


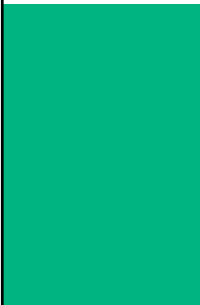
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SHARING EXPERTISE



**REPROCESSING, CARE & MAINTENANCE  
OF SURGICAL INSTRUMENTS AND ITS HYGIENIC IMPACT**

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**AGENDA**

1. Background
2. Types of Surface Changes
3. Objectives of Reprocessing
4. Most Common Root Causes
5. Evidence
6. Conclusion

## BACKGROUND

### HISTORY & RESPONSIBILITIES



Surface Changes on surgical instruments are a common appearances in the daily life of the O.T. & CSSD

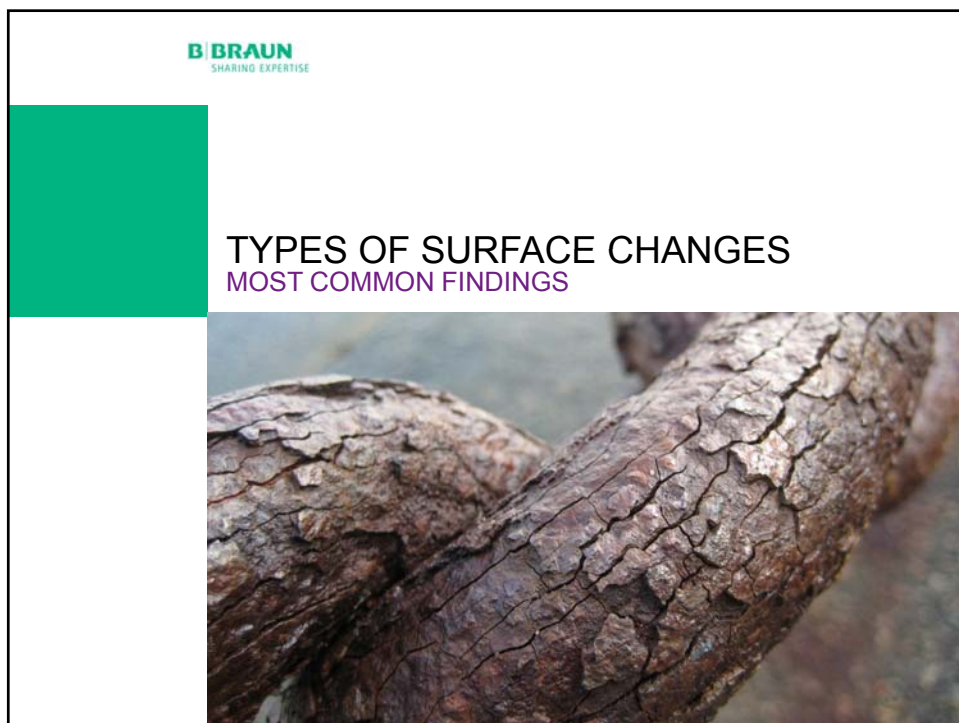
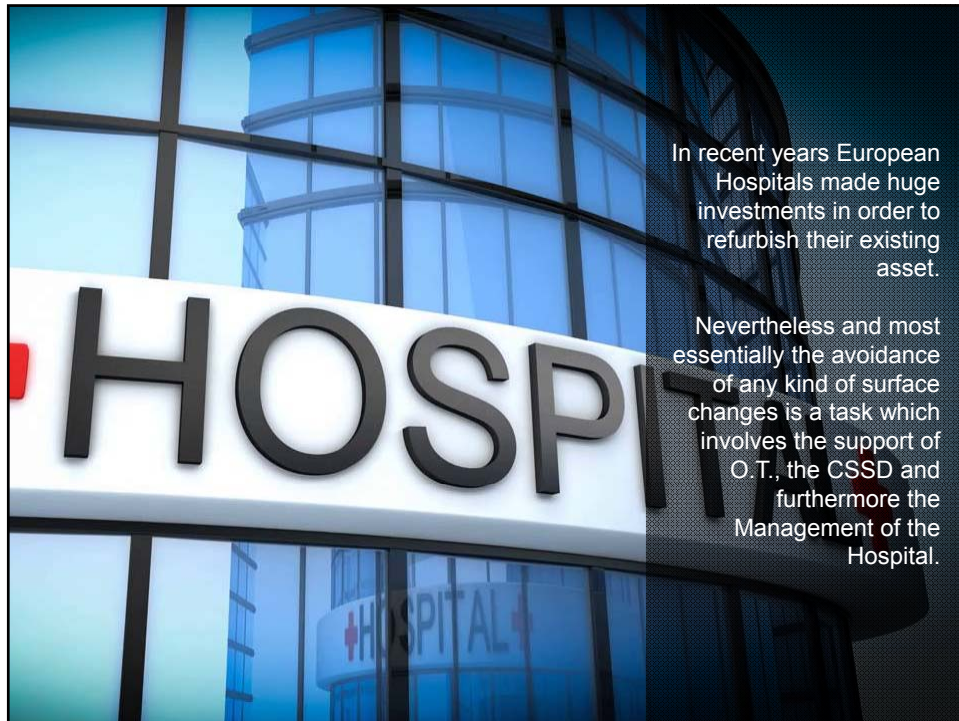
Frequently asked questions are...

