REVIEW

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Current status and trends of green endoscopy

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The increasing global emphasis on sustainability has extended its influence to the field of medicine, including endoscopy. Green endoscopy aims to minimize the environmental footprint of endoscopic practices while maintaining high standards of patient care. This review examines the current status of green endoscopy, focusing on its environmental impact, strategies for waste reduction, and adoption of sustainable practices. The key topics include the environmental challenges posed by single-use devices, the role of sterilization and recycling, and innovations in energy-efficient endoscopic equipment. Furthermore, we highlight policy recommendations and actionable strategies for healthcare systems to transition toward green practices. By integrating these approaches, the field of endoscopy can meaningfully contribute to global sustainability efforts without compromising clinical outcomes.

Keywords: Carbon footprint; Endoscopy; Environment and public health; Medical waste

INTRODUCTION

In recent years, healthcare has faced increasing pressure to address its environmental impact, and sustainability has become a critical concern. One area under scrutiny is endoscopy, a diagnostic and therapeutic tool central to gastroenterology. The concept of green endoscopy has emerged in response to growing concerns about the carbon footprint of healthcare, waste generation, and the increasing need for resource efficiency. International guidelines have emphasized strategies to make endoscopy more sustainable.[1,2] These include adopting energy-efficient technologies, improving reprocessing practices, and implementing waste-management systems to minimize the environmental impact while maintaining patient safety and clinical efficacy. This article explores the current state of green endoscopy, the historical background that has brought sustainability to the forefront of this field, and future trends aimed at balancing sustainability with clinical outcomes.

HISTORICAL BACKGROUND: THE RISE OF GREEN ENDOSCOPY

The conversation around green endoscopy has its roots in the broader context of global environmental awareness, which gained momentum in the late 20th century. Several key factors contributed to the rise of green endoscopy as a major issue.

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Global climate awareness (1990s–2000s)

The scientific consensus on climate change, as highlighted in the 1992 Earth Summit and the signing of the Kyoto Protocol in 1997, firmly placed environmental issues on the global agenda.[3,4] The healthcare sector, which is responsible for substantial greenhouse gas emissions, has begun to recognize its role in contributing to climate change. Reports such as the World Health Organization's climate and health assessments have further highlighted the connection between healthcare activities and environmental degradation.

Healthcare's environmental footprint (2000s–2010s)

In the early 2000s, studies revealed that the healthcare sector contributed to 4.4% of the world's total greenhouse gas emissions.[5] In particular, endoscopy units were identified as one of the highest waste-producing departments within hospitals, primarily due to the extensive use of single-use devices and energy-intensive reprocessing of reusable equipment.[6] In healthcare, endoscopy is a major contributor to the environmental footprint—generating around 3.09 kg of waste per bed-day.[7,8] High-throughput departments such as endoscopy units create multiple non-renewable waste streams, which are further compounded by a resource-heavy decontamination process. In Korea, more than 15 million gastrointestinal endoscopic procedures were performed in 2023, excluding those conducted independently by hospitals for health check-ups (Supplementary Material 1).[9,10] New approaches are urgently required to make endoscopic services more sustainable.[8,11] This recognition has prompted international organizations and medical societies to begin developing strategies to reduce the environmental impact of healthcare.[2,12,13]

Endoscope-related infection outbreaks (2010s)

A series of high-profile infection outbreaks linked to reusable duodenoscopes between 2010 and 2015 catalyzed a shift in endoscopic practices.[14-21] These incidents highlighted the difficulty in adequately cleaning and disinfecting endoscopes with complex designs, particularly those with intricate parts such as elevator mechanisms. In response, in April 2019, the United States Food and Drug Administration, recommended transitioning to innovative duodenoscope designs that include disposable components, such as disposable endcaps or fully disposable duodenoscopes. This has sparked a debate on balancing infection control with sustainability.[2,20,22-25]

Global policy movements toward sustainability (2015-present)

The Paris Agreement of 2015, signed by over 190 countries, set the goal of limiting global temperature rise to below 2 °C. This has marked a turning point for industries worldwide, including healthcare, in their commitment to reduce carbon emissions.[26,27] In response, healthcare systems have begun exploring ways to integrate sustainability into clinical practice, leading to the development of green endoscopy initiatives.[27,28] Major organizations such as the European Society of Gastrointestinal Endoscopy and the British Society of Gastroenterology have released guidelines and recommendations for reducing the environmental footprint of endoscopic practices.[2,12]

