Approaches for greening endoscopy and reducing waste

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Climate change represents a global crisis and a major menace to the future of the environment and humanity. Notably, the healthcare sector is responsible for 4.4% of the global carbon footprint.[1] Nonetheless, direct and indirect emissions from healthcare facilities contribute far less compared with healthcare supply chains (71%).[1] Gastrointestinal (GI) endoscopy is ranked third among the highest medical waste producers within a hospital.[2] This is related to the fact that endoscopy is a resource-intensive activity that requires various single-use, plastic predominant consumables.[3] However, the environmental impact of GI endoscopy is yet to be adequately addressed, as we currently still face a lack of interest from most stakeholders. The fact that endoscopy has a significant impact on the global carbon footprint leads to the question: What can we do to turn GI endoscopy into a more sustainable practice?

PRACTICAL STEPS TO REDUCE ENDOSCOPY-RELATED WASTE AND EMISSIONS

With the increasing use of GI endoscopy and a growing number of techniques available, circular economy and awareness of the 5R sustainability principles (Reduce, Reuse, Recycle, Rethink, Research) become paramount to reduce inadequate purchase and use of resources in GI endoscopy.[4]

Sustainable endoscopy strategies start outside the endoscopy room. Implementation of green-preferable purchasing strategies, that is, buying products with minimal environmental impact, including consumables that are made from recycled materials, sustainably sourced and/or recyclable at end of use, should be favoured.[3] Also, appropriateness should be at the core of endoscopy units as this is probably the most effective measure to mitigate greenhouse gas emissions related to GI endoscopy.[3] Assuring quality vetting procedures and following guideline recommendations are key to lessen the burden associated with inadequate endoscopic procedures.[3] Also, non-endoscopic diagnostic alternatives (eg, faecal calprotectin and faecal immunochemical test) may help us avoid unnecessary endoscopic procedures.[3 5] Nevertheless, some of these strategies still lack validation and comparative life cycle assessment studies between endoscopy and these less invasive alternatives.

Structural remodelling of endoscopy units should be aimed at reducing the environmental impact of GI endoscopy, as energy production and distribution are responsible for 40% of carbon emissions in the healthcare sector.[1 3] Energy-reducing strategies, such as the replacement of inefficient lighting, prioritisation of renewable energy sources, establishment of power-down initiatives and reduction of excessive use of heating, air conditioning and ventilation, are simple, yet effective carbon offsetting strategies.[3 6]

Rational use of accessories and adequate technique selection allows reduced use of endoscopic accessories. For example, combining both upper and lower GI endoscopies, whenever appropriate, will allow the reduction of time, personal protective equipment, single-use consumables and water and energy consumption and will grant the possibility of reusing accessories between procedures. Whenever possible, less resource-intensive techniques should be favoured, provided efficacy and safety are maintained.[3 6] This should be balanced with the 'getting it right first time' (GIRFT) principle that aims to reduce unnecessarily repeated procedures if a definitive outcome is not attained with the first intervention.[7] Tissue sampling should also be under the purview of the GIRFT principle, as inadequate biopsy processing entails an added energy requirement, generates hazardous waste and is responsible for a significant carbon footprint.[3 6 8] For example, this burden can be reduced by avoiding unnecessary routine 'confirmatory' biopsies and by considering *diagnose-and-leave* and *resect and discard* strategies for diminutive polyps.

Although waste represents a small proportion of the endoscopy carbon footprint, strategies to reduce, reuse and recycle endoscopic waste may be easily implemented in endoscopy units. However, most endoscopy staff are still unaware of how to adequately dispose of waste and most units are not equipped with recycling bins.[9] Nevertheless, whenever performed correctly, adequate waste handling and segregation may have a significant impact on the waste carbon footprint and waste processing expenses generated by endoscopy.[10]

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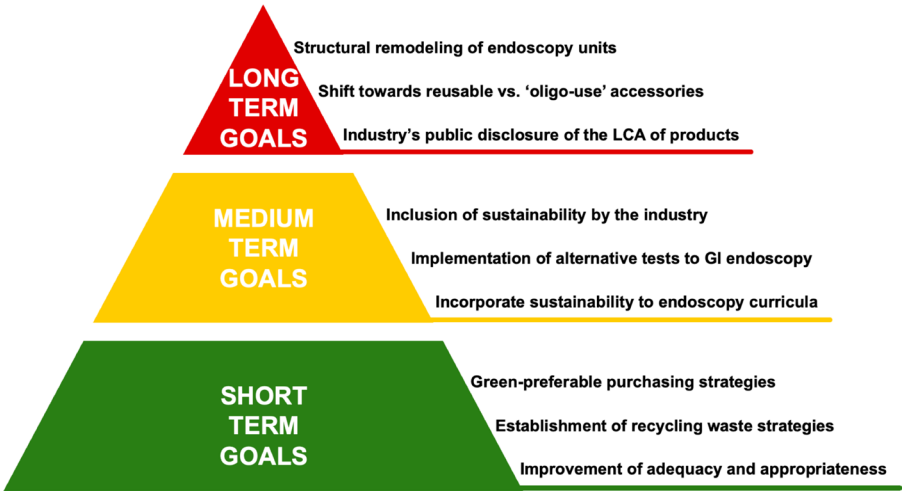

Figure 1 Steps towards sustainable endoscopy. GI, gastrointestinal; LCA, life cycle assessment.

