

Environmental sustainability guidance: Flexible nasoendoscopy

Version 1: November 2024

- **We recommend only using reusable flexible nasoendoscopes**
- **We do not recommend routine use of local anaesthetic spray**
- **We do not recommend routine use of anti-fog**
- **We do not recommend routine use of lubricant gels**
- **Nasoendoscopy can be safely performed without gloves**
- **Ultraviolet-C light is the preferred method for decontamination of flexible nasoendoscopes**

The importance of environmentally sustainable practice in healthcare is increasingly recognised, with the UK General Medical Council advising doctors to “Choose sustainable solutions when you’re able to, provided these don’t compromise care standards”¹

Flexible nasoendoscopy is a frequently used diagnostic tool in outpatient and emergency settings, with the average ENT consultant performing 700-1000 nasoendoscopies per year². Nasoendoscopy has potential to generate waste from use of disposable devices, personal protective equipment, supplementary items and from the decontamination process. In a survey at the 2024 ENT UK Spring Meeting, 36% of ENT UK members stated they use single-use nasoendoscopes as part of their practice.

Here we review evidence and provide recommendations on safety and environmental impact of practice (focused on carbon dioxide emissions and waste generation).

Reusable versus single-use flexible nasendoscopes

Compared to single use, reusable nasoendoscopes are more environmentally friendly and cost effective in the long term.^{3,4} A study of cystoscopes (of similar size and composition to nasoendoscopes) found that manufacture of a single use scope generates 1.37kg of CO₂, whilst for a reusable scope this is 6.55kg of CO₂. The use of an Endoscope Washer Disinfector for decontamination generates at least 0.18 kg of CO₂ per cycle.⁵ Assuming similar packaging and transport, and using these figures, a reusable nasoendoscope outperforms single use nasoendoscopes for carbon footprint after 6 uses. Single use nasoendoscopes are typically disposed of in clinical waste, and if incinerated would result in further CO₂ generation of 1.1kg per 1kg of waste.⁶

On the basis of a typical ENT consultant performing 700-1000 endoscope procedures per year, the estimated overall CO₂ reduction for an ENT surgeon from using reusable rather than single use nasoendoscopes is 1082-1576kg of CO₂ (manufacture and disposal combined).

Arguments for using a single-use nasoendoscope often revolve around ease of use, particularly for transportation to emergencies and remote locations, such as a hospital without on-site ENT equipment. However, the Tristel method of decontamination is small and lightweight, enabling portable decontamination of reusable endoscopes, and should be preferred wherever possible (ensuring manufacturer instructions for the Tristel system are followed). Use of disposable nasoendoscopes in elective settings is difficult to justify.

Use of co-phenylcaine spray, lubricants and anti-fog

Use of local anaesthetic spray is often advised to those learning to undertake nasoendoscopy and also recommended in some textbooks⁷. However, evidence suggests that it has no effect on discomfort from such a procedure, whether used alone or in combination with a vasoconstrictor^{8,9,10,11}. Local anaesthetic sprays also create stinging¹² and an unpleasant taste, and generate waste from the spray bottle and its packaging¹⁰.

For extended examinations with a nasoendoscope, such as a Functional Endoscopic Evaluation of Swallow (FEES) there is some evidence that pain and discomfort are reduced by local anaesthetic^{13,14}, and so may be a consideration, whilst acknowledging the potential of the anaesthetic to affect the swallowing mechanism being observed.

Use of local anaesthesia has also been evaluated in children undergoing nasoendoscopy, with one study showing no difference in pain and anxiety scores between those given nasal decongestant with and without lidocaine¹⁵. A randomized trial investigating co-phenylcaine spray vs placebo prior to nasogastric tube insertion in young children showed no difference in distress scores¹⁶. As nasendoscopes of finer diameter have become engineered, the argument for local anaesthesia or decongestant has become less compelling. Clinicians should make their own judgment on a case-by-case basis.

