Manual reprocessing of flexible endoscopes

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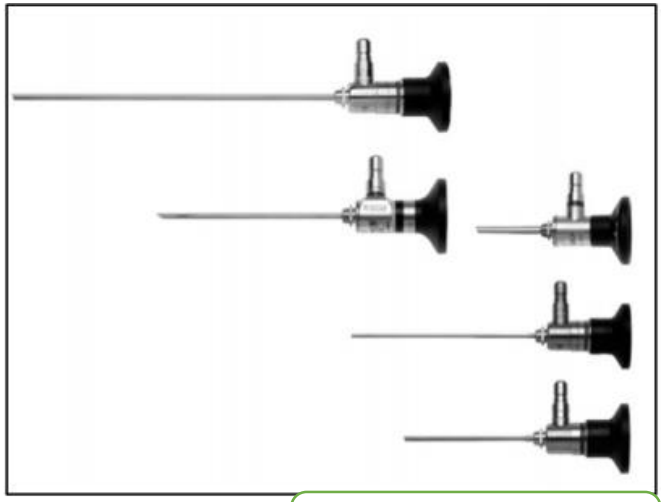
Overview of endoscope reprocessing

- **Manual reprocessing**
  - Carried out by an **certified / qualified person.**
  - Widely used in most parts of the world.
  - **Nurses and endoscope technicians** in hospitals are responsible to carry out this procedure.
  - Advantage: More effective for delicate and intricate equipments[1].
  - Disadvantage: Failure to comply with the guidelines can lead to compromise in the safety of the procedure[2], as also be harmful to the personnel involved.

- **Automatic reprocessing**
  - Carried out by an **automated endoscope reprocessor** (AER).
  - Advantage: The potential compromise to the safety of the procedure is minimized due to elimination of the human factor.
  - Disadvantages:
    - AERs are expensive and cannot be used for intricate instruments.
    - There remains an overhead in terms of the post diagnostic manual cleaning (which means a double resource requirement; only in diagnostic centers where a large number of reprocessing cycles are carried out per day, would the investment pay off).

Endoscope types

Flexible endoscope



Rigid endoscope

Directives and best practices

- Guidelines procedure steps and list of recommendations are provided by:
  - **WEO (**World Endoscopy Organisation)
  - **WGO (**World Gastroenterology Organisation).[1]

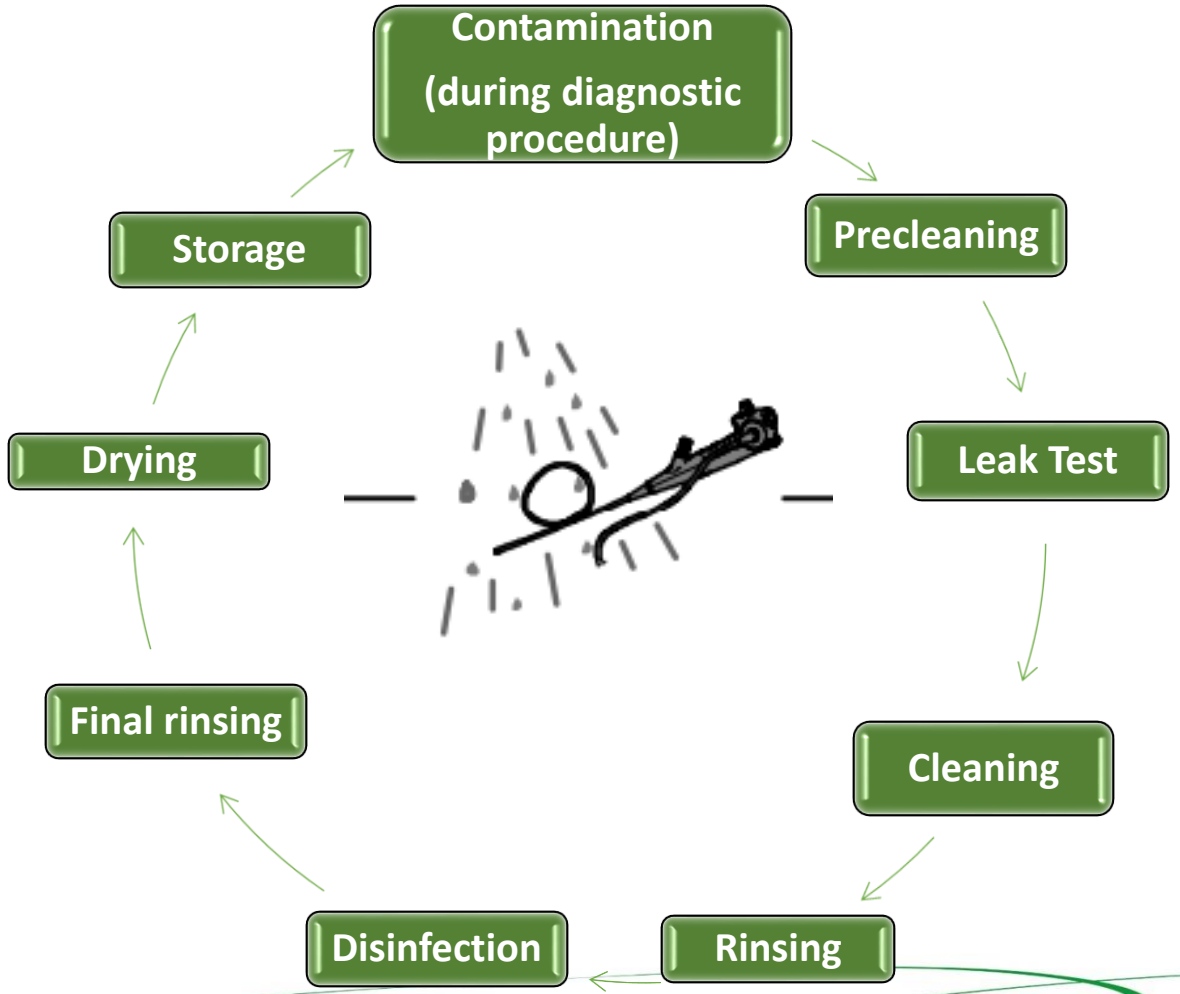
Step	General recommendations
Precleaning	• Preclean immediately
Cleaning	• Always perform leak testing and block testing before immersing the endoscope in a detergent or soap solution, as this may help prevent expensive repairs later
Rinsing	• Always rinse between cleaning and disinfection
Disinfection	• Always immerse the endoscope and valves in a disinfectant solution of proven efficacy (see below) • Always irrigate all channels with a syringe until air is eliminated, to avoid dead spaces • Always observe the manufacturer's recommendations regarding the minimum contact times and correct temperature for the disinfection solution • Always observe the manufacturer's recommendations regarding compressed air values • Always remove the disinfection solution by flushing air before rinsing • Always determine whether the disinfectant solution is still effective by testing it with the test strip provided by the manufacturer
Final rinsing	• Always discard the rinse water after each use to avoid concentration of the disinfectant and thus damage to mucosa • Never use the same container for the first and final rinsing
Drying	• Always dry the endoscope properly before storage to prevent microorganism growth in the endoscope channels
Storage	• Never store in a transport container

http://www.worldgastroenterology.org/guidelines/global-guidelines/endoscope-disinfection/endoscope-disinfection-english

