WHAT EVERY SURGEON NEEDS TO INCORPORATE INTO THEIR PRACTICE

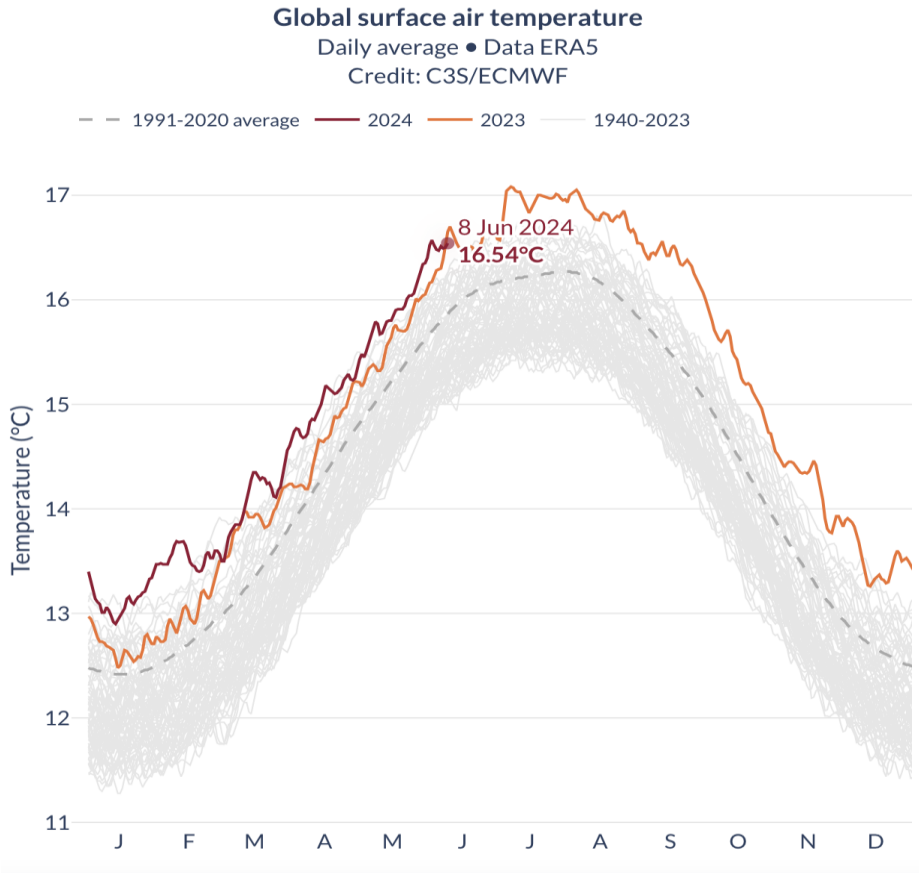
DR DANIEL SCHNEIDER
GASTROENTEROLOGIST, INTERVENTIONAL ENDOSCOPIST
UNIVERSITY COLLEGE LONDON HOSPITAL
IFSO WORLD CONGRESS, MELBOURNE 2024

