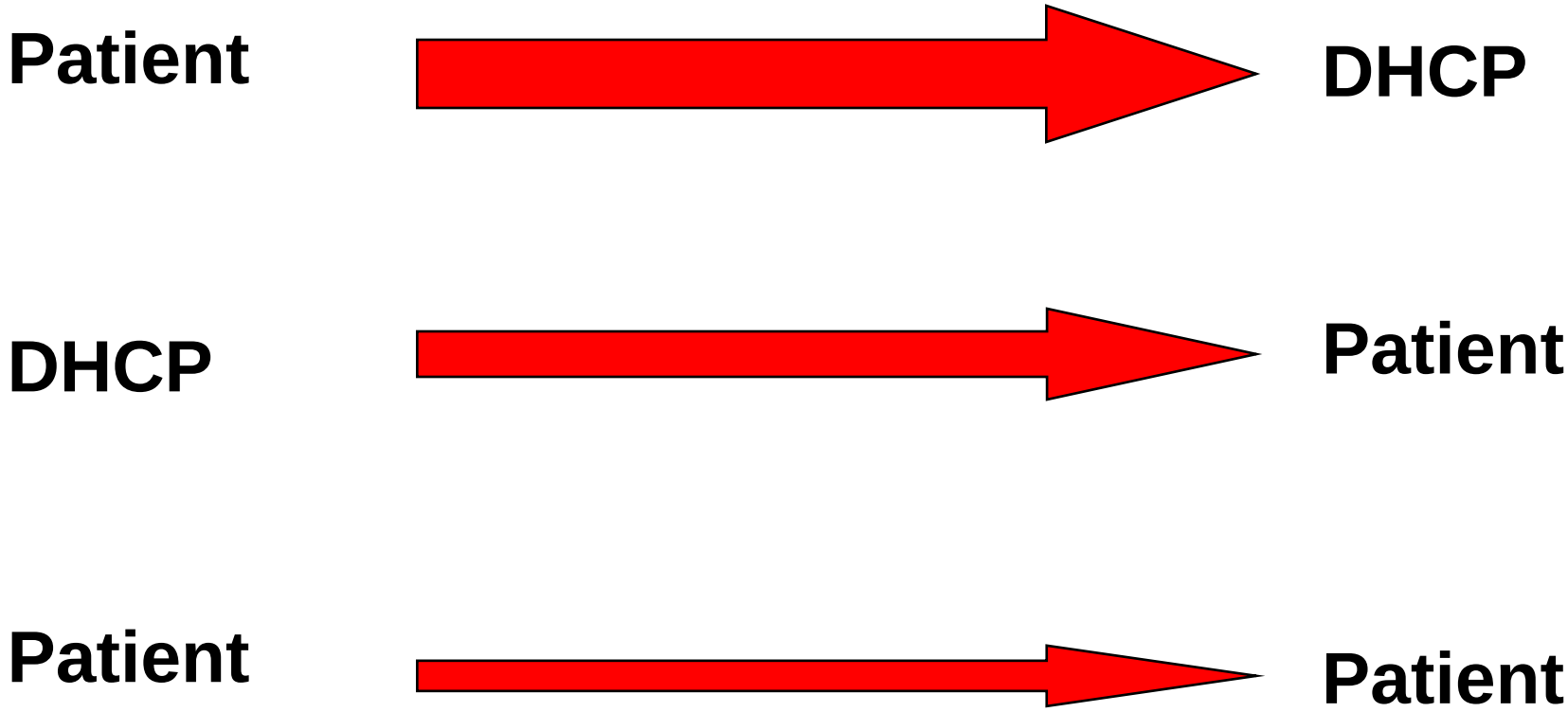
BLOODBORNE PATHOGENS

PREVENTING TRANSMISSION OF BLOODBORNE PATHOGENS

Bloodborne viruses such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)

- Are transmissible in health care settings
- Can produce chronic infection
- Are often carried by persons unaware of their infection

Potential Routes of Transmission of Bloodborne Pathogens

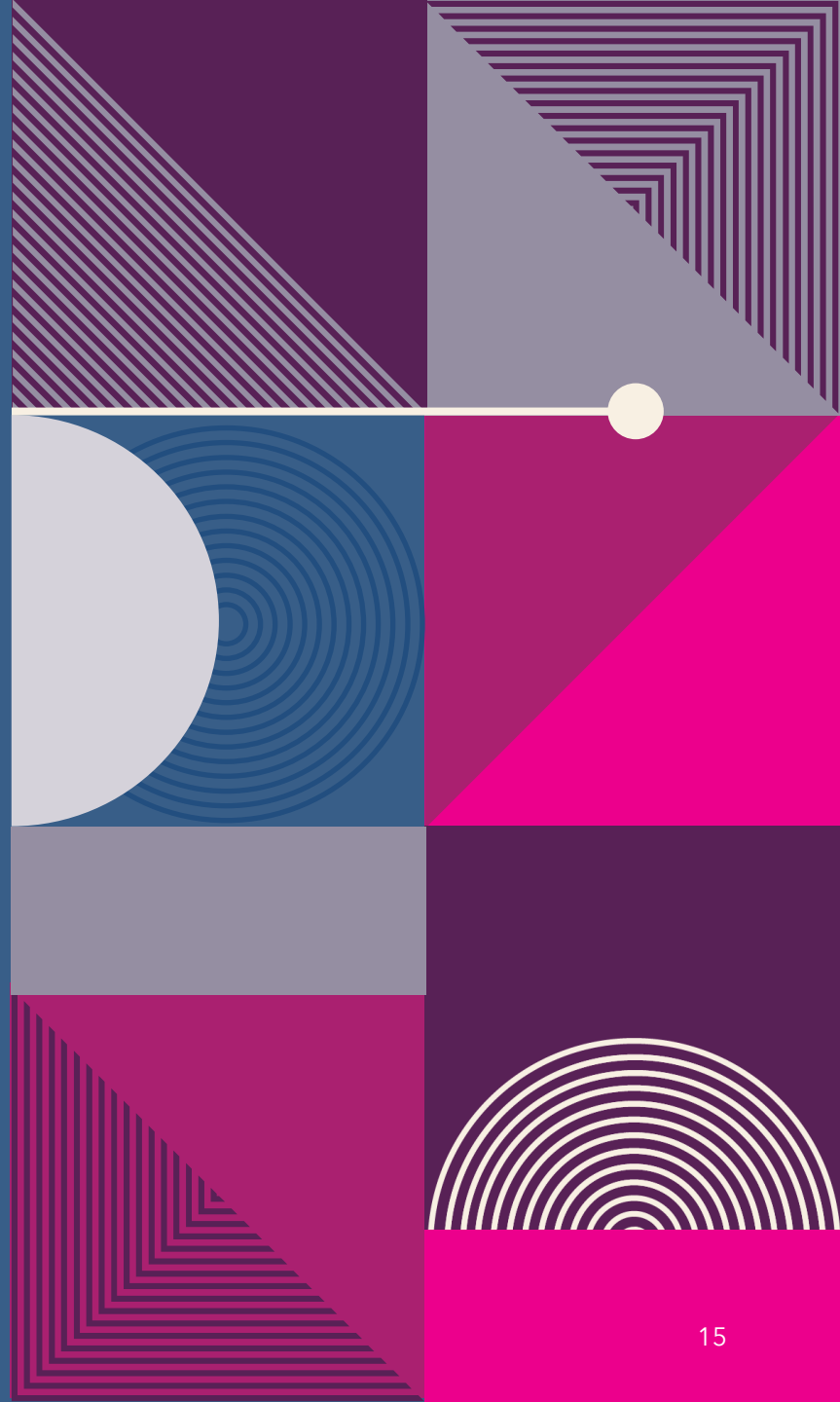


FACTORS INFLUENCING OCCUPATIONAL RISK OF BLOODBORNE VIRUS INFECTION

Frequency of infection among patients

Risk of transmission after a blood exposure (i.e., type of virus)

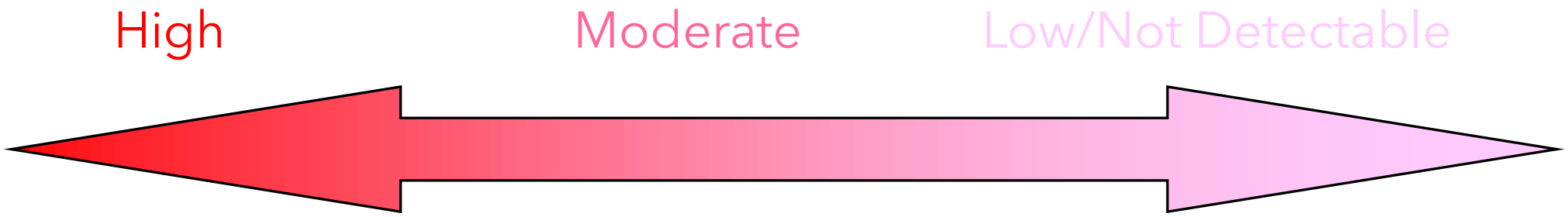
Type and frequency of blood contact



AVERAGE RISK OF BLOODBORNE VIRUS TRANSMISSION AFTER NEEDLESTICK

Source	Risk
HBV	
$HBsAg^+$ and $HBeAg^+$	**22.0%-31.0% clinical hepatitis; 37%-62% serological evidence of HBV infection**
$HBsAg^+$ and $HBeAg^-$	**1.0%-6.0% clinical hepatitis; 23%-37% serological evidence of HBV infection**
HCV	**1.8% (0%-7% range)**
HIV	**0.3% (0.2%-0.5% range)**

