

May 2005

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Learning objectives

1. Learn how to transport rigid laryngoscopes.
2. Learn how to disassemble rigid laryngoscopes.
3. Learn how to clean rigid laryngoscopes.
4. Learn how to sterilize/high-level disinfect laryngoscopes.
5. Learn how to store, handle and care for laryngoscopes.

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Guidelines for reprocessing rigid laryngoscopes

by Lawrence F. Muscarella, PhD

Background: A review of the medical literature and published guidelines that discuss the use, care, handling, and reprocessing of flexible and rigid laryngoscopes was performed. This review revealed several important conclusions, including the following:

- A formal set of standardized and universally-accepted instructions for reprocessing flexible laryngoscopes has not been published (but is in press).
- Flexible and rigid laryngoscopes—both their blades and handles—are classified as *semicritical* devices and, therefore, require cleaning and high-level disinfection (“HLD”) or sterilization.^{1-6,9,25}
- Quaternary ammonium products and other cleaner/disinfectants labeled to achieve intermediate-level (or low-level) disinfection are contraindicated for reprocessing flexible and rigid laryngoscopes (and other *semicritical* devices).
- HLD destroys all types of pathogenic microorganisms identified in the endoscopic setting, including *Clostridium difficile*, a spore-forming bacterium. Very few spore-forming bacteria are pathogenic. Those that do produce disease—such as *Bacillus anthracis* and some *Clostridium* species—either are destroyed by HLD or have not been associated with infection following endoscopy.²⁸

Step-by-step reprocessing guidelines:

A formal set of standardized and universally-accepted instructions for reprocessing rigid laryngoscopes has not been published. It is not surprising, therefore, that surveys report that the majority of responding medical facilities do not have on file a written policy or procedure for reprocessing rigid laryngoscopes.^{12,20,23} Moreover, reports indicate that reprocessing practices for the laryngoscope's blade and handle are often inadequate and vary from one medical facility to another.^{7,9,12,13,17,20,22,23} Variations in reprocessing practices (and guidelines; refer to the article, below) can result in inconsistencies in the standard of care, ineffective reprocessing, and an increase in the risk of nosocomial infection.^{5,7,11-13,20,23,24}

Both the laryngoscope's blade and handle can become contaminated during use and transmit disease from one patient to another.^{3,5,8-12,20,23} The following set of step-by-step instructions for

reprocessing rigid laryngoscopes is provided, therefore, to minimize the risk of nosocomial infection. These instructions, which may be used by medical facilities to develop policies and procedures for reprocessing rigid laryngoscopes, may lack some details and are to be used in conjunction with—not as a replacement for—the reprocessing instructions provided by the rigid laryngoscope's manufacturer. Some additional reprocessing steps may be required. Failure to adhere to these (or comparable) guidelines may result in not only nosocomial infection but also instrument damage.

STEP 1. Transportation (from the procedure room):

Purpose: To transfer the laryngoscope from the procedure room to the decontamination area for prompt reprocessing.

1. After use, promptly transport the blade and handle in an enclosed bag, package, or container to a dedicated decontamination area for reprocessing.

Note: Prolonged delay between use of the laryngoscope and reprocessing can result in the drying and hardening of patient debris on the laryngoscope's surfaces. Dried patient debris can pose a formidable challenge to cleaning, can interfere with the effectiveness of the high-level disinfection or sterilization process, and can damage the laryngoscope.

STEP 2. Disassembly (in the decontamination area):

Purpose: To expose all of the surfaces of the laryngoscope's blade and handle to both the cleaning and high-level disinfection (or sterilization) processes.

2a. Disconnect the blade from the handle. Disassemble the blade and handle as described in the laryngoscope's reprocessing instructions. Depending on the laryngoscope's design (i.e., conventional, fiber optic), removal of the light bulb or fiber optic light pipe (or light bundle) from the blade, and/or the lamp cartridge assembly from the handle, may be required prior to reprocessing. In some models, this light pipe (or light bundle) is encased in the blade and cannot be removed.

