RÜSCH®

Clinical Support – Single-use Laryngoscopes

Teleflex®

Reusable anesthetic equipment, including reusable laryngoscope handles, may become contaminated, particularly if improperly reprocessed and/or stored between uses. This may result in cross-contamination and subsequent cross-infection. Using single-use products may help reduce those risks.

This booklet contains summaries of five independent, third party publications that illustrate the potential risks of reusable anesthetic equipment and the potential benefits of switching from reusable to single-use equipment.

The publications highlight several clinically important points, as detailed below.

- Reusable laryngoscope handles that are considered clean and ready for use may be contaminated with bacteria
- A plastic disposable laryngoscope blade is comparable to a metallic reusable blade in terms of certain performance characteristics (e.g., duration of laryngoscopy, rate of successful intubation) and user satisfaction
- Single-use anesthetic equipment (including laryngoscopy equipment) may offer advantages over reusable equipment, including infection control and cost savings

Nosocomial contamination of laryngoscope handles: challenging current guidelines

Call TR, Auerbach FJ, Riddell SW et al. *Anesth Analg.* 2009;109(2):479-83.

A high incidence of bacterial contamination was identified on reusable laryngoscope handles that were considered clean and ready for use.

Cultures taken from reusable laryngoscope handles yielded potentially pathogenic bacteria, including *Enterococcus* spp. and *Staphylococcus aureus*.

Objective

- To assess institutional laryngoscope handle-cleaning techniques and investigate bacterial and viral contamination of reusable laryngoscope handles that were considered clean and ready for use

Methods

- This was a prospective study that involved the testing of 60 rigid reusable laryngoscope handles in use within the main adult operating theaters of a single hospital
- Forty samples for bacterial culture and 20 samples for viral detection were collected from the entire surface area of the handle (excluding the top [where the blade is attached] and the bottom [where the battery is inserted/removed])
  - The handles were swabbed approximately 20 times from the top to the bottom while the device was rotated
  - Samples were collected after the operating theater and equipment had been cleaned (using low-level disinfection) and were deemed ready for the next patient
  - Samples for bacteria culture were collected over a period of 8 non-consecutive days and samples for viral detection were collected over 2 consecutive days
- Identification of bacteria was done using standard laboratory methods
- Samples for viral detection were analysed for 17 respiratory viruses using a multiplex reverse transcriptase chain reaction assay

Results

- From the 40 samples taken for bacterial culture, 30 tested positive for one or more types of bacteria
- The most common bacteria identified were coagulase-negative staphylococci, *Bacillus* spp. (not *anthracis*) and α-hemolytic *Streptococcus* spp. (Figure 1)
  - Other bacteria identified included vancomycin-susceptible *Enterococcus* spp., methicillin-susceptible *Staphylococcus aureus* and *Corynebacterium* spp.

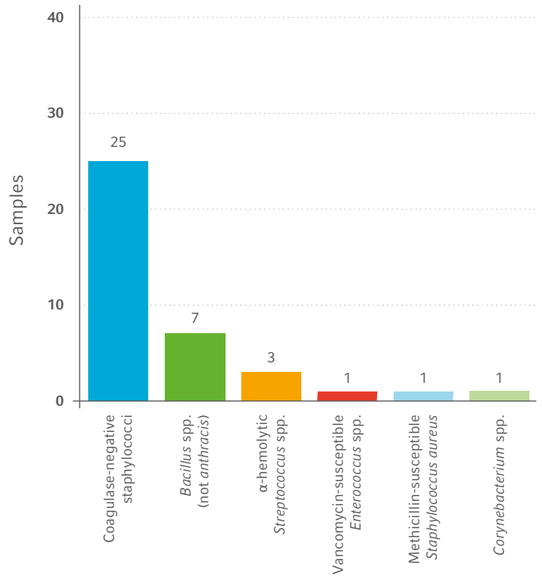


Figure 1. Bacteria identified on rigid reusable laryngoscope handles considered clean and ready for use

All viral tests were negative

Conclusions

- A high incidence of bacterial contamination was identified on reusable laryngoscope handles that were previously considered clean and ready for use
- Cultures taken from reusable laryngoscope handles identified potentially pathogenic bacteria, including *Enterococcus* spp. and *S. aureus*
- No nosocomial drug-resistant microorganisms or respiratory viruses were isolated

Comparison of disposable and metallic reusable Miller blades for tracheal intubation in children

Darabi ME, Mireskandari S-M, Salamati P. *Res J Biol Sci.* 2008;3(11):1252-6.