Concentration of HBV in Body Fluids

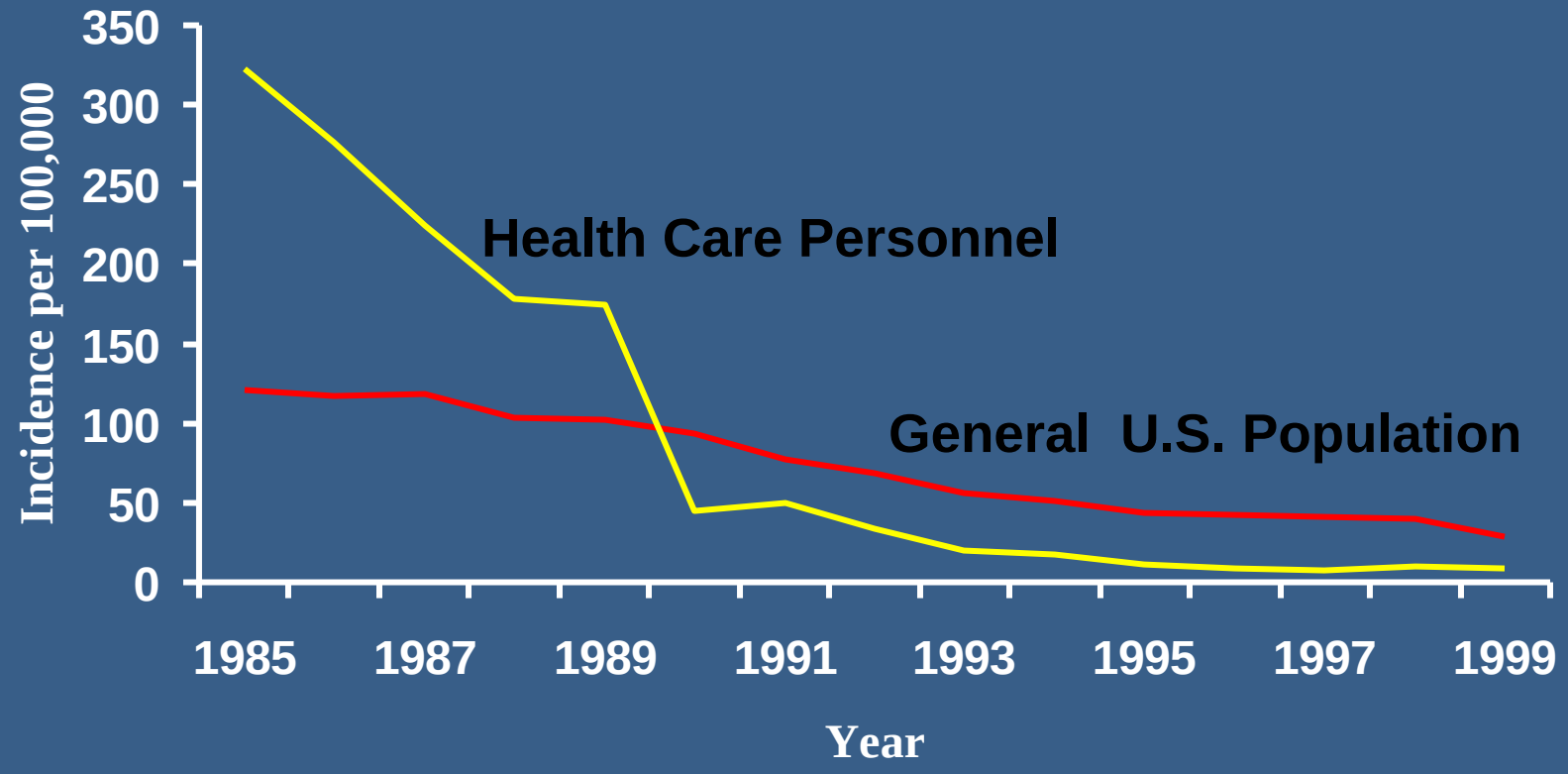


Blood
Serum
Wound exudates

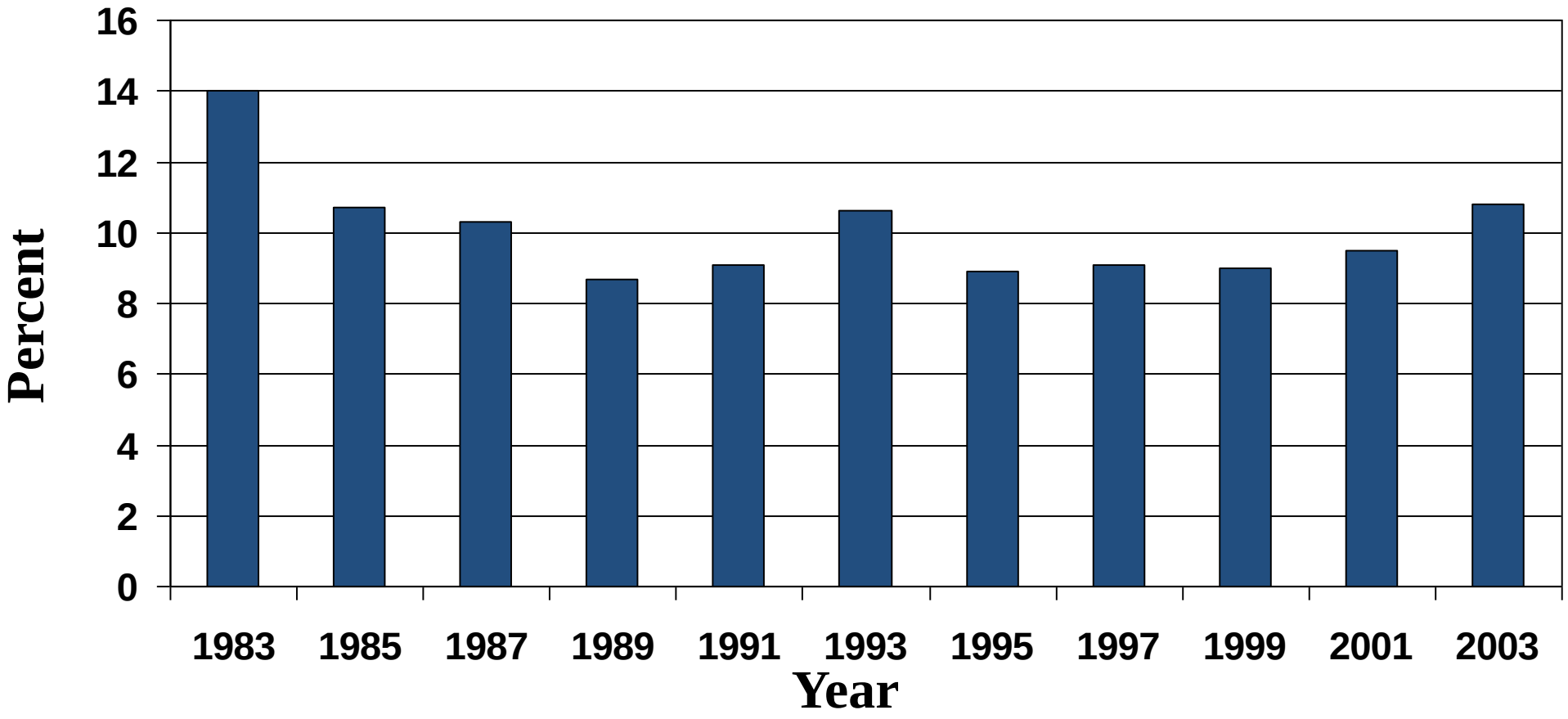
Semen
Vaginal Fluid
Saliva

Urine
Feces
Sweat
Tears
Breast Milk

ESTIMATED INCIDENCE OF HBV INFECTIONS AMONG HCP AND GENERAL POPULATION, UNITED STATES, 1985-1999



HBV Infection Among U.S. Dentists



Source: Cleveland et al., JADA 1996;127:1385-90.
Personal communication ADA, Chakwan Siew, PhD, 2005.

HEPATITIS B VACCINE

Vaccinate

- Vaccinate all DHCP who are at risk of exposure to blood

Provide

- Provide access to qualified health care professionals for administration and follow-up testing

Test

- Test for anti-HBs 1 to 2 months after 3rd dose

TRANSMISSION OF HBV FROM INFECTED DHCP TO PATIENTS

Nine clusters of transmission from dentists and oral surgeons to patients, 1970–1987

Eight dentists tested for HBeAg were positive

Lack of documented transmissions since 1987 may reflect increased use of gloves and vaccine

One case of patient-to-patient transmission, 2003

Occupational Risk of HCV Transmission among HCP

Inefficiently transmitted by occupational exposures

Three reports of transmission from blood splash to the eye

Report of simultaneous transmission of HIV and HCV after non-intact skin exposure

HCV Infection in Dental Health Care Settings

Prevalence of HCV infection among dentists similar to that of general population (~ 1%-2%)

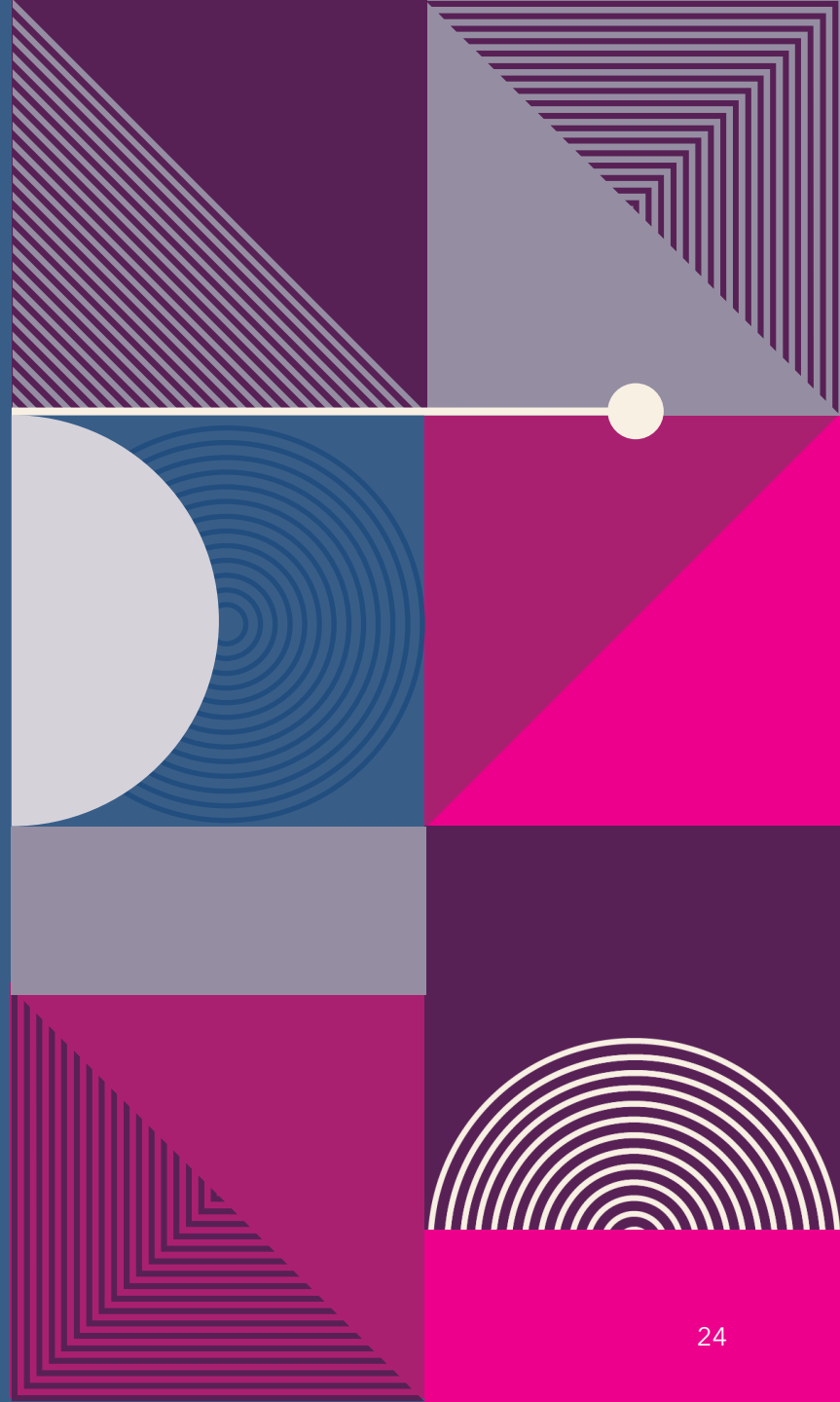
No reports of HCV transmission from infected DHCP to patients or from patient to patient

Risk of HCV transmission appears very low

TRANSMISSION OF HIV FROM INFECTED DENTISTS TO PATIENTS

Only one documented case of HIV transmission from an infected dentist to patients

No transmissions documented in the investigation of 63 HIV-infected HCP (including 33 dentists or dental students)



Health Care Workers with Documented and Possible Occupationally Acquired HIV/AIDS

CDC Database as of December 2002

	Documented	Possible
Dental Worker	0	6 *
Nurse	24	35
Lab Tech, clinical	16	17
Physician, nonsurgical	6	12
Lab Tech, nonclinical	3	–
Other	8	69
Total	**57**	**139**

* 3 dentists, 1 oral surgeon, 2 dental assistants

Risk Factors for HIV Transmission after Percutaneous Exposure to HIV-Infected Blood - CDC Case - Control Study

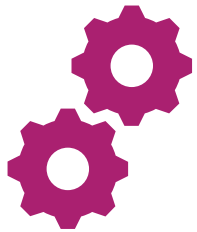
- Deep injury
- Visible blood on device
- Needle placed in artery or vein
- Terminal illness in source patient

Source: Cardo, et al., *N England J Medicine* 1997;337:1485-90.

