CURRENT UNDERSTANDING OF GREEN ENDOSCOPY

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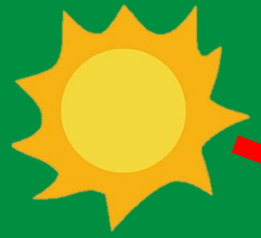
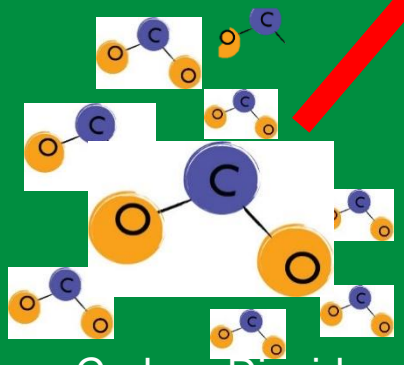
EXHIBIT DATES: MAY 3–5, 2026
@DDWMeeting | #DDW2026

Disclosure

I have no financial relationships with commercial support to disclose



Gets trapped in our atmosphere



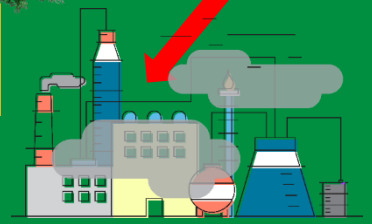
Carbon Dioxide (CO_2)

Global Warming

Keeps the planet a
tempera

Avg global tem

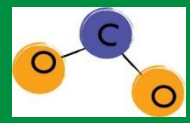
Makes Earth a inhabitable place



Industrialization happened

Optimal CO_2 is released

Excess greenhouse gases



Carbon Footprint

Anything that you do which **directly or indirectly** is responsible to increase emission of Carbon Gases

From buying a shirt to riding a car or traveling in an aircraft, everything contributes towards

Greenhouse Gases and Their Global Warming Potential in Carbon Dioxide Equivalents (CO_2e)	
Greenhouse gas	Global warming potential
(CO_2 equivalents)	
Carbon dioxide (CO_2)	1
Methane (CH4)	25
Nitrous oxide ($N2_O$)	298
Hydrofluorocarbons (HFCs)	124-14800
Perfluorocarbons (PFCs)	7390-12200
Sulfur hexafluoride (SF6)	22800
Nitrogen trifluoride (NF3)	17200

