

LARYNGOSCOPE HANDLES REPROCESSING: INTEGRATIVE REVIEW

Processamento de cabos de laringoscópio: revisão integrativa
Procesamiento de los mangos del laringoscopio: revisión integradora

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ABSTRACT: Objective: This is an integrative review study of the scientific literature based on the following guiding question: “What kind of processing is required for the safety reuse of the laryngoscope handle?” **Method:** An integrative review was performed using the following portals and databases: Pubmed, Embase, Scopus, Web of Science, and CINAHL. **Results:** Seven experimental studies were found and the results showed the uncertainty of the classification of the laryngoscope handle in relation to the risk of causing infection, proven by the diversity of reprocessing methods identified. **Conclusion:** We concluded that the laryngoscope handles cannot be considered independent of the blades and, therefore, they are semicritical materials. Considering the microbial and the organic load identified in this review, the recommended minimal processing is cleaning, followed by the high-level disinfection. A small inventory and the lack of access to technologies for reprocessing are not acceptable reasons for improvised recommendations, thus avoiding the certification and the spread of the bad practices.

Keywords: Laryngoscopes. Disinfection. Classification.

RESUMO: Objetivo: Estudo de revisão integrativa da literatura científica com base na seguinte questão norteadora: “Qual o tipo de processamento necessário para a segurança do reuso do cabo de laringoscópio?”. **Método:** Foi realizada uma revisão integrativa utilizando os portais e as bases Pubmed, Embase, Scopus, *Web of Science* e CINAHL. **Resultado:** Foram identificados sete estudos experimentais cujos resultados demonstraram indefinição da classificação do cabo de laringoscópio quanto ao risco de causar infecção, comprovada pela diversidade de métodos de processamento. **Conclusão:** Conclui-se que os cabos de laringoscópio não podem ser considerados materiais independentes das lâminas e, portanto, são materiais semicríticos. Levando-se em conta a carga microbiana e orgânica identificada nesta revisão, o processamento mínimo recomendado é a limpeza seguida de desinfecção de alto nível. Um inventário pequeno e a falta de acesso às tecnologias para processamento não são razões aceitáveis para recomendações improvisadas, evitando assim a certificação e propagação de más práticas.

Palavras-chave: Laringoscópios. Desinfecção. Classificação.

RESUMEN: Objetivo: Estudio de revisión integradora de la literatura científica basándose en la siguiente pregunta de investigación: “¿Cuál tipo de procesamiento se requiere para la seguridad de la reutilización del mango del laringoscopio?”. **Método:** Se hizo una revisión integradora utilizándose los portales y las bases PubMed, Embase, Scopus, *Web of Science* y CINAHL. **Resultados:** Fueron identificados siete estudios experimentales cuyos resultados demostraron una indefinición de la clasificación del mango del laringoscopio en relación al riesgo de causar infección, comprobada por la variedad de métodos para procesamiento. **Conclusión:** Los mangos del laringoscopio no pueden ser considerados materiales independientes de las láminas y, por lo tanto, son materiales semicríticos. Teniendo en cuenta las cargas microbiana y orgánica identificadas en esta revisión, el procesamiento mínimo recomendado es la limpieza seguida de la desinfección de alto nivel. El inventario pequeño y la falta de acceso a las tecnologías al procesamiento no son razones aceptables para las recomendaciones improvisadas, evitándose así la certificación y la propagación de malas prácticas.

Palabras clave: Laringoscopios. Desinfección. Clasificación.

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INTRODUCTION

The laryngoscope is an instrument composed of a handle, which comprises medium-sized batteries to power a light bulb and is linked to a straight or curved blade¹. The set consists primarily of heat-resistant stainless steel and/or brass. The companies Takaoka[®], Moriya[®] and HB Defense[®] instruct on their laryngoscope manuals to remove the batteries and sometimes the lamps before reprocessing.

This equipment is intended for ventilatory access in tracheal intubations, examination of airways, and surgical laryngeal procedures². For a procedure of laryngoscopy, equipment's blade is inserted into the oral cavity of the patient and, therefore, is classified as semicritical material³. However, the classification according to the potential to cause infection and the type of reprocessing suitable for the handle has generated controversy in the international literature^{4,5} because of the misapprehension that handle and blades are different equipment and the handle, "as do not come in direct contact with the patient", can be classified as noncritical material.