Regarding anesthesiologist satisfaction and duration of larygoscopy, laryngoscopy with a disposable blade was considered equal to that with a reusable blade in pediatric patients undergoing elective surgery.

Use of a disposable versus a reusable laryngoscope blade can potentially reduce cross-contamination between patients.

Objective

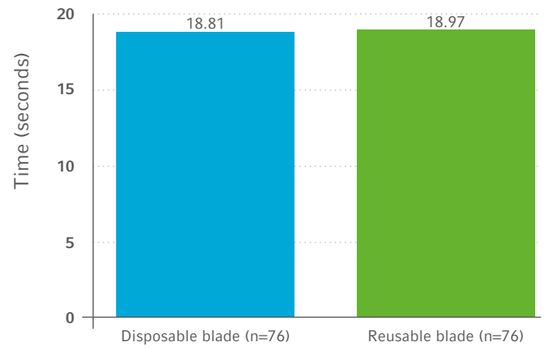
- To compare the use of disposable and reusable laryngoscope blades in pediatric patients

Methods

- This was a prospective, randomized trial that included children (aged 3–12 years) undergoing elective surgery that required laryngoscopy to facilitate tracheal intubation
  - Patients were American Society of Anesthesiologists physical status I and II and had apparently normal airways
- Patients were randomized to undergo laryngoscopy using a plastic disposable or a metallic reusable blade
  - The size of the blade was chosen based on the preference of the anesthesiologist and on the condition of the patient
- Outcomes of interest included
  - Duration of laryngoscopy and tracheal intubation
  - View of the glottis
  - Brightness of the laryngoscope field
  - Anesthesiologist satisfaction
  - Successful intubation

Results

- Overall, 76 patients were randomized to undergo laryngoscopy with a disposable blade and 76 patients were randomized to undergo laryngoscopy with a reusable blade
- The demographic and anesthetic characteristics of patients in the two groups were comparable
  - The mean age for the patients in the disposable blade group was 61.5 (±26.8) months and the mean age for patients in the metallic blade group was 65.4 (±32.6) months
  - The mean body weight was 19.1 (±8.9) and 18.4 (±7.8) for the patients in the disposable blade and metallic blade groups, respectively
- Successful intubation was achieved in all patients
- There was a significant between-group difference in the proportion of patients with a glottic view of I or II
  - A glottic view of I (most of the glottis) was observed in 50% of patients in the disposable blade group and in 66% of patients in the reusable blade group
  - A glottic view of II (only the posterior part of the glottis) was observed in 49% of patients in the disposable blade group and in 32% of patients in the reusable blade group
- There were no significant between-group difference in the duration of laryngoscopy and tracheal intubation (Figure 1)



† Time from inserting the laryngoscope into the oral cavity until passage of the tracheal tube via the vocal cords

Figure 1. Duration of laryngoscopy and tracheal intubation† with a disposable and a reusable laryngoscope blade