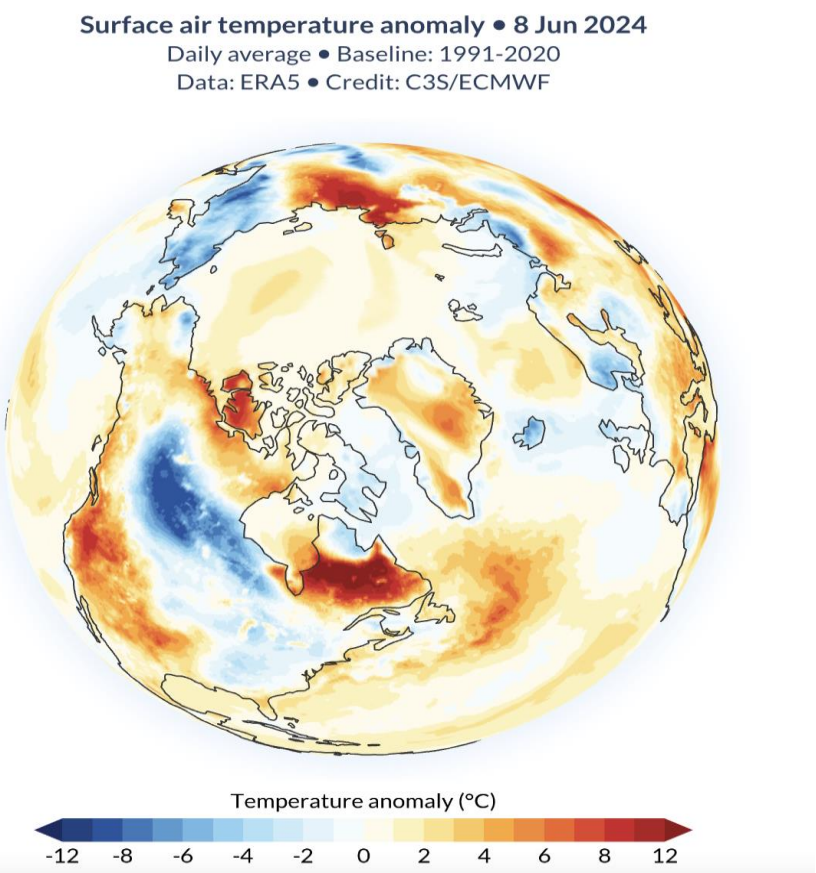
DISCLOSURES

- Nil

- Thank you to the organizing committee for the invitation to speak

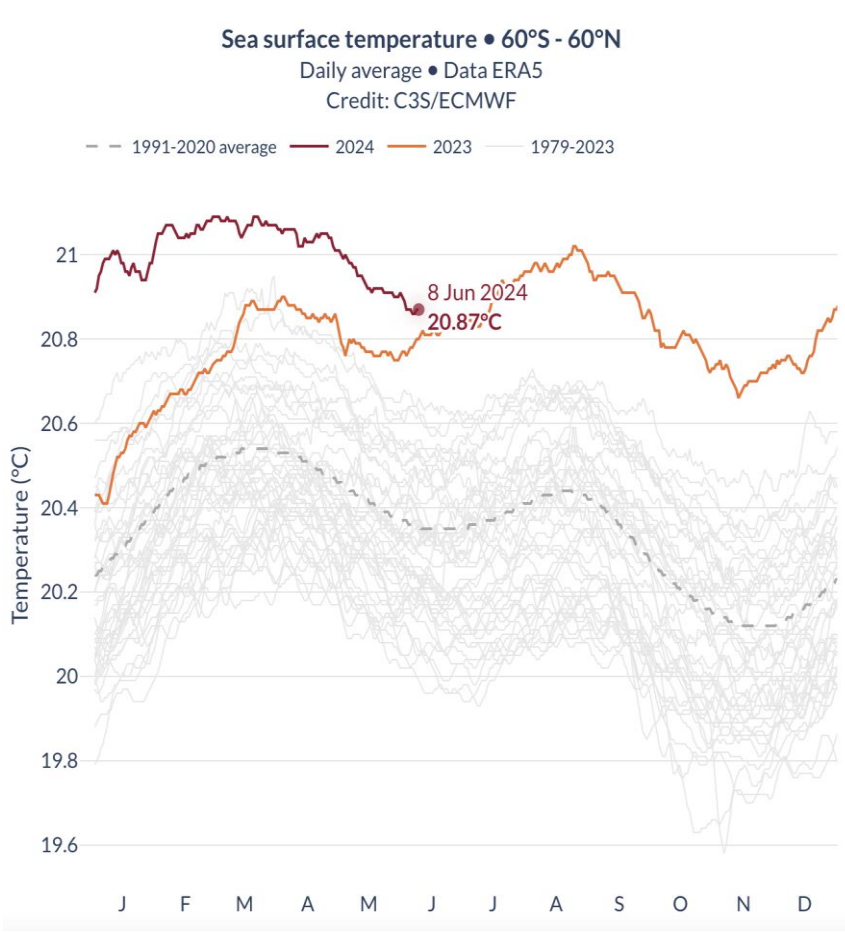
A RECAP ON CLIMATE CHANGE

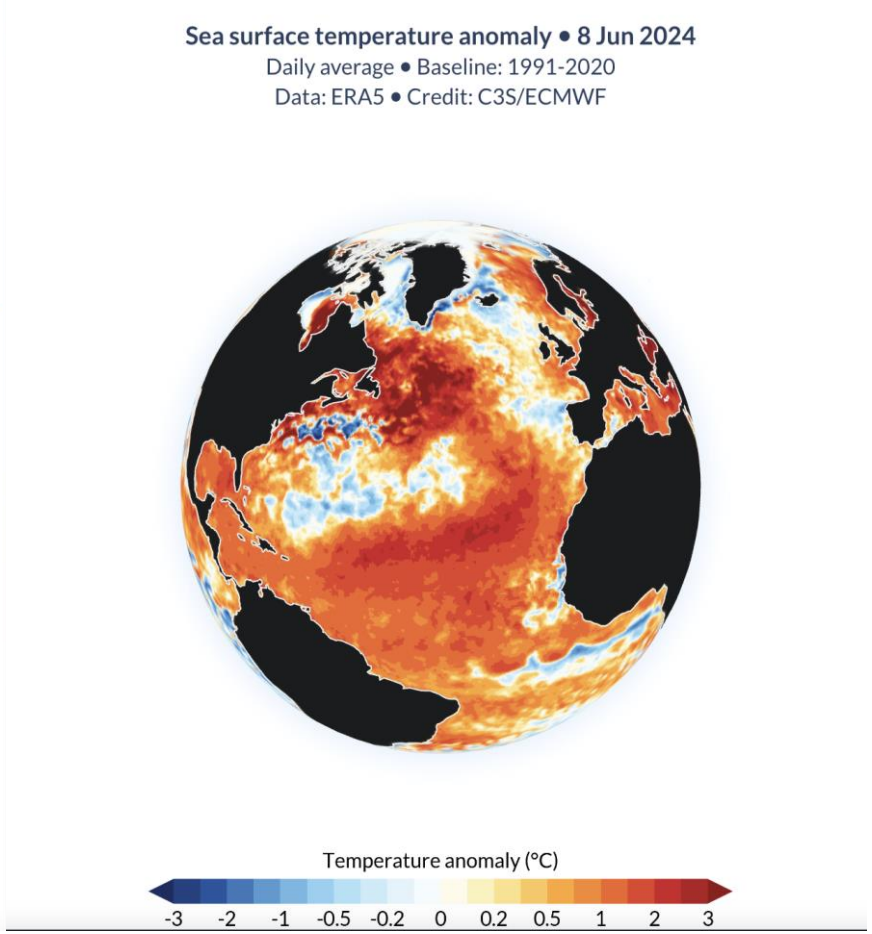




Global land and sea surface temperatures continue to rise

GLOBAL LAND AND SEA TEMPERATURES CONTINUE TO RISE





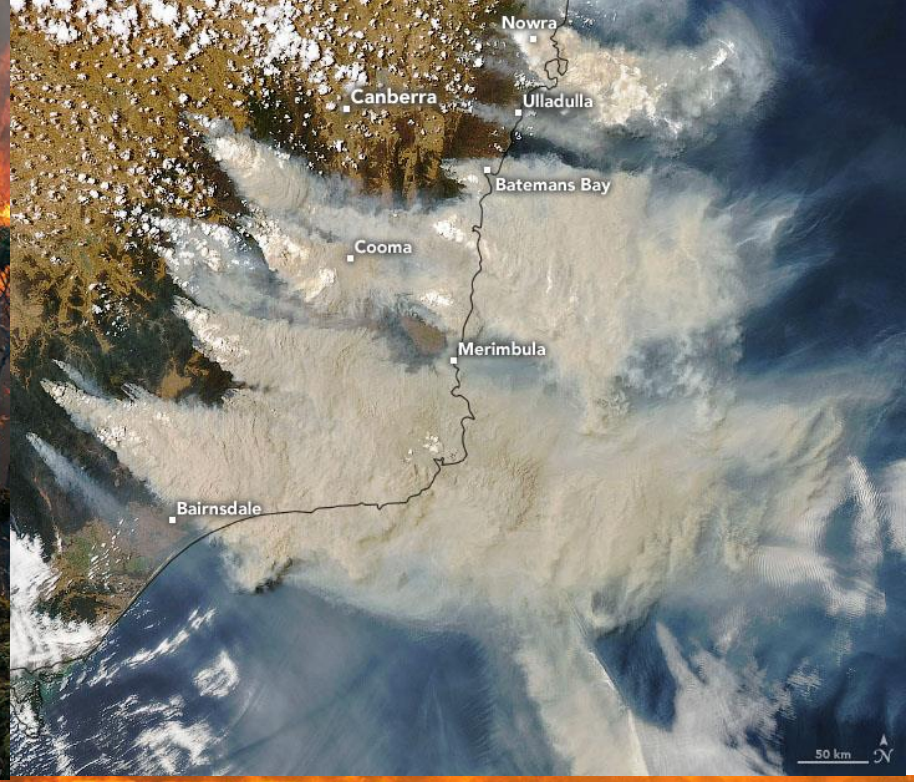
Global warming

Drier, hotter, wetter: Australia's weather to get even worse

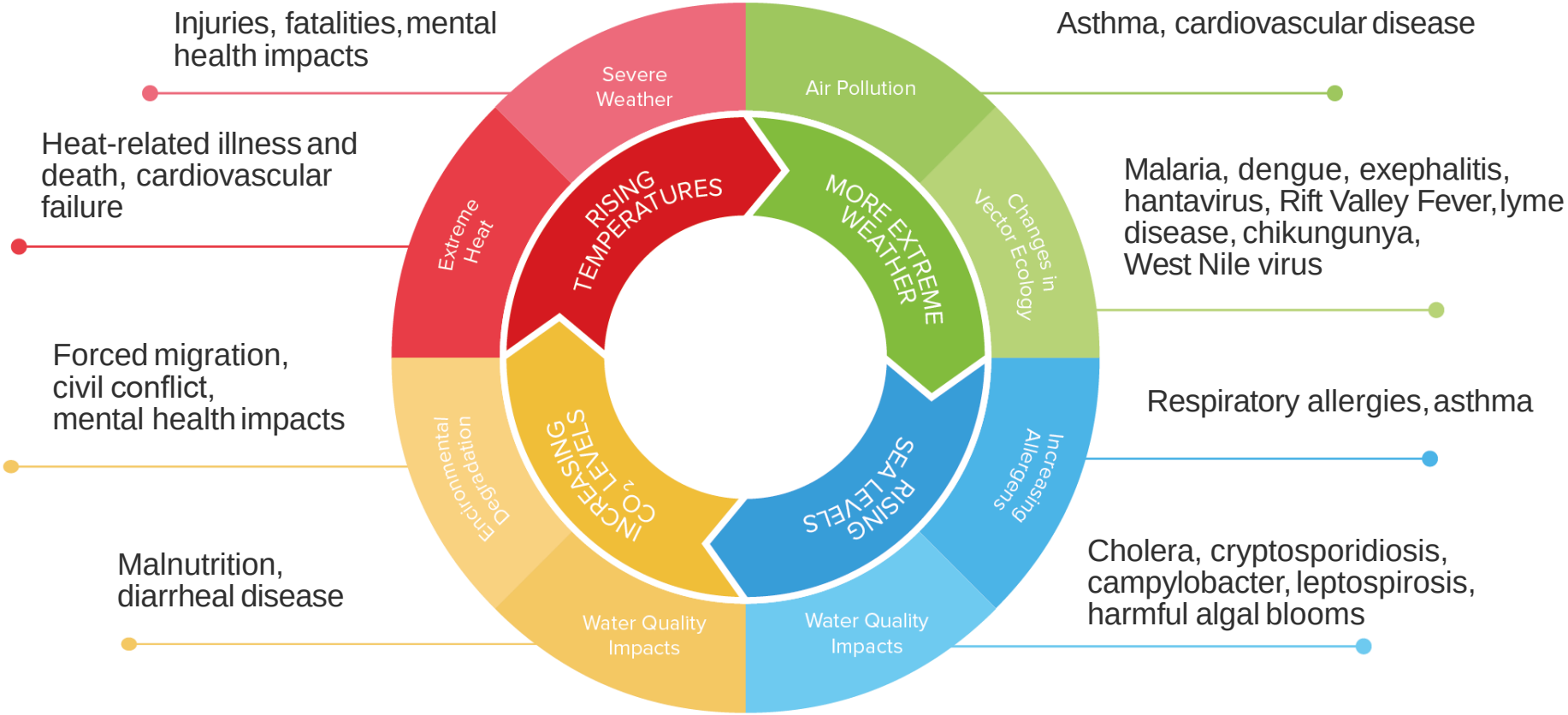
The Age, 23/11/22

Are eastern Australia's catastrophic floods really a one-in-1,000 year event?

Scientists say describing floods as 'one-in-1,000-year' events can mislead the public about the probability of such disasters recurring


Nowra
Canberra
Ulladulla
Batemans Bay
Cooma
Merimbula
Bairnsdale
50 km
N

MORE TO CLIMATE CHANGE THAN EXTREME WEATHER



The CDC Climate and Health Program. 2020

ACTIONS

- We know the context
- We know the risks
- We know we need to act

BUT…

- It's such a big problem, what can I do?