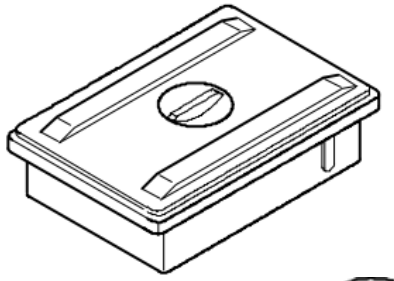
Country specific directives

Germany	France	Spain	USA	China	Malaysia	Poland	Scandinavia	Latin America
• RKI (Robert Koch Institut)	• SFED (Société Française d'Endoscopie Digestive)	• ?	• SGNA (Society of Gastroenterology Nurses and Associates)	• ASPIC (Asia Pacific Society of Infection Control)	• ASPIC (Asia Pacific Society of Infection Control)	• ?	• ?	• ?

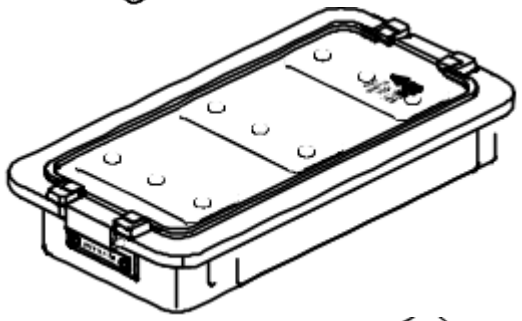
Reprocessing Cycle



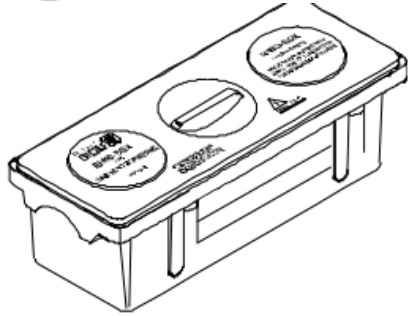
Equipment



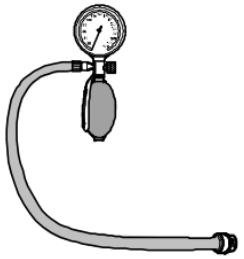