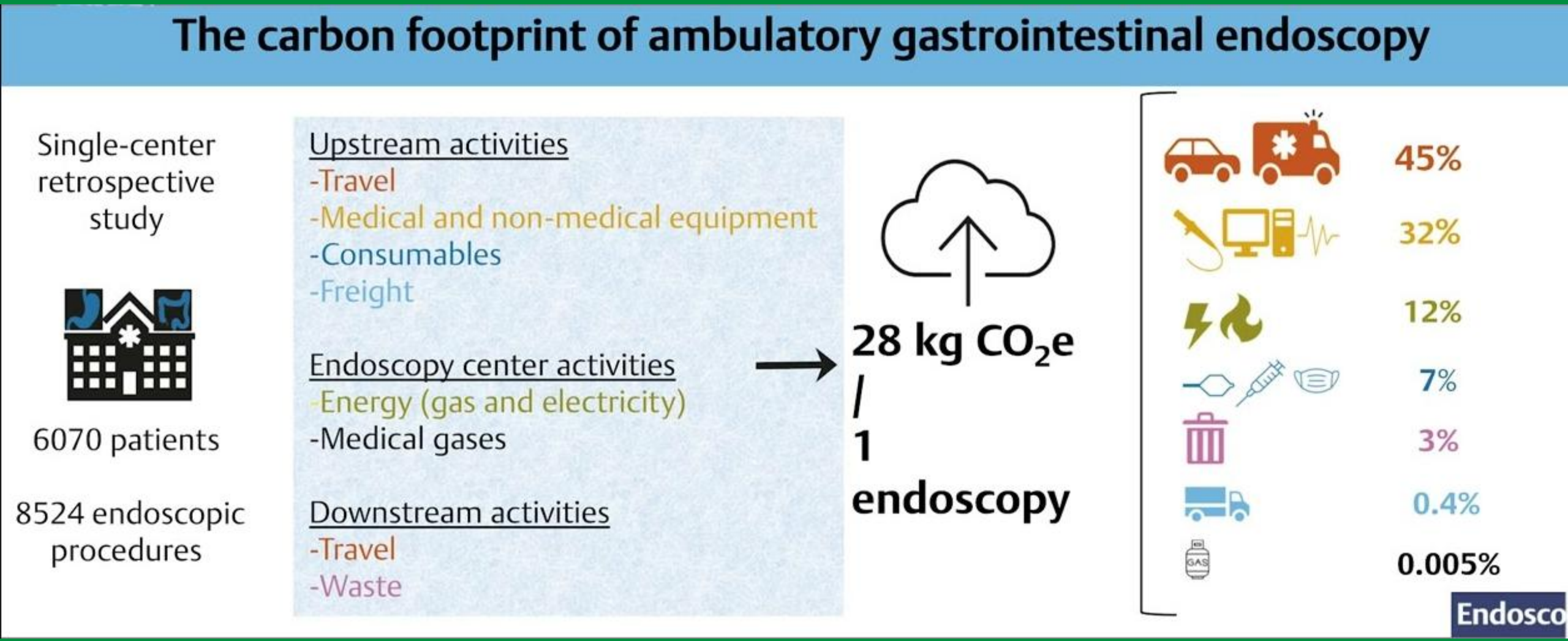
Environmental Impact of Endoscopy: "Scope" of the Problem

Endoscopy unit

Unit	Energy Consumption/day
Computers	8.96 kWh
Anaesthesia machines	12 kWh
Wash machines	24.67 kWh
Scope processors	27 kWh
Lighting	47.88kWh
Total	120.5 kWh

Swapna Gayam Am J Gastroenterol 2020

The carbon footprint of ambulatory gastrointestinal endoscopy



Lacroute Joël et al. Endoscopy 2023

Environmental footprint of gastrointestinal endoscopy services: a systematic review

Britta Vegting[1], Demi Gerritsen[1], Ceyda B. Izci[1], Nicole G.M. Hunfeld[2,3], Erik M. van Raaij[4], Wilco van den Heuvel[5], Pieter J.F. de Jonge[1], Peter D. Siersema[1]

Environmental footprint of GI endoscopy

Systematic review

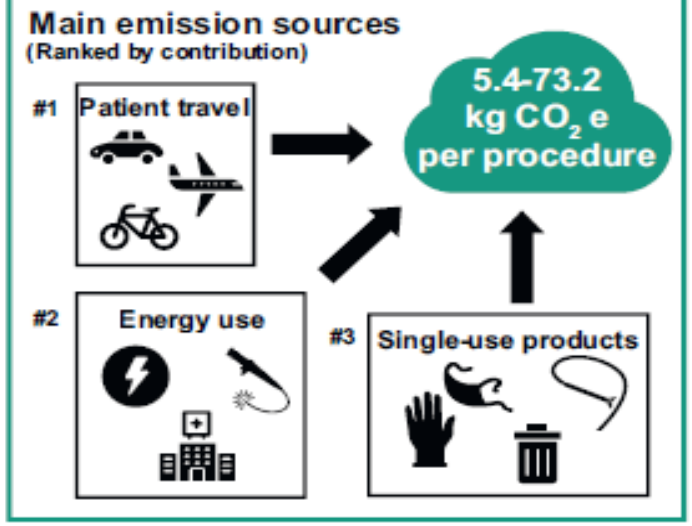
CO_2e

Carbon emissions (Scope 1–3) + Other environmental categories

28 studies
(up to May 2025)

10 LCAs | 10 prospective | 7 retrospective | 1 survey

Main emission sources
(Ranked by contribution)



Substantial methodological heterogeneity | Limited transparency in data sources | Inconsistent reporting

↓ ↓ ↓

Limited comparatability across studies

⚠ Risk of bias was high in 21 studies

CO_2e, carbon dioxide equivalent; GI, gastrointestinal; LCA, life cycle assessment.