It is an error to consider the laryngoscope handle as noncritical item, as cross-contamination occurs by the hands of the handler while performing the laryngoscopy. Furthermore, despite the inexistence of direct contact with the patient, the cable is connected to the blades, which are semicritical materials that may be contaminated or recontaminate the blade, especially when it is folded downwardly to turn off the light^{6,7}. In addition, the knurled finish of the handle surface facilitates the accumulation of dirt⁷.

Empirical evidence indicates variation in the reprocessing of laryngoscope handles from just cleaning to sterilization. Disagreement on the classification and reprocessing of laryngoscope handles and blades, in relation to the instructions provided by manufacturers and specialists associations, are also found in the scientific literature^{4,7}.

Considering the lack of agreement and the variety of reprocessing practices, we identified the need to respond to questions by seeking answers based on scientific evidences⁸ and analyze the published studies on the subject, as these materials are potential sources of cross-infection. The objective of this review was to identify the classification of the laryngoscope handle according to the risk of causing infection and highlight the required type of reprocessing.

METHOD

This research is characterized as an integrative review and the methodology consists of performing a comprehensive literature review, discussing methods and research findings, and identifying the need for conducting new studies⁹. The review was performed considering the following steps: definition of the research questions, determination of inclusion and exclusion criteria of studies, definition of the variables of interest that should be extracted, and analysis of results.

The guiding question for this review was: "What kind of reprocessing is required for the safe reuse of the laryngoscope handle?". The criteria for the inclusion of studies were: experimental studies with pragmatic approach, which identified the microbial and organic loads contained in the laryngoscope handles and presented recommendations regarding the type of reprocessing that was adequate, based on the findings. The excluded articles were those that analyzed only the blades.

For the retrieval of the studies the following portals and databases were used: Pubmed, Embase, Scopus, Web of Science, and CINAHL. The keywords used were laryngoscope(s), obtained after consulting the vocabulary Medical Subject Headings (MeSH) prepared by the US National Library of Medicine, in association with the term handle(s). There were no set limits in relation to the language and year of publication and the first included article dated 1994.

A comprehensive search was intentional so that questions could be answered. Keywords were used, as there were no specific descriptors for the laryngoscope handle. The use of additional descriptors or keywords refined the search in a way that prevented the retrieval of the references.

Reading titles and abstracts, making a preselection of the studies that met the inclusion criteria, while the duplicates in different databases were excluded, initially performed the selection of items. A full reading of the study was performed when the abstract did not provide enough information to clearly identify the criteria for inclusion of the study in this review. For final selection, a full reading was performed for all preselected studies.

Two researchers independently conducted the data collection in October 2014 by means of an instrument containing the variables of interest considered in the analysis of the publications: reprocessing of handles in the context of the research, objectives, methods, results, isolated microorganisms, conclusions, and recommendations.

To analyze the studies, we considered the detailed description of the variables of interest, by means of descriptive analysis presented in tables.

Laboratory experimental researches, different from clinical research, are not hierarchical.

As an example, it is not possible to establish an hierarchy of clinical trials in this review, such as the following classification elaborated by Stetler et al.¹⁰:

- Level 1 – evidence from the meta-analysis of multiple controlled and randomized clinical trials;
- Level 2 – evidence from individual studies with experimental design;
- Level 3 – evidence of quasi-experimental studies;
- Level 4 – evidence of descriptive studies (nonexperimental) or qualitative approach;
- Level 5 – evidence from case reports or experience;
- Level 6 – evidence based on expert opinions.

Even when employing other widely utilized classification, as the scientific levels of evidence according to the Oxford Centre for Evidence-based Medicine¹¹, these materials have evidence level D — Expert opinion without critical appraisal or based on basic subjects (physiological study or study with animals). However, this classification is inadequate because,

in some approaches, due to ethical or safety reasons, only the laboratory experimental approach is possible.

RESULTS

We identified a total of 447 studies, distributed as follows: Pubmed (110), Embase (134), Scopus (111), Web of Science (87), and CINAHL (5). However, only seven studies met the inclusion criteria. The excluded studies showed the following limitations: covered only the blades; were duplicated on different bases; did not identify microbial or organic load contained in the cables; did not elaborate recommendations in relation to the proper type of reprocessing. To facilitate the presentation of results and discussion, each selected study received a code: E0 to E6. The studies included in this review are presented in Chart 1.

The variables of interest used in the analysis of the studies are shown in Charts 2 and 3.