2b. Remove the batteries from the handle (unless otherwise instructed). Some models of

handles may only require removal of the batteries prior to steam sterilization. Refer to the laryngoscope's reprocessing instructions.

STEP 3. Cleaning:

Purpose: *To remove patient debris and reduce the number of microorganisms on the laryngoscope's blade and handle.*

3.(A) Clean the blade and handle (and, if necessary, the fiber optic light pipe) using fresh, clean warm potable water, a mild (e.g., enzymatic) detergent, a soft brush, and a wipe or cloth. Mix the detergent ensuring its dilution and temperature are in accordance with its labeling. (B) Soak the entire blade and handle in the detergent solution (unless complete immersion of either is contraindicated) for the recommended time. Do not immerse a hot light pipe into cold water or a cold detergent solution. (C) Rinse the blade and handle with a large volume of fresh, clean warm potable water (or, clean, demineralized water). (D) Dry the blade and handle with a clean, dry, soft lint-free cloth or towel. (E) Examine the blade and the handle for cleanliness and for damage.

Note: Do not ultrasonically clean the blade and/or handle unless it is recommended in the laryngoscope's reprocessing instructions. *Ultrasonic cleaning of the laryngoscope's blade and handle may be contraindicated.*

STEP 4. Sterilization, high-level disinfection:

Purpose: *To prevent disease transmission during laryngoscopy by destroying all of the microorganisms remaining on the laryngoscope's blade and handle after cleaning.*

4a. Wrap and steam sterilize the blade and/or handle.

Note 1: Steam sterilize the blade and handle unless it is contraindicated for either in the laryngoscope's reprocessing instructions. Also, although some models may be labeled as "steam-autoclavable," repeated exposure to steam sterilization may result in decreased performance and instrument damage.^{16,22} Contact the manufacturer to ensure steam sterilization does not void the laryngoscope's warranty.

Note 2: The recommended sterilization method for the blade may not be the same as for the handle. For instance, whereas steam sterilization may be recommended for the laryngoscope's blade, it may be contraindicated for the handle.

Note 3: Flash sterilization of a rigid laryngoscope is generally contraindicated and may void its warranty, due to damage that may result from rapid cooling.

4b. If steam sterilization of the blade and/or handle is contraindicated, consider using a low-temperature sterilization process (eg, ethylene oxide gas).²⁹ Refer to the laryngoscope's re-

cessing instructions for a list of recommended low-temperature sterilization processes.

4c. If sterilization of the blade and/or handle is not feasible, high-level disinfection is recommended.^{1,28,29} (A) Immerse the blade and/or handle in a liquid chemical sterilant (LCS) listed in the laryngoscope's reprocessing instructions as compatible. (B) Soak the blade and/or handle in the LCS for the recommended time and temperature to achieve high-level disinfection. Completely immerse the blade and/or handle, unless otherwise indicated in the reprocessing instructions. (C) Rinse the blade and/or handle with a large volume of sterile, demineralized water (or, fresh, clean warm potable water). Do not reuse the rinse water. Three or more separate water rinses may be necessary; refer to the LCS's label. (D) Dry the blade and/or handle with a clean, dry, soft lint-free cloth or towel. A wipe lightly dampened with 70% alcohol may be used to facilitate drying.

Note 1: Prolonged immersion in a LCS may result in instrument damage and/or patient injury.

Note 2: Monitor the concentration of the LCS to ensure it is equal to or above its *minimum effective concentration*, or "MEC."

Note 3: Pasteurization may also be a recommended method for reprocessing the laryngoscope's blade and/or handle. Refer to the laryngoscope's reprocessing instructions.