Heterogeneous and fragmented evidence on the environmental footprint of GI endoscopy highlights the need for standardized assessment methods

Endoscopy

Endoscopy 2025

CARBON FOOTPRINTING AND ENVIRONMENTAL IMPACT OF GASTROINTESTINAL ENDOSCOPY PROCEDURES AT A TERTIARY CARE INSTITUTION: A PROSPECTIVE MULTI-DIMENSIONAL ASSESSMENT

Single center prospective study

AIG HOSPITALS

All consecutive diagnostic and therapeutic GIE procedures (**May 29th to June 10th, 2023**)
Total patients: **3,244**
Total procedures: **3,873**

"THE GHG PROTOCOL" USED FOR SCOPE 1,2 AND 3 CARBON EMISSION CALCULATIONS USING VARIOUS EMISSION FACTORS

STUDY BOUNDARIES:

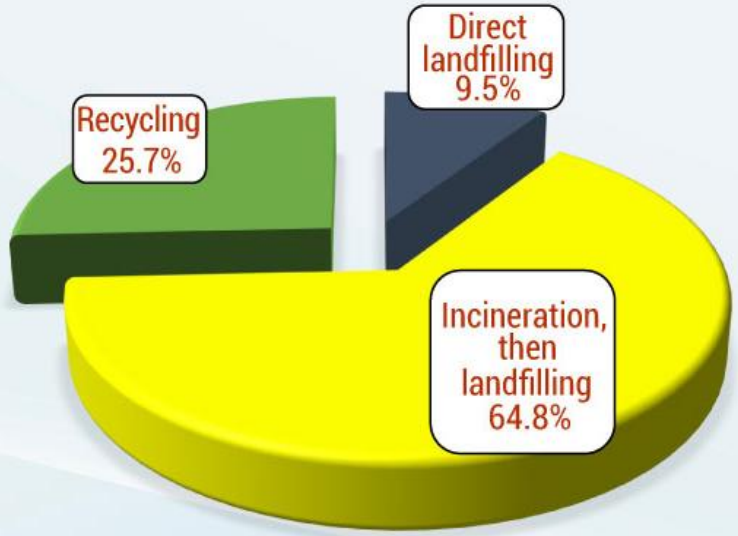
Variables	Production	Transport	Consumption/ Disposal
Electricity	×	×	√
Water	×	×	√
Consumables	×	×	√
Endoscopes & Accessories	×	√	×
Medical Gases	×	√	√
Detergent & Disinfectants	×	×	√
Patient travel	-	√	-
Staff travel	-	×	-

CARBON FOOTPRINTING

Patient Travel	83.09%
Electricity consumption	10.42%
Medical gases transport and usage	3.63%
Water consumption	1.86%
Detergent and disinfectant usage	0.52%
Endoscopes and accessories transport	0.41%
Waste emissions	0.025%

Parameters	Total (n=3,873)	Per procedure
Electricity consumption	19,160 kWh	4.94 kWh
Water consumption	262,800 litres	67.85 litres
Waste generated	1952 kg	0.504 kg
Carbon emissions	148,947 kg CO_2e	38.45 kg CO_2e (Excluding travel emissions: 6.50 kg CO_2e)

WASTE MANAGEMENT METHODS



Rughwani H et al Gut 2025

Waste segregation

CARBON PERSPECTIVES OF GASTROINTESTINAL ENDOSCOPY (GIE) PROCEDURES AT A TERTIARY CARE CENTER

AIG HOSPITALS

BMJ bsg

INDIVIDUAL PATIENT LEVEL:
A single GIE procedure (Rugwani H. *et al.*)

Carbon emissions:

6.5 kg CO_2e

(the new per-procedure value with travel)

AGGREGATE STUDY LEVEL:
Total Annual Emissions (AIG Study)