Container with detergent solution



Container with disinfection solution

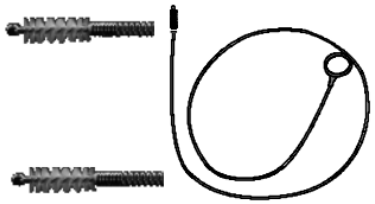


Container with distilled water



Leakage tester

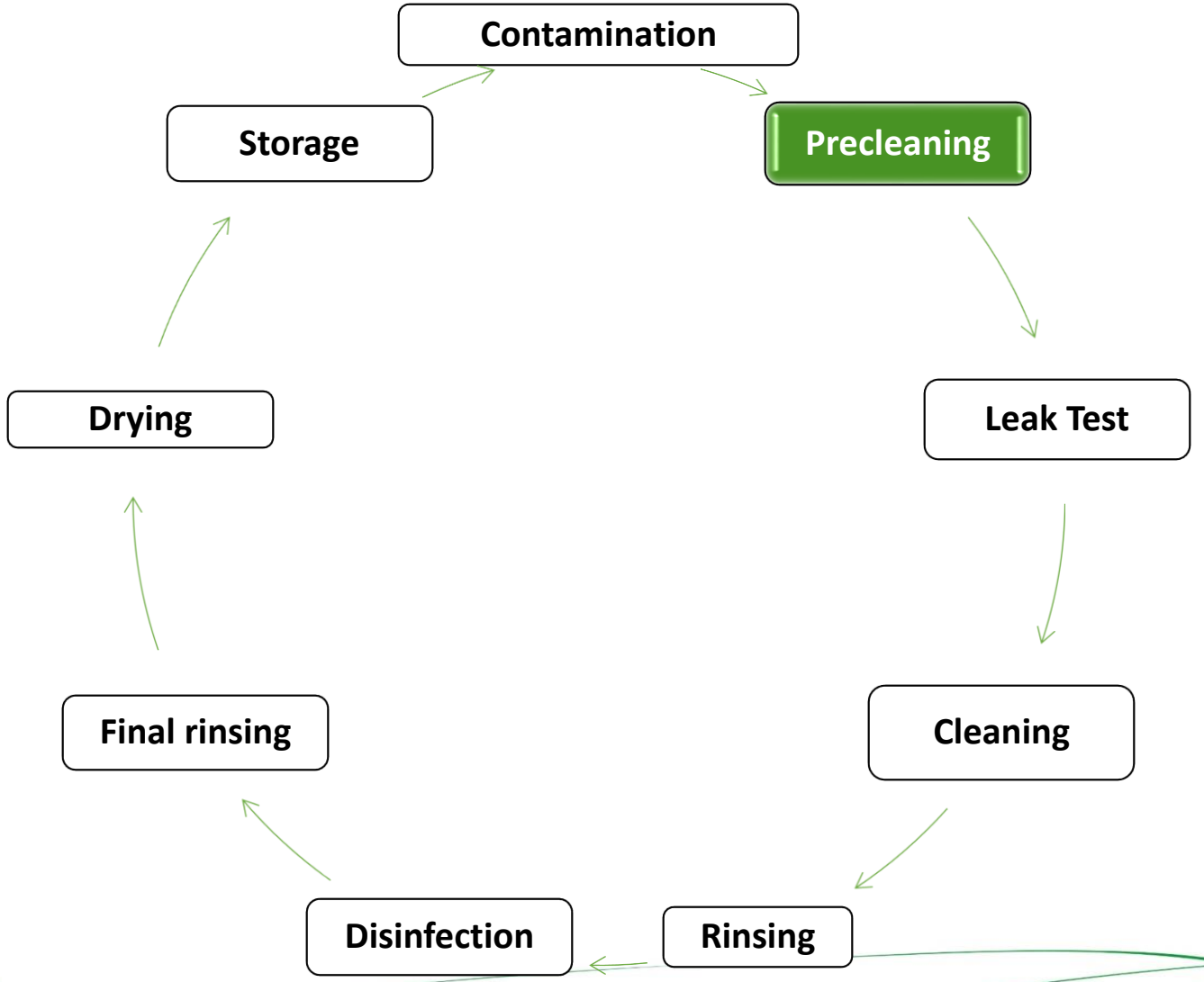
Syringe



Cleaning Brush

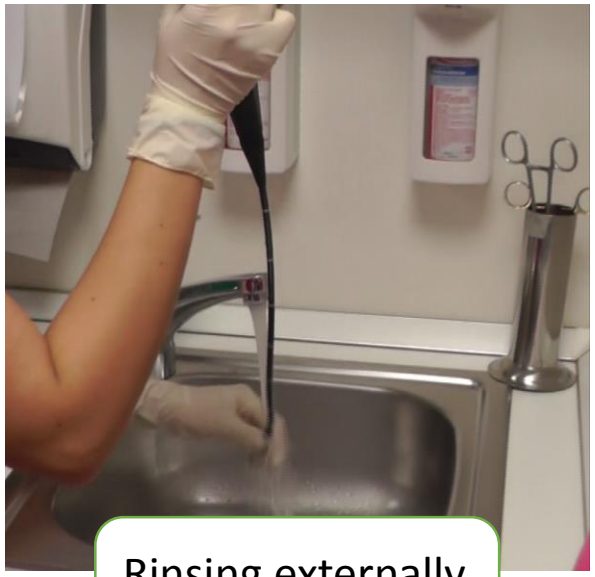
Lint-free cloth

SICOLAB mini Endo


Contamination
Precleaning
Leak Test
Cleaning
Rinsing
Disinfection
Final rinsing
Drying
Storage

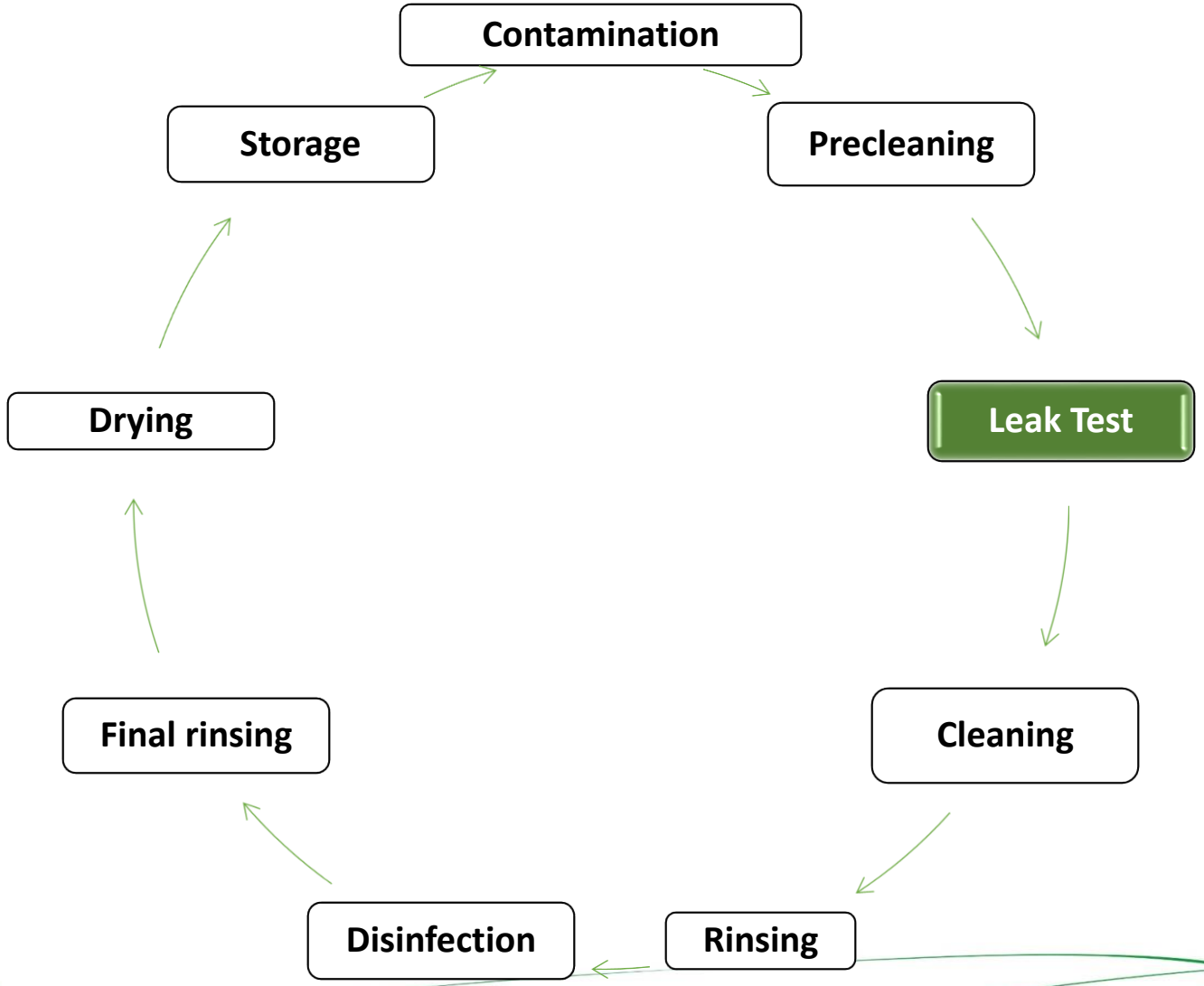
1. Precleaning

Wiping with a lint-free cloth or sponge - immediately after contamination to remove bioburden