"Is it only an optical appearance?!"

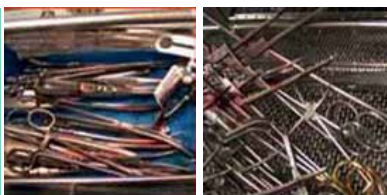
"Are the instruments still fully functioning?!"

"Are there any hygienic risks or even any toxic harms for the patient?!"





## Organic Residues



### Origin

Dry Residues due to long periods between usage and reprocessing  
 Protein Fixing e.g. aldehyde disinfectants  
 Cleaning shadows during washing  
 Time pressure for O.T. personal



### Consequences

Hygiene Risk  
 Infection for patients  
 Leads to corrosion



### Prevention

Intra Operative pre cleaning with sterile water  
 Reduce time between usage and reprocessing (under 6 hours)



### Recommendation

Repeated cleaning with ultrasound  
 Immersion in 3% H<sub>2</sub>O<sub>2</sub> Solution for approx. 5 Min.  
 Targeted manual cleaning

## Water Spots



### Origin

Stains of a milky white to gray colour. Mostly form of irregular spots.  
 Excessive time in the water used for cleaning.  
 Overloaded trays which leads to excessive condensate formation



### Consequences

No Corrosion – only cosmetic effect



### Prevention

Use fully demineralised water for the final rinse to prevent stain formation during automated reprocessing  
 Cleaning and as necessary intermediate rinses with demineralised water



### Recommendation

Wipe-off with a lint free cloth  
 Acid-based cleaning with special detergents as recommended by the instrument manufacturer



## Silicates



### Origin

Yellowish-brown to blue violet discolorations of various forms.

Passage of silicone dioxide in the production of fully demineralised water.

Silicates in the reprocessing water.



### Consequences

No corrosion – only a cosmetic effect



### Prevention

Use silicone dioxide-free, fully demineralised water for the final rinse during automated reprocessing

Usage of a steam quality which is in line with the EN285 or DIN 58946 Part 6



### Recommendation

Silicate deposits can be removed via acid-based cleaning using special detergents as recommended by the manufacturer.

Mechanical surface treatment by the manufacturer or a qualified repair service

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## Pitting Corrosion



### Origin

Pinprick-like corrosion holes in stainless steel, frequently microscopic small, surrounded by sparkling, reddish brown spots.

Exposure to halide ions (bromides, chlorides)

Dried on organic residues



### Consequences

Severely corroded instruments should be immediately withdrawn from service for reasons of patient and user safety

To retain the value of instruments, the causes of pitting must be eliminated

Holes can pose a hygienic hazard and leads to cracks



### Prevention

Use low-chloride water qualities for the reprocessing.

Minimise the exposure to organic residues and saline solutions

Keep the time between usage and reprocessing to a minimal





### Recommendation

Corrosion products can be dissolved with an acid-based detergent used in accordance with the manufacturer. The remaining corrosion holes may be treated mechanically



