

# Audit of nasendoscope disinfection practice

I. Street  
J. Hamann  
M. Harries

ENT Department, Royal Sussex County Hospital, Brighton, UK

Correspondence to: I. Street  
6<sup>th</sup> floor Nuffield House QEMC  
Birmingham B15 2TH, UK  
Email: [ianstreet@doctors.org.uk](mailto:ianstreet@doctors.org.uk)

**Introduction:** Several options exist with regard to flexible pharyngo-laryngoscope sterilisation. We audited the use of disposable sheaths in our department over a six-month period. **Methods:** A cost-analysis was performed and the advantages and disadvantages of this system were compared with several alternative options. **Results:** We found that the overall cost of disposable sheaths averaged £4008 per month over a six-month period. We subsequently introduced chlorine dioxide (ClO<sub>2</sub>) wipes as a means of disinfection. Chlorine dioxide wipes have enabled a monthly saving of £3145 over sheath usage. Additionally, they meet health regulation requirements and are a convenient, cost-effective alternative to sheaths. **Discussion:** The limiting factors, including time and financial issues, involved in nasendoscope disinfection are discussed. **Conclusions:** We have found chlorine dioxide wipes to be a satisfactory alternative means of nasendoscope disinfection. Possible time constraints aside, there are no advantages of sheath use over our current method. Chlorine dioxide wipes are also preferable from a financial point of view

**Keywords:** Otolaryngology, endoscope, disinfection  
*Surgeon, 1 February 2006 11-13*

## INTRODUCTION

The use of flexible endoscopes has become routine practice over the last decade and thousands of endoscopic examinations are performed each week nationwide. Each endoscopic procedure has an associated infection risk which has been classified as 'semicritical' or 'intermediate risk', as a consequence of contact with mucous membranes. Semicritical procedures require high level disinfection, which expressly means the eradication of all microorganisms except high numbers of bacterial spores.<sup>1</sup> The recent increase in the number of Creutzfeldt-Jakob disease cases and concern regarding the transmission of prion disease via medical devices has served to heighten concerns surrounding the use of non-disposable medical equipment.

Several methods of flexible pharyngo-laryngoscope disinfection exist, each with their own inherent merits. Budget constraints are, unfortunately, an important practical factor due to the financial pressure on NHS trusts. Some regimens have significant time constraints and consequent staffing implications. For example, a system allowing immediate reprocessing of the flexible pharyngo-laryngoscopes allows nursing staff to concentrate on their clinical tasks. Other more time-consuming disinfection methods demand higher staffing levels

to provide a clinical service while ensuring adequate processing of the instruments.

We have thus conducted an audit of disinfection practices in our department.

## METHODS

An analysis of the nasendoscopic practice in our ENT department over the previous six months was performed. This entailed examining the number of nasendoscopies performed. This was recorded by hand in a logbook (Decontamination/Cold Sterilisation Log. Bristol: Meditrax, 1995). Each entry was made when the scope was cleaned after each use. The cost of sheaths, any damage to the flexible pharyngo-laryngoscopes necessitating repair or replacement and the mode of sterilisation of the flexible pharyngo-laryngoscopes during each clinic session was also considered.

## RESULTS

The mean monthly cost of sheaths in the six month period from July 2003 to January 2004 was calculated. Our department performed an average of 253 nasendoscopic procedures per month in total; 209 of these involved the use of the flexible pharyngo-laryngoscopes and 44 involved rigid scopes. Each sheath costs £11, leading to a mean monthly expenditure of £2299 (£11 x 209).

A further £10,252 was spent on repairing or replacing flexible pharyngo-laryngoscopes damaged as a direct consequence of sheath use. The total mean monthly expenditure was, therefore, £4008 [ (£11 x 209) + (£10,252)].

Tables 1 and 2 display the budgetary demands of the Automated Endoscope Reprocessor (AER) system under consideration. An initial capital outlay of £145,336 would have been required, with a further annual maintenance cost of £84,500 annually.

Table 3 shows the financial and time factors associated with the ClO<sub>2</sub> wipes.

## DISCUSSION

Previously, aldehyde-based disinfectants, namely glutaraldehyde, provided a cheap and effective means of endoscope sterilisation. Concerns regarding its safety for patients and staff subsequently emerged. The Medical Devices Agency (MDA) recognises that it is an irritant and sensitiser.<sup>2</sup> Additionally, in countries with occupational health surveillance schemes in place, the fumes have been found to cause an asthma-like airways dysfunction syndrome.<sup>3,4,5</sup> It has also been associated with conjunctivitis and rhinitis. The potential for litigation has made glutaraldehyde far less attractive as a sterilising agent in this setting.