Total yearly footprint:

650,400 kg CO_2e

EQUIVALENTS & COMPENSATION

TRANSPORT EQUIVALENTS

145 gasoline-powered passenger vehicles driven for 1 year

1,667,520 miles driven

- **7** round trips to the Moon
- circling the **67** times
- **126** times Great Wall of China length
- **383** times Amazon River

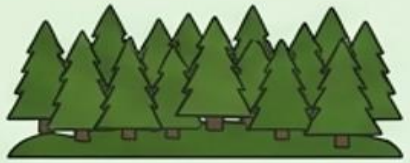
HOUSEHOLD & ENERGY EQUIVALENTS

Annual electricity emissions of **650** average Indian households

Equivalent to removing **145 cars** from Indian roads

NATURE'S COMPENSATION

Annual CO_2 absorption of **28,000** mature trees



Green Endoscopy

Key Barriers

- Cost concerns
- Infection risk
- Inadequate awareness
- Lack of policies
- Industrial support

Answers

- ↑ Efficiency
- ? Reuse
- Green team
- Quality parameters
- Proactive government

Perspectives and awareness of endoscopy healthcare professionals on sustainable practices in gastrointestinal endoscopy: results of the LEAFGREEN survey

Sustainable practices in gastrointestinal endoscopy – the LEAFGREEN survey

Cross-sectional study

407 respondents

Response rate **11%**

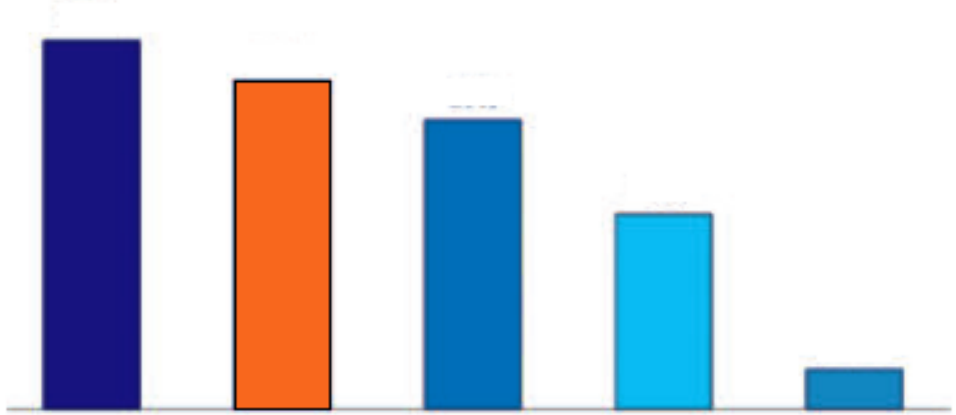
Climate change beliefs

Real and anthropogenic → **86%**

GI endoscopy is a contributor → **67%**

ESGE ESGENA

Main barriers to sustainable endoscopy



GI, gastrointestinal

Major challenges

- Inappropriateness of gastrointestinal endoscopy
- \+
- Overuse of single-use accessories & endoscopes

Endoscopy

Cunha Neves João A et al. Endoscopy 2024

Green Endoscopy: A Review of Global Perspectives on Environmental Sustainability of Gastrointestinal Endoscopy

