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Through the green lens: Sustainable solutions in endoscopy

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Abstract

The global threat of climate change is becoming ever more evident over recent years with natural disasters becoming the order of the day. Reducing healthcare's carbon footprint has never been so crucial. Endoscopy is regarded as a major contributor to healthcare waste and is considered to be the third highest waste generator in hospitals. Main factors contributing to this high waste generation include the need for sterility and decontamination and the use of non-recyclable disposable items. As clinicians, we should have both vested interest and responsibility in ensuring the implementation of measures aimed at mitigating the negative effects our endoscopic practice can have on the environment, whilst ensuring patient care remains a priority. Recent guidelines, backed by a joint European consensus, aim to underline practical approaches to a more sustainable endoscopy unit. In this editorial, we highlight how these employ the three Rs; Reduce, Reuse, Recycle - as core principles in the fight to tackle waste management in this area of our practice.

Key words *Green; climate; endoscopy*

INTRODUCTION

In a world increasingly marked by the ominous shadows of climate change, the call for sustainable practices resonates louder than ever. Recent international news has been dominated by natural disasters, including forest fires across the globe and devastating floods in Italy, Spain and Greece, leading to numerous lives lost and infrastructural strains. These events are stark reminders of our collective responsibility to combat climate change at all levels.

The healthcare sector accounts for around 4.4% of total greenhouse gas, with endoscopy being a chief contributor [1]. Thus, green endoscopy has been garnering interest as it presents many opportunities in decreasing the health care carbon footprint [1,2].

In this editorial, we delve into the significance of green endoscopy, not just as a medical innovation but as a symbol of our commitment to mitigating climate change. Figure 1 outlines how the three Rs - Reduce, Reuse, Recycle will be used as the backbone of this editorial to tackle the necessary changes that need to be adopted or researched further to help achieve a healthier future.

REDUCE

Embracing the principle of 'reduce' stands as a pivotal stride towards reducing our environmental footprint and fostering efficiency.

Clinical practice guidelines [CPGs] are the first line of defence against unnecessary referrals. They help streamline patient care by offering evidence-based guidelines which not only enhance patient outcomes, but also reduce the need for multiple endoscopy visits [e.g. over surveillance], minimising patient travel costs, and alleviating the strain on departmental resources [3]. For example, the latest Baveno VII guidelines highlight how CPGs can decrease the need for oesophagogastroduo-

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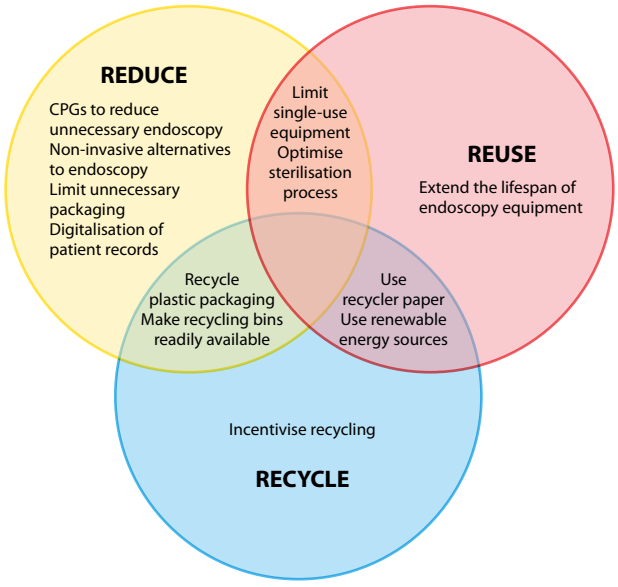

Figure 1. The Relationship between the 3 Rs in Sustainable Endoscopy.

denoscopy [OGD] [4]. Studies such as that carried out by Stefanescu et al. show how the use of non-invasive markers such as liver stiffness and platelet count can be used to assess portal hypertension in cirrhotic patients and predict the absence of oesophageal varices, avoiding so called "routine" OGDs [5].