Decontamination using Automated Endoscope Reprocessors provides an effective and safe means of sterilising flexible pharyngo-laryngoscopes and rigid nasendoscopes. However, they are associated with time and space constraints. They typically take 20 minutes to complete a sterilisation cycle. This requires the purchase of further compensatory flexible pharyngo-laryngoscopes and rigid nasendoscopes, necessary for clinic use while a cleaning cycle is ongoing. Due to their complexity, there is potential for incorrect use and thus inadequate decontamination. Other problems associated with Automated Endoscope Reprocessor use include its setup and maintenance cost (Tables 1 and 2), time required to train clinic and theatre staff, and space limitations in outpatient clinics. Available rooms should also be properly configured; for example, there should be separate entrance and exit doorways as well as excellent ventilation and storage space.

Disposable sheaths have several advantages as a means of sterile flexible pharyngo-laryngoscopic practice. They are portable, quick to change and minimise exposure to hazardous chemicals. Equipment is, however, still required to sterilise flexible pharyngo-laryngoscopes at the beginning and end of clinics, as well as to sterilise rigid nasendoscopes after each use. When first introduced, they were enthusiastically received by some because they did not appear to hinder flexible pharyngo-laryngoscope use and prevented the transmission of virus particles between patients.<sup>6,7</sup> The manufacturer's own figures advise that the sheaths protect the flexible pharyngo-laryngoscopes from particles down to the size of 27 nanometres, whilst viruses are generally recognised to range in size from 17-1000 nanometres.

They have drawbacks, however. These include damage to the delicate tips of the flexible pharyngo-laryngoscopes when the sheaths are removed. In the 6-month period audited, two flexible pharyngo-laryngoscopes were damaged, with repair costs totalling £10,252. The cause of damage to these flexible scopes was the incorrect sheath being fitted in one instance and a sheath being left on overnight in another. Specifically, the lining of each scope was ripped about 2cm from the flexible tip. This

**TABLE 1. COST ASSOCIATED WITH EQUIPPING OPD WITH AN AUTOMATED ENDOSCOPE REPROCESSOR**

Equipped	Nos.	Cost per item (x £1000)	Total (x £1000)
Washer/Disinfector	3	25	75
RO Plant	1	10	10
Ventilation Upgrade	1	10	10
UV/Dryer	2	10	20
Cleanascope Trolley	1	2	2
Ultrasonic Washer	1	2	2
Shelving	2	2	4
Adapting Room*	N/A	N/A	22.3
<b>Total</b>			<b>145.3</b>

\* Re-tiling, repainting, false ceiling

**TABLE 2. YEARLY COST ASSOCIATED WITH AN AUTOMATED ENDOSCOPE REPROCESSOR; REVENUE COSTS (PER YEAR)**

Item	Cost (x £1000)
Maintenance Technician	6
Decontamination Technician	15
Microbiology Testing	8
Chemicals	50
Filters	4.5
RO Maintenance	1
<b>Total</b>	<b>84.5</b>

**TABLE 3. COST AND TIME FACTORS ASSOCIATED WITH TRISTEL™ ClO<sub>2</sub> WIPES**

Item	Cost	Time
Endozime™ (Enzyme-impregnated sponge)	£1.28	30 seconds
Tristel™ ClO <sub>2</sub> Wipes	£1.65	30 seconds
Sterile Water Flush	£0.48	60 seconds
<b>Total</b>	<b>£3.41</b>	<b>120 seconds</b>

was due to the fact that the sheaths grip the tip of the flexible scopes tightly and can shear off the lining of the tip when being removed.

In our opinion, the use of sheaths increases the likelihood of trauma to the nasal mucosa due to the increased diameter of the flexible pharyngo-laryngoscopes. A typical flexible pharyngo-laryngoscope as used by our department (Keymed Olympus ENF Type P3) measures 3.87mm in diameter at its widest point. The sheath adds another 0.47mm to this, a 12% increase in its diameter. An unavoidable disadvantage of sheathed flexible pharyngo-laryngoscopes is that there is the potential to exacerbate patient discomfort as a consequence of their increased diameter. Previous studies have advocated using small diameter endoscopes as a way of improving patient co-operation.<sup>8,9</sup>

Winter *et al* (2002) have shown that there is a statistically insignificant difference in patient discomfort between using a flexible pharyngo-laryngoscope with or without a sheath.<sup>10</sup> Difficulties with interpretation of this study arise, however, when it is taken into account that neither patients nor operators were blinded. Additionally, the operator's perception of ease of use of the flexible pharyngo-laryngoscopes, with and without the sheath, is not included in the results.