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## Friction Corrosion

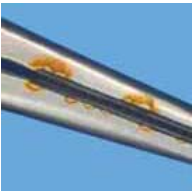

			
<b>? Origin</b>	<b>X Consequences</b>	<b>! Prevention</b>	<b>✓ Recommendation</b>
<p>Brown stains / discolorations or rust formation around the box locks</p> <p>Insufficient lubrication and / or foreign bodies lead to corrosion of the metallic friction surface. This micro abrasion makes the surface rough where deposits can easily accumulate to corrosion</p>	<p>Friction Corrosion impairs or completely destroys the instruments functionality.</p> <p>Friction corrosion may lead to pitting</p>	<p>Allow instruments to cool down to room temperature</p> <p>Apply manually care products (e.g. Oil) to the joints prior to the function check</p> <p>Distribute the care product uniformly in the joint by opening and closing the instrument</p>	<p>Discard defective instruments or have them repaired where possible</p> <p>Regrinding and/or polishing can usually repair corrosion damage</p>
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## Stress Corrosion

			
<b>? Origin</b>	<b>X Consequences</b>	<b>! Prevention</b>	<b>✓ Recommendation</b>
<p>Cracks / fractures in functional joints, tips</p> <p>Improper use (overstraining of clamps, needleholders)</p> <p>Strain on closure due to ratchet being completely closed during sterilisation</p> <p>Pitting corrosion</p>	<p>Destroyed instrument</p> <p>Corroded instrument should be immediately withdrawn from service for reasons of patient and user safety.</p> <p>To maintain the value of your asset an elimination of the root cause is recommended</p>	<p>Clean jointed instruments in an open position, sterilise them in the first ratchet</p> <p>Reduce contact to chlorides to a minimum</p> <p>Avoid improper handling that could lead to overstraining</p>	<p>None (cannot be corrected)</p>
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## Surface Corrosion

? Origin	X Consequences	! Prevention	✓ Recommendation
<p>Disinfection, poor steam and water quality</p> <p>Rusty surfaces (instruments &amp; machinery) in reprocessing cycle</p> <p>Biological material residue</p>	<p>Risk of cross contamination to other Instruments</p> <p>Deteriorate to pitting corrosion</p> <p>Corrosion of machinery</p>	<p>Remove and discard disposable products made of steel</p> <p>Avoid long term exposure time to chlorides</p>	<p>Rust removal through acid-based cleaning in the case of stainless steel</p> <p>Mechanical surface treatment – via polishing / grinding</p>


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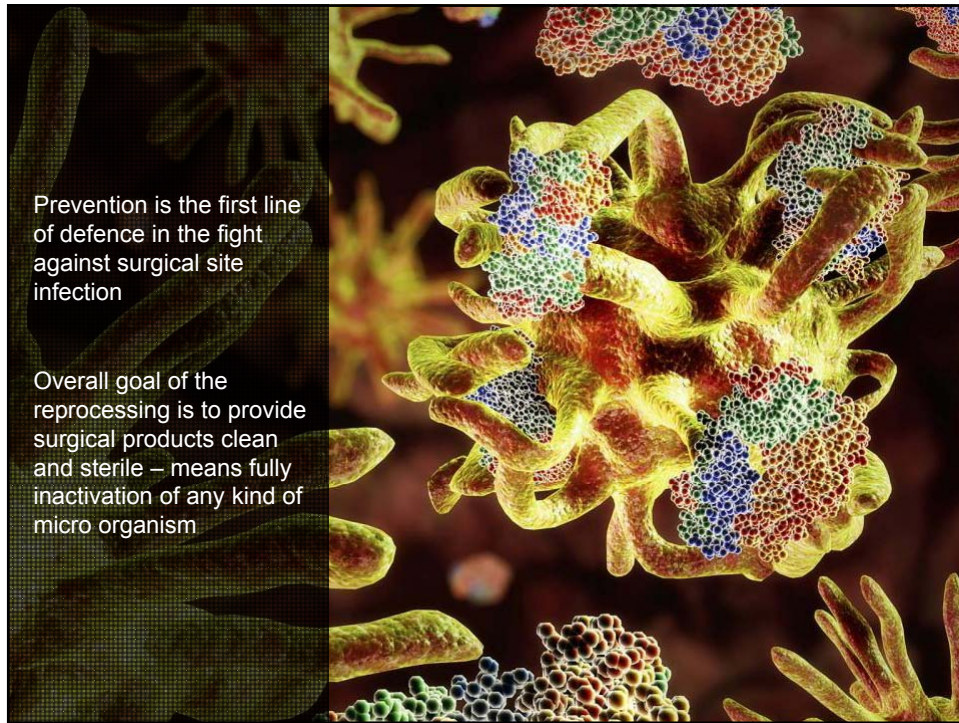


