

## Brushing Up: What, How & What If

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Cutting the infection rate by  
80% will prevent

**160,000 infections**  
**and**  
**8,000 deaths per year**



## The Risk of Dirty

- 1 out of 9 hospitalized patients in Canada contracts a healthcare-associated infection (HAI) annually (220,000 patients each year).
- 8,500 – 12,000 deaths a year attributed to HAI
  - The fourth leading cause of death in Canada.
  - 40% of these deaths occur in Ontario
- HAIs account for over \$1 billion in excess healthcare costs/year
- On average, 16% of hospital budgets are spent on reducing HAIs

Canada has the highest rate of HAIs in the developed world.

## The Challenge of Clean

There are no standards for measuring clean

- How clean is clean?
- How clean is clean enough?
- How clean is safe?

Testing for clean is difficult

- Takes time
- Costs money
- May require re-cleaning of the device due to contamination during the testing process

Manufacturer IFUs don't always contain instructions for testing



## FUN FACT

**Q: What is a more hygienic tool for cleaning?**

- Sponge
- Brush
- Washcloth

**A: Brush. They are easier to clean and faster to dry.**

Bacteria need three things to grow: moisture, food and temperature appropriate to the bacteria species. That means, if you deny it moisture and food, it dies. A brush **1) does not retain moisture** and the surface moisture dries quickly and **2) allows a user to see the *visible* food**. So at a minimum, rinse and dry. And **when in doubt, throw it out!**

Source: [www.apartmenttherapy.com](http://www.apartmenttherapy.com)



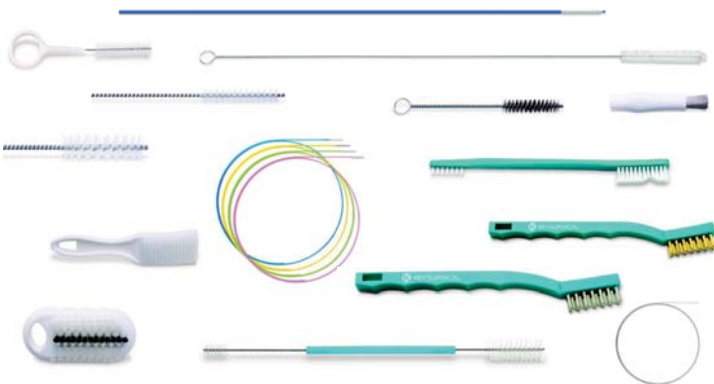
## Objectives

- Discuss the different brush materials available and their characteristics
- Explain antimicrobial properties of brushes
- Discuss the considerations when selecting a brush
- Explain the difference between disposable & reusable brushes and how to clean and sterilize them
- Apply industry guidelines to all the above objectives
- Discuss the risk of not following recommended practices and manufacturer's IFU when using brushes



## Brushes

### The Most Basic and Versatile Tool for Cleaning



## History of the Brush

**1498:** Emperor of China patented the 1<sup>st</sup> toothbrush made of hogback bristles set into a piece of bone or bamboo

**1780:** William Addis (England) began importing coarse boar bristles from Siberia & Northern China for quality mass-produced toothbrushes

**1844:** Meyer Rhein patented the 3-row toothbrush

**WWI:** Celluloid plastic brush handles appear because all bones were needed for soup

**1932:** Modern plastic toilet bowl brush was introduced

**1938:** Dr. West's Miracle Tuft Toothbrush was made with nylon bristles, a new invention from DuPont

**1940's:** Fuller Brush Company supplied the military with 40 million brushes for cleaning weapons



## Brush Terminology

**Bristles:** part of the brush that does the work

Three types of bristle filament (fill) material

- Synthetic: man-made
- Natural: hair, bristle or vegetable fiber
- Wire: strands of metal

**Handle:** part of the brush that holds the bristles in place

Popular handle materials include

- Twisted stainless steel
- Molded plastic blocks
- Tubing/rods
- Spring coil stainless steel wire



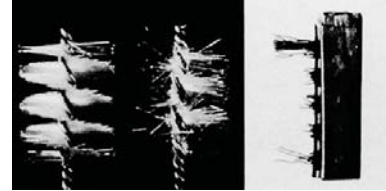
## Brush Terminology

**Corrosion Resistance**

- Gradual destruction of material, usually metals, by chemical reaction
- Ability to fight off electrochemical oxidation attacks (rust)