For all of this to be achieved in the daily routine, awareness of the staff is essential. To a certain level, this can be improved by nominating a green endoscopy champion (ie, a motivated and resilient person, responsible for staff training and for leading interventions).[11] However, global efforts should be made to make sustainability part of the standing agenda for every endoscopy unit, as the progressive implementation of these small steps across the globe will significantly influence the environmental impact of endoscopy (figure 1).

SINGLE USE OR REUSABLE?

Although the carbon footprint of GI endoscopy is composed of a multitude of factors, the use of equipment and accessories constitutes a significant component worth considering separately.

For many years, there has been a considerable push towards the preference of single-use items not only from industry but also from endoscopists. Guidelines have been prepared and revised aiming at zero contamination, somehow counterintuitive in the world of GI endoscopy. In addition to this pressure for single use, recent guidelines have urged an ever more comprehensive process of endoscope reprocessing.[12] The goal of this is an optimised situation for the individual patient, without exposure to any untoward microorganisms, particularly through cross-contamination. However, until recently, this drive towards sterility has been unopposed, creating an ever more concerning situation for another patient, the planet Earth.

For endoscopy personnel, the impact of current practice is very visual, with the daily collection of used accessories and packaging material (figure 2). Accordingly, the most obvious measure to take is to improve waste sorting, as discussed above. In addition, industry must be challenged to improve packaging and other components of their products, for example, multilingual instructions for use of plastic stents, which could be replaced with a quick-response (QR) code. Regulations mandated by the authorities could be challenged by users and industry together to improve the situation further.

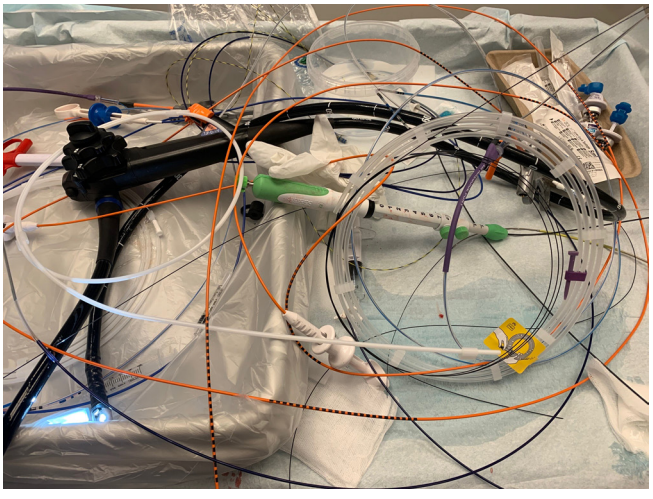

Figure 2 Waste from a typical combined endoscopic ultrasound and endoscopic retrograde cholangiopancreatography procedure, not including packaging.

Improved utilisation of single-use items is also possible, for example, to carefully assess and anticipate what will be required for each procedure, be certain that a device will be used prior to its unwrapping and save haemostatic powder kit for possible rebleeding in the same patient.

However, this does not affect the much bigger footprint of materials, production and transportation, which must be addressed by the production industry. Still, a push for this needs to come, at least in part, from the customer side. By including sustainability requirements in tender processes along with price, performance and service, the industry will need to take this element into consideration in every component of their production process.

Time has come to reconsider the purported benefits of single-use accessories.

Most of our current single-use accessories were previously reusable and sterilised or otherwise reprocessed. Thus, a return to this situation is conceivable and technically feasible, at least for a number of our endoscopic accessories.[3] However, despite the obvious upside in terms of circular economy, such a reversal does mandate careful consideration of the other consequences, including reprocessing cost and time, manpower required and deterioration of function over time. Variants of reuse of single-use items are well known in many parts of the world, although not authorised. It may be that models of 'oligo use' can be learnt from some of this experience, though under controlled conditions.

Single-use endoscopes have been available for many years in other specialties, such as pulmonology, urology and intensive care. Recently, outbreaks of serious infections by multiresistant microbes in numerous units connected with inappropriately disinfected duodenoscopes led to the rapid introduction of single-use duodenoscopes.[13] Initial experiences indicate that such instruments are functional, offering comparable usability to reusable instruments.[14] Financially, there are various calculations available, but the discussion has highlighted the non-trivial monetary as well as the environmental costs of the current reprocessing

requirements for reusable duodenoscopes. Cost comparisons that include the few but potentially devastating infections caused by resistant microorganisms indicate that the added cost of single-use instruments can be justified, but such calculations include modelling with a lot of uncertainty involved.[15] At the moment, the carbon footprint of production and transportation of single-use endoscopes is still the main concern to be addressed.

Presently, the jury is still out concerning the appropriate role of single-use GI endoscopes. The introduction of these instruments has however brought attention to the need for improvement of the current situation, and single-use endoscopes vendors surely have a strong focus on the matter, including development of more sustainable production chains, climate-friendly raw material and recycling-friendly instrument design. Thus, regardless of their final role, the introduction of this technology has resulted in a welcome renewed focal point on sustainability.

In conclusion, the carbon footprint of gastroenterology is considerably affected by the impact of GI endoscopy. Improving the situation is surely possible but mandates a significant joint effort by endoscopists and industry together. The role of single-use items has been highlighted by the introduction of single-use endoscopes, and a revised attitude to the relative risks to the patient versus the planet may be in order.

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