REDUCE

1. Inappropriate endoscopies
2. Repeat procedures
3. Energy utilization
4. Single-use scopes

REUSE

1. Endoscope caps and trays
2. Rechargeable batteries
3. Lifting solutions, dyes

RECYCLE

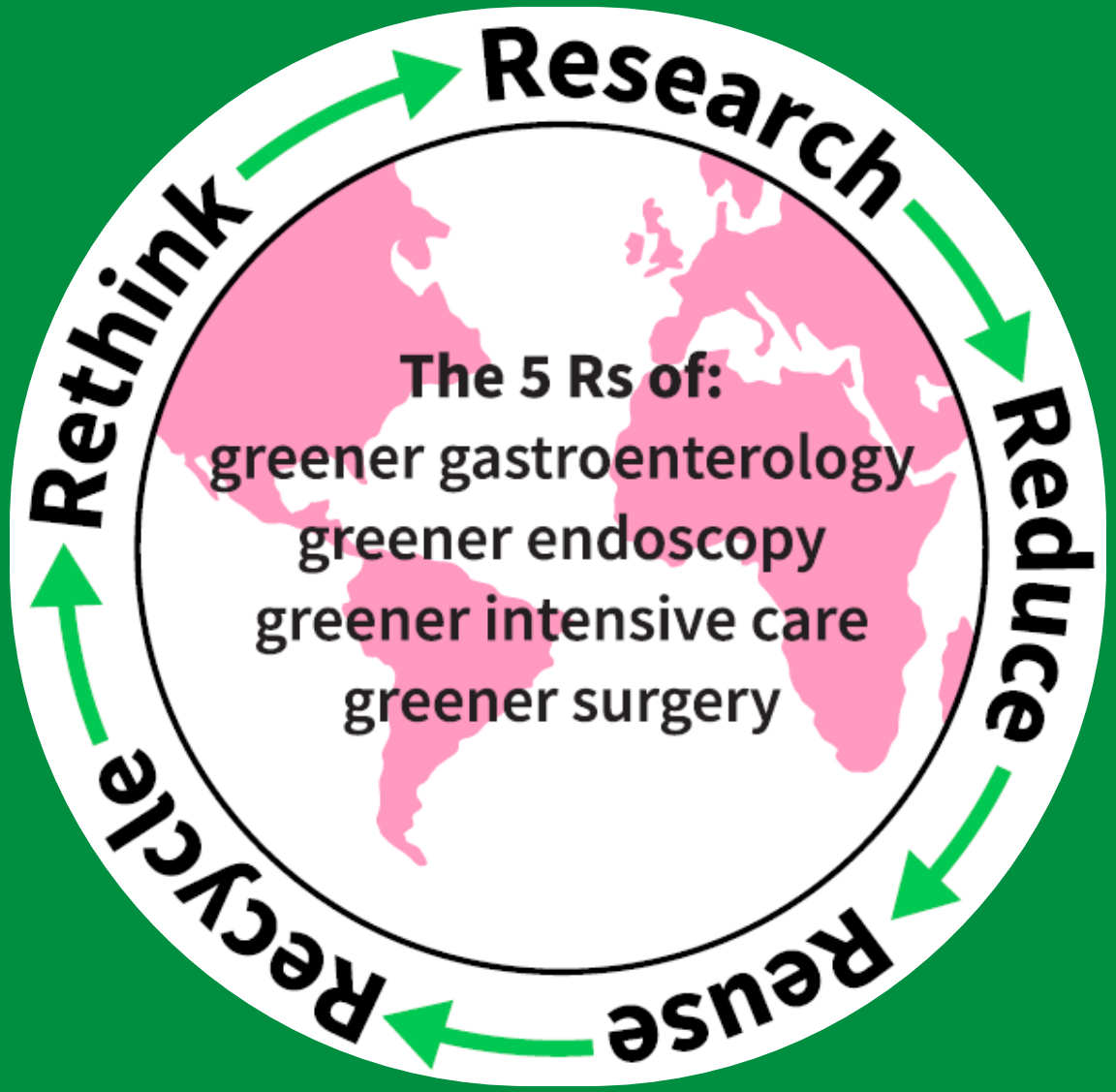
1. Segregation of waste products
2. Waste management training for HCWs

RESEARCH

1. Greater society–industry integration
2. Weightage for sustainability in research

Adishwar rao et al J. Clin. Med. 2025

The United European Gastroenterology green paper—climate change and gastroenterology



Marjolijn Duijvestein et al United European Gastroenterol J. 2024

Practical steps to green your endoscopy unit: Reduce!

