Environmental Impact of Endoscopy: "Scope" of the Problem

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Climate change is an imminent and undeniable crisis faced by the planet. Greenhouse gases (GHG's) are major contributors to climate change. Global response to this impending threat led to the Paris Agreement in 2015, an accord signed by most nations promising commitment to reduce emissions. Irrespective of the Unites States' current position on the issue, it would be irresponsible not to evaluate the environmental impact of our respective disciplines and take steps where possible to ensure that it is minimized.

Williams et al. (1) broadly addressed the issue of carbon footprint related to our profession, gastroenterology (GI), in their recently published commentary. Carbon footprint is defined as GHG, commonly carbon dioxide and methane, caused by an individual, event, product, or process. Carbon footprint was originally conceptualized by William E Rees and Mathis Wackernagel as one component of ecological footprint, a comparison of human demand vs planetary supply of resources. In GI, transportation, nonrecyclable plastic, and electric use are important contributors to GHGs (1).

A procedure-dominant field, such as GI, by its very nature is bound to have a larger carbon footprint than some counterparts. To get an idea of how large the footprint might be, let us consider one field—endoscopy, particularly the associated plastic waste and energy consumption. Table 1 lists materials disposed of after one endoscopic procedure. One procedure generates 1.5 kg of plastic waste, of which only 0.3 kg is recyclable. A typical endoscopy suite is not equipped with recycling bins; therefore, the entire 1.5 kg becomes landfill. This problem would be compounded by the potential adoption of disposable scopes. Although disposable scopes have the advantage of reducing costs and cross contamination from inadequate reprocessing, they significantly add to plastic waste (2).

Our unit on average performs 40 endoscopies per day (Table 2). This equates to 29,003 kW h energy and 15.78 ton CO2 emission per year (assuming 5 d/wk operation) (3). Consider 18 million endoscopy procedures (4) performed annually in the United States to better understand the scope of the problem. Extrapolation of our data on a national scale means endoscopy generates 13,500 tons of plastic waste, of which 10,800 tons are nonrecyclable. The GHGs produced by 18 million endoscopy procedures are equivalent to the emissions of nearly 88,108,062 miles driven by an average vehicle. The CO2 emissions from these procedures are equivalent to more than 3,995,448 gallons of gasoline consumed or nearly 39,124,447 pounds of coal burned. To sequester the CO2 produced by these procedures would take 46,371 acres of forests over one year! (5).

To reduce this environmental impact, we must consider ways to reduce plastic wastage and energy consumption. We can begin by recycling. There are different thoughts about the impact of recycling on carbon footprint in surgery. Thiel et al. (6) analyzed the effect of surgery on GHG emissions and found that recycling had minimal contribution; however, their conclusion is less generalizable to endoscopic procedures. Two thousand seven hundred tons of plastic wastage can be reduced immediately by placing recycle bins in all endoscopy units. Efforts could be made to convert nonrecyclable plastics into sustainable materials when feasible.

An incentivized approach to generate less land fill waste and more recyclable materials is needed. Recycling could be logged into the American College of Gastroenterology (ACG) website, and compliant endoscopy suites could be recognized as "ACG-certified green suites." This would be easy to institute without

Table 1. Waste generated by an endoscopic procedure

Plastic box that contains 4 × 4 gauze
Plastic water bottle
Plastic bite block
Plastic suction canister
Plastic suction tubing used for endoscopy
Plastic suction canister used by anesthesia
Plastic suction tubing used by anesthesia
Plastic suction catheter used by anesthesia
Plastic isolyzer bottle
Plastic packaging of biopsy forceps
Plastic packaging of disposable scope buttons
Gloves

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Table 2. Energy consumption by our endoscopy unit in a single day

Unit	Energy consumption per day
Wash machines (5)	24.67 kW h[a]
Endoscopy machines (6)	27.00 kW h[a]
Anesthesia machine (6)	12.00 kW h[a]
Room lighting (6)	47.88 kW h[a]
Total	111.55 kW h[a]

[a]Please refer to Tables (see Supplementary Digital Content 1, hiips://links.lww.com/AJG/B747) for breakdown of energy calculations.

significant economic burden and would motivate most centers to recycle (Table 2).

Regarding energy consumption, conversion to renewable energy to power endoscopy suites would also have a huge impact. Thiel et al. concluded that electricity accounts for 10%–30% of environmental impact related to operating room–based surgery (7). In endoscopy, room lighting consumes more energy than the endoscopy machine itself. Switching lights off during extended breaks reduces energy consumption. Replacing halide bulbs with light emitting diode bulbs would also reduce energy consumption by more than 60%. Conversion to light emitting diode bulbs would likely pay for itself in approximately 2 months. (Please refer to see Tables, Supplementary Digital Content 1, hiip://links.lww.com/AJG/B747).

Further reduction in energy consumption could be achieved by using the most efficient endoscopes and wash machines. Of note, double basin wash machines use less energy when cleaning 2 scopes simultaneously, compared with single basin wash machines. (600 W for 2 scopes cleaned vs 400 W for one scope cleaned, respectively).

Our data shows the staggering environmental impact of endoscopy when calculated on a national scale. Converting endoscopy suites to renewable energy sources, such as solar panels, would involve a significant economic burden to implement initially and could also benefit from an incentivized approach from ACG. It would cost our endoscopy unit, for example, approximately $25,000 to install solar panels sufficient to offset 100% of our energy consumption (8).

In closing, according to Greta Thunberg, global climate activist "we are in the beginning of a mass extinction… setting off irreversible chain reactions beyond human control." We hope this article highlights the environmental impact of endoscopy and inspires meaningful change.

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CONFLICTS OF INTEREST

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