Green endoscopy: BSG/JAG/CSH joint consensus on practical measures for environmental sustainability in endoscopy

Shaji Sebastian ,[1,2] Anjan Dhar ,[3,4] Robin Baddeley,[5,6] Leigh Donnelly,[7] Rosemary Haddock,[8] Ramesh Arasaradnam ,[9,10] Archibald Coulter ,[11] Benjamin Robert Disney ,[10] Helen Griffiths ,[12] Christopher Healey,[13] Rosie Hillson ,[14] Ingeborg Steinbach ,[14] Sarah Marshall,[15,16] Arun Rajendran ,[17] Andrew Rochford,[18] Siwan Thomas-Gibson ,[6] Sandeep Siddhi,[19] William Stableforth,[20] Emma Wesley,[21] Bernard Brett Allan John Morris,[23] Andrew Douds ,[24] Mark Giles Coleman,[16,25] Andrew M Veitch ,[26] Bu'Hussain Hayee [27]

bsg BRITISH SOCIETY OF GASTROENTEROLOGY

Sebastian S et al, Gut, 2022

GIE

MULTISOCIETY STRATEGIC PLAN

ASGE
American Society for Gastrointestinal Endoscopy

GI multisociety strategic plan on environmental sustainability

Heiko Pohl, MD,[1,2] Rabia de Latour, MD,[3] Adrian Reuben, MBBS, MRCP,[4] Nitin K. Ahuja, MD, MS,[5] Swapna Gayam, MD,[6] Rohit Kohli, MBBS, MS,[7] Deepak Agrawal, MD, MPH,[8] M. Bishr Omary, MD, PhD[9]

Pohl H et al, GIE Dec 2022

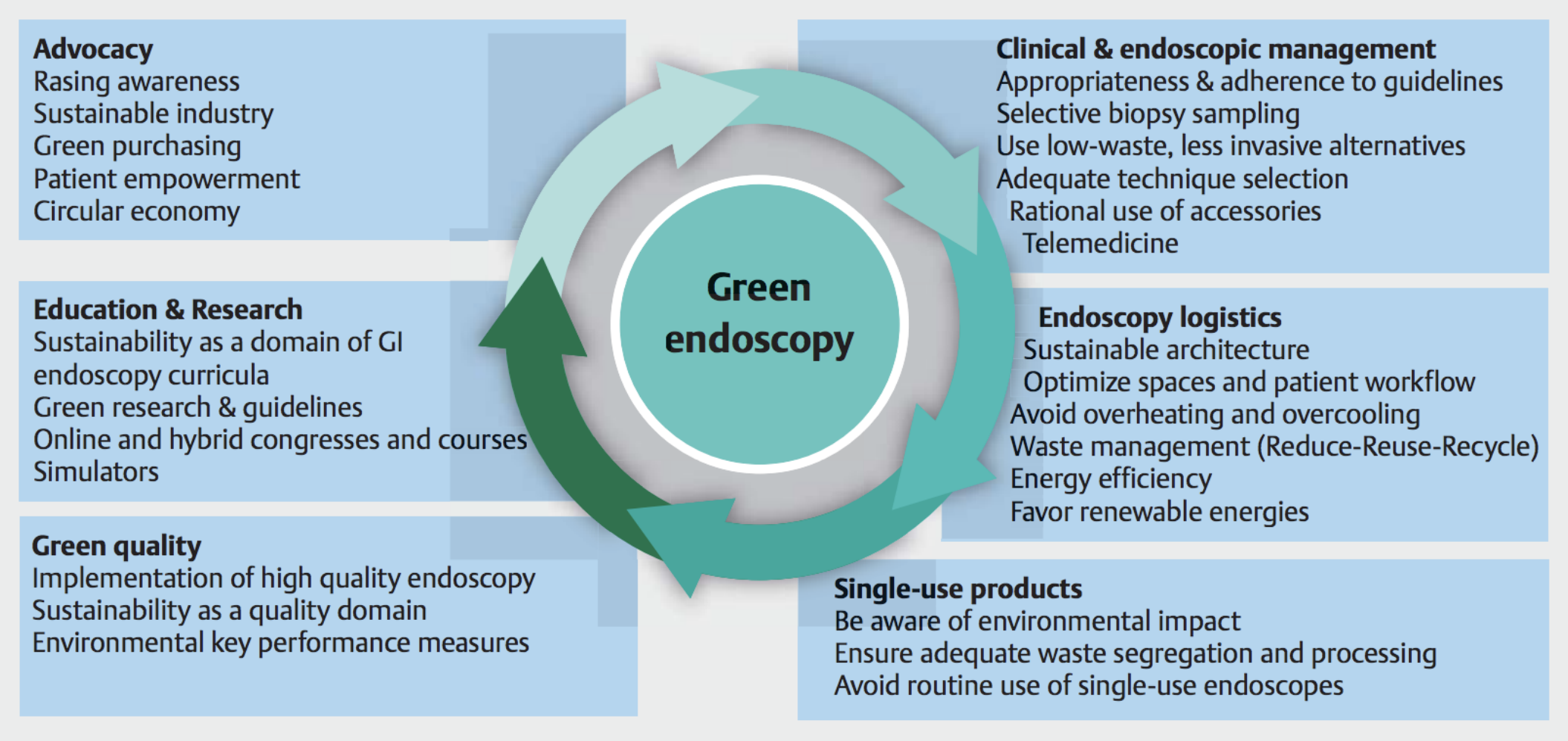
Reducing the environmental footprint of gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA) Position Statement

Authors

Enrique Rodríguez de Santiago[1,*], Mario Dinis-Ribeiro[2,*], Heiko Pohl[3], Deepak Agrawal[4], Marianna Arvanitakis[5], Robin Baddeley[6], Elzbieta Bak[7], Pradeep Bhandari[8], Michael Bretthauer[9], Patricia Burga[10], Leigh Donnelly[11], Axel Eickhoff[12], Bu'Hussain Hayee[13], Michal F. Kaminski[14], Katarina Karlović[15], Vicente Lorenzo-Zúñiga[16], Maria Pellisé[17], Mathieu Pioche[18], Keith Siau[19], Peter D. Siersema[20], William Stableforth[19], Tony C. Tham[21], Konstantinos Triantafyllou[22], Alberto Tringali[23], Andrew Veitch[24], Andrei M. Voiosu[25], George J. Webster[13], Ariane Vienne[26], Ulrike Beilenhoff[27], Raf Bisschops[28], Cesare Hassan[29], Ian M. Gralnek[30], Helmut Messmann[31]

Endoscopy, 2022

ESGE/ESGENA POSITION STATEMENT – 39 RECOMMENDATIONS



AIMS

1. To raise awareness of the ecological footprint of GI endoscopy
2. To provide guidance to reduce its environmental impact

THE ENVIRONMENTAL IMPACT OF HEALTHCARE

- Air, land and water pollution
- 4-6% of greenhouse gas emissions

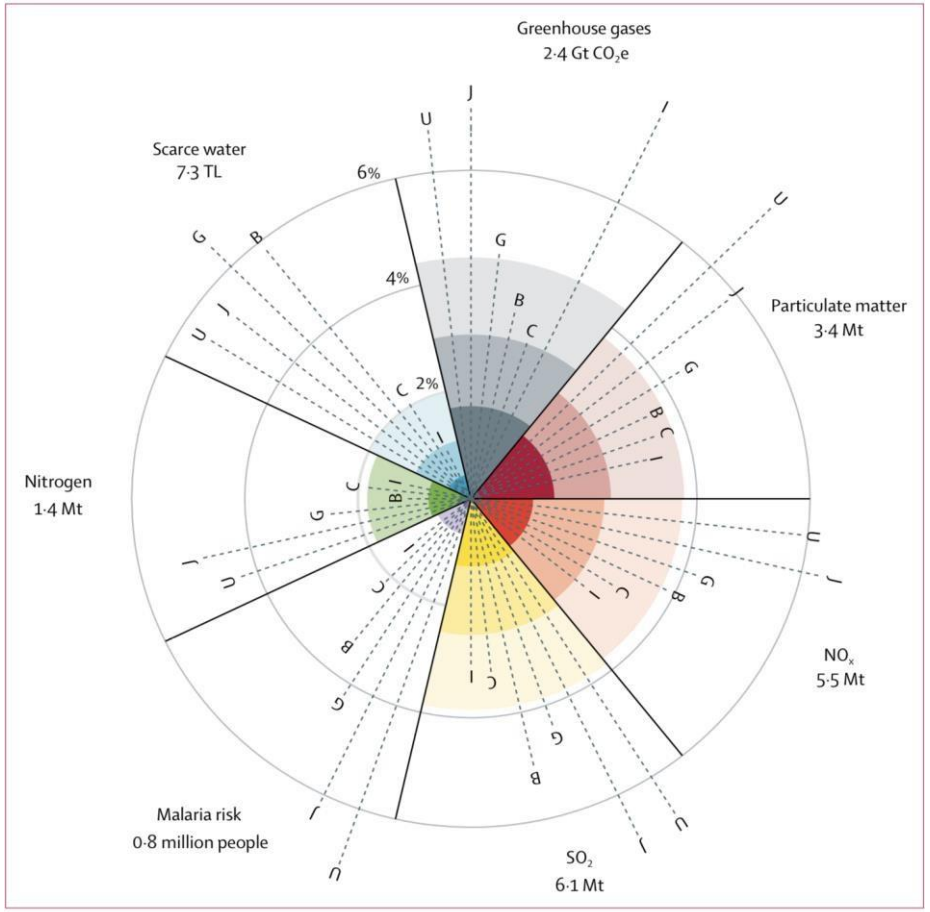


Figure 1: Environmental footprints of health care for 2015

Lenzen M, et al. Lancet Planet Health. 2020
J Karliner, et al. European Journal of Public Health. 2020