CHARACTERISTICS OF PERCUTANEOUS INJURIES AMONG DHCP

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

Exposure Prevention Strategies



Engineering controls

Work practice controls

Administrative controls

ENGINEERING CONTROLS

Isolate or remove the hazard

Examples:

- Sharps container
- Medical devices with injury protection features (e.g., self-sheathing needles)

WORK PRACTICE CONTROLS

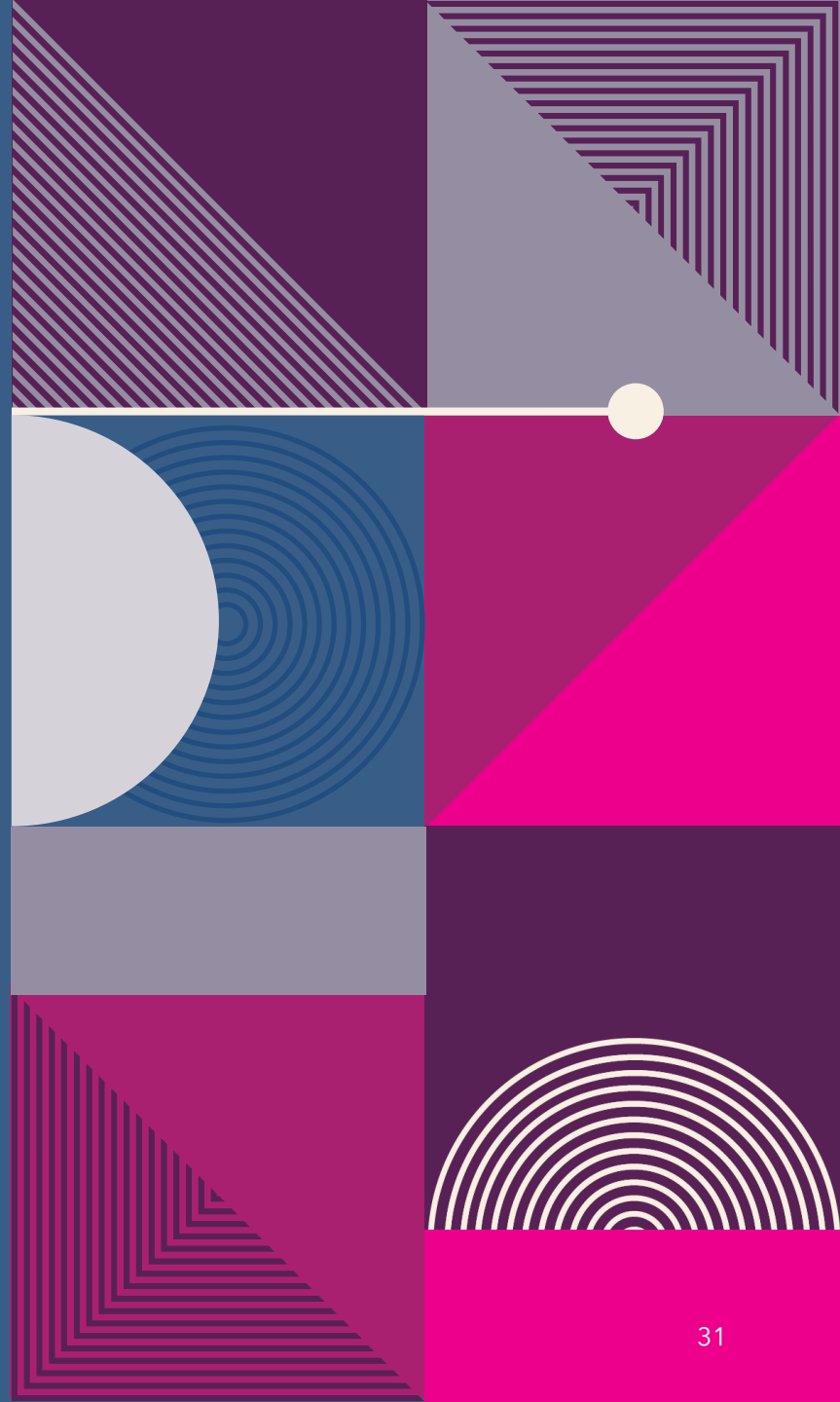
- Change the manner of performing tasks
- Examples include:
  - Using instruments instead of fingers to retract or palpate tissue
  - One-handed needle recapping

ADMINISTRATIVE CONTROLS

Policies, procedures, and enforcement measures

Placement in the hierarchy varies by the problem being addressed

- Placed before engineering controls for airborne precautions (e.g., TB)



Post-exposure Management Program

Clear policies and procedures

Education of dental health care personnel (DHCP)

Rapid access to

- Clinical care
- Post-exposure prophylaxis (PEP)
- Testing of source patients/HCP

Post-exposure Management

Wound management

Exposure reporting

Assessment of infection risk

- Type and severity of exposure
- Bloodborne status of source person
- Susceptibility of exposed person

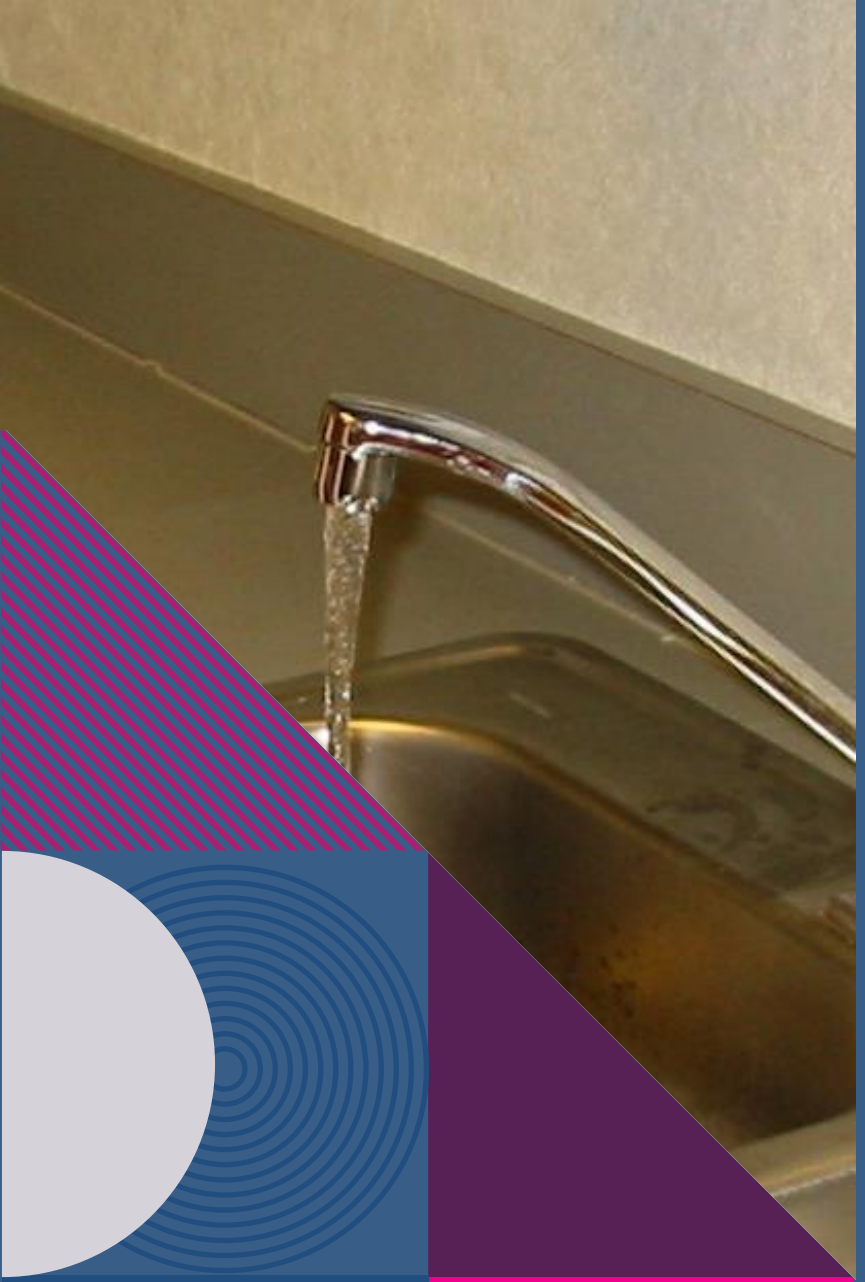
HAND HYGIENE

Why Is Hand Hygiene Important?

Hands are the most common mode of pathogen transmission

Reduce spread of antimicrobial resistance

Prevent health care-associated infections



HANDS NEED TO BE CLEANED WHEN

Visibly dirty

After touching contaminated objects with bare hands

Before and after patient treatment (before glove placement and after glove removal)

Hand Hygiene Definitions

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

EFFICACY OF HAND HYGIENE PREPARATIONS IN REDUCTION OF BACTERIA

Plain Soap

Antimicrobial soap

Alcohol-based handrub

Source: http://www.cdc.gov/handhygiene/materials.htm

ALCOHOL-BASED PREPARATIONS

Benefits

Cannot be used if hands are visibly soiled

Store away from high temperatures or flames

Hand softeners and glove powders may “build-up”

Limitations

1. Rapid and effective antimicrobial action
2. Improved skin condition
3. More accessible than sinks

Special Hand Hygiene Considerations

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

PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT

A major component of Standard Precautions

Protects the skin and mucous membranes from exposure to infectious materials in spray or spatter

Should be removed when leaving treatment areas

Masks, Protective Eyewear, Face Shields

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

PROTECTIVE CLOTHING

Wear gowns, lab coats, or uniforms that cover skin and personal clothing likely to become soiled with blood, saliva, or infectious material

Change if visibly soiled

Remove all barriers before leaving the work area

Gloves

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

RECOMMENDATIONS FOR GLOVING

Wear gloves when contact with blood, saliva, and mucous membranes is possible

Remove gloves after patient care

Wear a new pair of gloves for each patient

Recommendations for Gloving

Remove gloves that
are torn, cut or punctured

Do not wash, disinfect
or sterilize gloves for reuse

LATEX HYPERSENSITIVITY AND CONTACT DERMATITIS

Latex Allergy

- Type I hypersensitivity to natural rubber latex proteins
- Reactions may include nose, eye, and skin reactions
- More serious reactions may include respiratory distress– rarely shock or death