Additionally, the use of non-invasive alternatives to endoscopy such as faecal calprotectin and intestinal bowel ultrasound as an accessory to the clinical picture minimises the need for colonoscopies [6]. Moreover, further future innovations such as the Cytosponge biomarker panel may aid in prioritising the surveillance of patients with Barrett's oesophagus, having the potential to significantly reduce the need for OGDs while improving early pre-cancerous detection [7].

When endoscopy is necessary, exercising prudence can minimise waste. The CO_2 generated for three biopsy pots has been estimated to be similar to that emitted during a two-mile drive, thus biopsies should only be taken when strictly necessary and guided by CPGs [8,9]. Advances in artificial intelligence [AI] may also reduce the need for biopsies, as has been shown in patients with Barrett's oesophagus [10]. In a pilot study by Hashimoto et al., the development of an artificial intelligence model showed promising results in its capacity to pick up on early oesophageal neoplasia in patients with Barret's oesophagus, potentially paving the way to more targeted use of biopsies [11].

In addition, to ensure efficient resource utilisation, discussions on which instruments and accessories are likely to be used prior to the procedures should be encouraged, with packaging only being opened once need is confirmed.

In patients who require sedation, careful administration of appropriate dosages is necessary to reduce waste. Furthermore, if Entonox is used for sedation, endoscopy units should make use of modern equipment which eliminates the nitrous oxide found in Entonox, thereby reducing the release of this greenhouse gas into the atmosphere [2].

The production and packaging of sterile water involves significant energy consumption. Therefore, efforts should be made to ensure that sterile water is only used when necessary. Employing smaller, recyclable containers for endoscope testing can also significantly reduce water usage.

In an attempt to prevent repeat endoscopy due to inadequate patient compliance, accessible services such as online instructional videos accessed through a QR (Quick Response) code can be invaluable [12]. These videos can provide clear guidance on bowel preparation. By enhancing patient education and support, one can reduce the chances of incomplete procedures and subsequent repeat endoscopies and their associated environmental impact whilst ultimately improving the patient experience. A digital shift may also reap its own benefits in the fight against excessive paper waste. Embracing digital technologies to store patient records and investigations facilitates seamless sharing of information between healthcare facilities, reducing paper waste, and eliminating the duplication of tests due to fragmented patient data [13].

To enhance sustainability at the endoscopy unit level, the adoption of energy-efficient lighting and motion sensors can effectively manage energy consumption. Additionally, all equipment, including computers and machines, should be powered off when not in use. Heating, ventilation, and air conditioning [HVAC] are primary energy consumers in healthcare facilities. Implementing smart HVAC practices, including turning off ventilation during non-occupancy periods, can dramatically reduce energy wastage. On a broader scale, promoting the adoption of renewable energy sources like solar panels is crucial, especially in Mediterranean regions, which receive abundant sunlight [1,2].

REUSE

In the fight for improved sustainability, the concept of "reuse" emerges as a potent catalyst for change.

In endoscopy, the advent of single-use scopes has been championed as a means to mitigate the risk of infectious transmission. However, a closer examination reveals a compelling case for reconsidering this approach in light of its significant environmental impact. Studies have shown that single-use scopes are associated with 24-47 times more CO_2 emissions than that of reusable scopes, with manufacturing accounting for over 90% of the greenhouse gas emission [14,15]. Restricting the use of these scopes to scenarios where there is a demonstrably high risk of infectious transmission, and where the standard decontamination process is not easily achievable, should be considered.

It is essential to also acknowledge that even the decontamination of reusable endoscopes for subsequent use comes at a cost, both in terms of resource consumption and energy expenditure. To address this, the decontamination process should be optimised to minimise water usage, reducing the overall energy consumption per cycle.

When it comes to PPEs, we should actively promote the availability and use of reusable options whenever feasible to curb waste generated. Safely re-using accessories or instruments used within the endoscopy suite should be further researched as this may curtail further environmental costs [16].

RECYCLE

Recycling plays a pivotal role in green endoscopy and this can be achieved not only by educating staff on waste separation but also by incentivising recycling.