HEALTHCARE'S GREENHOUSE GAS EMISSIONS ARE RISING

- 2000 – 2015:
  ↑ 29% GHG

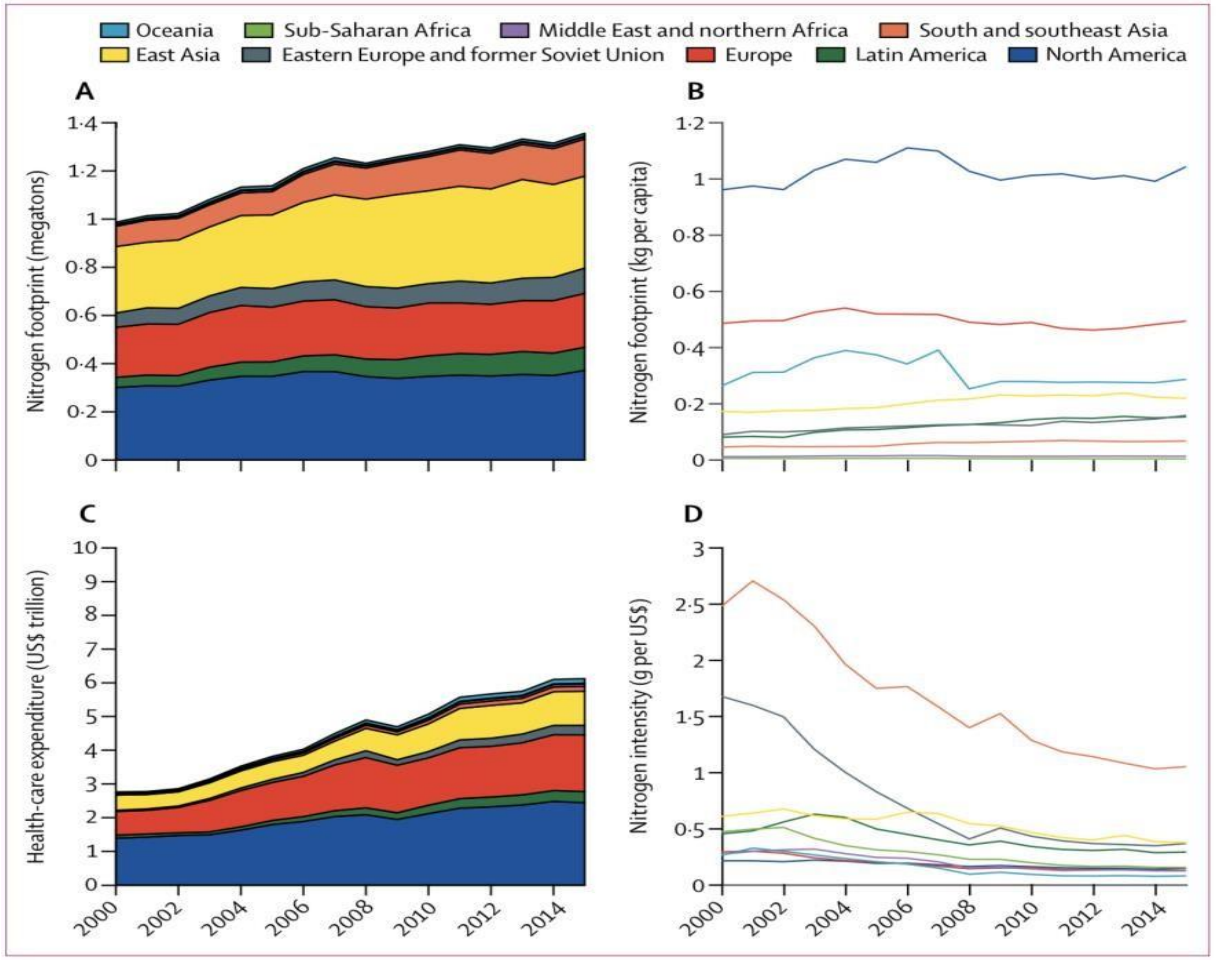
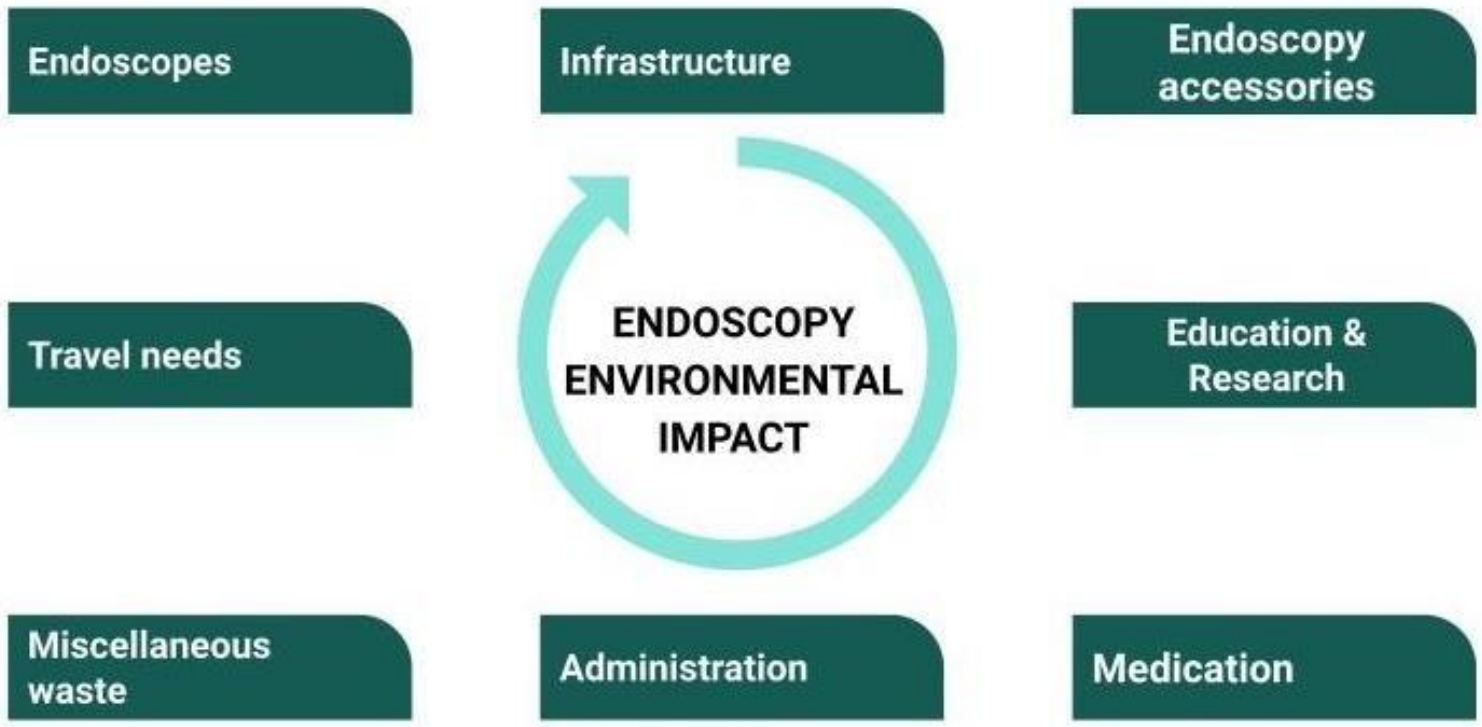


Figure 2: **Trends in the nitrogen footprint of global health care, 2000–15**

Lenzen M, et al. Lancet Planetary Health 2020.
Healthcare's climate footprint. ARUP 2022.

THE ENVIRONMENTAL IMPACT OF GI ENDOSCOPY

Significant but poorly assessed environmental impact



THE ENVIRONMENTAL IMPACT OF GI ENDOSCOPY

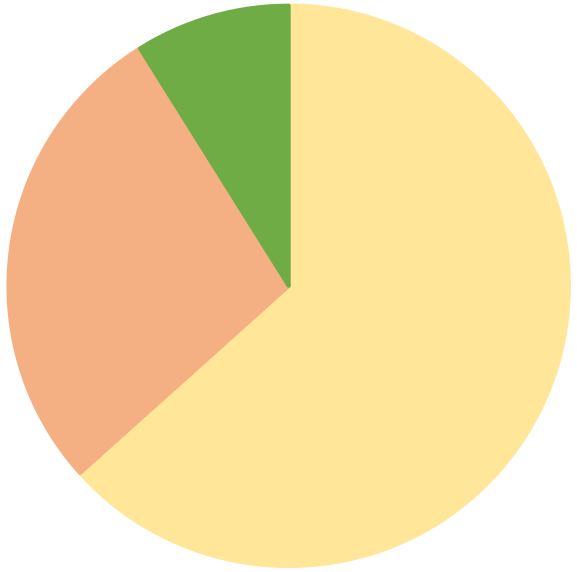
Significant but poorly assessed environmental impact

Author	Year	Design
Gayam S	2021	Cross-sectional
Namburar S	2021	Cross-sectional
Keith S	2021	Narrative review
Gordon I	2021	Life cycle assessment
Hernández LV	2021	Life cycle assessment. Abstract
Vaccari	2018	Cross sectional

THE ENVIRONMENTAL IMPACT OF GI ENDOSCOPY

Waste generator

- **2nd – 3rd highest waste generator**
- ≈ 2 kg per procedure



- Landfill (64%)
- Incinerated (28%)
- Recycled (9%)