ENVIRONMENTAL IMPACT OF ENDOSCOPY

As previously mentioned, the environmental footprint of healthcare is increasingly under scrutiny, with endoscopy being identified as a significant contributor owing to its resource-intensive nature. Endoscopic procedures require substantial energy and materials for the production of single-use devices and reprocessing of reusable equipment, making them a notable source of carbon emissions. A single endoscopic procedure is estimated to generate approximately 28.4 kg of CO_2, reflecting the environmental costs of manufacturing, sterilization, and transportation.[5]

However, the awareness of green endoscopy remains low among healthcare professionals performing gastrointestinal endoscopy. A recent survey conducted in Korea revealed that only 16.3% of healthcare professionals were familiar with the concept of green endoscopy. This awareness gap, particularly among younger professionals and those working in larger hospitals, highlights the need for greater education and engagement in green practices in the field.[29]

Waste generation

Endoscopy produces considerable amounts of waste, much of which is non-recyclable. Single-use devices such as biopsy forceps, snares, and guidewires are essential for infection control and contribute significantly to the accumulation of non-renewable waste. High-throughput endoscopy units generate approximately 3.09 kg of waste per bed-day, including contaminated materials, non-recyclable plastics, and chemical disinfectants. Contamination risks often preclude recycling and exacerbate the environmental burden.[6,30,31]

Reprocessing of reusable devices

Reusable endoscopic equipment, while reducing waste in comparison with single-use devices, are associated with their own environmental challenges. Reprocessing of these devices requires large amounts of water, energy, and chemical disinfectants. Each cycle of cleaning, disinfecting, and sterilizing contributes to a substantial carbon footprint. For example, glutaraldehyde and peracetic acid, which are commonly used in high-level disinfection, not only pose risks to human health, but also have long-term environmental implications when improperly disposed.[12]

Energy consumption

The energy demands of endoscopic units extend beyond reprocessing. Powering endoscopic equipment, maintaining optimal ventilation systems, and operating sterilization units collectively increase electricity consumption. These energy-intensive processes are key contributors to the carbon footprint of healthcare facilities.[2,22]

Systemic challenges

The environmental impact of endoscopy is not limited to waste or energy use. The production and distribution of endoscopic equipment involves complex supply chains that generate additional emissions. Furthermore, the reliance on single-use plastics in device packaging increases the environmental burden, especially when these materials are not biodegradable or recyclable.[32]

By addressing these environmental challenges, healthcare systems can lay the groundwork for sustainable endoscopy practices. The subsequent sections explore the conflicts in green endoscopy, along with innovative solutions and trends that are paving the way for a greener future in endoscopy.

SINGLE-USE VS. REUSABLE ENDOSCOPES

Single-use duodenoscopes were introduced primarily in response to the infection-control challenges posed by reusable devices. Traditional reusable endoscopes, particularly duodenoscopes used in procedures such as endoscopic retrograde cholangiopancreatography, have complex designs with intricate parts, such as the elevator mechanism, making thorough cleaning and disinfection difficult. These difficulties led to several high-profile outbreaks of infection, prompting the introduction of single-use alternatives.[33,34]

Although single-use duodenoscopes effectively reduce the risk of cross-contamination and infection, they have substantial environmental trade-offs. As illustrated by Pioche et al.[35] in Figure 1A, single-use gastroscopes follow a linear lifecycle from raw material extraction to disposal after a single use, generating substantial non-recyclable medical waste and higher carbon emissions due to the production, transportation, and disposal processes. Studies have shown that the carbon footprint of single-use duodenoscopes can be up to 20 times greater than that of reusable endoscopes.[36] With the growing demand for infection control, balancing safety and sustainability has become a central issue in endoscopy.[2,37]

In contrast, reusable gastroscopes follow a circular lifecycle involving multiple stages, such as reprocessing, reuse, and repair. This approach significantly reduces waste per procedure but introduces other environmental challenges. The reprocessing cycles require substantial resources, including water, energy, and chemical disinfectants. Furthermore, repair processes require material resources and transportation, which contribute to the environmental footprint of reusable devices. However, as Figure 1B quantitatively demonstrates, reusable devices consume more water during reprocessing cycles and more energy resources during repair and maintenance activities. The reprocessing stages involve substantial use of water, energy, and chemical disinfectants, which contribute to their environmental impact.[38]