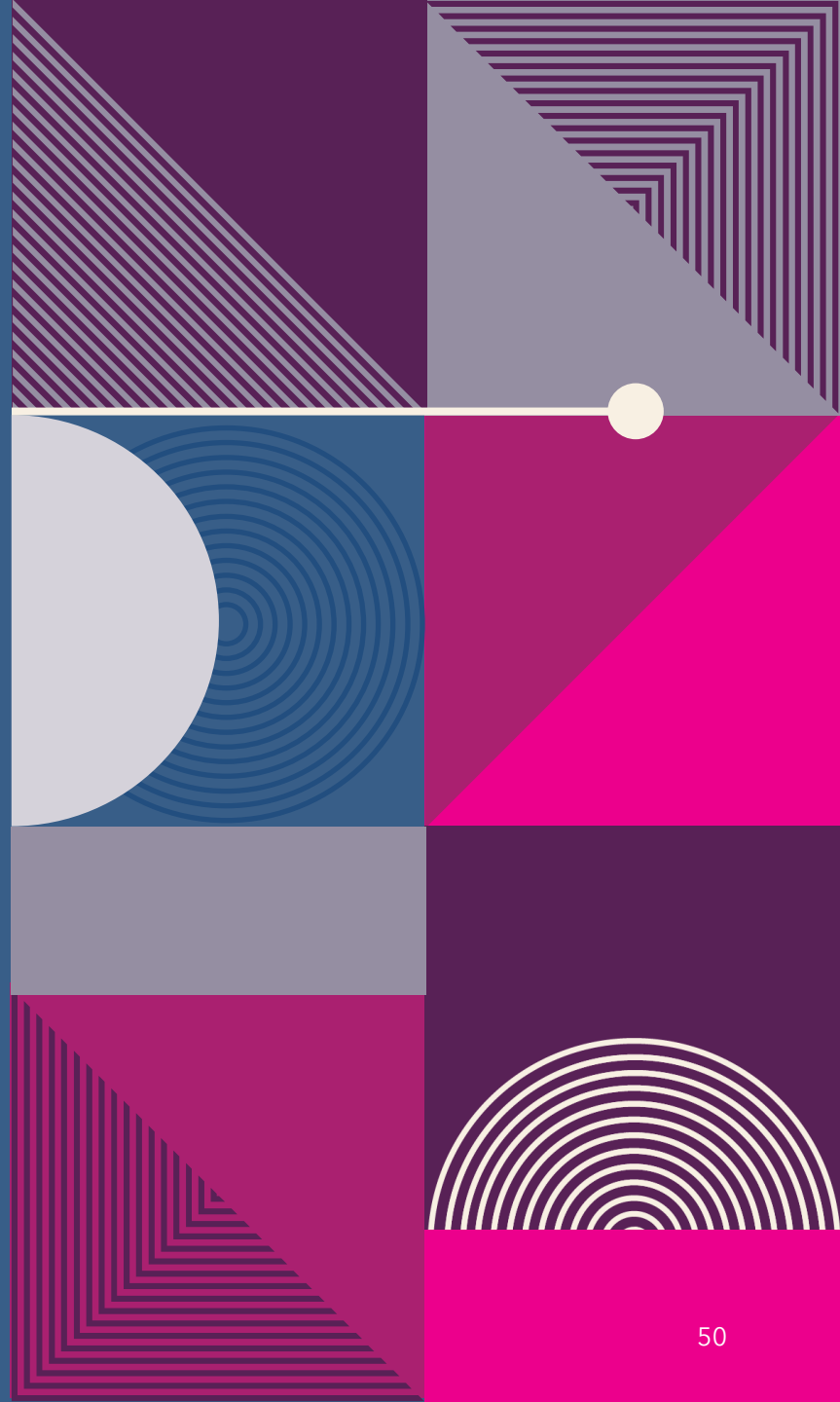
CONTACT DERMATITIS

Irritant contact dermatitis

- Not an allergy
- Dry, itchy, irritated areas

Allergic contact dermatitis

- Type IV delayed hypersensitivity
- May result from allergy to chemicals used in glove manufacturing



GENERAL RECOMMENDATIONS CONTACT DERMATITIS AND LATEX ALLERGY

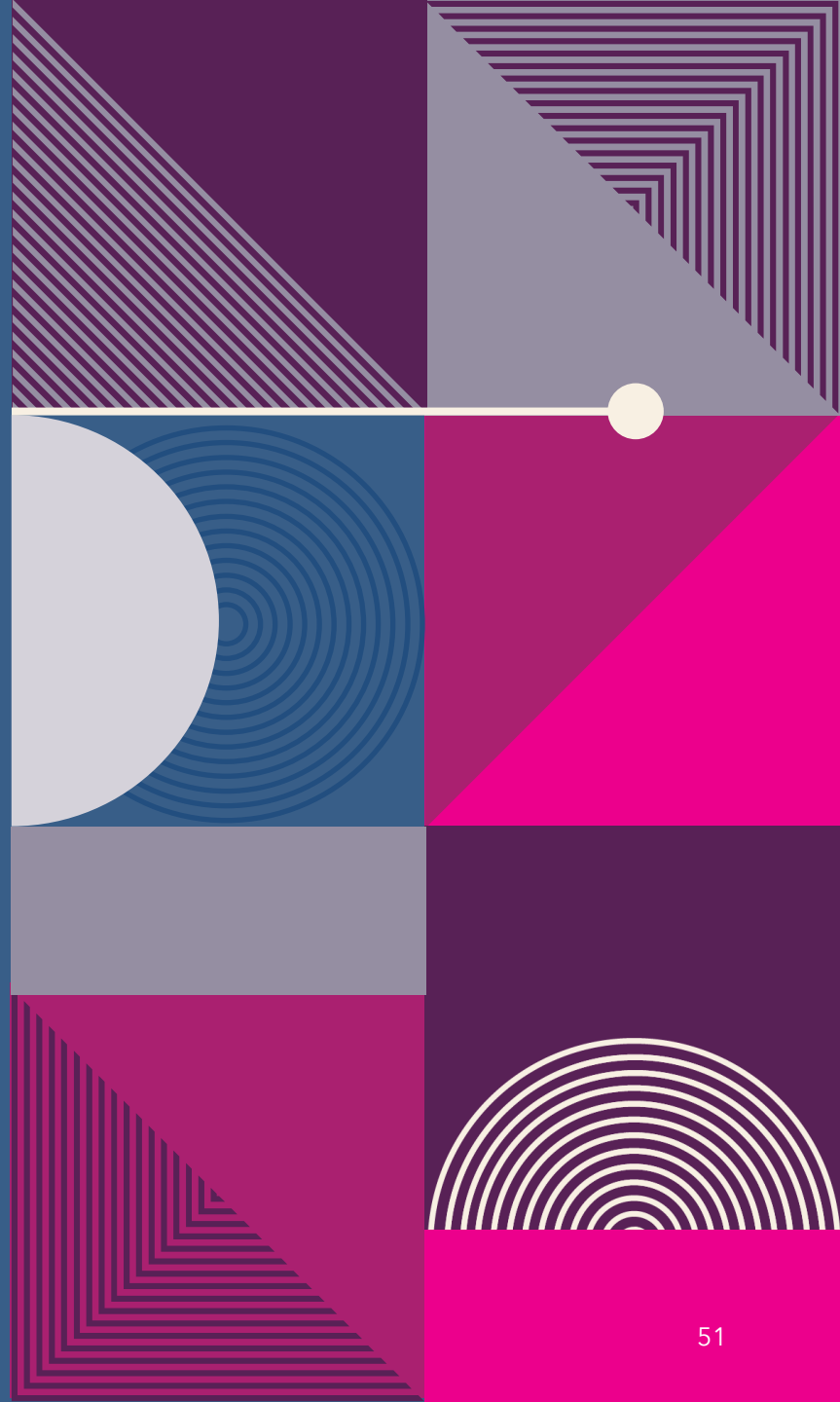
Educate DHCP about reactions associated with frequent hand hygiene and glove use

Get a medical diagnosis

Screen patients for latex allergy

Ensure a latex-safe environment

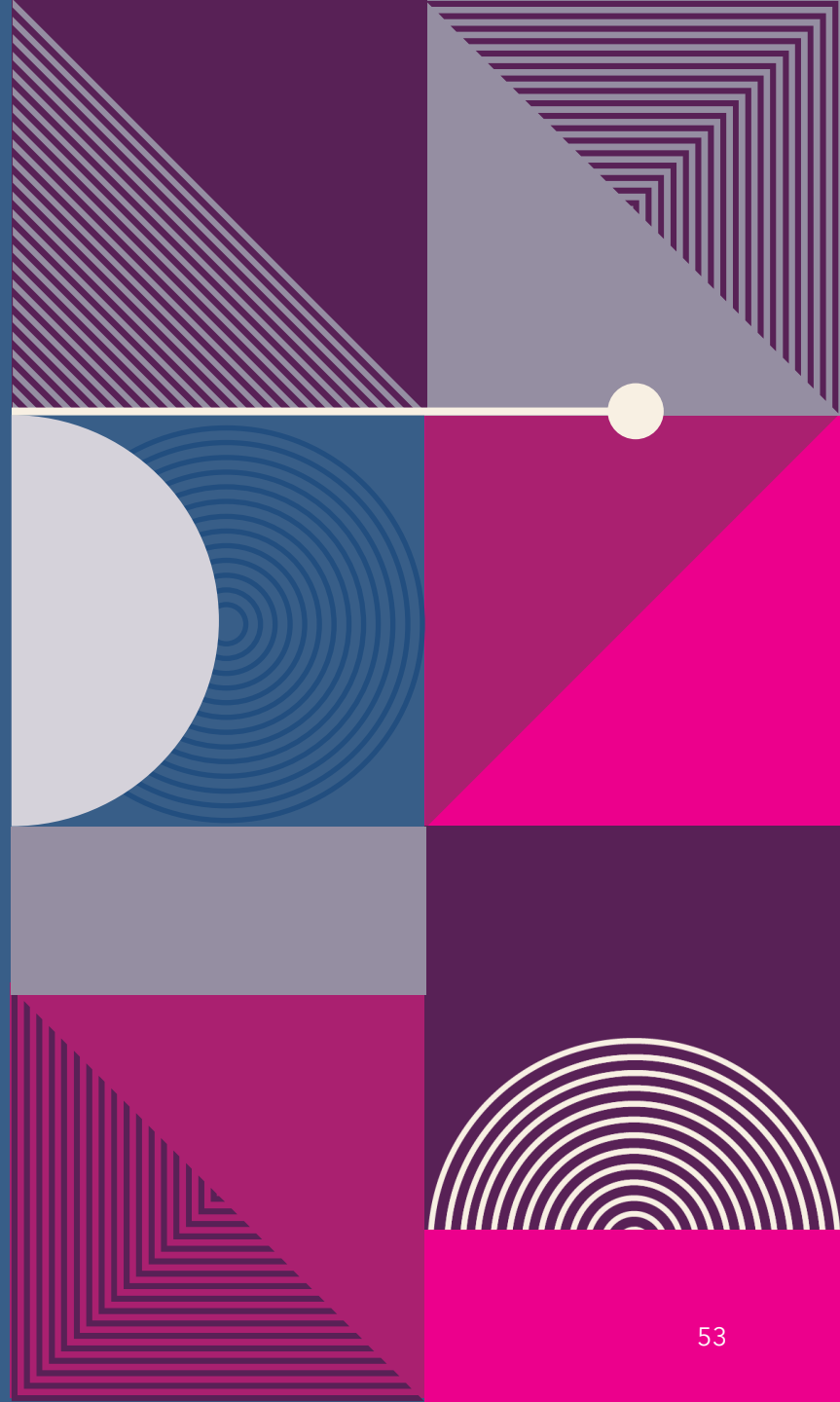
Have latex-free kits available (dental and emergency)