CO2 emissions

- ≈ 5 kg CO2 per endoscopic procedure
- 0.28 kg CO2 per biopsy

10 endoscopic procedures
1 biopsy per procedure

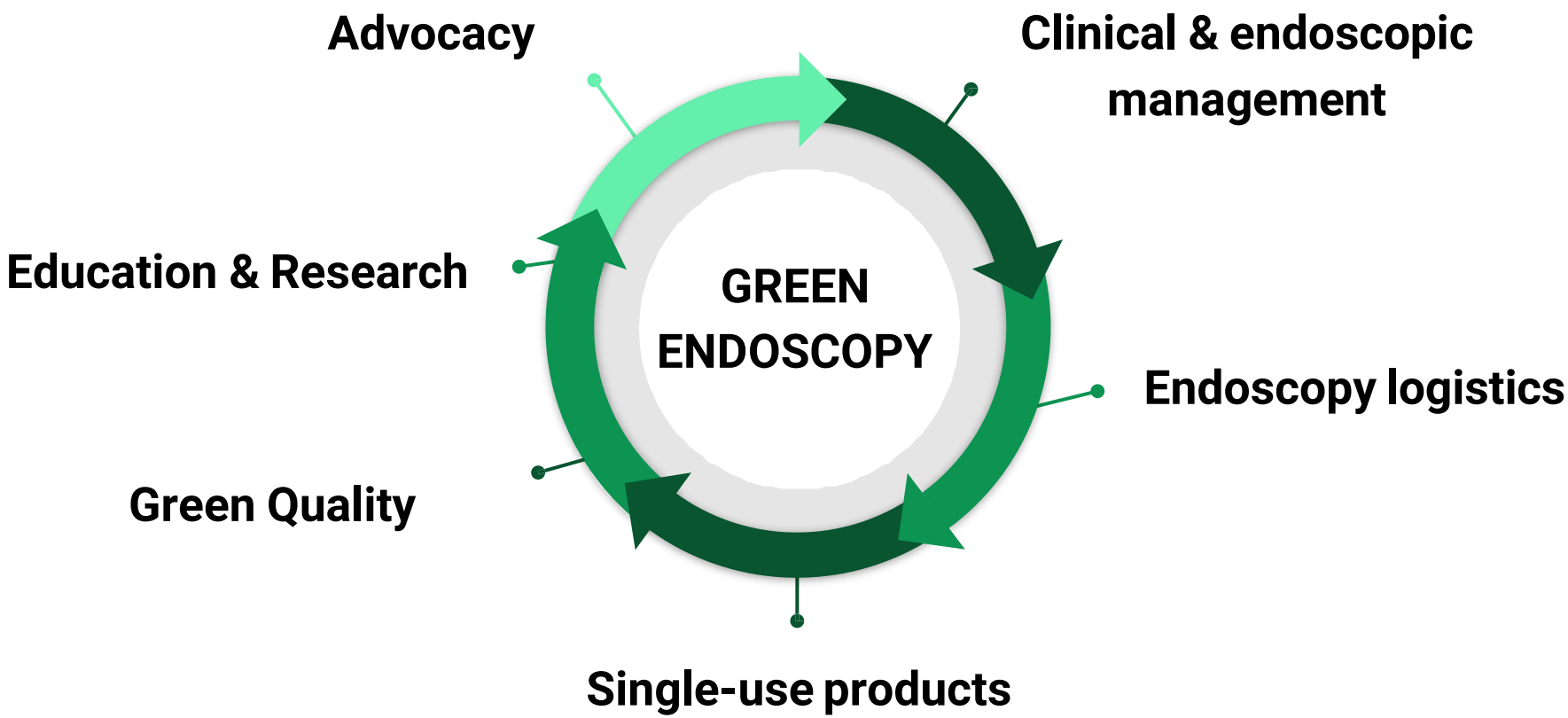
55 kg of CO2

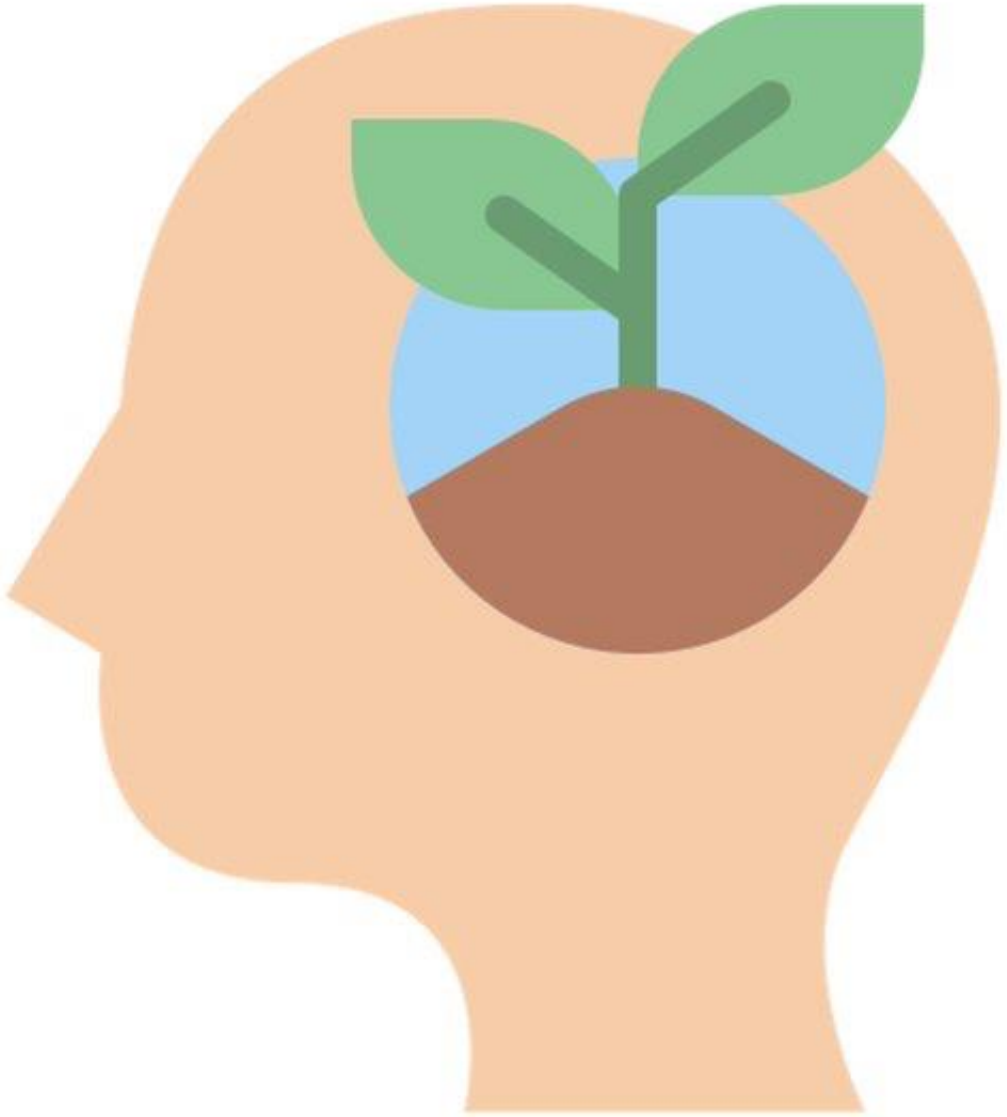
Vaccari M, et al. Waste Manag Res 2018
Siau K, et al. Techniques and Innovations in Gastrointestinal Endoscopy 2021
Namburar S, et al. Gut. 2021

AIMS

1. To raise awareness of the ecological footprint of GI endoscopy
2. To provide guidance to reduce its environmental impact

THE PATH TOWARDS SUSTAINABLE ENDOSCOPY



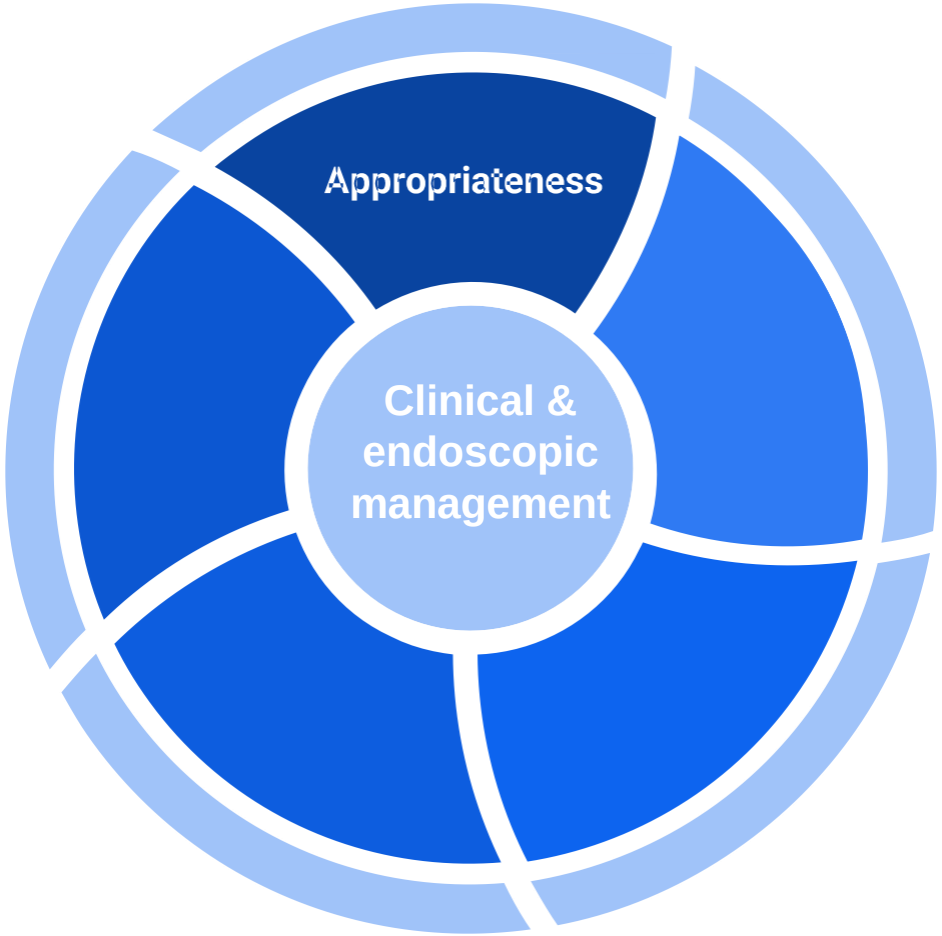


"The most wasteful procedure is one that did not need to be done in the first place."