Rinsing externally with clean water

Flushing of channels with clean water– up to 3 times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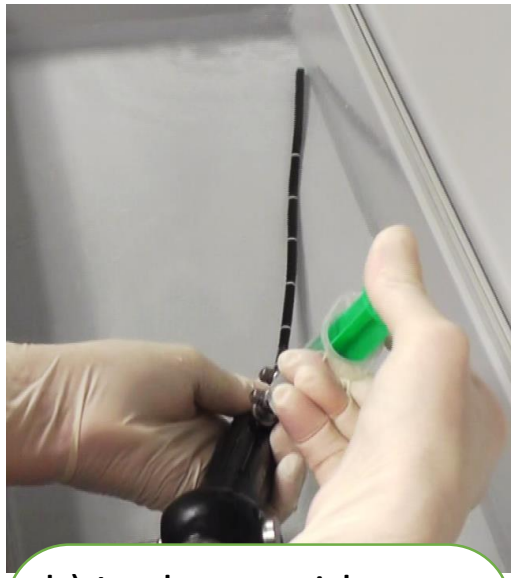
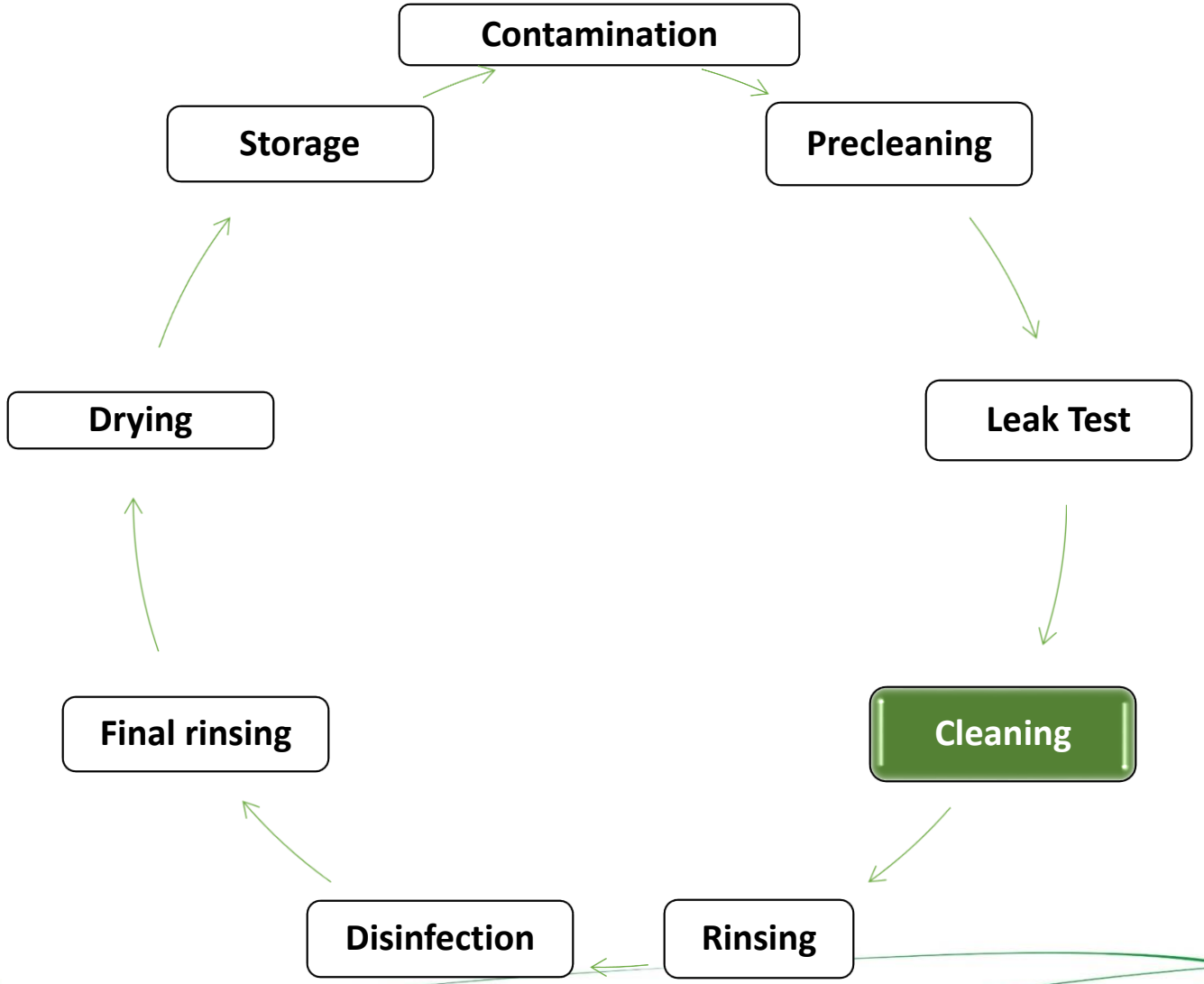
2. Leak Test

a) Leak test with leakage tester – recommended method



b) Leak test with a pistol or syringe, plugging channel openings during leak testing – often used in practice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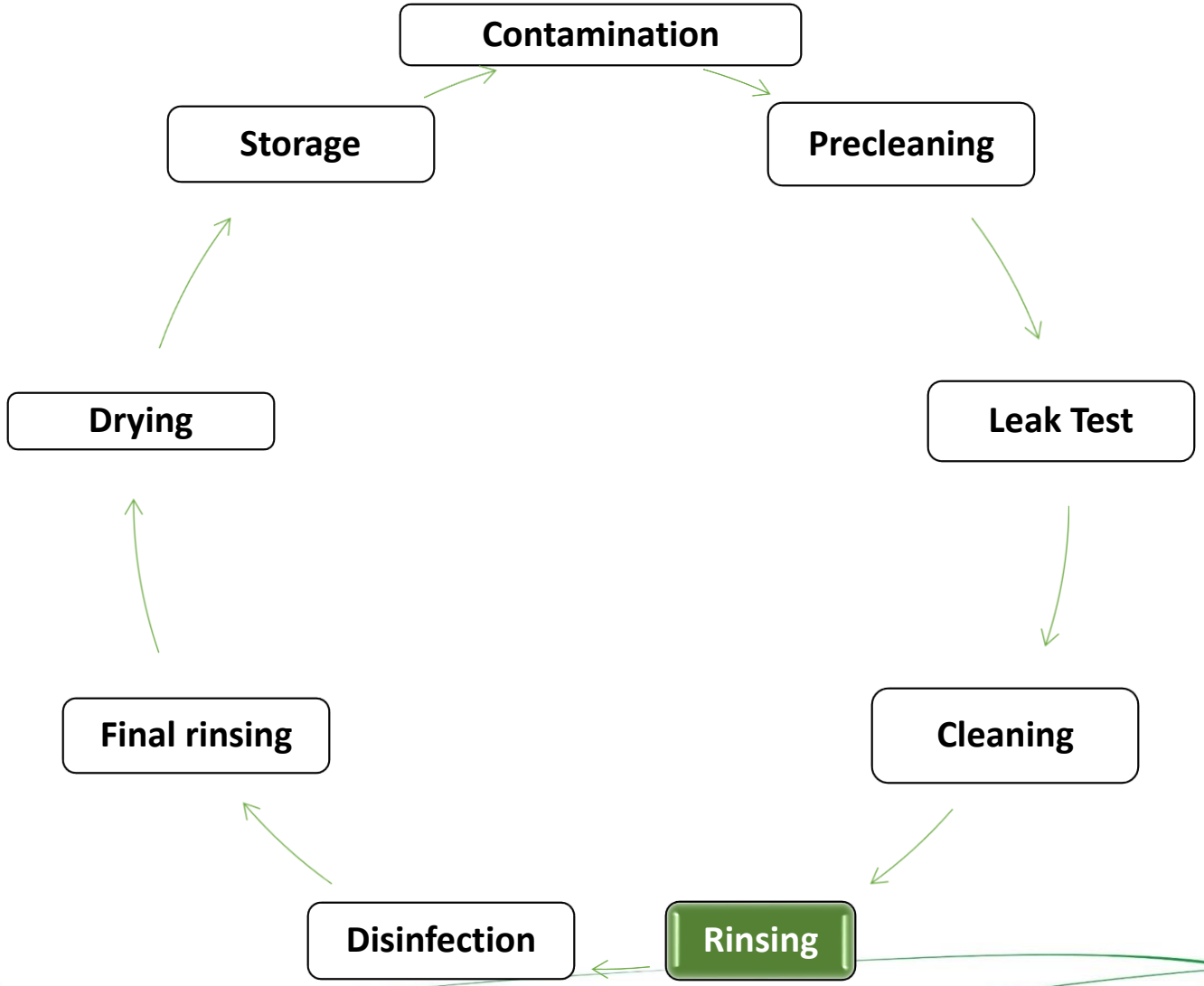
3. Cleaning

