Upper airway endoscopy: achieving a balanced service whilst minimising the conflict of sustainability

BY ANDREW C SWIFT AND MATTHEW E RYAN

Nasal endoscopes present a unique challenge in balancing sustainability and practicality. Both disposable and reusable scopes may have distinct roles in modern practice.

Flexible endoscopy of the upper aerodigestive tract is an essential technique that facilitates detailed assessment of the nose, pharynx and larynx. Technology has led to massive improvements, especially in endoscopic image quality. However, there is a significant cost element as well as decontamination and potential risk of cross-infection.

Several years have now passed since we had the scare of potential outbreaks of mad cow disease, Creutzfeldt–Jakob disease (CJD) and prions, when the focus was on decontamination issues. At that moment in time, most endoscopes were non-disposable fibreoptic nasendoscopes (Figure 1). Disposable endoscopes were expensive in the early years of their development and offered an inferior image quality. However, things have moved on and now we have disposable endoscopes with good-quality imaging and recording facilities (Figure 2). Technological advance also occurred in non-disposable endoscopes, with chip-tip endoscopes that enable greatly enhanced superior images (Figure 3) [1].

Decontamination of non-disposable endoscopes will always be of high priority, given risk of cross infection. The principles demand consistent, reliable and standardised decontamination processes and traceability of each endoscope and endoscopic procedure being entered into the patient records. The chlorine dioxide wipe system (Tristel™) is simple and effective for channel-free endoscopes but requires trained support staff within the clinic. Dedicated standardised endoscopic washers within a central decontamination unit are considered as the gold standard and essential for endoscopes with biopsy/suction channels, but there are practical issues. The decontamination processing is slow and may not be on site, which is highly relevant for specialist clinics with high

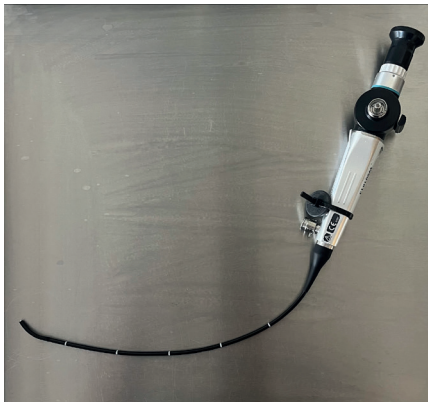

Figure 1: Reusable flexible nasendoscope

endoscope utilisation. Once endoscopes have been through the specialised washer cycle, they are returned to clinic, where they can be stored in a specific endoscope temperature-controlled cabinet that offers sterile, dry conditions with positive HEPA filtered air (Figure 4). A combination of both decontamination methods is an effective compromise for channel-free devices but still needs substantial numbers of endoscopes to facilitate timely clinical practice. A newly described innovative technique of decontamination utilises ultraviolet irradiation UV-C (UV Smart D60). UV-C exposure to flexible endoscopes has demonstrated both bactericidal and viricidal features and disrupts bacterial DNA and RNA [2]. However, concern has been raised that there is a potential risk of some bacteria surviving, either from bacterial mutation or (in certain models of UV cabinet) from shadow effects of the UV-C rays. The modality still requires initial washing, surface wiping and placement in a specialised cabinet for 60 seconds, thus claiming to significantly reduce endoscope turnaround time to several minutes [3].

Sustainability is an important domain within modern healthcare and society, focusing especially on disposable

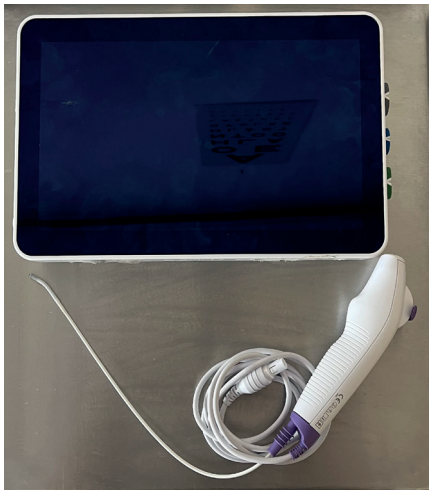

Figure 2: Disposable flexible nasendoscope and portable screen / control unit.

instruments and equipment. However, there should be a balanced debate that encompasses all aspects, including manufacture, the component parts and endoscope disposal. Disposing of endoscopes automatically raises concerns, but the argument is not that simple. Central decontamination uses significant amounts of water, chemicals, energy and may involve transport to off-site resources, but frequency of decontamination can be curtailed by combining this with the chlorine dioxide wipe system throughout the period of the clinic. However, the latter also relies on chemicals and introduces a component of cleaning time within the clinic. The newly described UV-C process is limited to channel-free endoscopes. Decontamination seems simple and can be performed within the clinic unit. Chemicals are avoided but manual cleaning is essential prior to UV-C exposure and plastics are required for the cabinets.