STERILIZATION AND DISINFECTION OF PATIENT CARE ITEMS

TRANSPORTATION

- Always carry instruments to sterilization on a tray, cassette or bin that locks
- Never run with instruments
- Watch blind corners in areas so as not to run into anyone
- Sharps should be properly discarded prior to transporting instruments out of operatory



CRITICAL INSTRUMENTS

Penetrate mucous membranes or contact bone, the bloodstream, or other normally sterile tissues (of the mouth)

Heat sterilize between uses or use sterile single-use, disposable devices

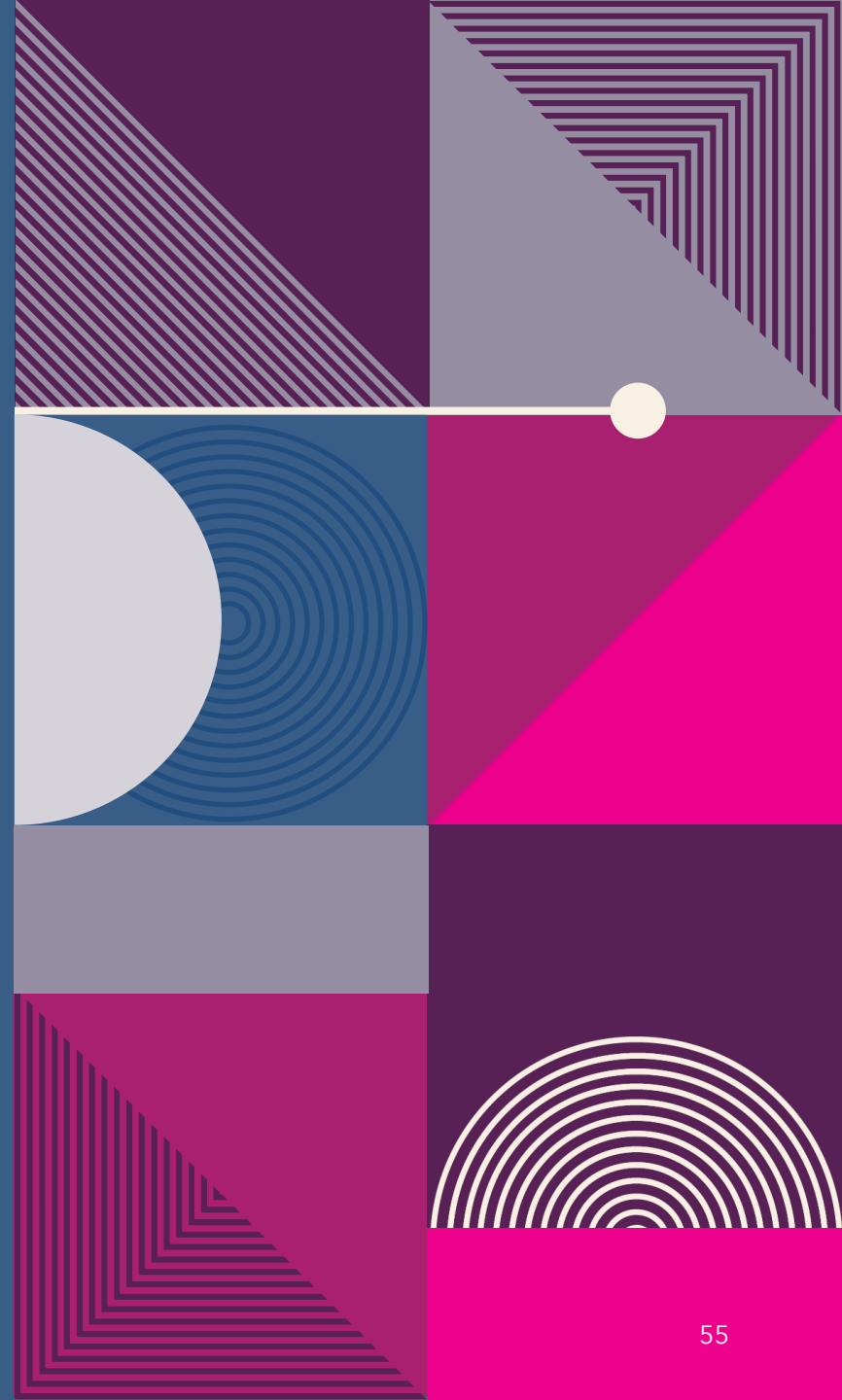
Examples include surgical instruments, scalpel blades, periodontal scalers, and surgical dental burs

SEMI-CRITICAL INSTRUMENTS

Contact mucous membranes but do not penetrate soft tissue

Heat sterilize or high-level disinfect

Examples: Dental mouth mirrors, amalgam condensers, and dental handpieces



Noncritical Instruments and Devices

Contact intact skin

Clean and disinfect using a low to intermediate level disinfectant

Examples: X-ray heads, facebows, pulse oximeter, blood pressure cuff

Instrument Processing Area

Use a designated processing area to control quality and ensure safety

Divide processing area into work areas

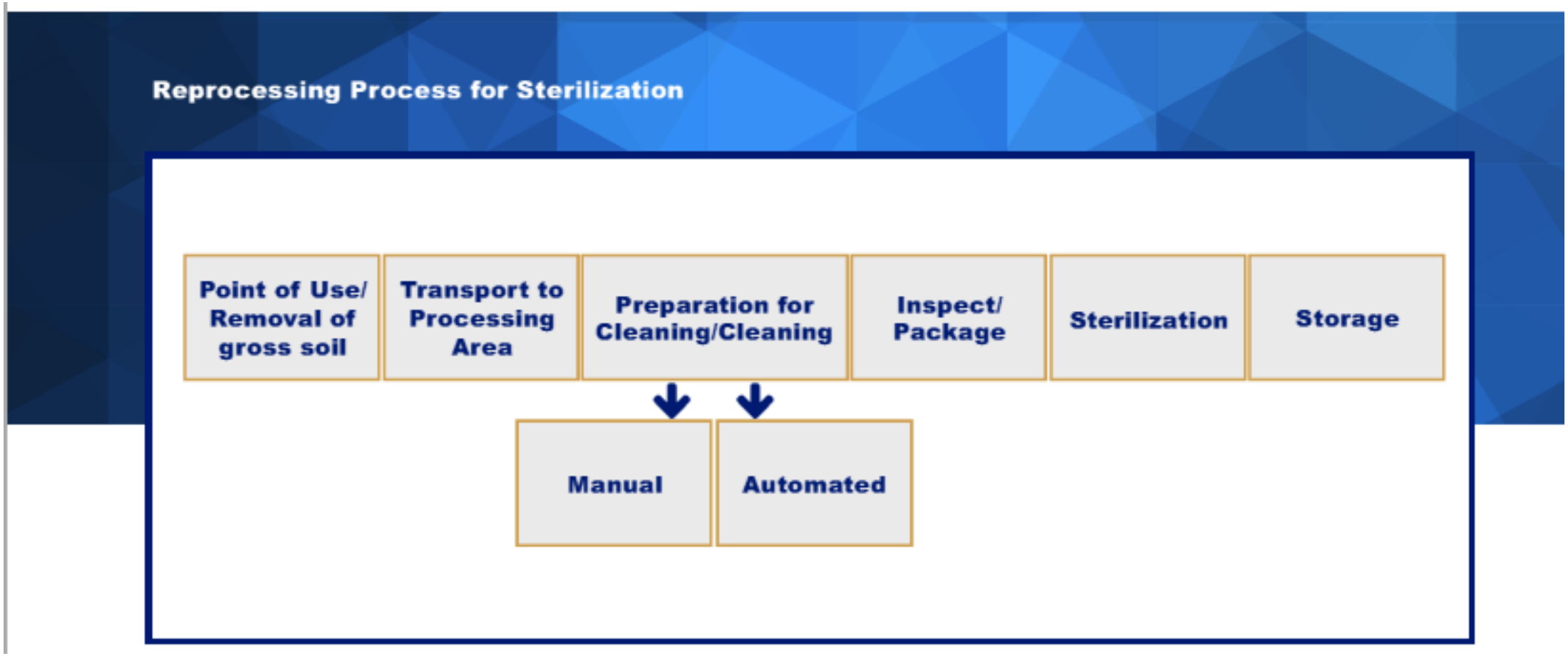
Receiving, cleaning, and decontamination

Preparation and packaging

Sterilization

Storage

Instrument Cleaning and Autoclave Process



AUTOMATED CLEANING

Ultrasonic cleaner

Instrument washer

Washer-disinfector

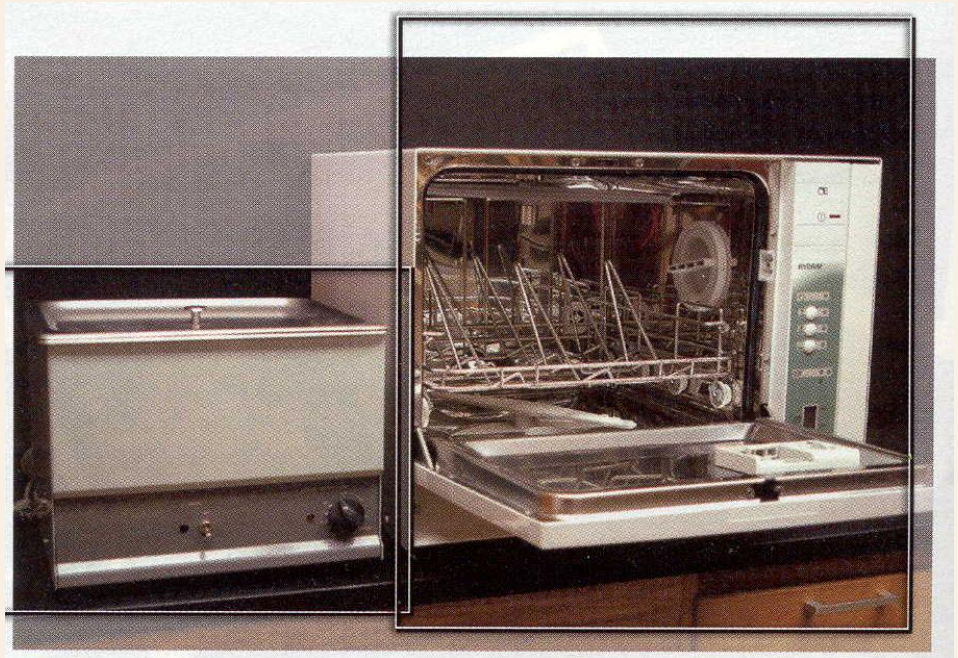


Fig. 2 Cleaning in an instrument washer (right) and an ultrasonic cleaner should be performed according to the manufacturer's directions.