DISCUSSION

The evidences reveal uncertainty in relation to the classification of risks of the laryngoscope handle to causing infection, proven

Chart 1. Description of authors, title, publication references, and search source. São Paulo, 2014.

Code	Authors	Title	References	Portal/database
E0	Howell et al. ¹²	<i>Chlorhexidine to maintain cleanliness of laryngoscope handles: an audit and laboratory study</i>	Eur J Anaesthesiol. 2013;30(5):216-21	PubMed EMBASE
E1	Williams et al. ¹³	<i>Contamination of laryngoscope handles</i>	J Hosp Infect. 2010;74(2):123-8	PubMed EMBASE SCOPUS Web of Science
E2	Call et al. ¹⁴	<i>Nosocomial contamination of laryngoscope handles: challenging current guidelines</i>	Anesth Analg. 2009;109(2):479-83	PubMed EMBASE SCOPUS Web of Science
E3	Qureshi et al. ¹⁵	<i>Laryngoscope handles in a medical intensive care unit: the level of bacterial and occult blood contamination</i>	J Hosp Infect. 2008;68(1):94-5	PubMed EMBASE SCOPUS Web of Science
E4	Simmons ¹⁶	<i>Laryngoscope handles: a potential for infection</i>	AANA J. 2000;68(3):233-6	PubMed EMBASE SCOPUS Web of Science
E5	Phillips & Monaghan ¹⁷	<i>Incidence of visible and occult blood on laryngoscope blades and handles</i>	AANA J. 1997;65(3):241-6	PubMed
E6	Morell et al. ¹⁸	<i>A survey of laryngoscope contamination at a university and a community hospital</i>	Anesthesiology. 1994;80(4):960	PubMed

by the variety of reprocessing methods. It was observed that, in addition to the variation in reprocessing methods, subjective criteria such as the presence of visible organic residue (E1, E5-E6) were determining factors for the reprocessing type selection: none (E5 and E6), cleaning (E1-E3, E5-E6), low-level disinfection (E0 and E2), intermediate-level disinfection (E0, E1, E3), high-level disinfection (E4), and sterilization (E0 and E1).

Unlike the blades, the handles have not been directly associated with the transmission of infection¹⁹; however, this statement is contestable because the discrimination of a part of the set that carried microorganisms cannot be established in an investigation. The handle is manipulated and is attached to the blades, which come in contact with the mucosa; therefore, it is not possible to dissociate it from the set⁷. According to the

Chart 2. Description of the reprocessing in the research context, objectives and methods of the selected studies. São Paulo, 2014.

Code	Reprocessing in the research context	Objectives	Methods
E0	Autoclaving prior to the storage placed next to the beds. Before use, the handles were removed from the package for the insertion of batteries and were tested for functionality; then they were placed in the same package and classified as ready for use	To establish an effective decontamination routine for laryngoscope handles To compare the efficacy and quantify the residual effect of Sani-Cloth CHG 2% (chlorhexidine 2%/ isopropyl alcohol 70%) and Tuffie 5 wipes (Cocoalkyl dimethylbenzyl ammonium chloride) for the decontamination of the handles	Microbiological cultures using swabs in 55 cables considered ready for use and laboratory studies for microbial recovery after challenge infection with <i>Escherichia coli</i> , glycopeptide-resistant <i>Enterococcus faecium</i> , and methicillin-resistant <i>Staphylococcus aureus</i>
E1	Chlorhexidine spray or cleaning with detergent or alcohol and drying Sterilization, when the handles were considered "very dirty"	To identify the extent and nature of the contamination of laryngoscope handles considered clean and ready for use	Microbiological cultures by means of swab and test for occult blood in 64 laryngoscopes handles considered "ready for use" in a surgical center were performed.
E2	No specific guidelines. Cleaning of the handles using 3M HB Quat Disinfectant Cleaner (EPA registration for noncritical materials) or Caviwipes®. Both considered low-level disinfection	To evaluate institutional cleaning techniques and expand existing data by means of microbiological culture samples obtained from laryngoscope handles	Microbiological cultures were performed (for bacteria and viruses) by means of swabs in 60 laryngoscopes that were in operating rooms: 40 units for aerobic bacterial culture and 20 for viral contamination
E3	Cleaning and disinfection of the handles using Surfa'safe®	To determine the frequency of bacterial contamination and the presence of occult blood in laryngoscope handles	Microbiological cultures by means of swab and test for occult blood in 120 surfaces of laryngoscope handles from an intensive care unit (ICU) were performed
E4	High-level disinfection by means of Maxima Spray (germicidal detergent based on quaternary ammonium and chlorine)	To identify the incidence, type and sensitivity profile of bacteria isolated from laryngoscope handles	Microbiological cultures from 20* laryngoscope handles were performed (13 from operating rooms, 4 from facilities for same-day surgery suites, 1 from delivery room, and 1 from electrophysiology laboratory)
E5	The handles are washed after each use with an agent "approved by the institution". According to the authors, in fact, the handles are cleaned only when very dirty	To determine the incidence of visible and occult blood on laryngoscope blades and handles which were identified as ready for patient use	Test for occult and visible blood was performed (inspection) in 65 laryngoscopes from operating rooms in the morning and afternoon
E6	No protocols for cleaning the cable. When very dirty, cleaning was done with a cloth	To determine the presence of contamination by occult blood on laryngoscope blades and handles	Test for occult blood was performed on collected handles and blades from anesthetizing locations of 25 university hospitals and 13 community hospitals