In the 2024 survey, 79% of ENT surgeons used lubricant gel when performing nasoendoscopy. Lubricating gel does not reduce discomfort or pain and gives an inferior image quality compared to using water as a lubricant.^{9,10,17,18} We recommend the use of tap water (in a cup) instead of lubricant gel.

There is no evidence to support requirement for anti-fog or alcohol prior to performing nasoendoscopy, and if needed, in our experience the patients' own saliva is a good anti-fog agent.

Personal Protective Equipment

Hand hygiene during nasoendoscopy is important as an estimated 20% of hospital acquired infections are due to healthcare professional contact with mucosal surfaces (direct or indirect)¹⁹. In the 2024 survey, 67% of ENT UK members report using gloves when they perform nasoendoscopy.

Non-sterile gloves carry a similar microbial load to appropriately washed hands, and do not reduce risk of transmission of infection, with one study showing contamination of hands in ungloved encounters to be lower (15%) than in gloved encounters (20%),^{20,21}. Use of non-sterile gloves is also associated with poor hand hygiene (increasing risk of cross-contamination) and contact dermatitis^{22,23}. During nasoendoscopy, the clinician's hand is in contact with the decontaminated scope and not the inside of the patient's nose, and so handwashing or hand sanitiser prior to and after undertaking nasoendoscopy is sufficient to prevent infection transmission. Gloves are only required when there will be direct contact with blood, other body fluids, non-intact skin, or mucous membranes. There is

no indication to wear an apron, as aprons are only designed to protect against contact with body fluids.

For staff responsible for handling and cleaning nasoendoscopes, a clean (decontaminated) nasendoscope can be handled with clean hands, and gloves are not required. For handling the distal end of a used (contaminated) nasoendoscope, or handling any chemicals used for cleaning, gloves are an appropriate form of protection.

Decontamination of (non-lumen) flexible nasendoscopes

A flexible nasoendoscope is classed as a 'semi critical' device in contact with mucous membranes, and therefore requires, as a minimum, high level disinfection²⁴. Current methods for decontamination include the endoscope washer disinfectant (also used for gastrointestinal and other channeled endoscopes), the Tristel wipe system, and Ultraviolet-C (UV-C) light.

The Endoscope Washer Disinfectant (EWD) is the traditional approach to decontamination, but consumes time (minimum of 22 mins, up to 45minutes²⁵), large amounts of water (100-136 litres per cycle²⁶), chemicals, and energy (0.62-6.13 kWh per cycle, generating 0.18-0.59 kg CO₂ per endoscope)^{27,25}. This would result in 126-590kg of CO₂ release for each consultant using EWD's as their decontamination method for nasoendoscopy.

In our 2024 survey, 50% of ENT UK members used Tristel wipes for decontamination, which is as effective as an Endoscope Washer Disinfectant if performed in accordance with manufacturer's instructions.²⁸ The wipes are not biodegradable and must be disposed of in clinical waste, and the sachets that contain them are a laminate containing plastic making these unsuitable for recycling²⁹. The total weight of wipes and their packaging is 45g, which translates to 35-45kg of clinical waste per year for an ENT consultant using Tristel wipes as their preferred method of decontamination. If incinerated this would represent 34.65-49.5kg of CO₂ generation.

UV-C light disinfection is a modern approach, which incorporates a manual pre-clean using water and a microfibre cloth to remove debris, followed by a 60 second decontamination cycle with UV-C light. UV-C light decontamination is as effective as the Endoscope Washer Disinfectant,^{30,31} with no statistical difference in the number of colony forming units (CFUs) on nasoendoscopes.³⁰ UV-C light appears to be the most cost-effective method for high volume reprocessing compared to the Tristel wipes system³² or other chemical disinfection protocols,³³ and generates less waste, and uses only 0.01kWh of electricity per cycle³⁴ (0.0029 kg CO₂³⁵): 60-600 times lower than an endoscope washer disinfectant. The manual pre-cleaning uses a microfibre wipe which weighs approximately 4g, and is disposed into clinical waste. Therefore, each ENT consultant using UV-C light decontamination generates 2.8-4kg of clinical waste per year, which if incinerated generates 3.1-4.4kg of CO₂.