@GreenEndoscopy

CLINICAL AND ENDOSCOPIC MANAGEMENT

Ensure adequate indication for endoscopy



THE PATH TOWARDS SUSTAINABLE GI ENDOSCOPY

- **2 meta-analyses:** ≈ 75.000 patients
- ↑↑ Yield of GI endoscopy

Meta-Analysis

Diagnostic yield of upper endoscopy according to appropriateness: A systematic review

Systematic review with meta-analysis: the appropriateness of colonoscopy increases the probability of relevant findings and cancer while reducing unnecessary exams

Rate of inappropriate GI endoscopy: 20% - 30%

Frazzoni L, et al. Aliment Pharmacol Ther. 2021
Zullo A, et al. Dig Liver Dis. 2019

CLINICAL AND ENDOSCOPIC MANAGEMENT

Endoscopic findings not requiring surveillance

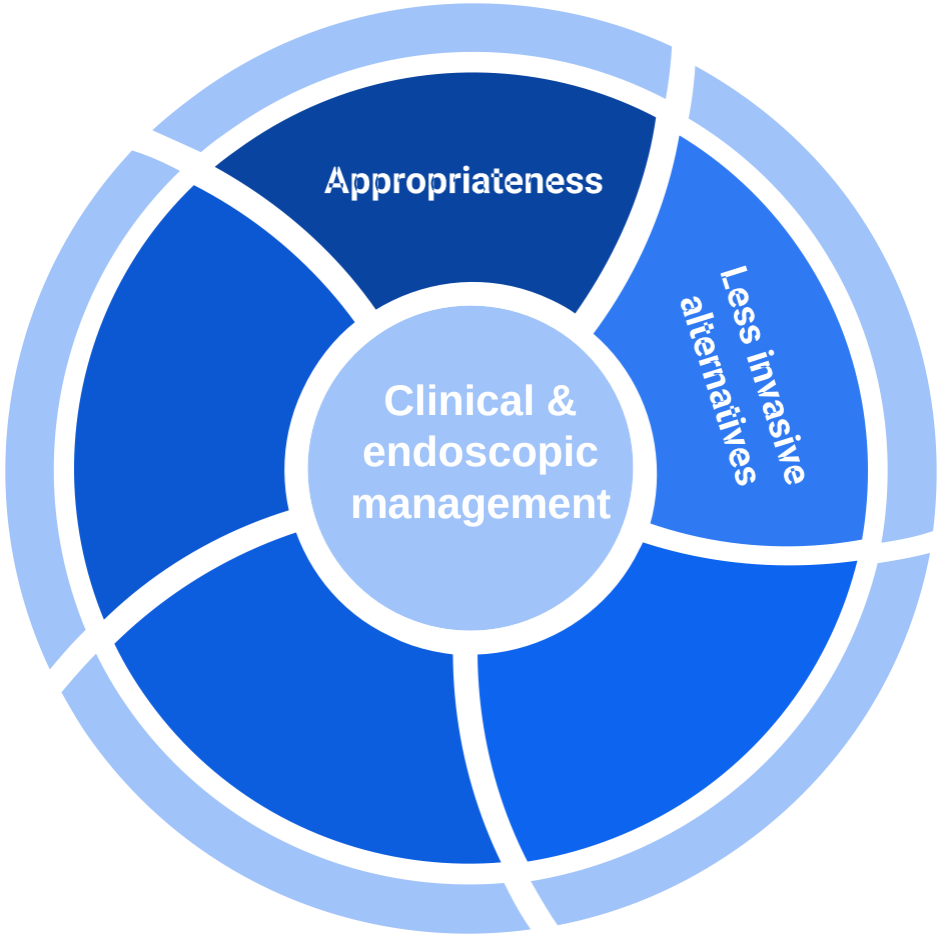
▶ **Table 1** Prevalent digestive findings that might not require endoscopic surveillance.

	Finding or condition	Prevalence	Malignancy risk
Esophagus	Inlet patch	0.1% – 12%	0 – 1.6% risk of dysplasia
	Erosive esophagitis	11%	0 – 9% risk of Barrett's esophagus for LA grade A or B erosive esophagitis
	< 1 cm columnar-lined esophagus	10%	No increased risk of esophageal cancer
Stomach	Intestinal metaplasia or atrophy limited to one location (i. e., antrum or corpus only)	Up to 25%	0.55% risk of progression to gastric cancer
	Fundic gland polyps	13% – 77%	No documented risk of gastric cancer if < 1 cm and no suspicious features
Subepithelial lesions	Leiomyoma	0.08% – 0.43%	Benign lesion
	Lipoma	0.2%	Benign lesion
	Pancreatic rest	0.6% – 13.7%	Anecdotal malignant transformation
Duodenum	Duodenal peptic ulcer	2% – 13%	No cancer risk
Pancreas	Serous cystic neoplasm	Up to 16% of pancreatic cystic neoplasms	Benign lesion

R. de Santiago, et al.. 2020Endoscopy

CLINICAL AND ENDOSCOPIC MANAGEMENT

Use low-waste, less-invasive alternatives to endoscopy

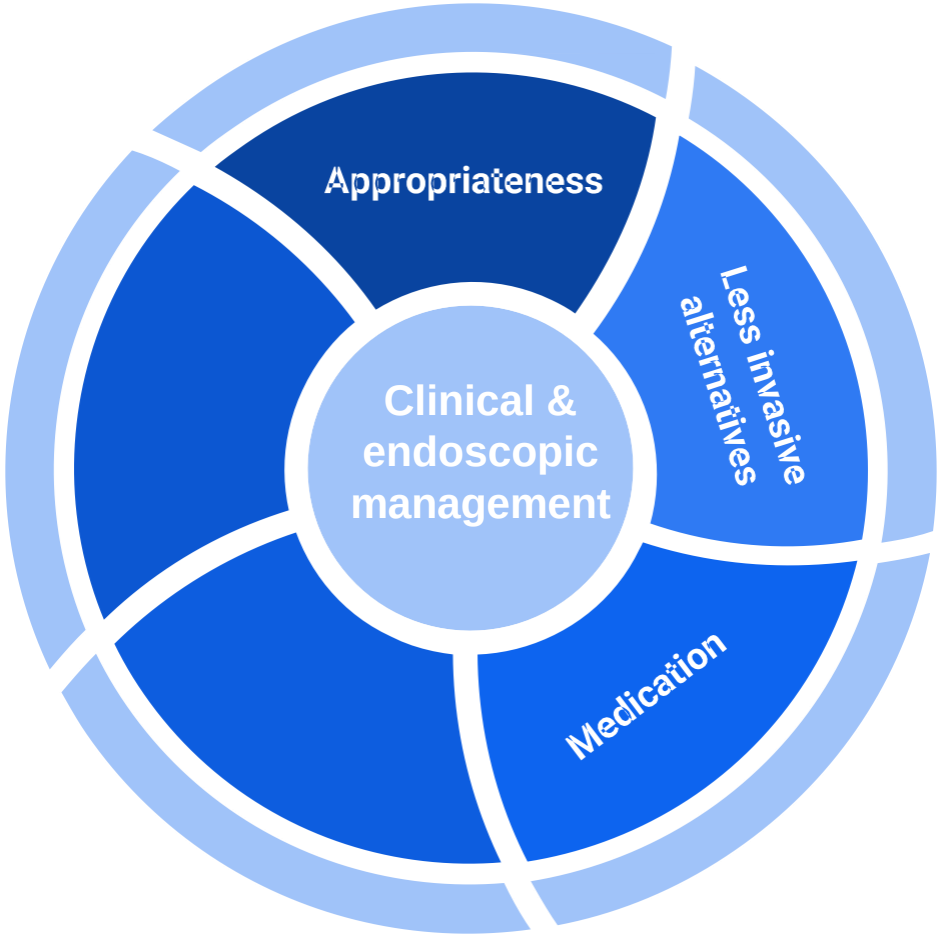


LOW-WASTE, LESS INVASIVE ALTERNATIVES TO ENDOSCOPY

- **Screening tests: FOBT**
- **H. pylori: urea breath test**
- **Chronic diarrhoea: faecal calprotectin**