Note 4: Although steam sterilization is always preferred due to its wider margin of safety, high-level disinfection of the laryngoscope's blade and handle has not been reported to pose an infection risk. *Clinical differences in the infection rate between sterilized and high-level disinfected, or pasteurized, laryngoscopes, as well as other rigid and flexible endoscopes, have not been reported.*^{28,29} Several factors such as cost, turn-around time, available space, label claims, and convenience contribute to a medical facility's selection of a specific sterilization or high-level disinfection process.

4d. Transport the blade and handle from the decontamination area to the procedure room, using care to prevent re-contamination and damage prior to reuse. Reassemble the blade and handle if required and as described in the laryngoscope's reprocessing instructions. Some laryngoscope manufacturers may recommend reassembly prior to, instead of after, sterilization or high-level disinfection.

STEP 5. Storage, handling, and care:

Purpose: *To prevent re-contamination and damage of the blade and handle during storage, handling, and care.*

5a. Transport the blade and handle from the decontamination area to the storage area, using care to prevent re-contamination and damage prior to and during storage.

5b. Store the blade and handle in a clean, dry area. Refer to the laryngoscope's instructions for proper storage. To avoid bacterial colonization, do not store the blade or the handle in a closed carrying case, container, or kit.

Note: If the blade and/or handle has been sterilized, consider the application of the "event-related" paradigm for maintaining instrument sterility.

5c. When needed for laryngoscopy, carefully transport the blade and the handle from storage to the procedure room. Examine the blade and the handle for re-contamination and damage prior to reuse. Confirm that the batteries have been placed back into the handle and are charged. Test the blade and handle for proper functioning and to ensure the light is bright and is not flickering or otherwise operating improperly. Have available spare batteries, bulbs, light pipes, lamp assemblies, and other replacement parts as required.**HPN**

Author's Note: It is my interpretation of the medical literature and published guidelines, including the FDAs and CDCs, that it is recommended that the laryngoscope handle (as well as, of course, the laryngoscopes blade) receive high-level disinfection (or sterilization). Low-level disinfection and intermediate-level disinfection are inadequate for the handle and can result in cross-infection. This position of mine, which, again, is evidence-based (refer to the references in the article), will likely cause a change to the current standard of care, which usually calls only for low-level disinfection of the handle, an unacceptable practice according to the medical literature.

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ANSWERS
1. A
2. A
3. B
4. B
5. E
6. A
7. B
8. B
9. C
10. B

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Guidelines for reprocessing rigid laryngoscopes

CIRCLE THE CORRECT ANSWER

- 1. Flexible and rigid laryngoscopes – both their blades and handles – are classified as semicritical devices.**
A. True
B. False
- 2. Semicritical devices require cleaning and high-level disinfection or sterilization.**
A. True
B. False
- 3. Only the laryngoscope's blade can become contaminated during use and transmit disease from one patient to another.**
A. True
B. False
- 4. It is always acceptable to ultrasonically clean the blade and/or handle of the laryngoscope.**
A. True
B. False
- 5. Which of the following are used to clean the blade and handle of the laryngoscope?**
A. Fresh, clean, warm potable water
B. Wipe or cloth
C. Soft brush
D. Mild detergent
E. All of the above
- 6. The purpose of sterilization and/or high-level disinfection is to prevent disease transmission during laryngoscopy by destroying all of the microorganisms remaining on the laryngoscope's blade and handle after cleaning.**
A. True
B. False
- 7. Which of the following is generally contraindicated when reprocessing a rigid laryngoscope?**
A. Steam sterilization
B. Flash sterilization
C. Low temperature sterilization process
D. High-level disinfection
- 8. To avoid bacterial colonization, store the blade and handle in a closed carrying case, container, or kit.**
A. True
B. False
- 9. Which step directly follows transportation in the reprocessing of a rigid laryngoscope?**
A. Cleaning
B. Sterilization
C. Disassembly
D. Storage
- 10. The instructions provided in this Self-Study are meant to replace the reprocessing instructions provided by the rigid laryngoscope's manufacturer.**
A. True
B. False

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