Endoscope sheaths

Endoscope sheaths are a disposable cover for the distal part of a nasoendoscope, but do not cover the hand controls, and so risk cross contamination. If used, additional full decontamination of the nasoendoscope is recommended³⁶. Sheaths can also reduce image quality, or damage endoscopes during application and removal. For these reasons, we do not recommend use of endoscope sheaths.

Image recording

Most modern nasoendoscopes allow for image recording, which may be particularly helpful when procedures are undertaken by less experienced doctors or allied health care practitioners. This enables images or videos to be reviewed by more senior members of the team, avoiding need for a second nasoendoscopy procedure, which would consume further resources as well as causing potential patient discomfort. Images should therefore be recorded where clinically indicated.

Summary

From the data available, the most environmentally sustainable way to perform nasoendoscopy is with a reusable nasoendoscope decontaminated with UV-C light. The second choice is to use Tristel wipes, and the third the endoscope washer disinfectant. Single use nasoendoscopes are the least environmentally friendly option, with little argument to support their use. Supplementary items such as local anaesthetic spray, lubricant gel, “anti-fog” preparations, gloves and aprons are unnecessary, and their use should be restricted to only exceptional circumstances.

References

1. GMC website – professional standards learning materials. <https://www.gmc-uk.org/professional-standards/learning-materials/sustainability-questions-and-answers>, accessed 26/07/2024
2. Sethi RKV, Kozin ED, Remenschneider AK, Lee DJ, Gray ST, Shrimel MG, et al. Subspecialty emergency room as alternative model for otolaryngologic care: implications for emergency health care delivery. *Am J Otolaryngol* 2014;35:758–65.
3. J Ellis et al A cost comparison between reusable and flexible and disposable laryngoscopes. *American Journal of Otolaryngology*. Apr 2022 (2) 43
4. L Jegatheeswaran et al. Disposable versus reusable fibre-optic nasendoscopes: a national survey of UK ENT surgical trainees and a single-centre cost-analysis. *J of Laryngol & Otol* 2023 August; 137(8): 866-872
5. Kemble JP, Winoker JS, Patel SH, Su ZT, Matlaga BR, Potretzke AM, Koo K. Environmental impact of single-use and reusable flexible cystoscopes. *BJU Int*. 2023 May;131(5):617-622. doi: 10.1111/bju.15949. Epub 2023 Jan 2. PMID: 36515438.
6. Ji A, Guan J, Zhang S, Ma X, Jing S, Yan G, Liu Y, Li H, Zhao H. Environmental and economic assessments of industry-level medical waste disposal technologies - A case study of ten Chinese megacities. *Waste Manag*. 2024 Feb 15;174:203-217. doi: 10.1016/j.wasman.2023.11.036. Epub 2023 Dec 6. PMID: 38061188.
7. Corbridge, Rogan, and Nicholas Steventon, *Oxford Handbook of ENT and Head and Neck Surgery*, 3 edn, Oxford Medical Handbooks (Oxford, 2019; Oxford Academic, 1 Nov. 2019), doi: 10.1093/med/9780198725312.001.0001
8. Neil K Chadha et al. Intranasal topical local anaesthetic and decongestant for flexible nasendoscopy in children: a randomized double-blind, placebo-controlled trial. *JAMA Otolaryngol Head Neck Surg*. 2013 Dec 139(12):1301-5
9. P C Nankivell et al. Nasal and instrument preparation prior to rigid and flexible nasendoscopy: a systematic review. *J Laryngol Otol*. 2008 Oct;122(10):1024-8
10. C Georgalas et al. Cophenylcaine spray vs. placebo in flexible nasendoscopy: a prospective double blind randomized controlled. *Int J Clin, Pract*. 2005 Feb;59(2):130-3
11. A E Conlin, L Maclean. Systematic review and meta-analysis assessing the effectiveness if local anaesthetic, vasoconstrictive, and lubricating agents in the flexible fibreoptic nasolaryngoscopy. *J Otolaryngol Head Neck Surg*. 2008 Apr; 37(2):240-9
12. Joy AK, Philip A, Mathews SS, Albert RRA. Transnasal Flexible Laryngoscopy Using Different Topical Preparations and Methods of Application-A Randomized Study. *J Voice*. 2022 Nov;36(6):847-852. doi: 10.1016/j.jvoice.2020.10.009. Epub 2020 Oct 20. PMID: 33092947.
13. Fife TA, Butler SG, Langmore SE, Lester S, Wright SC Jr, Kemp S, Grace-Martin K, Lintzenich CR. Use of topical nasal anesthesia during flexible endoscopic evaluation of swallowing in dysphagic patients. *Ann Otol Rhinol Laryngol*. 2015 Mar;124(3):206-11. doi: 10.1177/0003489414550153. Epub 2014 Sep 9. PMID: 25204714.
14. O'Dea MB, Langmore SE, Krisciunas GP, Walsh M, Zanchetti LL, Scheel R, McNally E, Kaneoka AS, Guarino AJ, Butler SG. Effect of Lidocaine on Swallowing During FEES in Patients With Dysphagia. *Ann Otol Rhinol Laryngol*. 2015 Jul;124(7):537-44. doi: 10.1177/0003489415570935. Epub 2015 Feb 9. PMID: 25667217.
15. Jonas NE, Visser MF, Oomen A, Albertyn R, van Dijk M, Prescott CA. Is topical local anaesthesia necessary when performing paediatric flexible nasendoscopy? A double-blind randomized controlled trial. *Int J Pediatr Otorhinolaryngol*. 2007 Nov;71(11):1687-92. doi: 10.1016/j.ijporl.2007.07.001. Epub 2007 Aug 27. PMID: 17720256.