Daniel von Renteln, MD,[1] Yuting A. Jiang, MD,[1] Deepak Agrawal, MD, MPH,[2] Seth Crockett, MD, MPH,[3] Lyndon Hernandez, MD,[4] Sonali Palchaudhuri, MD, MCHI,[5] Rahul Shimpi, MD,[6] Kevin S. Skole, MD,[7] Jim Collins, BS, RN, CNOR,[8] Heiko Pohl, MD[9,10]

Gastrointestinal Endoscopy 2026

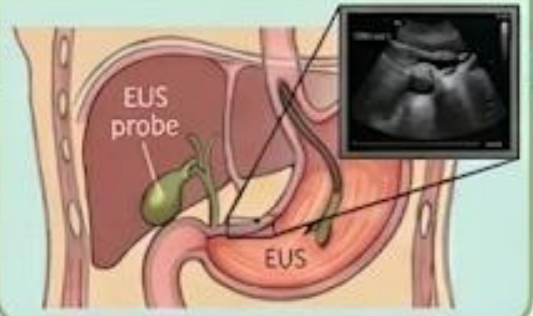
EUS versus MRCP to perform ERCP in patients with intermediate likelihood of choledocholithiasis

SINGLE-CENTRE RANDOMIZED CONTROLLED TRIAL
(Nov 2019 - May 2020)

INTERMEDIATE LIKELIHOOD CHOLEDOCHOLITHIASIS PATIENTS
(n=266 screened)

ENROLLED & RANDOMIZED
(n=224)

EUS Group
(n=112)



- **PREVALENCE:** 46/112 (41.1%)
- **SENSITIVITY:** 98%
- **NPV:** Significantly Higher (p<0.05)
- **FALSE NEGATIVES:** 2
- **FALSE POSITIVES:** 1

MRCP Group
(n=112)

- **PREVALENCE:** 63/112 (56.3%)
- **SENSITIVITY:** 92%
- **NPV:** Lower
- **FALSE NEGATIVES:** 5
- **FALSE POSITIVES:** 2

ERCP PERFORMED
for Stone+ **OR** Suspicion
Suspicion during FU

6-MONTH CLINICAL FOLLOW-UP
for Stone- Cases

6-MONTH CLINICAL FOLLOW-UP
for Stone- Cases

KEY CONCLUSION: Performance parameters similarly high (Sensitivity: 92%–98%).
No significant differences between EUS and MRCP.

CHOICE BASED ON:
- Local Expertise
- Resource Availability
- Patient Preference

Nitin J et al GUT 2022

Putting the carbon saving in perspective: EUS vs MRCP

INDIVIDUAL PATIENT LEVEL: AVOIDED MRCP

MRCP procedure avoided saves **14.5 kg CO_2e / patient**

Equivalencies (per patient)

Burning 5 litres of petrol

5 L Petrol

Driving approximately **96 km**

Carbon Budget Impact

Single EUS (4.53 kg CO_2e)

(4.53 kg CO_2e) — **0.23%** of annual 2,000 kg CO_2e budget

Single MRCP (18.98 kg CO_2e)

(18.98 kg CO_2e) — **0.80%**

AGGREGATE STUDY LEVEL (108 Patients, total save: 1,560 kg CO_2e)

EUS system,
total save: **1,560 kg CO_2e)**

EXTRAPOLATED INSTITUTIONAL POLICY (Annual, 18,720 kg CO_2e)