Immersing the endoscope in a detergent/soap solution and cleaning surfaces with a lint-free cloth

Brushing instrument channel and channel port – types of cleaning brush are listed in manufacturer's instruction

Flushing with detergent solution– up to 3 times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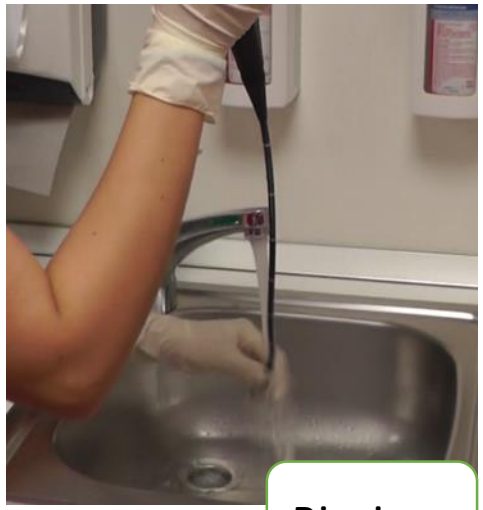
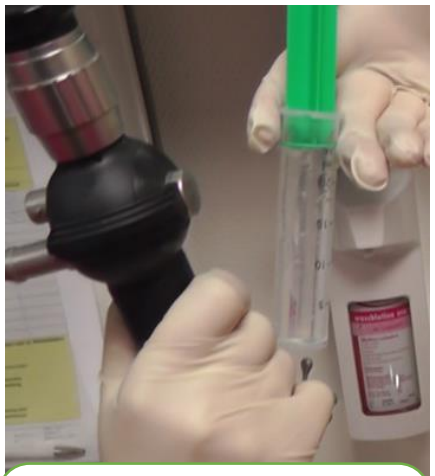
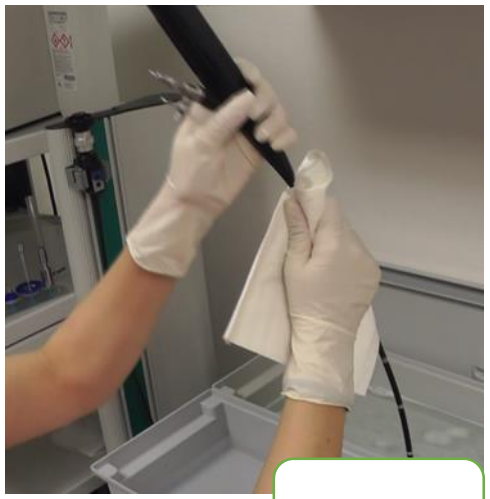
4. Rinsing