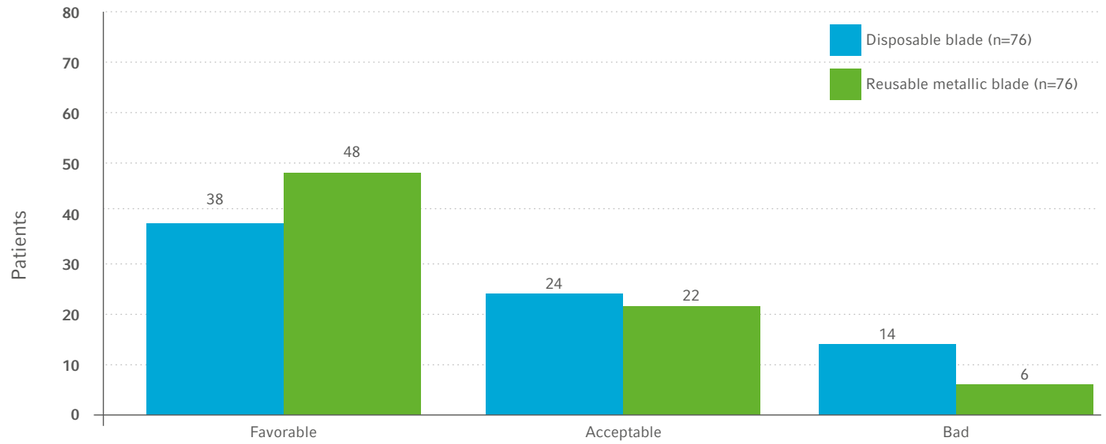


Figure 2. Self-reported anesthesiologist satisfaction with a disposable and a reusable laryngoscope blade

- A significantly ($p<0.01$) brighter field was achieved with the reusable blade than with the disposable blade
- There was no significant between-group difference in self-reported anesthesiologist satisfaction ($p=0.1$) (Figure 2)

Conclusions

- Laryngoscopy with the Topster Miller single-use, disposable blade was considered equal to that with a reusable blade in pediatric patients undergoing elective surgery requiring tracheal intubation, and it was recommended that every new disposable laryngoscope blade should be compared with metallic reusable blades before routine clinical use

Infection control practices of laryngoscope blades: a review of the literature

Machan MD. *AANA J.* 2012;80(4):274-8.

The concept of using single-use, disposable laryngoscope blades is a sensible one.

The main advantages of using a disposable laryngoscope blade include infection control and cost.

Introduction

- Nosocomial infections are associated with substantial consequences in terms of cost and patient health-related quality of life
  - The prevention of such infections is a key focus for hospitals and insurance companies alike
- Because contaminated anesthesia airway equipment may act as a vector for potentially pathogenic organisms, it is imperative that reusable airway equipment (e.g., laryngoscope blades) be clean, or that single-use (i.e., disposable) equipment be used
- Numerous studies have shown that methods for cleaning and sterilizing reusable anesthetic airway equipment are ineffective
  - The potential for cross-contamination with improperly cleaned reusable equipment could be avoided by using single-use equipment

Infection control practices for reusable airway equipment

- Typically, reusable anesthesia airway devices that come into contact with mucous membranes, blood or bodily fluids are classed as semi-critical items according to the so-called Spaulding criteria
  - Between uses, semi-critical items should be cleaned and then processed using high-level disinfection or sterilization
- Often the laryngoscope handle is overlooked in this scenario, despite that it may act as a potential source of cross-infection (the tip of the blade may contaminate the handle when it is in the folded-down [i.e., closed] position)
- Manipulation of a patient's airway, as with intubation procedures, can be bloody
  - Numerous studies have demonstrated that laryngoscope blades and handles that are considered ready for patient use harbor significant amounts of visible and occult blood
  - Although blood contamination may pose an infection risk to patients and anesthesia providers, to date there are no data to confirm that this is the case
- Studies have shown that the cleaning and disinfection/sterilization of reusable laryngoscope blades does not always occur
  - This was demonstrated when four children whose airway was managed with a single reusable laryngoscope blade developed serious *Pseudomonas aeruginosa* infections

Use of single-use laryngoscope blades

- In order to reduce the spread of hospital-acquired infections, the use of disposable laryngoscope blades (which are designed to be used once and then discarded) is recommended, wherever possible
- In routine situations, single-use laryngoscope blades appear to be efficient devices, although the use of reusable blades may be preferred for patients with difficult airways
- From a personal point of view, clinicians appear to prefer single-use devices
  - In one study, one-third of respondents to a survey stated that they would not be prepared to put a reusable laryngoscope blade deemed ready for patient use into their mouth
  - In another study, most clinicians stated that, if they were patients, they would want single-use as opposed to reusable devices used on themselves and their families

Conclusions

- Studies have shown that current procedures for cleaning, disinfecting, sterilizing and handling reusable laryngoscope blades and handles are suboptimal or that established cleaning and disinfection/sterilization protocols are not well adhered to
- The concept of using a single-use, disposable laryngoscope blade is a sensible one, but previously-published studies reported less user satisfaction than with reusable laryngoscope blades
- According to the author, based on the outcomes of other studies, advantages of using disposable laryngoscope blades include infection control and cost.