**Flex Fatigue/Non-Shedding**

- Measure of a material's resistance to splitting or breaking



Photos courtesy of DuPont® Filaments



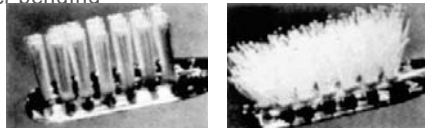
## Brush Terminology

**Abrasion Resistance**

- Property which allows a material to resist wear; will resist erosion caused by scraping, rubbing and other mechanical wear
- Allows the material to retain its integrity and hold its form

**Bristle Bend Recovery**

- Ability of a material to return to its original shape after deformation
- Determined by measuring the ability of a filament to straighten out after bending



Photos courtesy of DuPont® Filaments



## Bristle Materials

Material	Characteristics
<b>Nylon (Synthetic)</b>	<ul style="list-style-type: none"> <li>• Toughest, most durable synthetic filament available</li> <li>• Non-shedding</li> <li>• Excellent abrasion resistance</li> <li>• Excellent bristle bend recovery</li> <li>• Very good chemical resistance; resists most acids</li> <li>• Best choice for abrasive, rough use as it does not scratch most surfaces</li> </ul>
<b>Polypropylene (Synthetic)</b>	<ul style="list-style-type: none"> <li>• One of the most chemically resistant synthetic filament materials, especially strong acids and bases</li> <li>• Does not absorb moisture so maintains stiffness when wet</li> <li>• Excellent resistance to fungal and bacterial growth</li> <li>• Flex fatigue resistance so bristles don't splay as quickly</li> <li>• Good abrasion resistance</li> <li>• Sheds dirt easily</li> <li>• Inert to most solvents, oils and chemicals</li> </ul>



## Bristle Materials

Material	Characteristics
<b>Brass</b>	<ul style="list-style-type: none"> <li>• Softest metal fiber available</li> <li>• Used for light to medium cleaning of scratch susceptible surfaces</li> <li>• High degree of abrasion for cleaning heavily soiled equipment without damaging the surface</li> <li>• Corrosion resistant</li> <li>• Poor bristle recovery</li> <li>• Will not generate sparks making it suitable for use in static reduction applications</li> <li>• Same gage filament as soft stainless steel (.003")</li> </ul>
<b>Stainless Steel</b>	<ul style="list-style-type: none"> <li>• Highly resistant to corrosion, heat and chemicals</li> <li>• Excellent bend recovery</li> <li>• Provides high degree of abrasion and wear resistance</li> <li>• Not to be used on insulated or coated instruments</li> <li>• Excellent for more aggressive cleaning (i.e. serrations, box locks)</li> <li>• Also available in a softer stainless version (.003" vs .008" filament)</li> </ul> <p>Note: Use stainless steel brushes instead of carbon steel wire, which is a stronger, more aggressive bristle that can damage instruments</p>



## Antimicrobial

### What is an antimicrobial?

- A substance that kills or inhibits the growth of microorganisms such as bacteria, fungi or protozoans
- Can be antibiotics or synthetically formed compounds

### What are antimicrobial bristles?

- Bristles, usually nylon, that have been either coated or inbuilt with an inorganic antimicrobial m
  - Coated: antimicrobial material is applied to the surface area of the bristle filament
  - Inbuilt: antimicrobial material is infused in the bristle filament during the manufacturing of the filament



## FUN FACT

**Q: What is a common use for wire bristle brushes?**

**A: Cleaning the teeth of large animals such as pigs and crocodiles.**



## Antimicrobial

### What is the benefit of antimicrobial bristles?

- They provide superior infection control properties by preventing the growth of bacteria, mold and yeast on the surface of the bristles

### How does this affect the brush bristles?

- There is no impact to the fit, form or function of the brush or its cleaning capabilities
- The resistance of bacterial growth slows the breakdown of the bristle material, which may prolong the useful life of the bristles

### Does this mean antimicrobial brushes clean better?

- NO – they do not improve the cleaning properties nor do they prevent specimen growth on the surfaces being cleaned



## Brush Selection One Size Does Not Fit All

Cleaning brushes shall:

- meet the endoscope manufacturer's specifications;
- be the correct length and diameter for the channel;
- pass easily through the channel without excessive force;
- bristles should extend to all edges of the device and be stiff enough to dislodge any debris; and
- be constructed with a shaft that does not kink or cause channel damage during use

CSA Z314.8-14, Section 11.9.1.5.1, Pg. 62



## Brush Selection One Size Does Not Fit All

Proper brush selection is critical to  
thorough & effective cleaning!