Recent innovations in reprocessing technologies have aimed to address these challenges. Automated systems that minimize the use of water and chemicals while maintaining high disinfection levels have been introduced. For example, closed-loop reprocessing systems reduce the consumption of cleaning agents and reduce environmental pollution. Advanced drying technologies also ensure that endoscopes are completely dry before reuse, thereby reducing the risk of bacterial growth between procedures. These innovations, coupled with efficient repair systems, can make reusable endoscopes a more environmentally sustainable option for high-volume endoscopy units.[39]

Despite these advancements, infection control remains a critical concern in the use of reusable devices. Proper reprocessing and repair are essential to ensure patient safety, and lapses in these processes can have severe consequences. In addition, repair processes require transportation and material resources, which further contribute to their environmental footprints. To balance these trade-offs, many healthcare providers are adopting hybrid models, where reusable endoscopes are used for low-

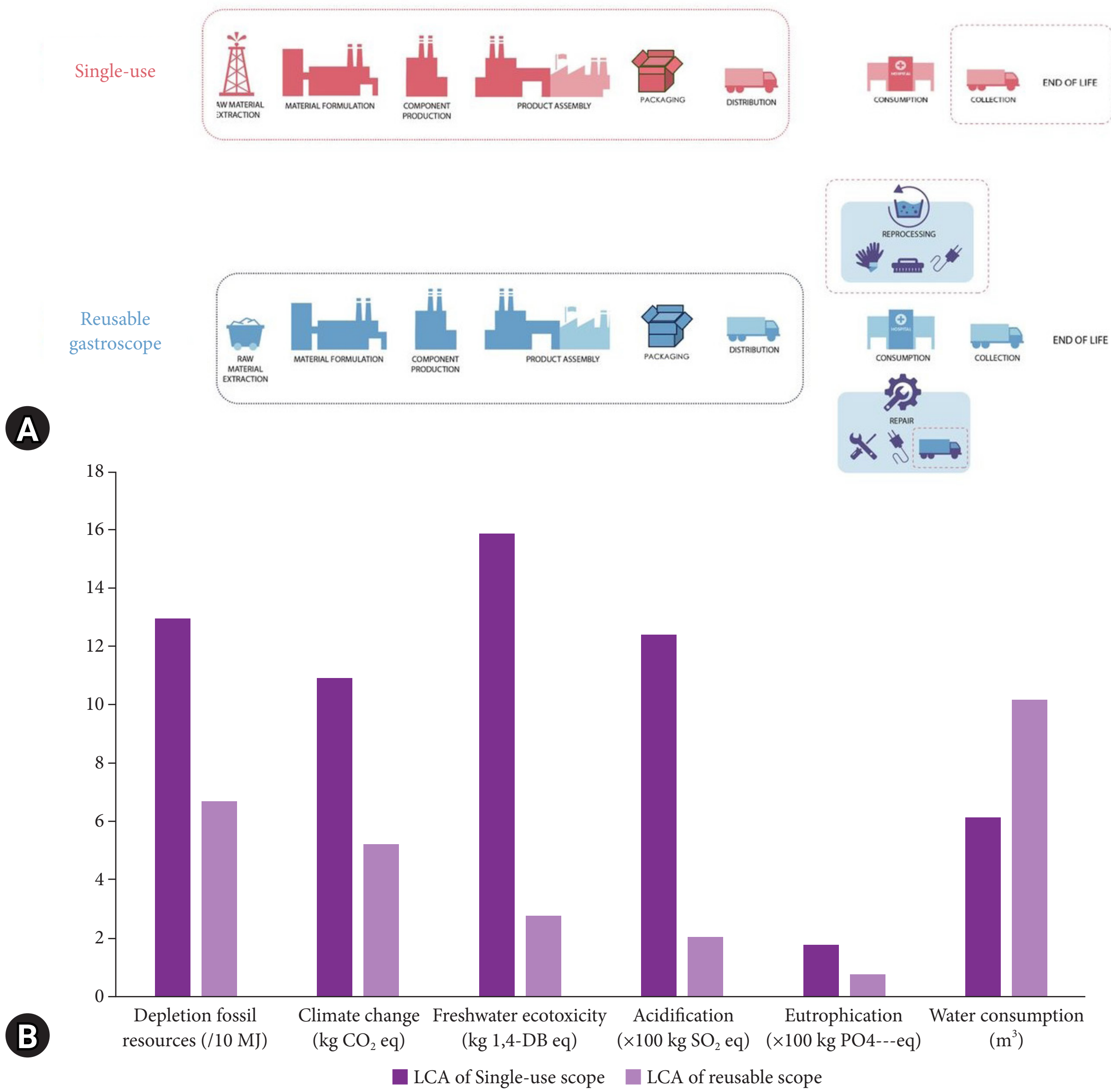

Fig. 1. Environmental impact of single-use versus reusable gastroscopes. (A) Lifecycle analysis of reusable and single-use scopes. (B) Schematic representation of the effects of single-use vs. reusable endoscopes. "PO4---eq" as labeled in the original figure refers to phosphate (PO_4^{3-}) equivalents, a standard metric used in assessing freshwater eutrophication potential. Reproduced from Pioche et al. Gut 2024;73:1816–1822, with permission from BMJ Publishing Group Ltd.[35]

risk patients and single-use devices are reserved for high-risk or immunocompromised patients.[6,12]

Ultimately, the decision between single-use and reusable endoscopes involves complex considerations of clinical safety, environmental sustainability, and operational efficiency. Figure 1B underscores these trade-offs, showing that single-use devices have a higher carbon footprint and resource-depletion rates, whereas reusable devices consume more water because of their reprocessing cycles. Advancements in endoscope design, such as partially disposable devices, may offer a more balanced solution, reducing both infection risks and the environmental impact.[40]

REPROCESSING AND WASTE MANAGEMENT

Reprocessing reusable endoscopes is essential for maintaining patient safety; however, it incurs substantial environmental costs. This process involves high water and energy consumption, as well as the use of chemical disinfectants that can be harmful to both human health and the environment. While necessary for thorough decontamination, these disinfectants often contain chemicals that contribute to water pollution and have potential long-term environmental consequences if not managed properly.[6,12]