Cost comparison of reusable and single-use fibrescopes in a large English teaching hospital

McCahon RA, Whynes DK. *Anesthesia.* 2015;70(6):699-706.

A single-use fibrescope appeared to be better value than a reusable fibrescope in the setting of a teaching hospital in the United Kingdom.

Cost savings of more than one-third per fibre-optic intubation could be achieved by using a single-use versus a reusable fibrescope.

Objective

- To perform a cost assessment of fibre-optic intubation using reusable and single-use fibrescopes

Methods

- This was a retrospective analysis of cost and utilization data related to fibre-optic intubations conducted in the operating theaters and emergency department of a single teaching hospital in the United Kingdom
- The cost of using a reusable fibrescope was calculated over a period of 5.3 years and was based on three categories of expenditure
  - Purchase of capital equipment
  - Maintenance and repair
  - Sterilization and storage
- The cost calculation was conducted in tandem with an audit of fibre-optic intubation practices to determine the annual rate of fibre-optic intubations (relative to all general anesthetic procedures)
- For comparative purposes, cost data for use of a single-use fibrescope (Ambu® aScope™) was modelled over the same time period for an equal number of fibre-optic intubations per annum

Results

- The annual cost (overall and per use) of using a reusable fibrescope is shown in Table 1

Table 1. Annual costs of fibre-optic intubation with reusable fibrescopes

TYPE OF EXPENDITURE	ANNUAL COST (£)
Capital consumption†	19,292
Storage	3,480
Maintenance and repair	19,927
Sterilizing	3,687
Total	*46,386§*
Cost per intubation‡	*329*

† Gross cost to acquire the instruments (including any ancillary equipment) divided by their useful life

§ The value shown is the sum of the individual costs reported for capital consumption, storage, maintenance/repair and sterilization; the value reported in the published paper is £46,385

‡ Based on an estimated annual throughput of 141 fibre-optic intubations per annum (1.2% of general anesthetic procedures)

- Cost 'isopleths'* were identified for the relationship between total cost of use versus number of uses for a fibrescope
  - Below a value of ~200 uses per year (i.e., a range commensurate with normal practice), a single-use fibrescope was found to be generally cheaper
  - This was true even when the repair costs for reusable fiberscopes were negligible

Conclusions

- In the setting of a teaching hospital in the United Kingdom, a single-use fibrescope appeared to be better value than a reusable fibrescope
  - The use of single-use versus reusable fibrescopes could result in costs savings of more than one-third per fibre-optic intubation

* A line that joined all the points where the cost of a reusable versus a single-use fibrescope was equal

Contamination of laryngoscope handles

Williams D, Dingley J, Jones C, Berry N et al. *J Hosp Infect.* 2010;74(2):123-8.

A majority of reusable laryngoscope handles that were considered clean and ready for use were contaminated with bacteria.

It is possible that laryngoscope handles could act as potential vehicles for transmission of infection.

Objective

- To identify the extent and nature of contamination on the laryngoscope handles that were considered to be clean and ready for use in the anesthetic room within the operating room of the hospital

Methods

- This was a prospective study that involved the testing of rigid reusable laryngoscope handles in use within a single hospital
  - The handles were stored in the anesthetic rooms of 32 operating theatres that were in use at the time of the study
  - All handles were designated as clean and ready for use
- Samples were collected from three sites on each handle
  - The smooth metal surface at the side of the hook mount (tested for bacteria only)
  - The knurled metal surface on the upper third of the handle (tested for bacteria and occult blood)
  - The knurled metal surface on the lower third of the handle at the point where the laryngoscope blade would contact the handle when in the closed position (tested for bacteria and occult blood)
- Sample collection occurred over two consecutive days and took place in the middle of the operating day
  - Sterile templates were used to define a consistent area of 3.14 cm^2 from which samples were collected
- Any organisms that were isolated were identified using routine laboratory methods as well as mass spectrometry
- In order to prevent any changes in their routine practice, operating theater personnel were not made aware of the study