MANUAL CLEANING

Soak until ready to clean

Wear heavy-duty utility gloves, mask, eyewear, and protective clothing

Preparation and Packaging

Critical and semi-critical items that will be stored should be wrapped or placed in containers before heat sterilization

Hinged instruments opened and unlocked

Place a chemical indicator inside the pack

Wear heavy-duty, puncture-resistant utility gloves

Heat-Based Sterilization

Steam under pressure (autoclaving)

- Gravity displacement
- Pre-vacuum

Dry heat

Unsaturated chemical vapor

Liquid Chemical Sterilant/Disinfectants

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

Sterilization Monitoring
Types of Indicators

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

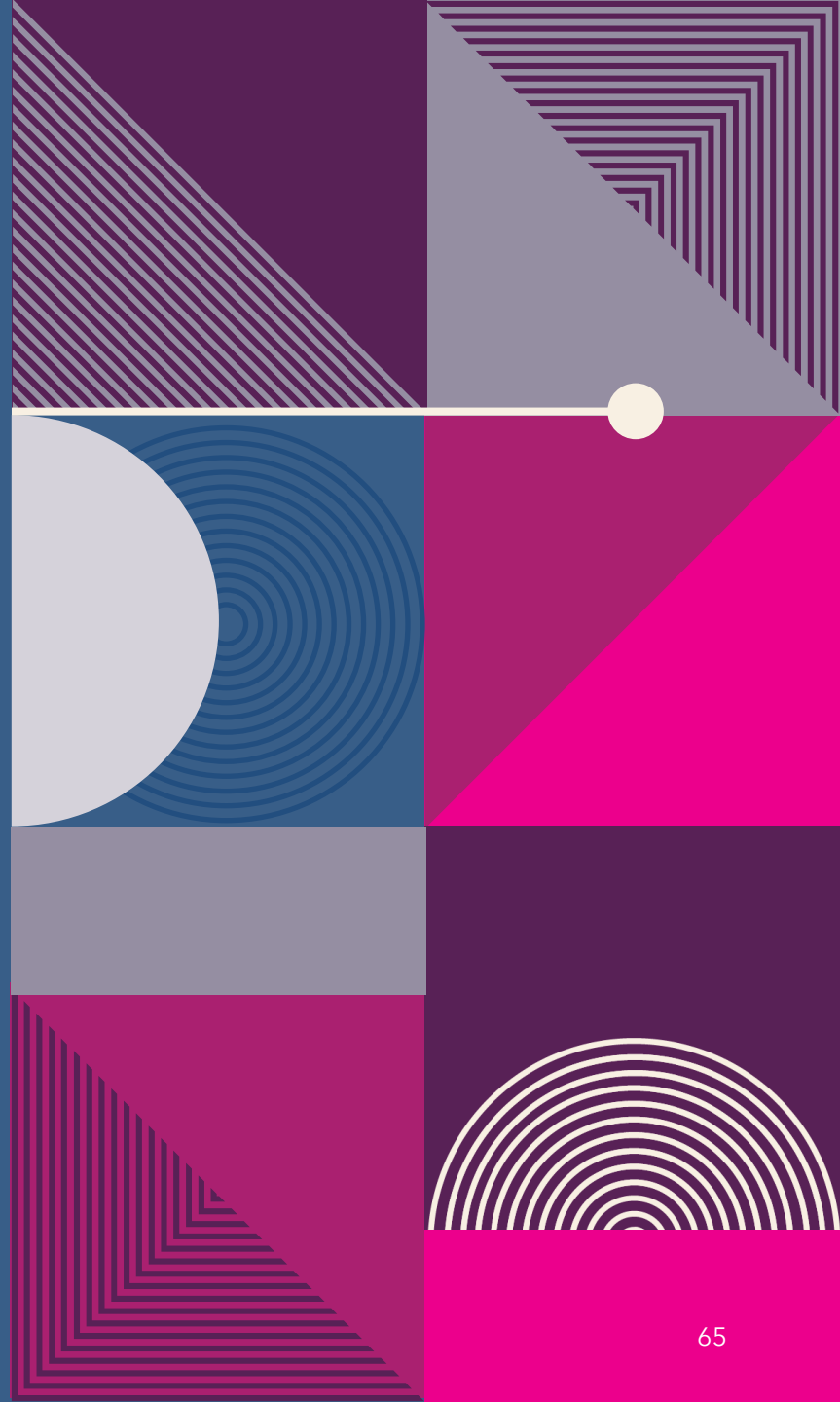
STORAGE OF STERILE AND CLEAN ITEMS AND SUPPLIES

Use date- or event-related shelf-life practices

Examine wrapped items carefully prior to use

When packaging of sterile items is damaged, re-clean, re-wrap, and re-sterilize

Store clean items in dry, closed, or covered containment



ENVIRONMENTAL INFECTION CONTROL

Environmental Surfaces

May become contaminated

Not directly involved in infectious disease transmission

Do not require as stringent decontamination procedures

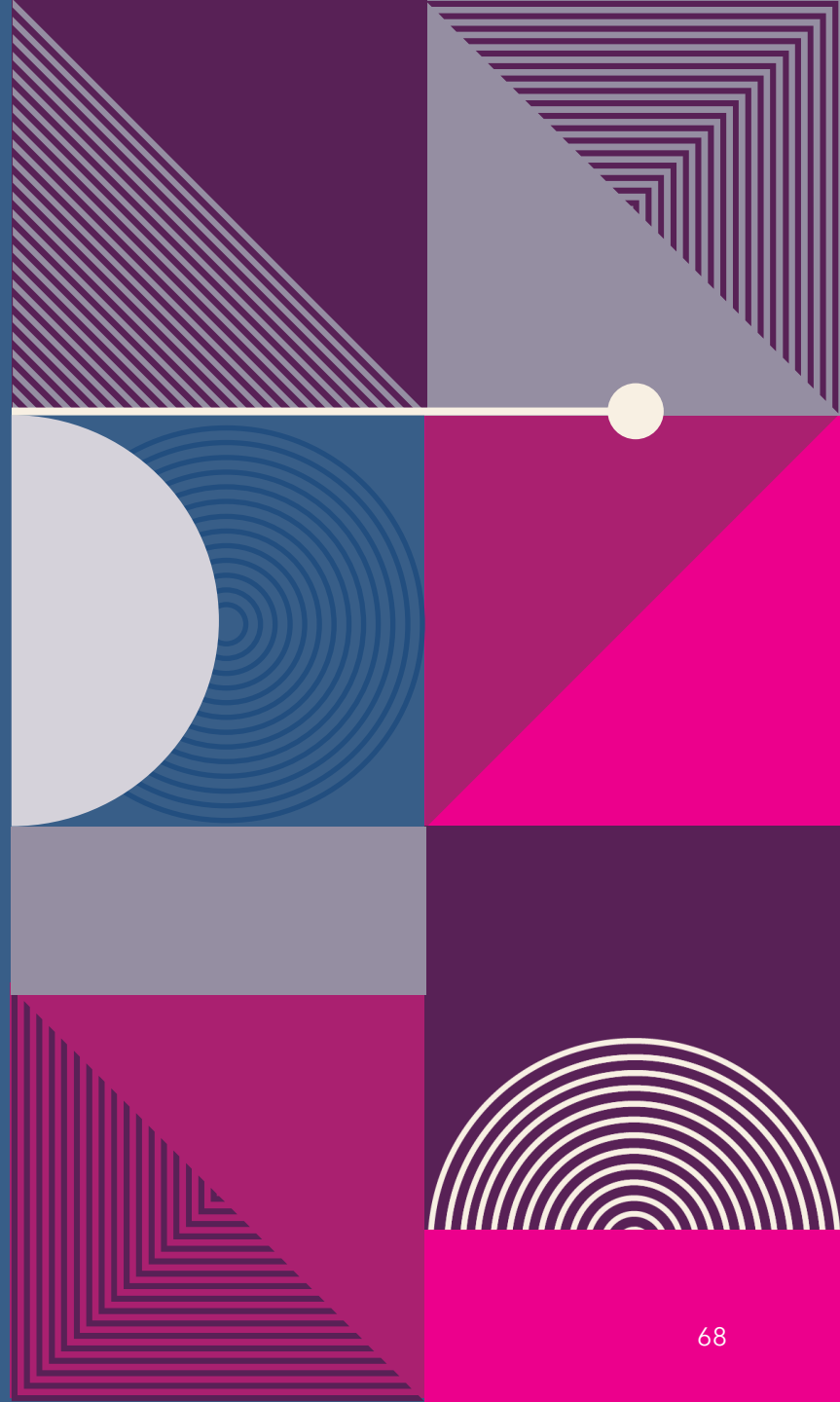
CATEGORIES OF ENVIRONMENTAL SURFACES

Clinical contact surfaces

- High potential for direct contamination from spray or spatter or by contact with DHCP's gloved hand

Housekeeping surfaces

- Do not come into contact with patients or devices
- Limited risk of disease transmission



CLINICAL CONTACT SURFACES

HOUSEKEEPING SURFACES

General Cleaning Recommendations

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

CLEANING CLINICAL CONTACT SURFACES

Risk of transmitting infections greater than for housekeeping surfaces

Surface barriers can be used and changed between patients

OR

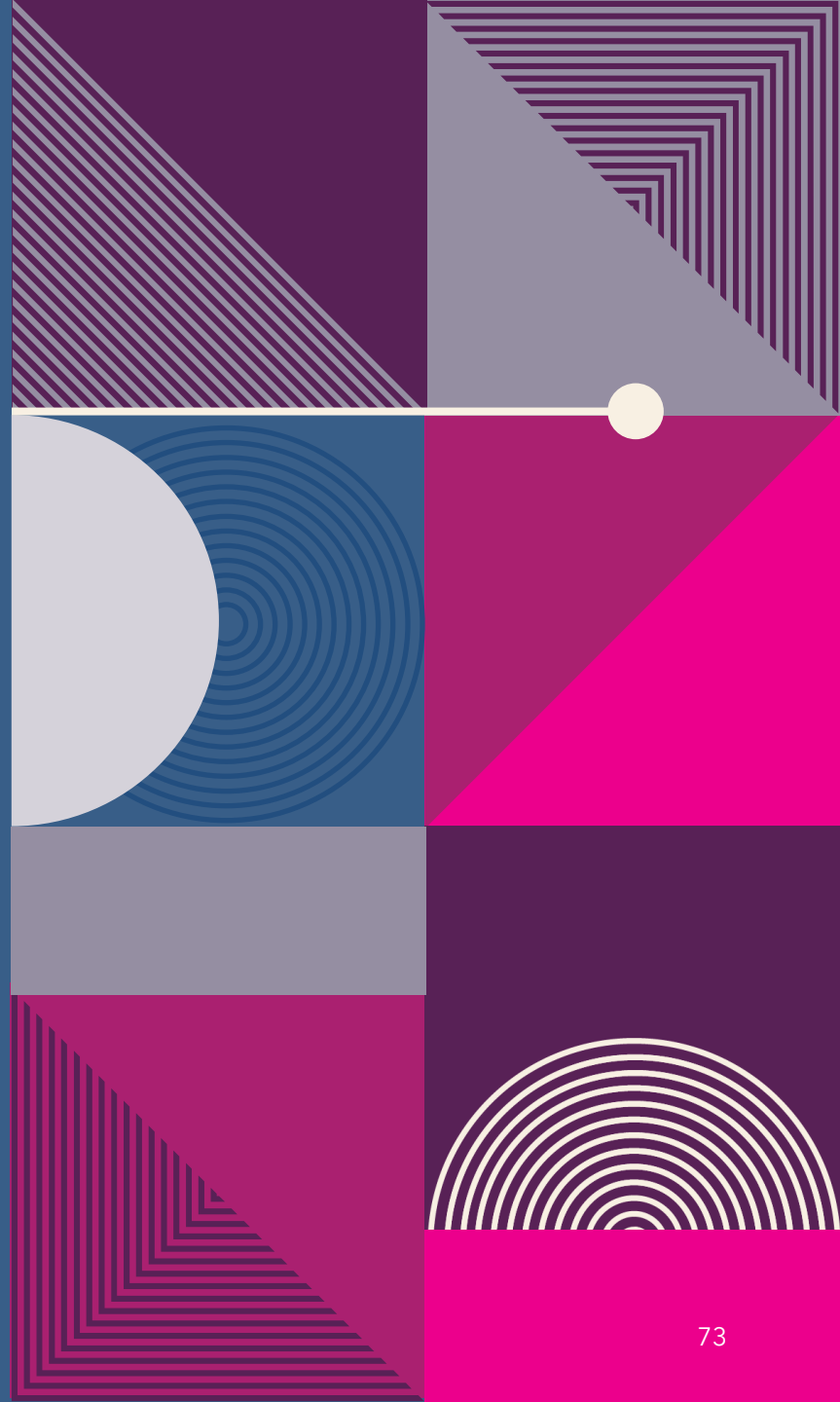
Clean then disinfect using an EPA-registered low- (HIV/HBV claim) to intermediate-level (tuberculocidal claim) hospital disinfectant