*The autor describes only 19 laryngoscope handles in source article.

Chart 3. Description of the results, conclusions, and recommendations of the selected studies. São Paulo, 2014.

Code	Results	Isolated	Conclusions/recommendations
E0	<p>Cultures:</p> <p>In 32 handles there was no growth</p> <p>In 23 handles one or more species were found</p> <p>It was observed higher residual effect in Sani-Cloth CHG 2% wipe</p>	<p>Coagulase-negative <i>Staphylococci</i></p> <p><i>Corynebacterium</i> spp</p> <p><i>Bacillus</i> spp</p> <p><i>Pseudomonas aeruginosa</i></p>	<p>The authors recommend cleaning and decontamination using Sani-Cloth CHG 2% for 10 seconds</p> <p>In suspected cases of infection by <i>Clostridium difficile</i> and <i>Norovirus</i>, sterilization is recommended</p> <p>In the emergency and intensive care services, decontamination should occur before and after each use</p> <p>The monthly sterilization is suggested for decontamination of inaccessible areas for Sani-Cloth CHG 2% wipes</p>
E1	<p>*Culture:</p> <p>9 handles presented no growth</p> <p>19 handles presented growth of one species</p> <p>18 handles presented growth of two species</p> <p>11 handles presented growth of three species</p> <p>5 handles presented growth of four species</p> <p>2 handles presented growth of five species</p> <p>The occult blood was negative for all samples</p> <p>*No association with the amount and type of microorganism, anesthetizing location number, type of surgical procedure and hospital location.</p>	<p><i>Bacillus</i> sp.</p> <p>Coagulase-negative <i>Staphylococci</i></p> <p><i>Enterococci</i></p> <p><i>Micrococcus</i></p> <p><i>Acinetobacter</i></p> <p><i>B. cereus</i></p> <p><i>Leuconostoc</i></p> <p>Methicillin-Susceptible <i>Staphylococcus</i></p> <p><i>Klebsiella</i></p> <p><i>Streptococcus viridans</i></p>	<p>The laryngoscope cable is a potential source of cross-infection</p> <p>There is a need for developing guidelines to standardize the laryngoscope handles cleaning methods</p> <p>To develop a design that prevents contact of the tip of the blade with the handle</p> <p>High-level disinfection is recommended</p>
E2	<p>Bacteria: 30 positive samples</p> <p>Viruses: all negative samples.</p>	<p><i>Bacillus</i> spp. (not anthracis)</p> <p>Alpha-hemolytic <i>Streptococcus</i> spp.</p> <p>Vancomycin-susceptible <i>Enterococcus</i> spp.</p> <p>Methicillin-Susceptible <i>Staphylococcus</i></p> <p><i>Corynebacterium</i> spp.</p>	<p>It is necessary to adopt processing protocols with at least low-level disinfection</p>
E3	<p>*Culture:</p> <p>In 37 samples there was no growth</p> <p>In 58 samples there was growth of one species</p> <p>In 25 samples there was a growth of two or more species</p> <p>Average of 78CFU/200 uL</p> <p>Negative occult blood for all samples</p> <p>*Number of CFUs higher in handles unused for more than 3 days</p>	<p>Coagulase-negative <i>Staphylococci</i></p> <p><i>Bacillus</i> spp</p> <p><i>Corynebacterium</i></p> <p><i>Micrococcus</i></p> <p>Non-hemolytic <i>Streptococcus</i></p> <p><i>Staphylococcus aureus</i></p>	<p>The laryngoscope handle is not considered a significant threat</p> <p>The authors consider that the risk of contamination can be minimized with proper disinfection</p>

Continues...