Key to efficiency is **maximum bristle tip contact** to surface  
and the **proper type of bristle** for the surface being cleaned



## Brush Selection One Size Does Not Fit All

Common reprocessing errors are:

- using the incorrectly sized brush for a particular channel;
- using a damaged or contaminated brush; and
- lack of cleaning and disinfection of the sink and accessories between each use.

CSA Z314.8-14, Section 11.7.7.2.4, Pg. 55

"Brushes, cloths, syringes, and other cleaning accessories used for cleaning shall be of an appropriate size and shall be inspected before use."

CSA Z314.8-14, Section 11.9.1.5.1, Pg. 62



## Brush Selection One Size Does Not Fit All

Feature	Consideration	Risk
Brush Diameter	Too large <i>Brush diameter should be no more than 1/8" larger than the channel</i>	<ul style="list-style-type: none"> <li>Bristles lay against walls of the lumen and don't produce enough friction for scrubbing</li> <li>Brush becomes stuck inside channel, possibly damaging device and/or brush</li> </ul>
	Too small <i>Brush diameter should be no smaller than the actual channel diameter</i>	<ul style="list-style-type: none"> <li>Bristles don't touch the walls of the lumen, providing no scrubbing action necessary for cleaning</li> </ul>
Brush Length	Too short <i>Brush should be about 2" longer than the channel being cleaned</i>	<ul style="list-style-type: none"> <li>Doesn't clean entire length of channel</li> <li>Unable to push dirt through open end</li> </ul>



## Brush Selection One Size Does Not Fit All

Feature	Consideration	Risk
Brush Handle	<p>Looped end</p> <p><i>Loops at the end prevent the brush from completely entering the lumen and getting stuck</i></p> <p><i>Loops allow brushes to be hung for drying and storage</i></p>	<ul style="list-style-type: none"> <li>Looped ends prevent the brush from reaching the full length of the lumen</li> <li>Improper storage of brushes between uses can damage the bristles and promote the growth of biofilms</li> <li>Brush can become lodged inside of lumen, causing damage to the device</li> <li>Repeated cleaning action may cause kinks in the brush handle, which lead to damage of the lumen walls</li> </ul>
	<p>Non-Looped end</p> <p><i>Non-looped handles allow the brush to be pulled through the lumen</i></p>	
	<p>Handle material</p>	



## Brush Selection One Size Does Not Fit All

Feature	Consideration	Risk
Bristle Material	<p>Bristle material should be suitable for the material of the device being cleaned</p>	<ul style="list-style-type: none"> <li>Harder bristle materials could damage the surface of the instrument or device</li> <li>Soft bristle material will not provide abrasive scrubbing action for difficult to remove soils</li> <li>Cleaning agents and chemicals can have different effects on the various bristle materials, causing them to breakdown, shed and otherwise impact the ability to clean effectively</li> </ul>
	<p>Abrasiveness of bristle material should be appropriate to the condition of the device being cleaned</p>	
	<p>Compatibility &amp; performance of bristle material with cleaning agents</p>	



## Brush Selection One Size Does Not Fit All

Feature	Consideration	Risk
Brush Tip	<p>Brush tip</p> <p><i>Fan tips are great for close ended channels</i></p> <p><i>Acrylic and standard tips are best with open ended channels</i></p>	<ul style="list-style-type: none"> <li>Not all tip styles clean the same way and could damage lumens and devices</li> <li>Ends of close ended lumens pose a cleaning challenge as dirt is difficult to reach and can become caked onto surface</li> </ul>
Bristle Area Length	<p>Amount of bristle area is proportionate to size of device being cleaned</p>	<ul style="list-style-type: none"> <li>Too long of an area may result in bristles extending out of channel during cleaning motion, resulting in splatter spray from exposed bristles</li> <li>Too short of an area may not provide efficient cleaning and result in loss of time</li> </ul>



## Brush Selection One Size Does Not Fit All

Feature	Consideration	Risk
Device Being Cleaned	<p>Brush recommendation from device manufacturer's IFU</p>	<ul style="list-style-type: none"> <li>Device manufacture has validated cleaning instructions with a specific type or size of brush other than what is available</li> <li>Damage to devices and ineffective cleaning</li> <li>More soiled devices require more rigorous cleaning applications so more aggressive brushes may be required</li> <li>Reuse of brushes after use on some types of instrument sets may increase risk of patient harm due to cross-contamination</li> </ul>
	<p>How soiled is the device</p>	
	<p>Type of procedure device was used in</p>	