CLEANING HOUSEKEEPING SURFACES

Routinely clean with soap and water or an EPA-registered detergent/hospital disinfectant routinely

Clean mops and cloths and allow to dry thoroughly before re-using

Prepare fresh cleaning and disinfecting solutions daily and per manufacturer recommendations



MEDICAL WASTE

Regulated Medical Waste: Poses a potential risk of infection during handling and disposal

Medical Waste: Not considered infectious, thus can be discarded in regular trash

REGULATED MEDICAL WASTE MANAGEMENT

Properly labeled containment to prevent injuries and leakage

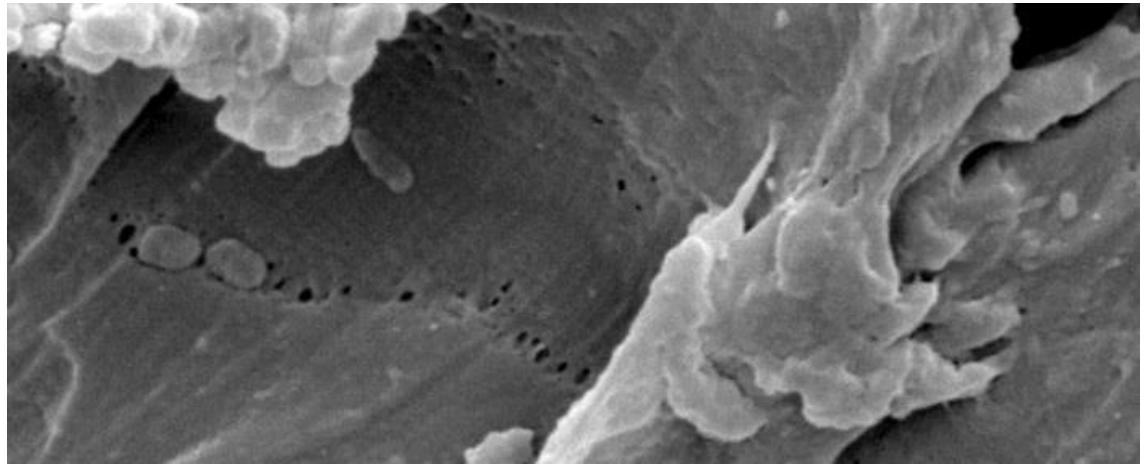
Medical wastes are “treated” in accordance with state and local EPA regulations

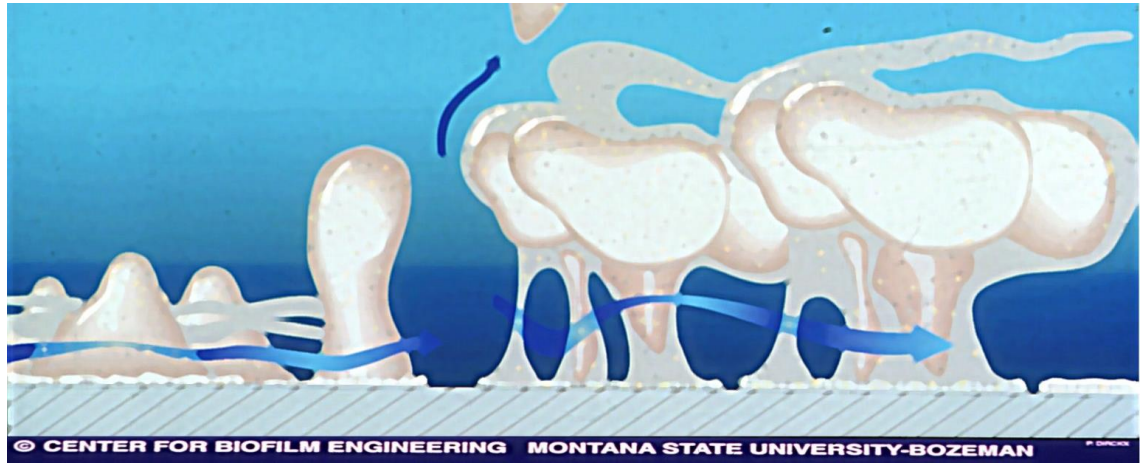
Processes for regulated waste include autoclaving and incineration

DENTAL UNIT WATERLINES, BIOFILM, AND WATER QUALITY

Dental Unit Waterlines and Biofilm

- Microbial biofilms form in small bore tubing of dental units
- Biofilms serve as a microbial reservoir
- Primary source of microorganisms is municipal water supply





Dental Unit Water Quality

Using water of uncertain quality is inconsistent with infection control principles

Colony counts in water from untreated systems can exceed 1,000,000 CFU/mL

CFU=colony forming unit

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

Dental Water Quality

For routine dental treatment, meet regulatory standards for drinking water.*

* <500 CFU/mL of heterotrophic water bacteria

Available DUWL Technology

- Independent reservoirs
- Chemical treatment
- Filtration
- Combinations
- Sterile water delivery systems

Monitoring Options

Water testing laboratory

In-office testing with self-contained kits

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

Sterile Irrigating Solutions

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

- Use devices designed for the delivery of sterile irrigating fluids

Special Considerations

- Dental handpieces and other devices attached to air and waterlines
- Dental radiology
- Aseptic technique for parenteral medications
- Single-use (disposable) Devices
- Preprocedural mouth rinses
- Oral surgical procedures
- Handling biopsy specimens
- Handling extracted teeth
- Laser/electrosurgery plumes or surgical smoke
- Dental laboratory
- *Mycobacterium tuberculosis*
- Creutzfeldt-Jacob Disease (CJD) and other prion-related diseases

Dental Handpieces and Other Devices Attached to Air and Waterlines

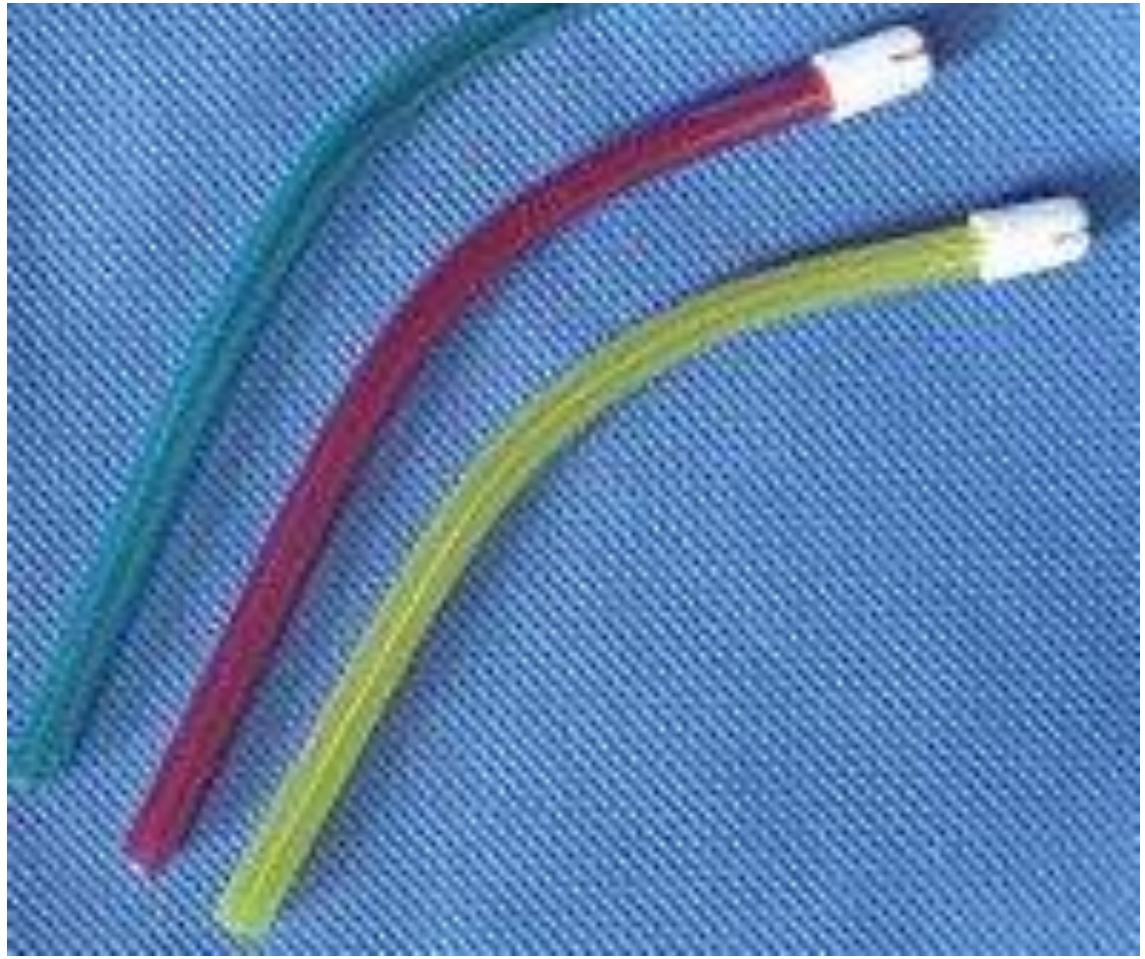
Clean and heat	Follow	Do not use
Clean and heat sterilize intraoral devices that can be removed from air and waterlines	Follow manufacturer's instructions for cleaning, lubrication, and sterilization	Do not use liquid germicides or ethylene oxide

Components of Devices Permanently Attached to Air and Waterlines

Do not enter	Do not enter patient's mouth but may become contaminated
Use	Use barriers and change between uses
Clean and intermediate	Clean and intermediate-level disinfect the surface of devices if visibly contaminated

Saliva Ejectors

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



Dental Radiology

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

Parenteral Medications

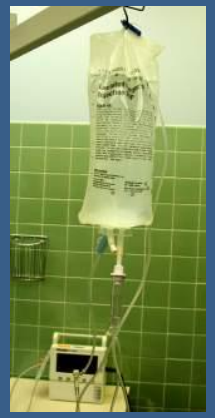
Definition: Medications that are injected into the body