## OBJECTIVES OF REPROCESSING

WHY ARE WE DOING IT

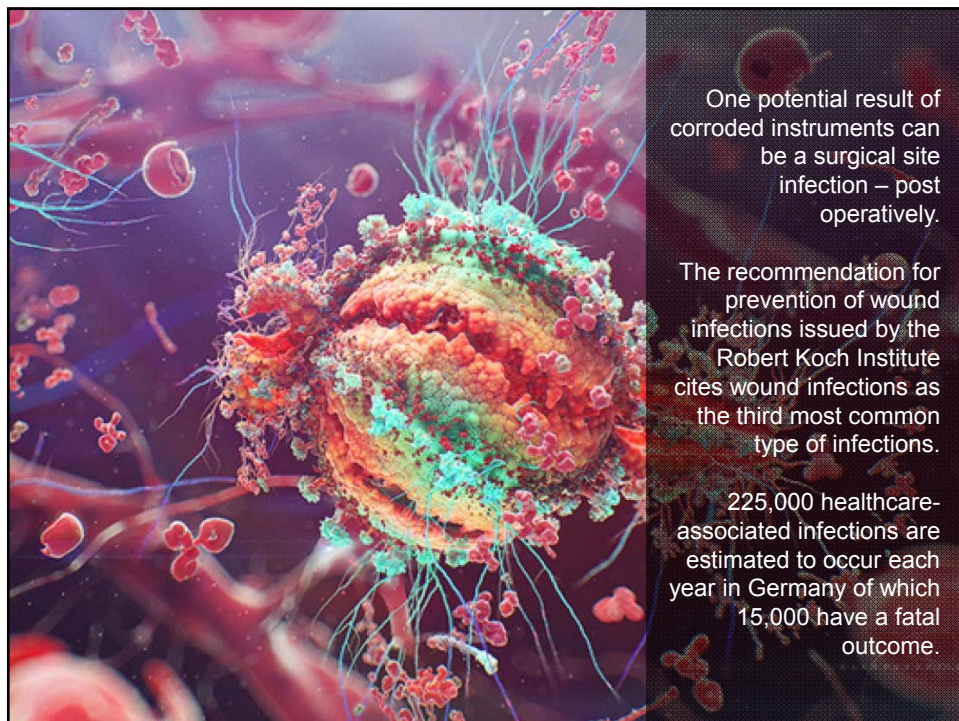






Prevention is the first line of defence in the fight against surgical site infection

Overall goal of the reprocessing is to provide surgical products clean and sterile – means fully inactivation of any kind of micro organism



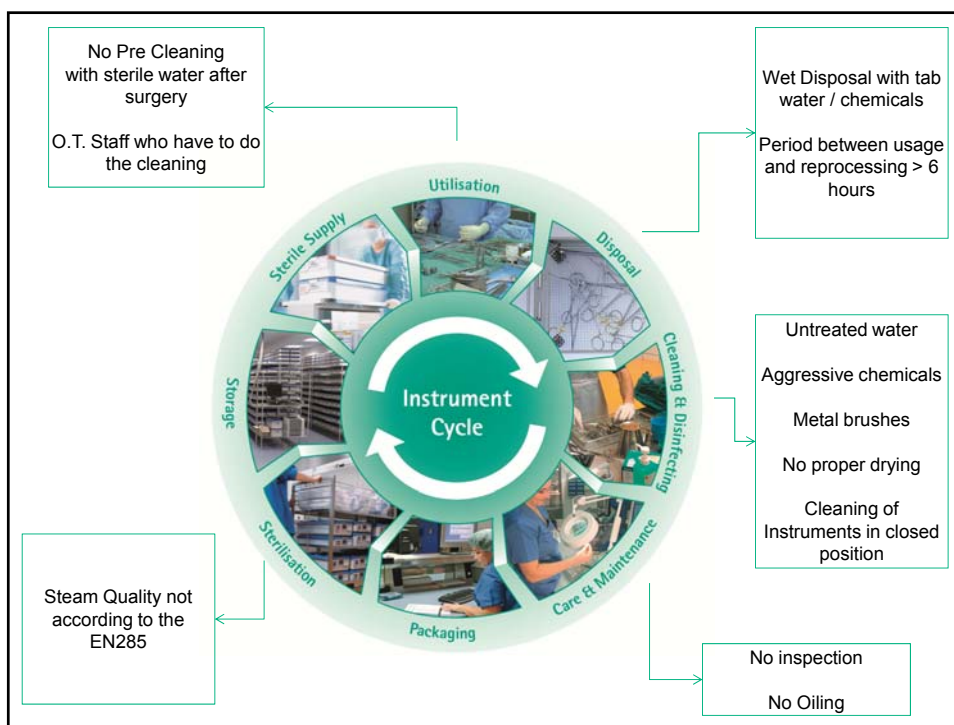
One potential result of corroded instruments can be a surgical site infection – post operatively.