16. Craig SS, Seith RW, Cheek JA, Wilson K, Egerton-Warburton D, Paul E, West A. Lidocaine and phenylephrine versus saline placebo nasal spray for the pain and distress of nasogastric tube insertion in young children and infants: a randomised, double-blind, controlled trial. *Lancet Child Adolesc Health*. 2019 Jun;3(6):391-397. doi: 10.1016/S2352-4642(19)30058-6. Epub 2019 Apr 15. PMID: 31000379.
17. D D Pothier et al. A randomized controlled trial: is water better better than a standard lubricant in nasendoscopy? *Clin Otolaryngol*. 2006 Apr; 31(2):134-7
18. D D Pothier et al. The use of lubrication in flexible fibreoptic nasendoscopy: a randomized controlled trial. *Clin Otolaryngol*. 2005 Aug; 30(4):353-6
19. King MF, López-García M, Atedoghu KP, Zhang N, Wilson AM, Weterings M, et al. Bacterial transfer to fingertips during sequential surface contacts with and without gloves. *Indoor Air*. 2020;30(5):993–1004
20. Paul G, Bobic R, Dawud J, Ertelt K, Fluhr M, Harms G, Jovanovic J, Klink T, Loh U, Pollitt A, Schäfer E, Schöneck B, Synowzik I, Sethi S, Trautmann M. Bacterial contamination of nonsterile gloves versus hands after hand hygiene. *Am J Infect Control*. 2021 Nov;49(11):1392-1394. doi: 10.1016/j.ajic.2021.04.002. Epub 2021 Apr 18. PMID: 33882280.
21. Bingham J, Abell G, Kienast L, Lerner L, Matuschek B, Mullins W, et al. Health care worker hand contamination at critical moments in outpatient care settings. *Am J Infect Control*. 2016;44(11):1198–202.
22. UK Department of Health and Social Care. Personal Protective Equipment (PPE) Strategy: Stabilise and Build Resilience. <https://www.gov.uk/government/publications/personal-protective-equipment-ppe-strategy-stabilise-and-build-resilience/personal-protective-equipment-ppe-strategy-stabilise-and-build-resilience>. Accessed 23/03/2024
23. Fuller C, Savage J, Besser S, Hayward A, Cookson B, Cooper B, et al. "The dirty hand in the latex glove": a study of hand hygiene compliance when gloves are worn. *Infect Control Hosp Epidemiol*. 2011;32(12):1194–9.
24. N J Rowan et al. A review of Spaulding's classification system for effective cleaning disinfection and sterilization of reusable medical devices: Viewed through a modern-day lens that will inform and enable future sustainability. *Science of the total environment*. March 2023
25. Rizan C, Bhutta MF. Re: The Carbon Footprint of Single-Use Flexible Cystoscopes Compared with Reusable Cystoscopes: Methodological Flaws Led to the Erroneous Conclusion That Single-Use Is "Better". *J Endourol*. 2022 Nov;36(11):1466-1467. doi: 10.1089/end.2022.0482. Epub 2022 Aug 22. PMID: 35848502.
26. Sebastian S, Dhar A, Baddeley R, Donnelly L, Haddock R, Arasaradnam R, Coulter A, Disney BR, Griffiths H, Healey C, Hillson R, Steinbach I, Marshall S, Rajendran A, Rochford A, Thomas-Gibson S, Siddhi S, Stableforth W, Wesley E, Brett B, Morris AJ, Douds A, Coleman MG, Veitch AM, Hayee B. Green endoscopy: British Society of Gastroenterology (BSG), Joint Accreditation Group (JAG) and Centre for Sustainable Health (CSH) joint consensus on practical measures for environmental sustainability in endoscopy. *Gut*. 2023 Jan;72(1):12-26. doi: 10.1136/gutjnl-2022-328460. Epub 2022 Oct 13.
27. Reducing the environmental footprint of gastrointestinal endoscopy: European Society of Gastrointestinal endoscopy (ESGE) and European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA) Position Statement de Santiago Enrique Rodríguez et al. *Endoscopy* 2022; 54: 797–826
28. M Tofanelli, V Capriotti, C Saraniti, A V Marcuzzo, P Boscolo-Rizzo, G Tirelli, Disposable chlorine dioxide wipes for high-level disinfection in the ENT department: A systematic review. *American Journal of Otolaryngology*, 2020, Volume 41, Issue 3, 102415, 10.1016/j.amjoto.2020.102415.
29. Tristel manufacturer information obtained from Tristel UK