A further shortcoming with sheaths is that they cannot be used with rigid scopes. Rigid scopes are not used as frequently as flexible pharyngo-laryngoscopes in our department but are present in most otolaryngology departments and require disinfection to the same standard as flexible pharyngo-laryngoscopes. A rational solution would be to use a disinfection method that could be used with both rigid and flexible endoscopes to prevent the expensive duplication of systems.

Particular concern in the past has been raised about endoscopes with side-channels, due to the difficulty with disinfecting the lumen of the side channel.<sup>11</sup> However, flexible pharyngo-laryngoscopes do not utilise an operating sideport and can therefore be adequately disinfected using chemical means.

Our department opted to disinfect our flexible pharyngo-laryngoscopes and rigid nasendoscopes using Tristel™ ClO<sub>2</sub> wipes. Chlorine dioxide is a powerful oxidising agent which has been found to be an effective disinfecting agent.<sup>12,13</sup> The cost has been calculated to be £3.41 per procedure (Table 3). An advantage of using the Tristel™ ClO<sub>2</sub> wipes is the relatively short time taken in a busy outpatient clinic to clean the flexible pharyngo-laryngoscopes and rigid nasendoscopes; two minutes compared with 20 minutes with the Automated Endoscope Reprocessor (Table 3).

No flexible pharyngo-laryngoscopes have been damaged since the introduction of the ClO<sub>2</sub> wipes. Therefore, the total monthly cost of using ClO<sub>2</sub> wipes over the six months examined is on average £863 (£3.41 x 253), resulting in a monthly saving of £3145 over sheath usage.

## CONCLUSIONS

We have found Tristel™ ClO<sub>2</sub> wipes to be a satisfactory alternative means of flexible pharyngo-laryngoscope and rigid nasendoscope disinfection. Apart from possible time constraints, there are no advantages of sheath use over our current method. Flexible pharyngo-laryngoscope users in the department prefer use of the scope without the sheath and it is a cost-effective alternative. Therefore, we feel that when cost is taken into account, it is more appropriate to use the ClO<sub>2</sub> wipes instead.

Copyright 11 October 2005

## REFERENCES

1. Rutala WA, Weber DJ. New Disinfection and Sterilisation Methods. *Emerg Infect Dis* 2001;7(2): 348-53.
2. Decontamination of endoscopes. MDA DB2002(05) July 2002.
3. Ballantyne B, Jordan SL. Toxicological, medical and industrial hygiene aspects of glutaraldehyde with particular reference to its biocidal use in cold sterilisation procedures. *J Appl Toxicol* 2001;21(2):131-51.
4. Di Stefano F, Siriruttanapruk S, McCoach JS, Burge PS. Occupational asthma due to glutaraldehyde. *Monaldi Arch Chest Dis* 1998; 53(1):50-55.
5. Ong TH, Tan KL, Lee HS, Eng P. A case report of occupational asthma due to glutaraldehyde exposure. *Ann Acad Med Singapore* 2004;33(2):275-78.
6. Silberman HD, Hampel A, Kominsky AH. New technique for the sterile introduction of flexible nasopharyngolaryngoscope. *Ann Otol Rhinol Laryngol* 1993;102(9):687-89.
7. Baker KH, Chaput MP, Clavet CR, Varney GW, To TM, Lytle CD. Evaluation of endoscope sheaths as viral barriers. *Laryngoscope* 1999; 109(4):636-39.
8. Dumortier J, Napoleon B, Hedelius F, Pelletier PE, Leprince E, Pujol B *et al*. Unsedated transnasal EGD in daily practice: results with 1100 consecutive patients. *Gastrointest Endosc* 2003;57(2):198-204.
9. Sato K, Nakashima T. Office-based foreign-body management using videoendoscope. *Am J Otolaryngol* 2004;25(3):167-72.
10. Winter SC, Thirwell A, Jervis P. Flexible nasendoscope with a disposable-sheath system versus standard nasendoscopy: a prospective, randomised trial. *Clin Otolaryngol* 2002;27(2): 81-83.
11. Ishino Y, Ido K, Koizumi H, Sugano K. Pitfalls in endoscope reprocessing: brushing of air and water channels is mandatory for high-level disinfection. *Gastrointest Endosc* 2001;53(2): 165-68.
12. Cleaning and Disinfection of equipment for gastrointestinal endoscopy. Report of a Working Party of the British Society of Gastroenterology Endoscopy Committee. *Gut* 1998;42(4): 585-93.
13. Ayliffe G. Minimal Access Therapy Decontamination Working Group. Decontamination of minimally invasive surgical endoscopes and accessories. *J Hosp Infect* 2000;45(4):263-77.