For instance, the chemicals used in the high-level disinfection of reusable endoscopes, such as glutaraldehyde or peracetic acid, require careful handling and disposal. Improper disposal of these chemicals can lead to environmental contamination, particularly in water systems. Moreover, the energy-intensive nature of the reprocessing cycle, which includes washing, sterilization, and drying, further increases the carbon footprint of reusable endoscopes. Each of these steps requires significant electricity, and the heat used in the sterilization processes increases overall energy consumption.[2,30]

Despite these challenges, technological advancements in reprocessing equipment have helped reduce the environmental impact of endoscopy. Newer automated endoscope-reprocessing machines have been designed to use less water and energy while still ensuring that the devices meet stringent sterilization standards. These machines can also optimize the use of chemical disinfectants and reduce the volume of chemicals required per cycle. By improving the efficiency and reducing resource consumption, these advancements have made the reprocessing of reusable endoscopes more sustainable.[1,6]

According to the guidelines of the European Society of Gastrointestinal Endoscopy and the European Society of Gastroenterology and Endoscopy Nurses and Associates, safe reuse of endoscopic equipment, supported by rigorous reprocessing protocols and microbiological surveillance, is a key strategy for reducing medical waste and its associated carbon footprint. By implementing these measures, endoscopy units can align their practices with sustainability goals while maintaining patient safety.[1]

In addition to improvements in reprocessing equipment, healthcare facilities are implementing waste-management strategies to further reduce their environmental footprint. Waste-segregation programs have been adopted in endoscopy units to separate recyclable materials from contaminated waste. For example, non-contaminated plastic components from packaging, such as the outer wrappings of endoscopic accessories, can be collected and recycled to reduce the volume of waste sent to landfills.[12,30]

Recycling programs are particularly important to mitigate the environmental burden of medical waste. If properly sorted, single-use packaging materials can be diverted from incineration and landfills, where they would otherwise contribute to pollution and greenhouse gas emissions. Hospitals need to expand their partnerships with local recycling facilities to ensure that as much non-contaminated waste as possible is recycled.[28]