Empowering endoscopy staff with a comprehensive understanding of waste management is the first step towards effective recycling. Through education and training, all members of the endoscopy team should be well-versed in differentiating between recyclable and non-recyclable materials. Recyclable items such as plastic used in the packaging of cannulas and endoscopic accessories should be properly segregated for responsible disposal. Recycling bins should be readily available and clearly labelled.

Motivating endoscopy units to embrace recycling can be incentivised through recognition and certification programs. For instance, endoscopy suites that consistently adhere to recycling practices could earn recognition such as "ACG-certified green suites" through the American College of Gastroenterology [ACG] [6]. This not only fosters a sense of achievement, but also promotes a culture of environmental responsibility within the healthcare community.

In cases where the use of paper is unavoidable, advocating for the utilisation of 100% recycled paper aligns with broader organisational sustainability goals.

GREEN HORIZONS - THE FUTURE OF SUSTAINABLE ENDOSCOPY

The quest for sustainability extends far beyond the confines of the endoscopy suite. It beckons us to reimagine the very landscape of healthcare, urging us to explore innovative strategies that not only minimise environmental impact but also enhance patient care.

The foundation of sustainability in endoscopy lies in the judicious reduction of unnecessary procedures. Embracing evidence-based guidelines and rigorous adherence to them ensures that each endoscopy is not just medically justified but also environmentally responsible. Implementing stricter triage protocols allows us to allocate endoscopic procedures to those who truly need them. Table 1 summarises some of the key sources of waste and how these can be tackled.

Assessing different aspects of the endoscopic procedure offers the possibility for further approaches to curtailing its environmental impact. The future necessitates the development and adoption of alternative pain relief methods that are less harmful to the environment.

Pivotal strategies in achieving such changes may involve the appointment of sustainability leaders within healthcare units. These individuals, often referred to as green or sustainability champions, can play a central role in driving sustainability initiatives forward. They may act as facilitators, ensuring that changes and sustainable practices are effectively communicated, implemented, and sustained within the units with an aim to establish a workplace culture that prioritises awareness of climate change and its mitigation strategies.

This approach not only enhances the dissemination of best practices but also fosters a focal point for the continuous improvement of sustainability efforts. Moreover, the Joint Advisory Group [JAG] in England now integrates sustainability into its accreditation process, while the inclusion of green champions on each unit is part of the Global Rating Scale [1]. This not only underscores the importance of sustainability within the organisational structure but also provides an added incentive to elevate sustainability practices within en-

Table 1. *Waste at the Endoscopy Unit: A Summary of Sources and Solutions.*

Problem/Source of Waste	Description	Solutions/Reduction Strategies
Excessive-Single Use Items and Failure to Recycle	Overuse of disposable materials such as gowns and caps. Irresponsible discarding of recyclable waste	Explore reusability of items e.g., endoscopes Train staff on judicious use of disposables and recycling Make recycling bins available
Energy Inefficient Equipment	Use of outdated or non-energy-efficient endoscopy equipment	Upgrade to energy-efficient equipment Implement power-saving settings when not in use e.g., energy-efficient lighting
Improper/wasteful Sterilisation Practices	Inadequate sterilisation can lead to equipment damage or need for more disposables. Beware excessive waste of water	Follow manufacturer's sterilisation guidelines Use sterile water judiciously
Excessive Paper Documentation	Reliance on paper-based record-keeping for patient data and procedures	Transition to electronic health records Encourage digital patient instructional videos and consent forms
Unnecessary Endoscopy	Performing unnecessary endoscopy generates unnecessary waste, as outlined above	Following CPGs to perform endoscopy only when indicated Use of non-invasive tests as an alternative to endoscopy where appropriate

doscopy units.

In conclusion, green endoscopy represents a pivotal shift towards eco-conscious healthcare practices, aiming to minimise waste, resource consumption, and emissions associated with endoscopic procedures. Its significance lies in limiting the environmental impact of healthcare, fostering sustainability, and ensuring that essential medical services align with the imperative of preserving our planet.

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