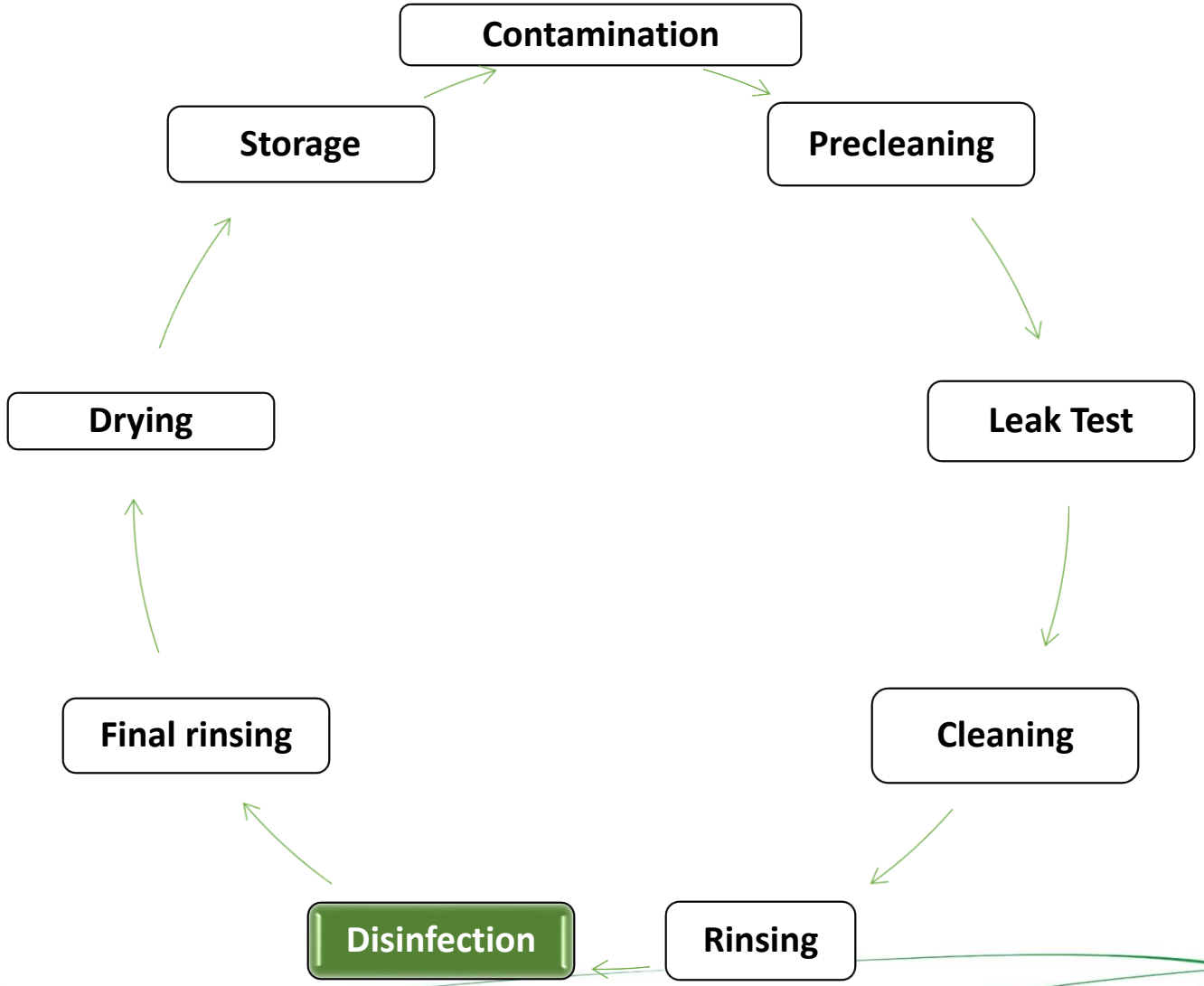
Rinsing



Flushing with clean water– up to 3 times



Wiping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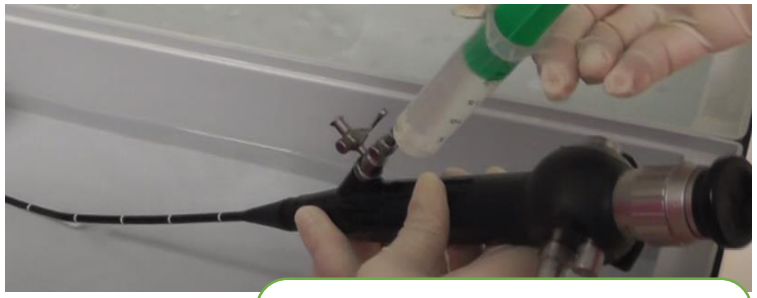
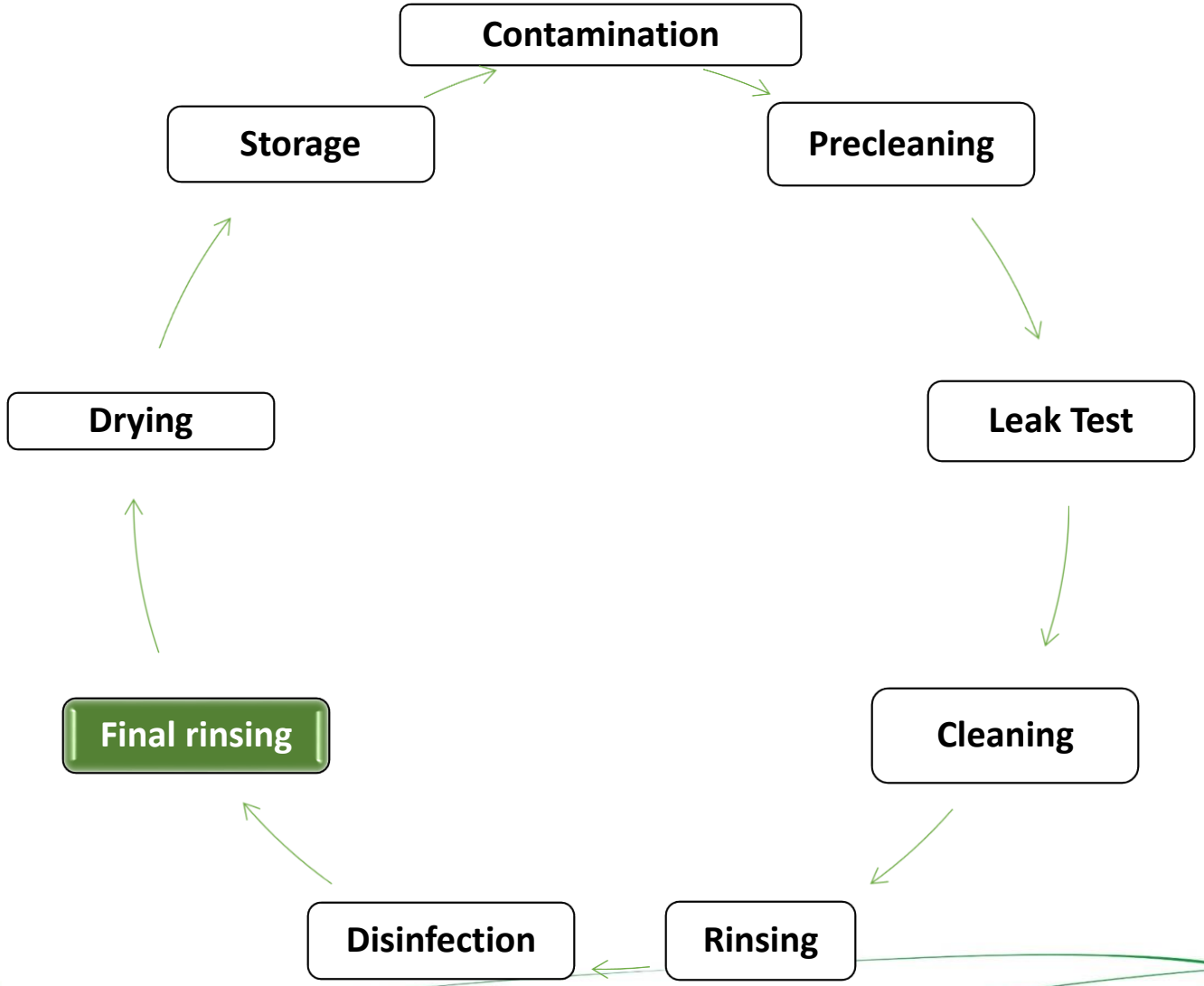
5. Disinfection