Another aspect of waste management is the push toward reducing overall plastic consumption within endoscopy units. Single-use plastics, such as syringes, gloves, and tubing, account for a large portion of the waste generated during these procedures. Efforts to minimize the use of plastic items or replace them with biodegradable alternatives are underway in many healthcare settings.[6,30] Additionally, the use of biodegradable disinfectants is gaining traction as a means of minimizing the harmful effects of chemical disposal, providing a greener solution to the reprocessing challenge.[12]

However, despite these advances, several factors still hinder the widespread adoption of sustainable waste-management practices. Cost is often a limiting factor because the initial investment in more efficient reprocessing machines and the implementation of comprehensive recycling programs can be high.[2,27,28] Moreover, staff education and adherence to proper waste-segregation protocols are critical to the success of these programs. Without proper training, recyclable materials may inadvertently end up in general waste streams, thereby undermining efforts to reduce landfill contributions.[2]

In conclusion, although reprocessing and waste management in endoscopy present challenges, recent innovations have made it possible to minimize the environmental impact of these essential procedures. By embracing technological advances and adopting rigorous recycling and waste-reduction programs, endoscopy units can significantly reduce their ecological footprint while maintaining high standards of patient care and infection control.[41]

CARBON-REDUCTION STRATEGIES

Efforts to reduce the carbon footprint of endoscopy are increasingly focusing on practical and systemic changes that target resource efficiency and sustainable practices.[42] Several strategies have been explored and recommended by experts and in international guidelines.

Energy-efficient endoscopy units

Endoscopy units can significantly reduce their carbon footprint by implementing energy-efficient practices. Energy-saving measures such as installing light-emitting diode lighting and optimizing ventilation systems have been highlighted in several studies as practical ways to reduce electricity consumption in medical facilities.[5,6,32] Additionally, more efficient reprocessing equipment is being adopted in healthcare settings, which minimizes energy usage during the cleaning and sterilization of reusable endoscopes. The consensus of the British Society of Gastroenterology, Joint Accreditation Group, and Centre for Sustainable Health highlights the importance of energy-efficient technologies and structured waste-segregation systems as essential components of carbon-reduction strategies. Endoscopy units can adopt these measures by replacing outdated equipment with energy-efficient alternatives and implementing robust recycling programs to minimize landfill waste.[2] International guidelines, including those from green healthcare initiatives, encourage the exploration of renewable energy sources such as solar power for powering endoscopy units.[27] Although these approaches are still in the early stages in some regions, they are promising long-term solutions for reducing emissions associated with healthcare operations.[5]

Digitalization and paper reduction

Transitioning to electronic health records and other digital tools can play a critical role in reducing the environmental footprint of endoscopy units. This shift from paper-based documentation can reduce wastage and enhance administrative efficiency. Patients can access their health information digitally, eliminating the need for printed materials such as test results and procedure notes.[30] Studies have also noted that digitalization streamlines workflows, reduces errors, and minimizes physical resource use.[5] In line with British recommendations, adopting digital documentation systems not only aligns with environmental goals, but also enhances operational efficiency.[2] In line with international healthcare recommendations, many facilities have adopted digital documentation systems to align their environmental and operational goals.

Optimizing reprocessing practices

Innovations in reprocessing technologies are enabling endoscopy units to reduce resource consumption while maintaining high standards of infection control. Modern reprocessing systems use less water and energy than the traditional methods, thereby reducing the environmental burden associated with the use of reusable devices. In addition, the use of biodegradable or less harmful chemical disinfectants is being explored to further minimize the ecological footprint of cleaning and sterilization processes.[2,31]

BARRIERS TO IMPLEMENTING GREEN ENDOSCOPY

Despite the growing recognition of the importance of sustainable healthcare, several significant barriers hinder the widespread implementation of green endoscopy. These challenges are multifaceted, ranging from financial constraints to operational and regulatory hurdles, and all of them complicate the adoption of environment-friendly practices in endoscopy units.