Results

- Overall, 192 specimens from 64 laryngoscope handles were assessed for bacterial contamination
- 99 positive cultures were identified, many of which were polymicrobial
- In total, 128 different organisms were isolated, comprising 35 different bacterial species
- 55 of 64 handles (86%) yielded one or more species of bacteria (Figure 1)
  - Potential pathogens included enterococci, meticillin-susceptible *Staphylococcus aureus* (MSSA), *Klebsiella* and *Acinetobacter*

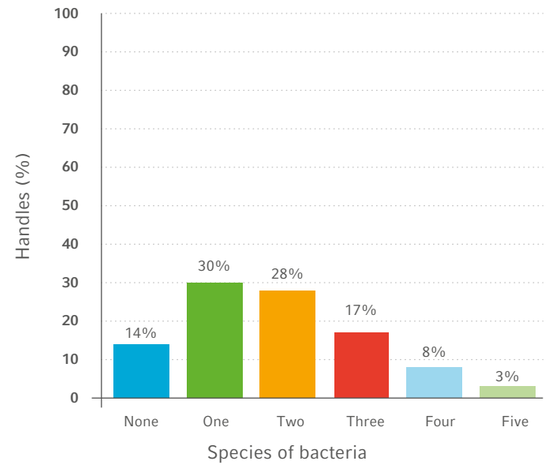


Figure 1. Extent of bacterial growth on reusable laryngoscope handles considered clean and ready for use

- Bacterial contamination most often occurred on the knurled metal surface on the lower third of the handle (Figure 2)
  - This was the only site to demonstrate 'heavy contamination' (i.e., >20 colonies of a given organism per plate) and the only site from which *Streptococcus viridans* was isolated

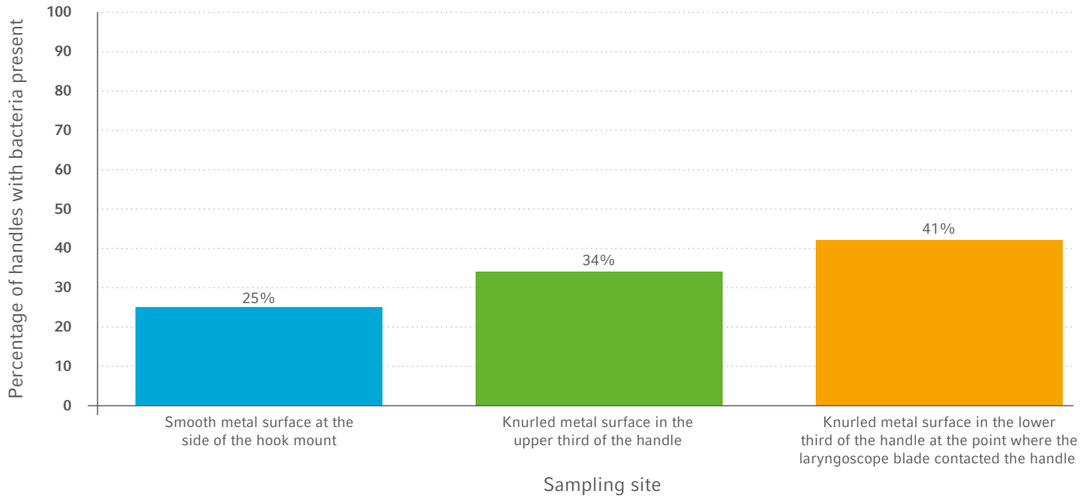


Figure 2. Bacterial contamination according to sampling site on reusable laryngoscope handles considered clean and ready for use

- Overall, 116 specimens from 58 laryngoscope handles were assessed for occult blood contamination
  - No occult blood contamination was demonstrated

Conclusions

- Bacterial contamination was demonstrated on 86% of reusable laryngoscope handles that were previously considered clean and ready for use
  - In this manner *"...it is possible for laryngoscope handles to function as a potential vehicle for transmission of infection"*
  - Isolates included MSSA and other organisms that have been implicated in nosocomial infections
- The authors noted that *"...strategies to prevent cross-infection [include] disposable 'single use' laryngoscope handles and laryngoscopes"*

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