CLINICAL AND ENDOSCOPIC MANAGEMENT

Rational use of medication

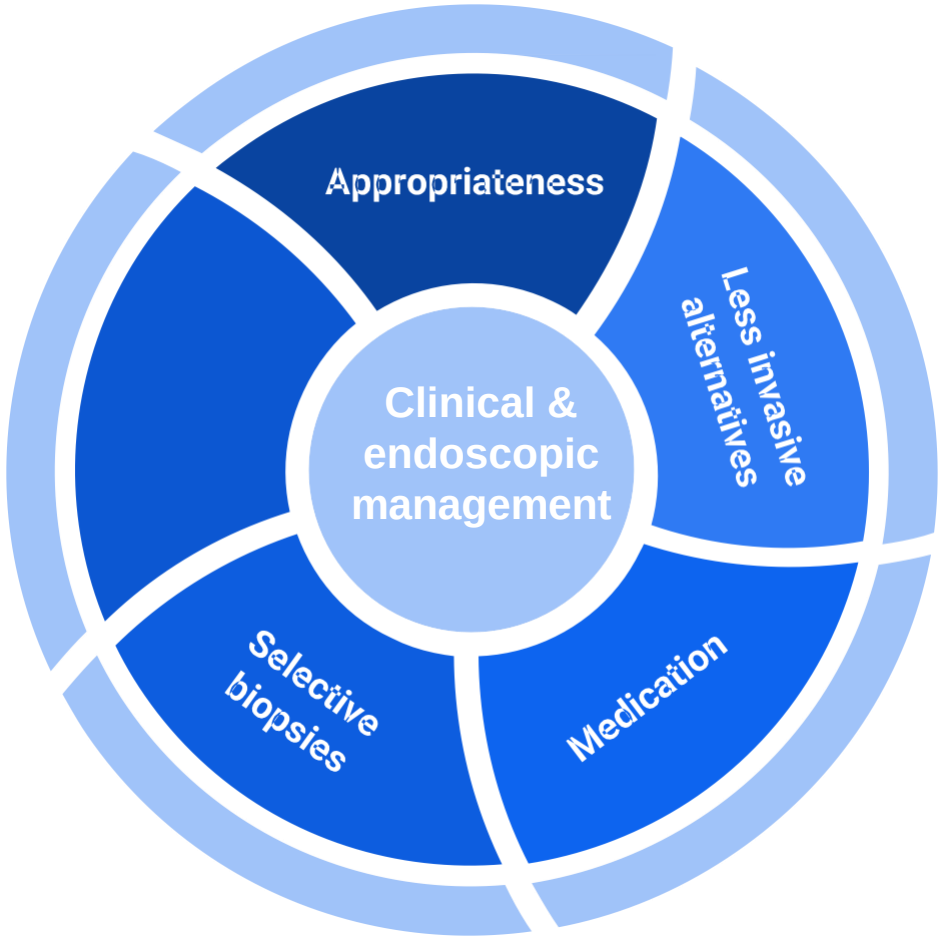


RATIONAL USE OF MEDICATION

- Avoid unnecessary antibiotics
- Avoid routine use if IV fluids, use judiciously
- Avoid non-indicated PPI
- Engage in shared-decision making with anaesthetic colleagues:
  - Propofol hand-bolus administration rather than infusion pumps
  - Avoid use of topical lignocaine spray if not required

CLINICAL AND ENDOSCOPIC MANAGEMENT

Reduce the number of biopsies, only take those that are truly necessary



APPROPRIATE BIOPSIES - GASTROSCOPY

- **Irregular Z-line:** does not need biopsy
- **Candida:** only biopsy if therapeutic consequences
- **Excluding coeliac disease:** use the same biopsy pot rather than separate D1 and D2

R. de Santiago, et al. Endoscopy. 2020
Pouw RE, et al. Endoscopy 2021

APPROPRIATE BIOPSIES - COLONOSCOPY

- **Dysplasia surveillance in IBD:** use NBI, chromoendoscopy to target biopsies rather than random specimens

- **Endoscopically-resectable lesions:** don't biopsy
  - Leave large non-malignant polyps requiring EMR/ESD for an interventionalist
  - NB: Biopsying polyps can cause fibrosis that then renders EMR more difficult

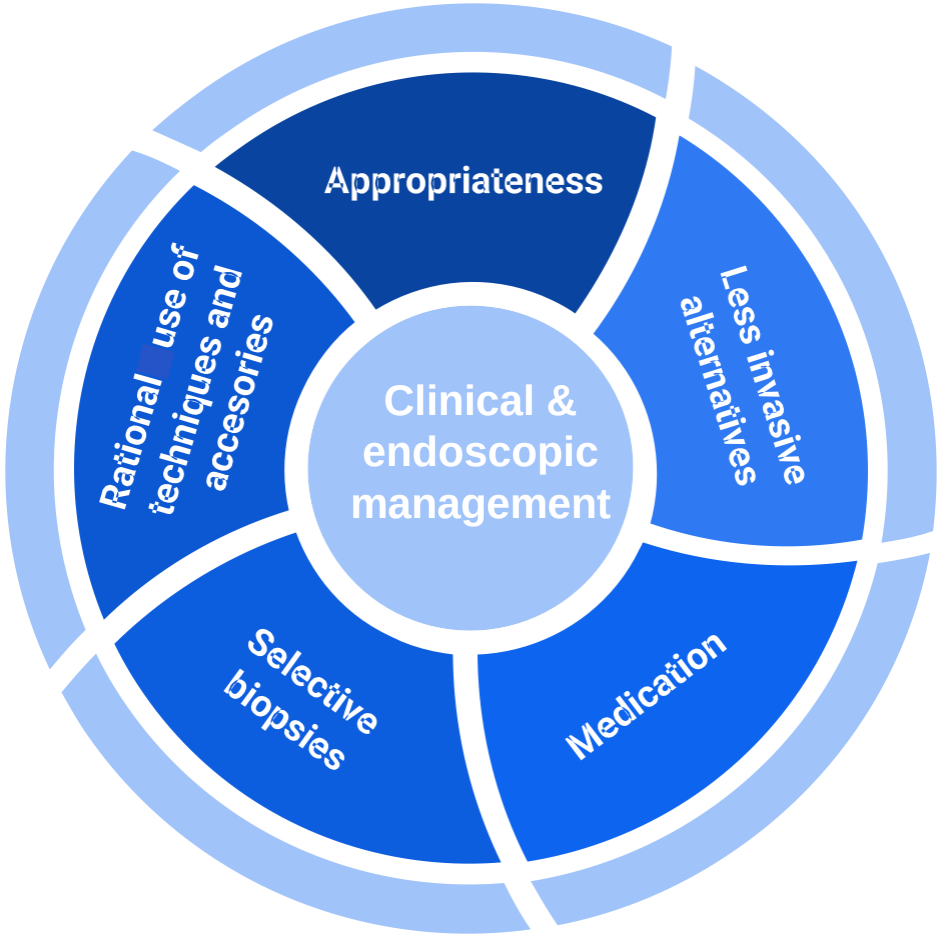
- **Hyperplastic polyps:** rectosigmoid obviously hyperplastic polyps do not need resection (as opposed to sessile serrated polyps)

- **Excluding Microscopic colitis:** use same pot for right and left colon biopsies

R. de Santiago, et al. Endoscopy. 2020 Pouw RE, et al. Endoscopy 2021 M Ma et al, Endoscopy 2022, M Ferlitsch et al, Endoscopy 2024