Cases of disease transmission have been reported

Handle safely to prevent transmission of infections

PRECAUTIONS FOR PARENTERAL MEDICATIONS

- IV tubings, bags, connections, needles, and syringes are single-use, disposable
- Single dose vials
  - Do not administer to multiple patients even if the needle on the syringe is changed
  - Do not combine leftover contents for later use



Single-Use (Disposable) Devices

- Intended for use on one patient during a single procedure
- Usually not heat-tolerant
- Cannot be reliably cleaned
- Examples: Syringe needles, prophylaxis cups, and plastic orthodontic brackets

Preprocedural Mouth Rinses

Antimicrobial mouth rinses prior to a dental procedure

- Reduce number of microorganisms in aerosols/spatter
- Decrease the number of microorganisms introduced into the bloodstream

Unresolved issue–no evidence that infections are prevented

Oral Surgical Procedures

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

Precautions for Surgical Procedures

Surgical Scrub

Sterile Surgeon's Gloves

Sterile Irrigating Solutions

HANDLING BIOPSY SPECIMENS

Place biopsy in sturdy, leakproof container

Avoid contaminating the outside of the container

Label with a biohazard symbol

EXTRACTED TEETH

Considered regulated medical waste

- Do not incinerate extracted teeth containing amalgam
- Clean and disinfect before sending to lab for shade comparison

Can be given back to patient

Handling Extracted Teeth in Educational Settings

- Remove visible blood and debris
- Maintain hydration
- Autoclave (teeth with no amalgam)
- Use Standard Precautions

Laser/Electrosurgery Plumes and Surgical Smoke

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

Dental Laboratory

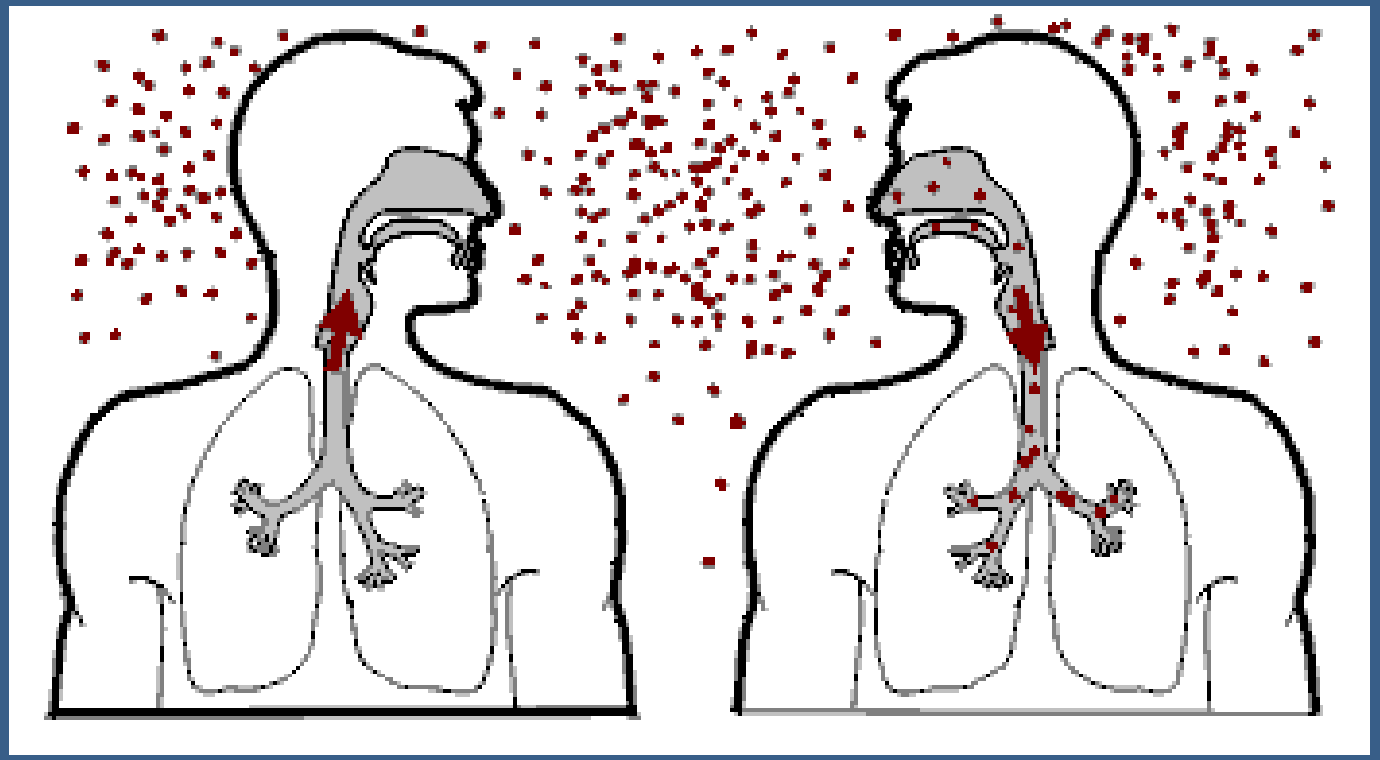
Dental prostheses, appliances, and items used in their making are potential sources of contamination

Handle in a manner that protects patients and DHCP from exposure to microorganisms

Dental Laboratory

Clean and disinfect	Clean and disinfect prostheses and impressions
Wear	Wear appropriate PPE until disinfection has been completed
Clean and heat	Clean and heat sterilize heat-tolerant items used in the mouth
Communicate	Communicate specific information about disinfection procedures

TRANSMISSION OF *MYCOBACTERIUM TUBERCULOSIS*



1. Spread by droplet nuclei
2. Immune system usually prevents spread
3. Bacteria can remain alive in the lungs for many years (latent TB infection)

RISK OF TB TRANSMISSION IN DENTISTRY

Risk in dental settings is low

Only one documented case of transmission

Tuberculin skin test conversions among

DHP are rare

PREVENTING TRANSMISSION OF TB IN DENTAL SETTINGS

Assess patients for history of TB

Defer elective dental treatment

If patient must be treated:

- DHCP should wear face mask
- Separate patient from others/mask/tissue
- Refer to facility with proper TB infection control precautions

CREUTZFELDT-JAKOB DISEASE (CJD) AND OTHER PRION DISEASES

A type of a fatal degenerative disease of central nervous system

Caused by abnormal “prion” protein

Human and animal forms

Long incubation period

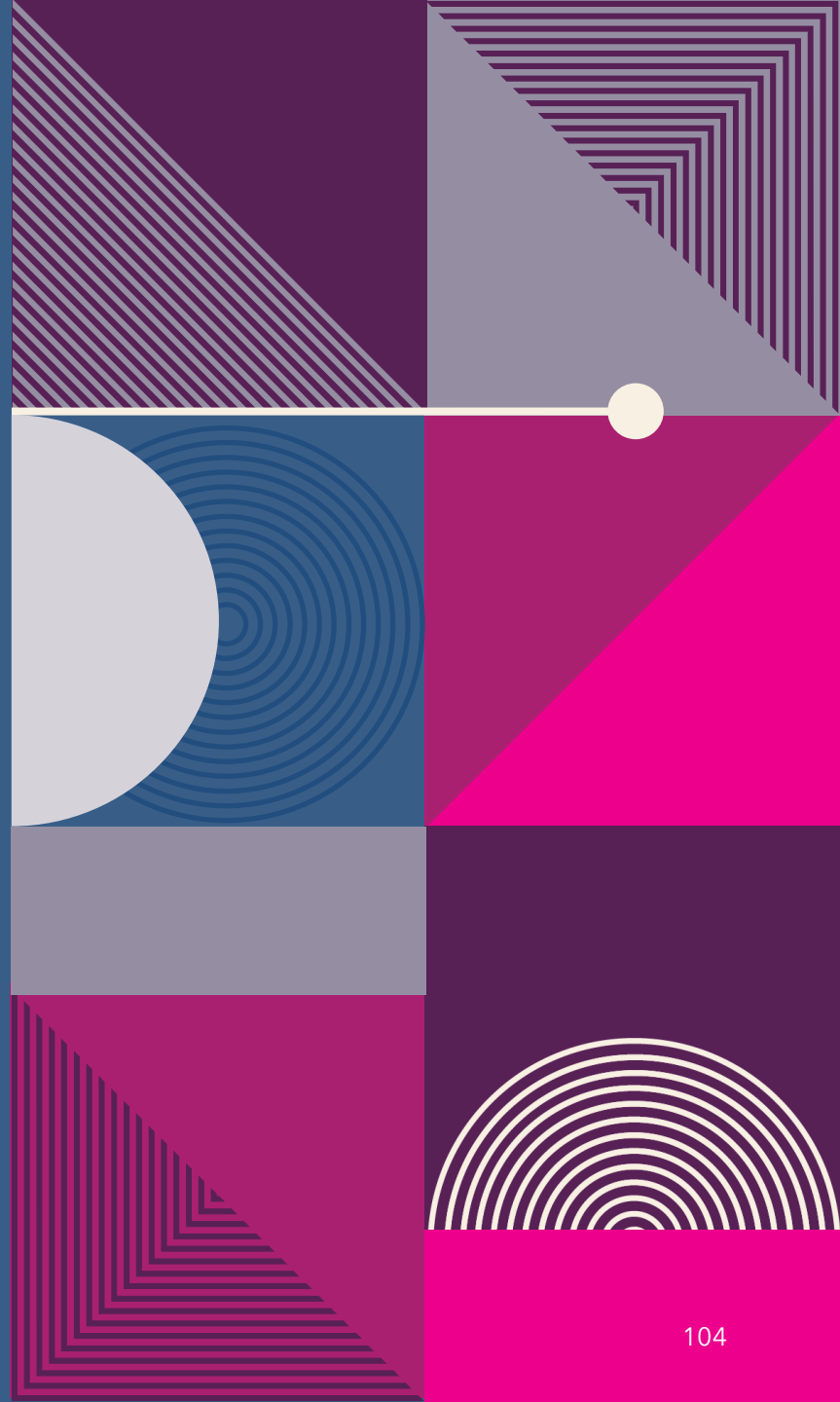
One case per million population worldwide

NEW VARIANT CJD (VCJD)

Variant CJD (vCJD) is the human version of Bovine Spongiform Encephalopathy (BSE)

Case reports in the UK, Italy, France, Ireland, Hong Kong, Canada

One case report in the United States – former UK resident



INFECTION CONTROL FOR KNOWN CJD OR VCJD DENTAL PATIENTS

Use single-use disposable items and equipment

Consider items difficult to clean (e.g., endodontic files, broaches) as single-use disposable

Keep instruments moist until cleaned

Clean and autoclave at 134°C for 18 minutes

Do not use flash sterilization

PROGRAM EVALUATION

"Systematic way to improve (infection control) procedures so they are useful, feasible, ethical, and accurate"

- **Develop standard operating procedures**
- **Evaluate infection control practices**
- **Document adverse outcomes**
- **Document work-related illnesses**
- **Monitor health care-associated infections**

INFECTION CONTROL PROGRAM GOALS

- Provide a safe working environment
  - Reduce health care-associated infections
  - Reduce occupational exposures

PROGRAM EVALUATION

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

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

FINAL TIPS & TAKEAWAYS

THANK YOU

Valerie Morefield

505-224-8740

Valerie_morefield@fcch.com