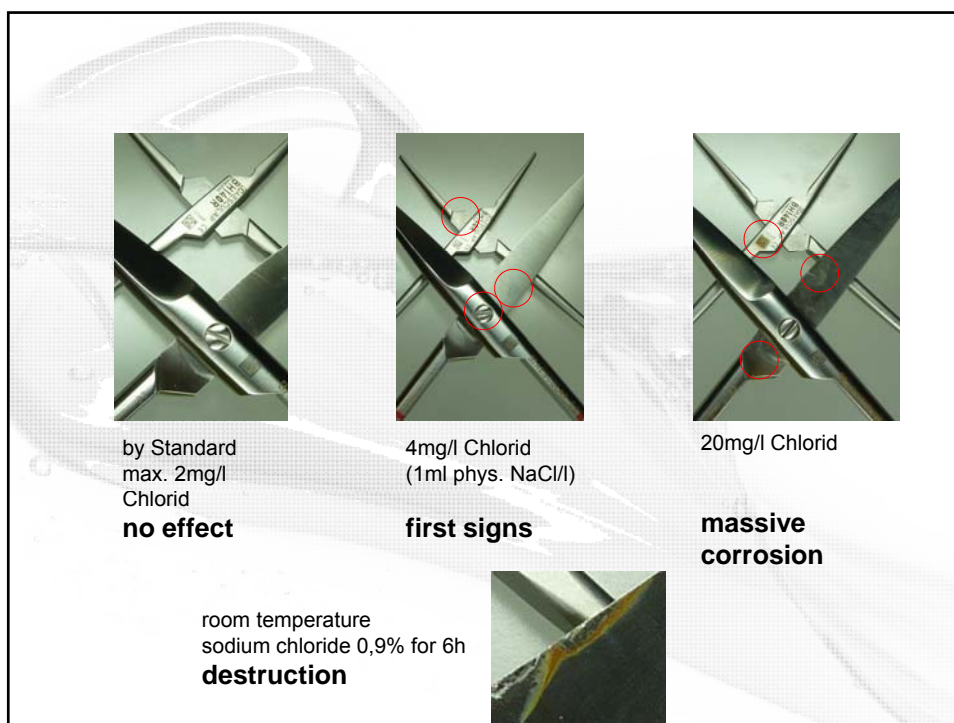
The recommendation for prevention of wound infections issued by the Robert Koch Institute cites wound infections as the third most common type of infections.



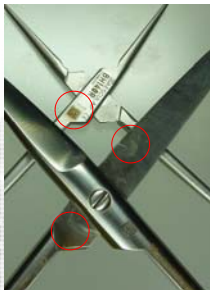
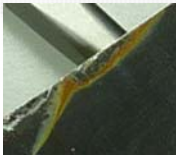
225,000 healthcare-associated infections are estimated to occur each year in Germany of which 15,000 have a fatal outcome.



## MOST COMMON ROOT CAUSES RISKS WITHIN THE INSTRUMENT CYCLE






		
<p>by Standard max. 2mg/l Chlorid <b>no effect</b></p>	<p>4mg/l Chlorid (1ml phys. NaCl/l) <b>first signs</b></p>	<p>20mg/l Chlorid <b>massive corrosion</b></p>
<p>room temperature sodium chloride 0,9% for 6h <b>destruction</b></p>		
		

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**EVIDENCE**  
REPORTED HARD FACTS



Reported cases where contaminated medical equipment caused infections:

2012 – USA  
Pseudomonas aeruginosa infection from inadequately cleaned shaver hand pieces

2012 – Men's Health  
Infections secondary to reconstruction of the cruciate ligament imputed to residues in cannulated instruments

2006 - N. Mamalis  
Toxic-Anterior-Segment-Syndrom (TASS) - non bacterial, inflammatory reaction of the eyes after surgery



With the help of an EDX – Analysis several Instruments were part of a research study of Aesculap.