Driving **123,800 km**

3.1 times around the Earth

Taking **12 Indian cars** off the road for a year

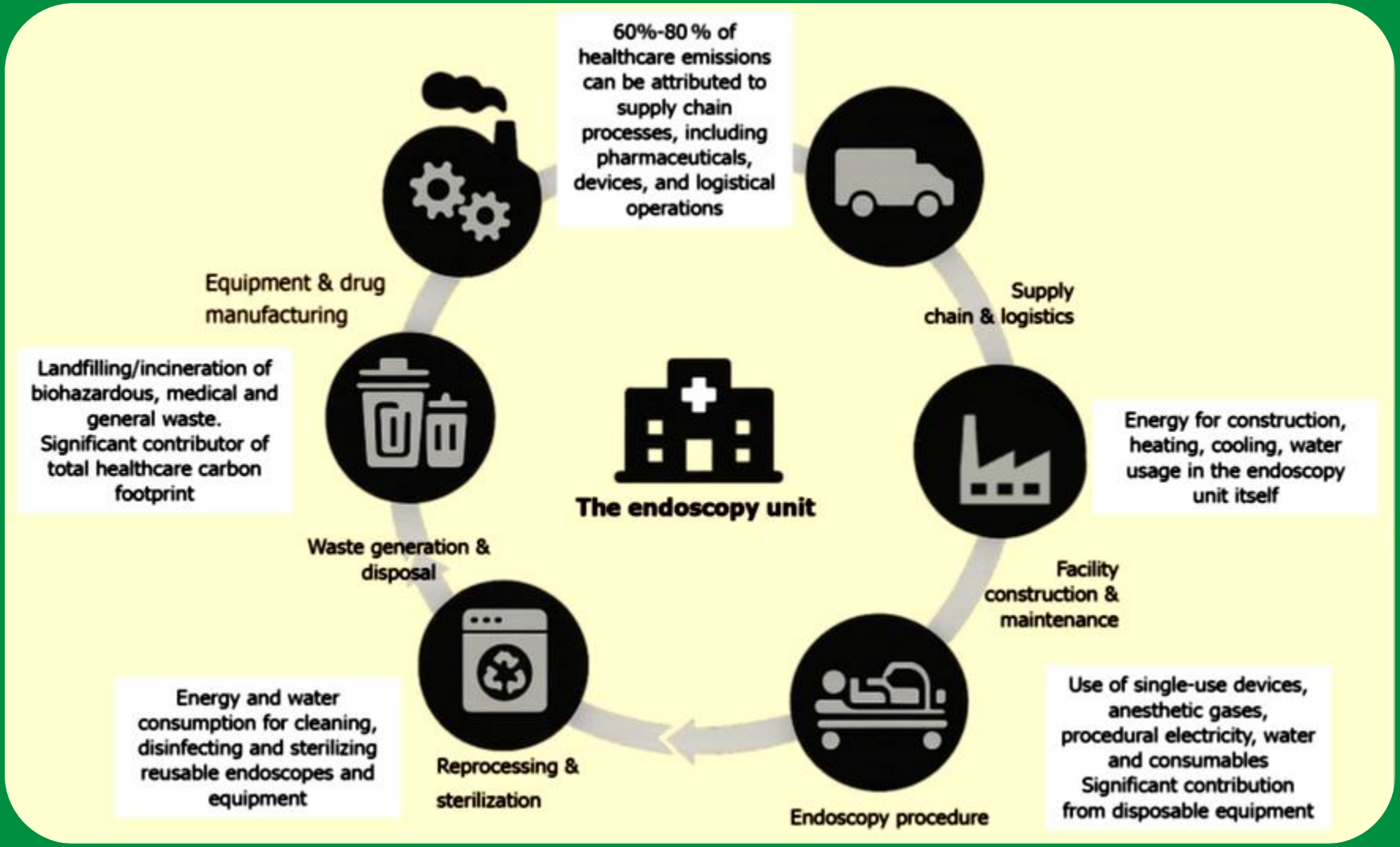
x12

Annual CO_2 absorption of **707 trees**

Unpublished data , AIG Hospitals

Green endoscopy: A review of strategies for sustainable practice

Niraj James Shah, Mark M Aloysius, Priyadarshini Loganathan, Tejas Nikumbh, Abhilash Perisetti, Hemant Goyal



World J Gastrointest Endosc 2025

Guidelines	Key aspect
ESGE	Emphasizes minimizing single-use devices and embedding sustainability in training
ASGE	Proposes forming “Green Teams” to lead local sustainability efforts
BSG	Prioritizes reducing unnecessary procedures to cut waste
APAC	Highlights lack of policies and calls for tools to assess carbon footprints

Digestive Endoscopy 2025

Net Zero Carbon Endoscopy Unit

Thank You