Transporting endoscopes to central decontamination units and handling is associated with the risk of damage, and

Figure 3: Chip-tip reusable endoscope.

image quality can decline rapidly. This must be factored into the increased number of endoscopes that are required for this system to work effectively in clinical practice. For the UV-C system to have any real impact, it must be accepted as being as effective as central decontamination. However, standardisation of the process is lacking, and, within the UK, the Department of Health would have to approve the process as being equivalent to central decontamination.

Non-disposable endoscopes generally provide high-quality images. The more conventional standard nasopharyngeal flexible endoscopes in widespread use are fibreoptic, most of which are channel-free, but some have port channels for suction and biopsy forceps. Chip-tip endoscopes have the camera in the tip of the endoscope and offer superior image quality but at a premium cost. Additionally, chip-tip endoscopes have facilitated both diagnostic and therapeutic possibilities in the outpatient department, including biopsy and vocal cord injection [4]. Non-disposable endoscopes also require stacking units that include a light source, a camera, a large viewing screen and electronic recording systems that ideally interact with electronic patient record programmes. To run an ENT clinic efficiently requires a stacking unit per clinic room and a stock of several flexible endoscopes that incurs substantial initial capital outlay.

Disposable endoscopes also offer good-quality clear images that are suitable for diagnostic purposes. The electronic display/control box includes the light source and touch screen. The device is small, light and portable, with an easy endoscope attachment, and offers good recording facilities. The display/control box is powered by the inbuilt battery that needs to be charged to avoid carrying a power source to remote sites.

Portable endoscope systems were always expensive, but prices have reduced over the years. They are single-use but, should repeated endoscopy be necessary on the same patient, the endoscope can be dedicated for repeated use. However, the financial outlay to stock a large busy unit

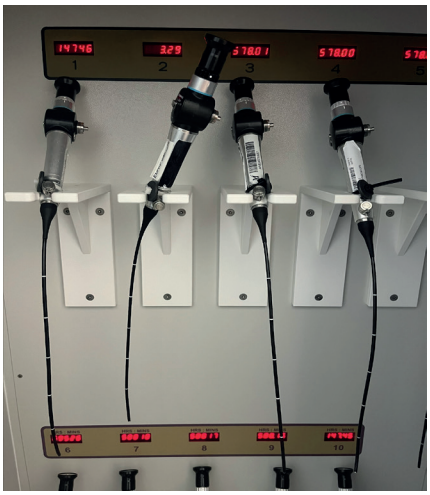

Figure 4: Sterile endoscope storage cabinet for reusable flexible nasendoscopes.

may still be considerable. Consideration needs to be given to fluctuations in demand that may lead to disposable endoscopes being unavailable, storage issues and potential wastage if an expiratory date is exceeded.

The ease of use and portability of disposable endoscopes makes them highly popular with trainee ENT surgeons and advantageous for emergency use. They are particularly useful for patient reviews on non-ENT wards or intensive care units, small off-site ENT clinics or GP surgeries. The recorded images can be securely transmitted to senior colleagues for review, which is advantageous for clinical advice in emergency situations. Disposable endoscopes with working access channels and suction are also available, thus facilitating interactive endoscopic procedures such as laryngo-pharyngeal biopsies and balloon dilatation. Image modulation with 'Slo-mo' and 'Freeze-frame' is also available and may be advantageous in laryngeal disorders.

One factor that is raised to justify the use of disposable endoscopes is that the risk of cross-contamination is eradicated. However, this relies on the fear factor that cross contamination leads to infection with non-disposable endoscopes, yet this is extremely unlikely to occur.

A comparison of disposable versus non-disposable endoscopes in an ENT unit, based on an evaluation of user-feedback and cost analysis, was published in 2020 [5]. This was a relatively small cohort of returned resident surveys but showed a significant result in favour of disposable endoscopes for convenience and setup. Manoeuvrability and ergonomics were similar, but image quality was better for reusable endoscopes. Surprisingly, the total cost analysis per endoscope use was substantially greater for non-disposable endoscopes. Why reusable endoscopes were more expensive is not clearly explained, as prolonged and frequent use should decrease the actual cost per case. Further research that avoids bias is essential to understand this dilemma.

A balanced combination of the disposable and non-disposable flexible endoscopic systems offers several advantages and should reduce the incidence of patient care being compromised due to lack of endoscope availability. Non-disposable flexible endoscopes may be best utilised in main ENT clinics, with disposable endoscopes being used in all other situations.

It is understandable why the mention of disposable endoscopes will trigger antibodies in some colleagues, yet others wish to abandon long-lasting non-disposable endoscopes. However, both endoscopic systems will complement each other if used in a sensible balanced way in UK clinical practice.

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Declaration of competing interests: None declared.