Immersing the endoscope in a disinfection solution



Flushing with disinfection solution– up to 3 times

Submerge, soak and rest the endoscope in the disinfectant according to the manufacturer's instructions and chemical specifications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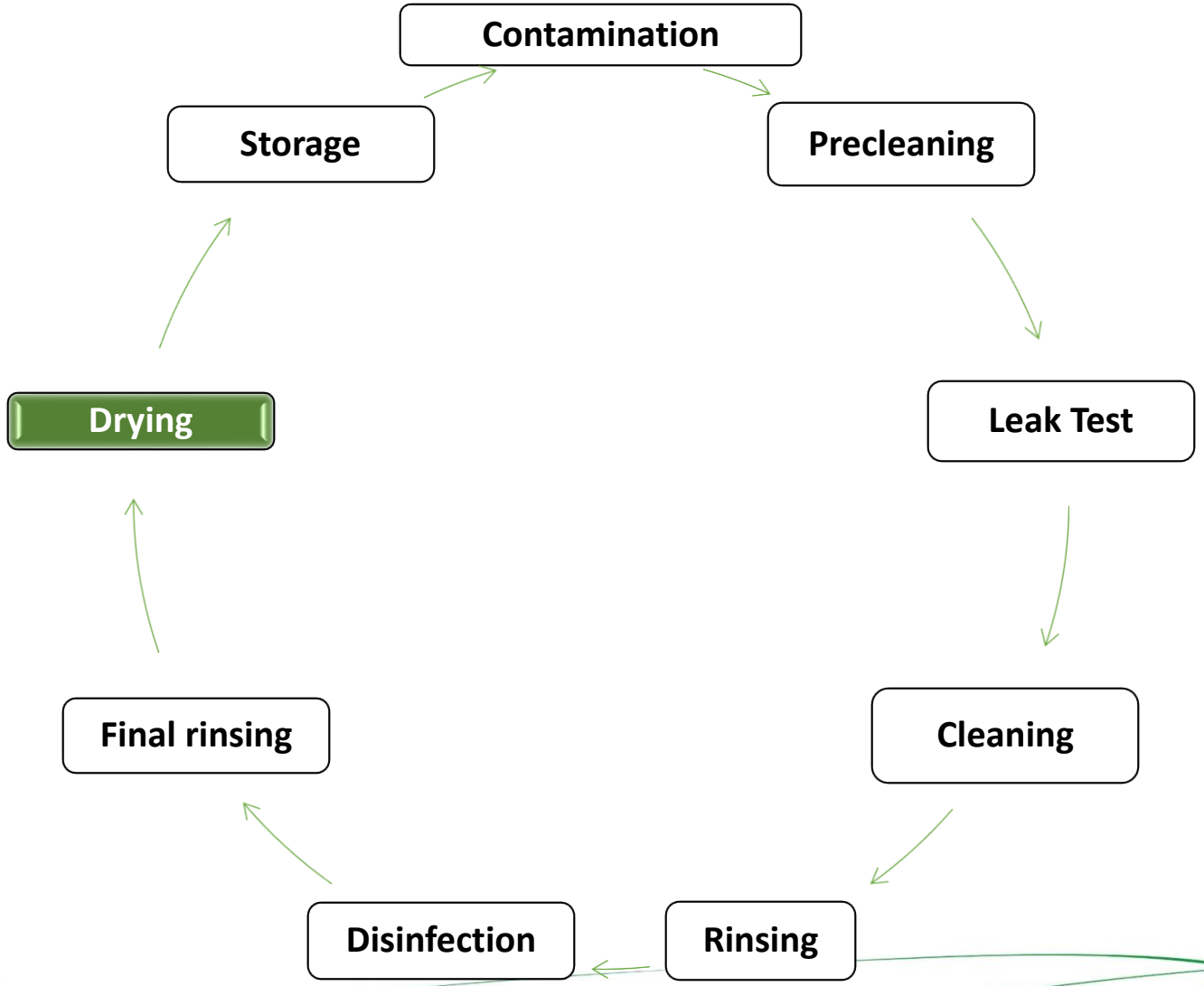
6. Final Rinsing

Immersing the endoscope in distilled water

Flushing with destilled water– up to 3 times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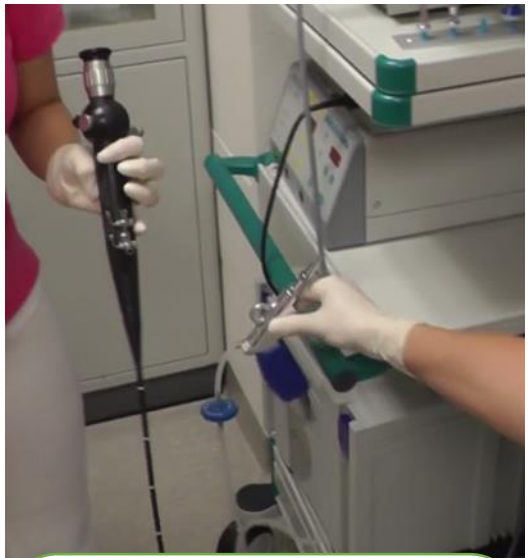
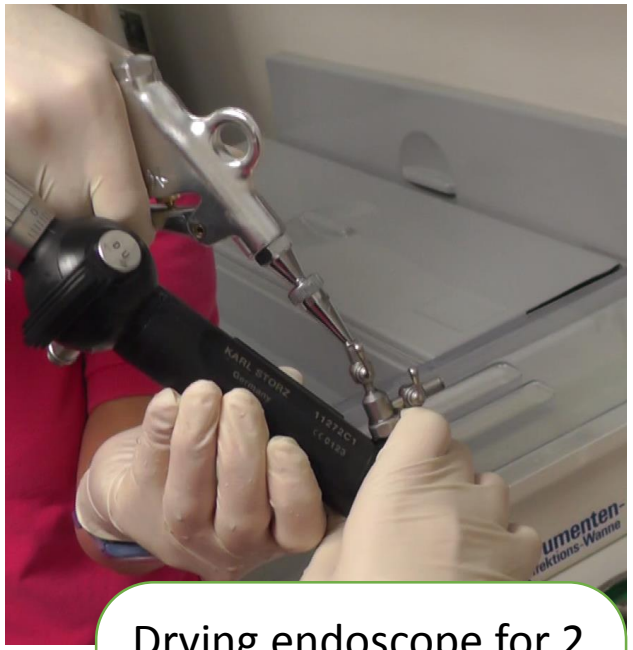
7. Drying