Chart 3. Continuation.

Code	Results	Isolated	Conclusions/recommendations
E4	All samples showed microbial growth (range from 1 to 400 CFU) One sample underwent high-level disinfection according to the described procedure, and did not present growth	<i>Staphylococcus epidermidis</i> (multidrug resistant) <i>Staphylococcus aureus</i> <i>Citrobacter freundii</i> <i>Pseudomonas aeruginosa</i> <i>Enterococcus</i> <i>Streptococcus</i> <i>Bacillus</i> <i>Micrococcus</i>	Decontamination with water and detergent, followed by high-level disinfection or sterilization
E5	None of the samples presented visible blood 26 positive samples. The presence of occult blood was significantly higher in samples collected in the afternoon	The identification of microorganisms was not performed	The protocols used are ineffective Reclassification of laryngoscope handle as semicritical material
E6	University hospitals: 12 positive handles Community hospitals 7 positive handles	The identification of microorganisms was not performed	Both the handle and the blade are potential sources of infection The use of strict decontamination protocols, equipment or disposable blades and covers to the handles can prevent cross-contamination

CFU: Colony-forming units.

official recommendations, the laryngoscope handles should undergo high-level disinfection after cleaning¹⁹⁻²¹.

The chemical disinfection requires immersion of the instrument; however, considering that they are heat-resistant materials, thermal disinfection can be recommended as the first option because it eliminates the inconvenient related to chemical processing, such as the dependence of complete immersion, the use of individual protection equipment, exposure of personnel to chemical agents, as well as the care with rinse procedure²⁰.

Failures in the reprocessing of this instrument resulted in two outbreaks of *Serratia marcescens* infection in intensive care units^{22,23}, in which the microorganism was isolated from the blades and in one of them dirt was visible. In addition to this literature, there is another outbreak of *Pseudomonas aeruginosa* that was also attributed to inappropriate reprocessing of the laryngoscopes⁴.

In relation to microbiological cultures, we observed in the reviewed literature the variety of microorganisms and colony-forming units in an order of 10^2 , confirming that the laryngoscope handle is a potential source of contamination. Among the microorganisms identified, there are bacteria of epidemiological relevance²⁴, such as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Acinetobacter*, and *Klebsiella*, common etiological agents in hospital pneumonias.

In relation to the methods employed, one limitation of the selected studies is the lack of identification of the microorganisms' origin: from the hands of professionals, from patients, or from the environment, considering that laryngoscopes generally are not packed in materials with bio-barrier properties. Although there are no exclusive packages for semicritical materials, it is prudent to protect them from inadequate handling and dust. Thus, to protect the materials for the next use, it is recommended to use clean, nontoxic, sealable plastic bags, commonly used for food packaging or disinfected plastic containers with lid²⁵.

One aspect not reported in the studies that contributes to the diversity of reprocessing methods is the inconsistent recommendations at the manual of instructions of the laryngoscope manufacturers or distributors, which can lead to errors. This fact is illustrated in Chart 4, in which we reproduced the guidelines of three companies obtained on their respective web sites.

Company 1 confuses concepts when recommends cleaning the set with an intermediate level disinfectant, but does not describe compatible sterilization and disinfection procedures, emphasizing the disinfection of the blade. The E5 and E6 studies presented occult blood in the handles, demonstrating the need for a cleaning procedure that essentially involves water, detergent, and friction.

The manual of Company 2 contains typographical errors and determines the immersion time in the detergent solution (2 minutes); however, the detergent manufacturer should make this recommendation. Another significant aspect is the inappropriate time recommended for sterilization: 30 minutes at 134°C.

Company 3 makes mistakes in the sequence of steps “clean, disassemble, and sterilize”. Cleaning a material requires it to be previously dismantled, when possible. Furthermore, it determines the disinfectant brand and the exposure time; again, the manufacturer of the solution should determine these items.

Inconsistent recommendations from the manufacturer such as to disinfect with “suitable germicide” or “appropriate solution” should not be approved at the time of registration of the product for marketing, as they do not allow the health-care institutions to develop secure protocols. Therefore, laryngoscope’s manufacturers must provide germicidal options that

meet high-level disinfectant category and clearly list compatible and incompatible formulations. The National Agency for Health Surveillance (ANVISA) must intervene so that decontamination instructions from any reusable material, including laryngoscopes, are accurate and secure.