Cost concerns

One of the most pressing challenges is the financial burden associated with the transition to greener practices. For many healthcare facilities, the upfront investment required to purchase energy-efficient equipment or switch to reusable devices is prohibitively expensive.[6,30] Although such investments may lead to long-term cost savings through reduced energy use and waste, the initial financial outlay, especially for smaller hospitals or clinics, can be difficult to justify.[12] Additionally, the ongoing costs of maintaining and reprocessing reusable devices, along with the need for specialized staff training, add to the financial burden.[1,41]

Infection control

Another major concern is the maintenance of infection-control standards, particularly when using reusable devices. Despite the advancements in reprocessing technologies, the risk of cross-contamination remains a critical issue.[6,12] This risk has led to resistance against reintroducing reusable accessories among healthcare providers, with many opting for single-use items that are perceived as safer in terms of infection control. Balancing the need for stringent infection prevention with sustainability goals is a constant challenge in endoscopy, especially given the complex designs of certain reusable endoscopes, which can be difficult to fully disinfect.

Lack of policy and industrial support

The absence of clear guidelines and policies on sustainable healthcare practices is another significant barrier. Many healthcare facilities lack well-defined protocols for implementing green initiatives, leading to inconsistent practices across sectors. Without a standardized approach, individual hospitals and clinics may struggle to develop and enforce effective sustainability measures. Furthermore, industrial support for reducing the environmental impact of endoscopic equipment is limited. Manufacturers are often slow to adopt greener production methods or provide more sustainable packaging options, leaving healthcare providers with few environmentally friendly alternatives for procuring endoscopic devices.

Addressing these barriers requires collaboration among healthcare providers, policymakers, and industry leaders to develop cost-effective solutions, promote innovation in infection control, and establish comprehensive guidelines that support sustainable endoscopic practices.

THE ROLE OF EDUCATION AND AWARENESS

Education is one of the most crucial elements for successful implementation of green endoscopy. A recent survey conducted in the Asia-Pacific region demonstrated that healthcare professionals with a deeper understanding of green endoscopy and its benefits were significantly more likely to embrace sustainable practices.[30] This suggests that increasing awareness of the environmental impact of endoscopic procedures is vital for driving change. Without sufficient knowledge, healthcare workers may underestimate the ecological consequences of their actions or remain unaware of sustainable alternatives.

Structured training programs play a critical role in raising this awareness. Such programs not only educate staff on the environmental consequences of their practices, but also provide practical, actionable solutions to reduce waste and emissions. Training could encompass aspects areas such as proper waste segregation, minimizing the use of single-use plastics, optimizing the reprocessing of reusable devices, and exploring alternative diagnostic tools to reduce unnecessary procedures.

Furthermore, healthcare facilities that integrate sustainability into their professional development programs are more likely to foster a culture in which environmentally friendly practices are encouraged and normalized. Continuous education, perhaps through workshops, certifications, or in-service training sessions, can ensure that all staff members align with the green healthcare goals. International healthcare organizations and professional societies are increasingly promoting green endoscopy initiatives as part of a broader move toward sustainable healthcare. These efforts can be bolstered by making education a central strategy.[2]

EMPHASIZING THE ENVIRONMENTAL RESPONSIBILITY OF ENDOSCOPE AND ACCESSORY MANUFACTURERS

Manufacturers play a central role in ensuring the sustainability of endoscopes and their accessories.[42] One of the most critical issues in the use of endoscopes and accessories is the transmission of contaminants, which has driven an increase in the use of single-use products. Infection control and environmental sustainability are often considered conflicting concepts. Flexible endoscopes, which are widely used for gastrointestinal examinations, have plastic components, unlike traditional surgical instruments. This limits the cleaning and reprocessing of instruments, leading to an inevitable increase in long-term single-use product consumption. Although managing resources efficiently and reducing waste are helpful, the most important factors are the production, handling, and reuse potential of these products.

Manufacturers play a vital role in ensuring environmental responsibility by focusing on production processes, waste management, and recyclability of endoscopes and accessories. Efforts such as the use of recyclable plastics during manufacturing, transportation innovations, and the reuse and recycling of non-contaminated products after use are crucial. Energy efficiency and resource conservation should be prioritized during the production process. These efforts can not only help reduce the environmental impact, but also encourage healthcare providers and hospitals to consider the environmental footprint in their procurement decisions.

Manufacturers' efforts can be shared as promotional information to highlight their commitment to environmental sustainability. Healthcare providers are likely to prioritize these efforts, and patients can also be informed about the environmental responsibility of the companies involved. Additionally, organizations, such as the government or endoscopy societies, should be involved in monitoring and managing these efforts to ensure proper implementation.