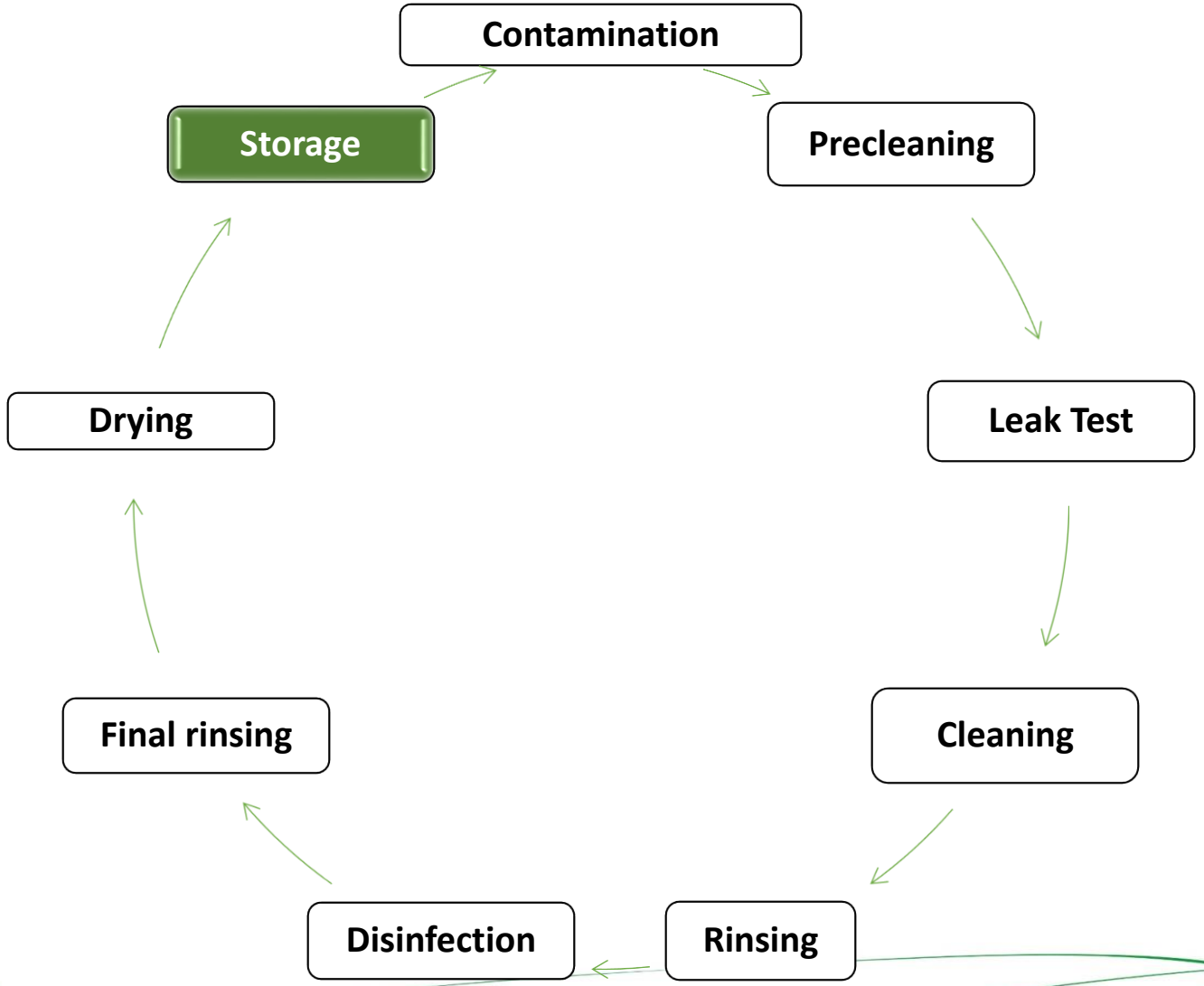


Drying process is intended to prevent the growth of microorganisms during storage



Drying endoscope for 2 – 3 minutes or until no water drops out anymore, depending on endoscope type

SICOLAB mini Endo is preset between 1 and 1,5 bar for optimal drying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8. Storage

- Ensure proper drying prior to storage
- Hang preferably in a vertical position to facilitate drying.
- Remove caps, valves, and other detachable components in accordance with the manufacturer’s instructions
- Uncoil insertion tubes
- Protect endoscopes from contamination by placing a disposable cover over them
- Only use a well-ventilated room or cabinet for reprocessed endoscopes
- Clearly mark which endoscopes have been reprocessed

Video endoscopes and areas of use

Flexible video endoscopes, used for a number of diagnostic and therapeutic procedures involving the lungs, esophagus, stomach, small intestine, bilary tract, pancreas and the large bowel, are equipped with „channels“ (internal hollow tubes), which are used for irrigation (air, water flushing) or for biopsy (removal of cells/ tissues for examination). [1]

Image Source 1

Each procedure involves contact by a medical device or surgical instrument with a patient‘s sterile tissue or mucous membrane. In such procedures, a major risk is the exchange of pathogens, which can lead to infections.[2] Endoscopes are classified as medium risk (semi-critical) instruments[3] and are required to be reprocessed (disinfected) after each patient procedure[2], as also before use in case the endoscope has been stored for more than 24-72 hours[2]. Due to the temperature sensitivity of fiberoptic video endoscopes, they cannot be sterilized, and need to be disinfected (high level disinfection).

Image Source 2

A number of organizations provide directives for the „high level disinfection“ of endoscopes. The World Endoscopy Organization, the World Gastroenterology Organization, Asia Pacific Society of Infection Control, American Society for Gastrointestinal Endoscopy (ASGE) etc are organizations which provide such directives and best practices.

This document aims to provide a brief overview of the reprocessing of flexible endoscopes with a focus on air-drying as a part of the reprocessing process.

Source 1: http://www.endoscopy-colon-explorer.com/wp-content/uploads/2014/04/Fig.2C.jpg
Source 2: https://sc01.alicdn.com/kf/HTB1f_9KGVXXXagXFXXq6xXFXXX6/220848866/HTB1f_9KGVXXXagXFXXq6xXFXXX6.jpg

Importance of drying and the risks related to moisture in endoscope channels

Why use compressed air?

The final drying steps greatly **reduce the possibility of recontamination** of the endoscope with waterborne microorganisms. Accurate drying and storage are important factors in the **maintenance of bacteria-free endoscopes**. The potential for microbial growth inside endoscope channels after disinfection mainly depends on the conditions within the endoscope channels during storage.[1]

Studies show that outbreaks of Pseudomonas aeruginosa, Acinetobacter spp., Carbapenemase producing K pneumoniae, and other pathogens have been traced to inadequately dried endoscopes. (Alfa, 2013; Carbonne et al.,2010; Kovaleva et al., 2013) Even when reprocessing steps are performed meticulously, a few microorganisms may survive high level disinfection. Those few microorganisms can multiply to over a million colony-forming units in just a few hours if any moisture remains in the endoscope channels or on its surface (Miner, 2013).

Moisture also promotes biofilm development (Alfa, 2013; Kovaleva et al., 2013). Drying the endoscope after every reprocessing cycle, both between patient procedures and before storage, is a requisite practice crucial to the prevention of bacterial transmission and nosocomial infection. Drying is as important to the prevention of disease transmission and nosocomial infection as cleaning and HLD (Kovaleva et al., 2013; Muscarella, 2006). [2]