The E0 and E1 studies showed the use of agents considered antiseptic (chlorhexidine) to date. Although the authors of the study E0 have demonstrated their effectiveness associated with residual effects, we observed that the authors emphasized the limitations of the product for inactivating *Norovirus* or *Clostridium difficile*. This limitation prevents the adoption of standard precautions for the reprocessing of laryngoscope handles. Furthermore, when suggesting the monthly sterilization to decontaminate inaccessible areas for Sani-Cloth CHG 2% wipes, the authors acknowledge that the adoption of this type of product, when routinely used, is unsafe.

Chart 4. Recommendations elaborated by different companies to the reprocessing of laryngoscopes. São Paulo, 2014.

Company	Raw material	Cleaning	Disinfection	Sterilization	Cautions/Warnings
1	AISI 304 stainless steel	“Alcohol” or “appropriate germicidal solution” and drying	Do not specify	Do not specify	Disassembly for cleaning Disinfection of the blade
2	“Stanless” steel, brass, plastic and electrically isolated handle	Rinse immediately after use Immersion in detergent for 2 minutes; Rubbing Drying	“Cold solutions” with exposure time and “power” according to the manufacturer. Immersion in 2.4% glutaraldehyde for 45 minutes at room temperature Rinsing and drying	Autoclave “Set the autoclave cycle in accordance to the following specifications: Temperature: 134°C / 270°F Cycle time: 30 minutes Drying time: 6 minutes”	Never clean the laryngoscope with ultrasound Do not use steel brushes “During the sterilization does not exceed the temperature of 134°C / 270°F and pressure of 28psi” “Autoclave at Flash cycle and by means of hot air are not recommended”
3	Chrome-plated brass / stainless steel	Immersion in water at 40-45°C for 10-20 minutes; Cleaning piece by piece with nylon brush and soap or mild detergent Rinsing and drying		Disassembly “Suitable germicidal solution” or ethylene oxide “Conditions of temperature 54°C (130°F)” Chemical sterilization “2% Glutaraldehy (Cidex®) for 12 hours” Rinse	“Clean, Disassemble and Sterilize”

Regarding the methods of physicochemical sterilization at low temperatures, it is not acceptable to recommend a single technology such as ethylene oxide (ETO), which in Brazil is applied by contractors. It is known that the adoption of this method implies considerable increase in the number of laryngoscope handles and blades in use. In the USA, there are also services that adopt plasma hydrogen peroxide; differently from ETO, this could be easily allocated in a health-care institution²¹.

Although some authors do not accept the security of high-level disinfection because of the contamination of areas that are difficult to clean, and propose the use of condoms as blade covers²⁶, it is emphasized that there are no validations for this proposal and argument. If the cleaning is not possible, there is an equipment design error that should be notified to the manufacturer and to regulatory agencies. Besides the fact that the use of a cover may lead to the misconception that the reprocessing is unnecessary, there is the possibility of disruption of the cover and contamination of the instrument.

A controversial aspect related to the reprocessing of the instrument is the possible contamination by prions. Some authors advocate the use of disposable laryngoscope blades due to the possibility of contamination of the blade by lymphoid tissues during a laryngoscopy, constituting a possible source of prion diseases transmission²⁷. The current scientific literature does not recommend the adoption of specific

measures to handle prions in laryngoscope blades²¹. Generally, in suspected cases, health-care facilities should adopt specific guidelines for prions²⁸.

CONCLUSION

Laryngoscope cables cannot be considered independent from the blades and thus are semicritical materials. Taking into account the microbial and organic load identified in this review, which illustrates serious failures in the reprocessing routine, as well as the limitations of the identified publications, we considered that the main implication of these findings for nursing practice is the adoption of cleaning followed by high-level disinfection as a minimal reprocessing, contributing to the creation of standard operational procedures to ensure patient safety.

We reinforce that the controversy regarding the transmission of prion diseases by means of the laryngoscope needs to be further investigated. It is also important to emphasize the inconsistencies observed in the manufacturers' manuals, which are vague and lead to misinterpretations, requiring urgent review with the co-participation of ANVISA to support safe practices.

A small inventory of the equipment and the lack of access to technologies for reprocessing are not acceptable reasons for improvised recommendations, thus preventing the spread of certification and malpractice.

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