## Disposable vs. Reusable vs. Reposable

### Disposable

- Intended for one-time use (i.e. one case/set)

Safest & easiest way to minimize cross-contamination

Expensive to replace brushes so often

### Reusable

- Can be reused after cleaning and decontamination

Cost effective & reduces waste

Increased risk of cross-contamination

### Reposable

- Handles are reusable but the bristles are single use; combination of disposable and reusable

Least amount of waste

Requires more time for cleaning and replacing; Could disassemble during use



## Cleaning of Reusable Brushes

“Single-use or damaged cleaning accessories shall not be reused. Reusable cleaning accessories shall be decontaminated at least daily, dried, and stored in a dry, clean location, and in accordance with manufacturer’s instructions.”

CSA Z314.8-14, Section 7.3.2.4, Pg. 25

“Visual inspection of brushes includes attention to worn or missing bristles, exposed metal, rust, and capacity for build-up of bioburden that could damage medical devices.”

CSA Z314.8-14, Section 7.3.2.4, Pg. 25

“Reusable brushes shall be discarded when bristles are worn, frayed, bent, or otherwise damaged.”

CSA Z314.8-14, Section 11.9.1.5.3, Pg. 62



## Brush Selection Risk Summary

### Risks associated with improper brush use include:

- Ineffective removal of biofilms resulting in patient harm
- Cross-Contamination
- Damage to device
- Damage to the brush resulting in broken bristles or stems being left in device; and
- Additional time required for recleaning



## Cleaning of Reusable Brushes

### During use:

- Clean in detergent with a soft bristle brush each time it emerges from the channel or lumen; repeat until the brush emerges free of soil

**This prevents reintroduction of soil back into the lumen**

### After use:

- Rinse gross soils from the brush in a deep sink

**This prevents the spraying of soils into the air and onto the user**

- Use an instrument detergent or enzymatic cleaner in a washer disinfecter, ultrasonic cleaner or by manually agitating the bristles under water; repeat until bristles appear free of soil

**Type of cleaner depends on types of soil the brush came in contact with during cleaning. Ineffective cleaning of brushes increases disinfection failures and cross-contamination**



## Cleaning of Reusable Brushes

### After cleaning:

- Cleaned brushes may be thermally disinfected in the automated washer disinfection stage or with liquid chemical sterilants

Check with disinfectant manufacturer for compatibility concerns with brush materials

- Reusable scope brushes should be high-level disinfected or sterilized after EVERY use on a single scope

Follow the brush manufacturer's IFU for HLD and sterilization

### Sterilization:

- Always check with the brush manufacturer before sterilizing—can brushes be sterilized after use or only prior to initial use?

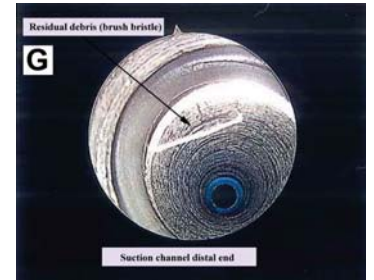
Proving that brushes are clean enough to be sterilized



## Inspecting Brushes How Do I Know When to Replace?

### Inspect brushes for:

- Wear, fraying or damaged bristles
- Kinks or bends in the brush handle
- Residual organic soil



## FUN FACT

**Q:** Your toothbrush has an average of 10 million germs on it. Therefore you should sterilize your toothbrush weekly to prevent the growth of bacteria such as E.coli, staphylococci and streptococcus.

True or False?

**A:** False!

The ADA recommends rinsing brushes thoroughly after use and allow to air-dry; do not share or let family brushes touch one another; and replace every three to four months or sooner if bristles are worn or splayed.

From the March 2007 issue of [Q: The Oprah Magazine](#)



## Final Thoughts

“I am only one, but I am still one;  
I cannot do everything, but I can do something;  
and because I cannot do everything,  
I will not refuse to do the something that I can do.”

- Edward Everett Hale

(1822 – 1909)





## Sources

3M Canada

Canadian Healthcare Facilities Magazine

CSA Z314.8-14 Decontamination of Reusable Medical Devices, February 2014

Canadian Union of Public Employees (CUPE)

Ontario Council of Hospital Unions (OCHU)



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# ThankS!