Most of the instruments effected with pitting corrosion were tested inside the pitting hole as well as on an intact reference point.

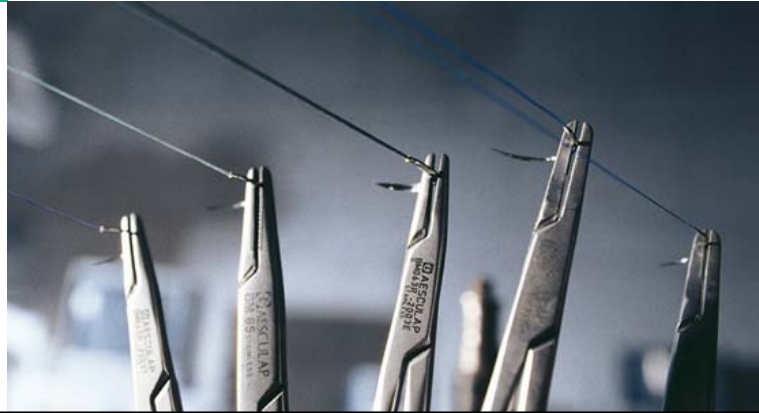
Inside the pitting holes an elevated amount of carbon as well as an oxygen concentration partially combined with Calcium, Silicon, Phosphor and sulfur was found.

This equals from a volume perspective in the measurement field 100µg of protein.



## CONCLUSION

### WHAT'S NEXT




There are clear signs of risks caused by surface changes – especially since a differentiation between corrosion and organic residues can be challenging in practical terms.

A clear recommendation can be to remove any effected instruments and send them for a refurbishment.

In any case appearances like this have to be observed in a tight manner in order to react upon – the earlier the better.



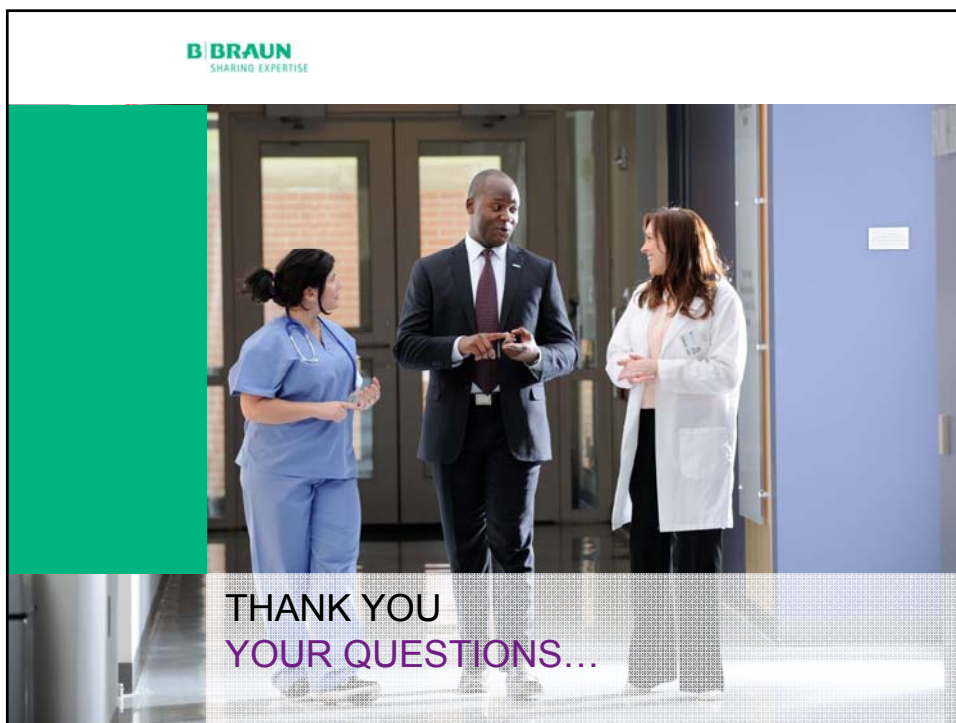




What can be done to minimize the risks...

- Minimize the contact between surgical instruments and chlorides to a minimum
- Intra operative pre cleaning with sterile water
- No Disinfection solution for disposal
- Minimize time between usage and reprocessing to a minimum
- Usage of demineralised water (EN285) in the reprocessing cycle

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THANK YOU  
YOUR QUESTIONS...