Leading endoscope manufacturers have recognized the need for these efforts and are taking the following actions: (1) Use of bioplastics[43]: Manufacturers are adopting bioplastics in single-use endoscopic devices to reduce the environmental impact of these devices. For example, Ambu A/S has announced plans to use bioplastics in the handles of all endoscopes by 2025 to minimize the reliance on fossil fuel-based materials[44]; (2) Recycling programs: Many manufacturers have introduced recycling initiatives to reduce waste and minimize the environmental impact[44,45]; Energy-efficient processes: Manufacturers are adopting energy-efficient manufacturing processes to minimize energy consumption and resource usage[45-47]; (3) Environmental transparency: Companies are disclosing their environmental goals and sustainable production processes, providing transparency, and reinforcing their commitment to reducing their carbon footprints[44-47]; and (4) Sustainable designs: Manufacturers are focusing on designing recyclable and environment-friendly endoscopes that use eco-friendly materials and minimize environmental harm.[45,46]

These sustainable practices serve as an important model to reduce the environmental impact of endoscope and related industries. Endoscope production and recycling processes with a lower environmental impact are essential for achieving sustainability across industries. Crucially, endoscope manufacturers should take the lead in implementing these changes and guide healthcare providers on being more environmentally responsible in their practice.

FUTURE TRENDS IN GREEN ENDOSCOPY

The future of green endoscopy is likely to be shaped by ongoing innovation and collaboration among healthcare providers, the medical industry, and policymakers. As the demand for sustainable healthcare grows, we expect to see a range of technological advancements aimed at reducing the environmental impact of endoscopic procedures. Manufactureres are at the forefront of these innovations and will continue to play a key role in driving progress by reducing resource consumption, improving recycling practices, and embracing eco-friendly materials.

One of the most promising areas for development is biodegradable endoscopic accessories. These items, designed to break down naturally without causing long-term environmental harm, are expected to replace many single-use plastic accessories currently used in endoscopic procedures. This innovation can significantly reduce the medical waste associated with these procedures, particularly in high-volume settings where single-use devices are the norm. Ongoing research by manufacturers on bioplastics and other sustainable materials is critical for reducing the environmental burden of disposable products.

Another important trend is the integration of artificial intelligence into endoscopy. Artificial intelligence-assisted imaging and diagnostic tools are already being developed to reduce the need for invasive biopsies, which not only decreases the use of disposable instruments, but also reduces the time and resources required for patient follow-up. This technology can also improve diagnostic accuracy, which may result in fewer unnecessary procedures and less strain on healthcare resources.

Moreover, advances in sterilization methods, such as ultraviolet light and ozone sterilization, are being explored as environment-friendly alternatives to chemical disinfectants. These methods could help reduce the environmental footprint of reprocessing reusable devices because they require less water and produce fewer harmful byproducts than traditional chemical sterilization methods.

Collaboration between healthcare facilities and the medical industry is crucial for making these innovations widely available. Policymakers will also play an important role by providing incentives for the adoption of sustainable technologies and establishing regulations that promote the development of greener medical devices. In the future, we can expect a growing emphasis on sustainability in healthcare procurement, with hospitals prioritizing environmentally friendly products and practices when selecting equipment and materials for endoscopy units.

By aligning technological advancements with education and policy support, green endoscopy holds significant promise for reducing the environmental impact of healthcare while maintaining high standards of patient care.

CONCLUSIONS

Green endoscopy represents a critical intersection of medical advancements and environmental responsibilities. This review underscores the urgent need for comprehensive strategies to address the environmental impact of endoscopic practices. Sustainable innovations such as reusable devices and energy-efficient technologies should be prioritized, along with waste-reduction and recycling initiatives. Collaboration among healthcare providers, policymakers, and industry stakeholders is essential for creating a robust framework for implementing green practices. By embracing these changes, endoscopy can achieve a sustainable balance between clinical excellence and environmental stewardship, thereby ensuring long-term benefits for patients and the planet.

Supplementary Material

Supplementary Material 1. The number of endoscopic procedures performed in Korea in 2003.

Supplementary materials related to this article can be found online at https://doi.org/10.5946/ce.2024.332.

Conflicts of Interest

The authors have no potential conflicts of interest.

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