30. Y Halmans et al. UV-C light, the future of disinfection of flexible endoscopes without a working channel? Clin Otolaryngol. Sep 2023
31. S Rudhart et al. UV light-based reprocessing of flexible endoscopes without working channel in Oto-Rhino-Laryngology: an effective method? European Archives of Oto-Rhino-Laryngology March 2021
32. A Biadsee et al. Cost minimization analysis of the nasopharyngoscope reprocessing in the community practice. J Otolaryngol Head Neck Surg. 2023 Feb; 52 (1):8
33. U C Ezech et al. The effectiveness of ultraviolet Smart D60 in reducing contamination of flexible fiberoptic laryngoscope. The Laryngoscope. Dec 2023;133: 3512-3519
34. UV Smart D60 Brochure - [UK] - DOC-1615 REV 5 - 2023 UV Smart Technologies B.V. available on request via <https://www.uv-smart.com>
35. Rizan C, Bhutta MF. Re: The Carbon Footprint of Single-Use Flexible Cystoscopes Compared with Reusable Cystoscopes: Methodological Flaws Led to the Erroneous Conclusion That Single-Use Is "Better". J Endourol. 2022 Nov;36(11):1466-1467. doi: 10.1089/end.2022.0482. Epub 2022 Aug 22. PMID: 35848502.
36. Javed F, Sood S, Banfield G. Decontamination methods for flexible nasal endoscopes. Br J Nurs. 2014 Aug 12;23(15):850-2. doi: 10.12968/bjon.2014.23.15.850. PMID: 25119327.