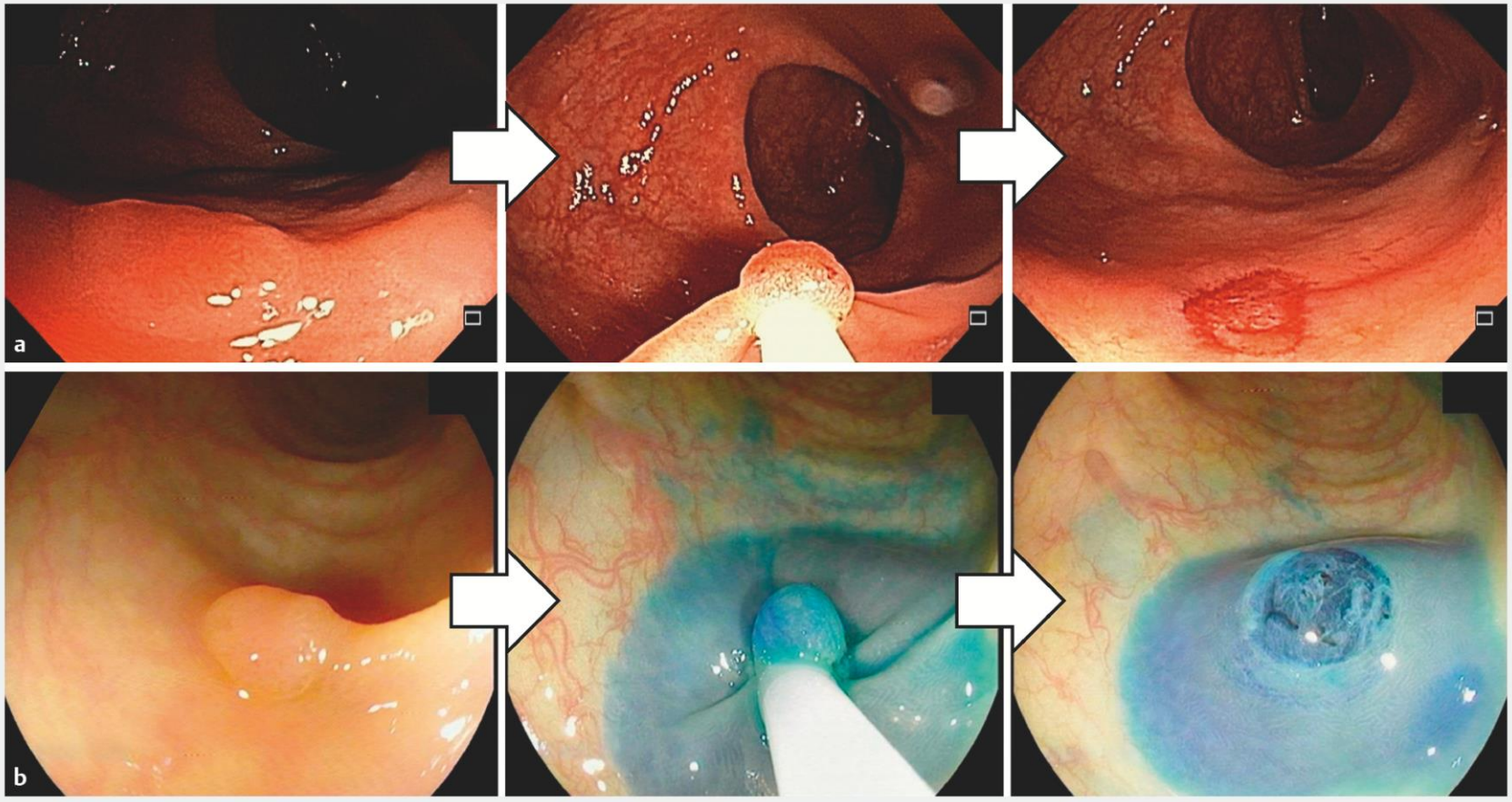
CLINICAL AND ENDOSCOPIC MANAGEMENT

Rational use of techniques and accessories



CLINICAL AND ENDOSCOPIC MANAGEMENT

Rational use of techniques and accessories

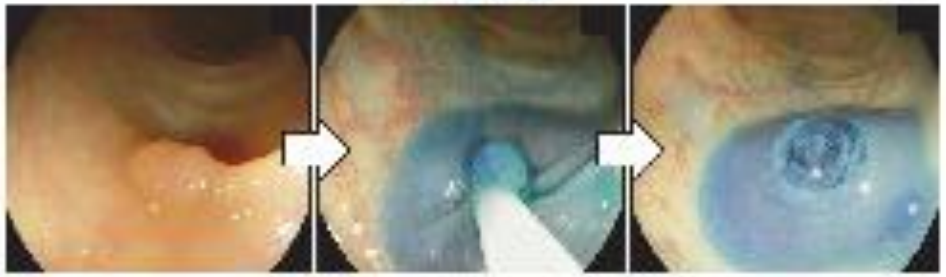


CLINICAL AND ENDOSCOPIC MANAGEMENT

Cold endoscopic mucosal resection versus cold snare polypectomy

A systematic review and meta-analysis

C-EMR



7 RCTs

2287 colorectal polyps: ≤20 mm

CSP

Outcomes	C-EMR vs CSP Risk ratio/mean difference (95%CI)
Complete resection	1.02 (0.98–1.07)
En bloc resection	1.08 (0.82–1.41)
Adverse events	0.74 (0.41–1.32)
Procedure time	42.1 seconds (14.5–69.7)

C-EMR, cold endoscopic mucosal resection; CSP, cold snare polypectomy; RCT, randomized controlled trial

Endoscopy

P Arruda do Espirito Santo et al, Endoscopy 2024

CLINICAL AND ENDOSCOPIC MANAGEMENT

Colorectal polypectomy and endoscopic mucosal resection (EMR): European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline

ESGE

RECOMMENDATION

ESGE recommends cold snare polypectomy for the removal of diminutive polyps (≤5 mm).
Strong recommendation, high quality of evidence.

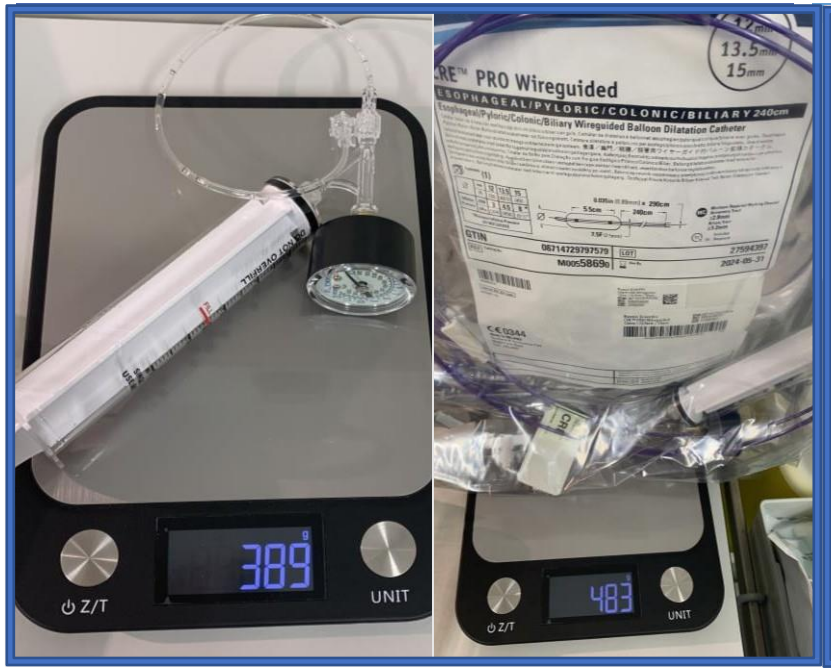
ESGE recommends including a clear margin of normal tissue (1–2 mm) surrounding the polyp.
Strong recommendation, high quality of evidence.

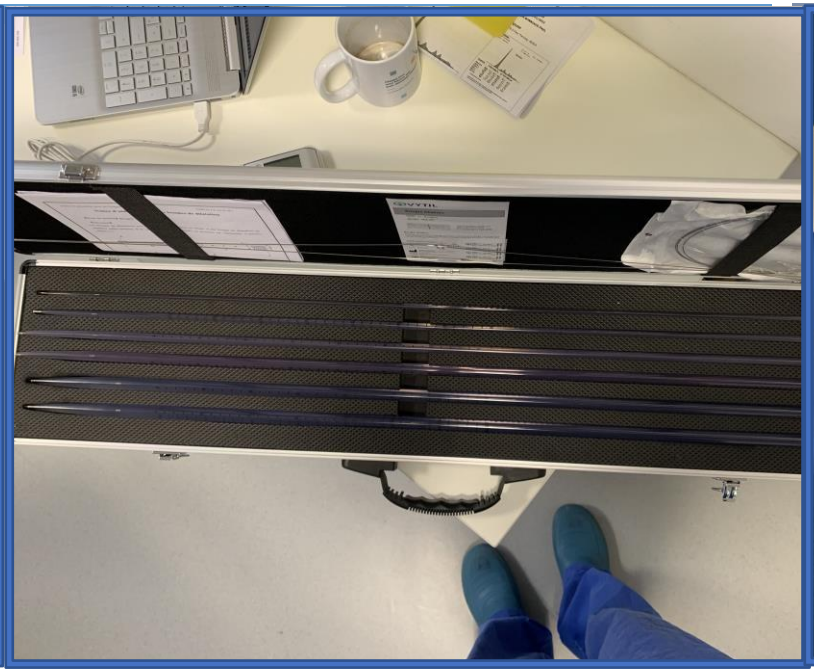
RECOMMENDATION

ESGE recommends cold snare polypectomy for the removal of small polyps (6–9 mm).
Strong recommendation, high quality of evidence.

ESGE recommends including a clear margin of normal tissue (1–2 mm) surrounding the polyp.
Strong recommendation, high quality of evidence.

Ferlitsch M et al, Endoscopy, 2017





Balloon dilation
Weight of balloon and packaging : **94 g**
Single use manometer : **389 g**

Bougie dilation
Disinfection solution
No plastic weight
10 years old use

Bougie cap 1 cap

3 g

CLINICAL AND ENDOSCOPIC MANAGEMENT

Take away messages on equipment use:

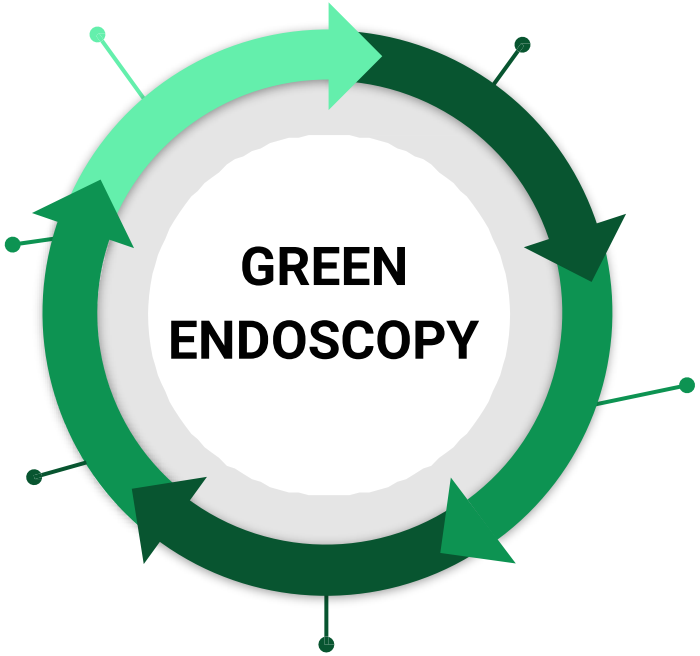
- Use the less resource-intensive technique
- Re-use accessories within the same procedure
- Do not clip all polyp defects
  - Should be reserved for cases of uncontrolled bleeding, concerns about depth of injury/risk of perforation

Turan AS, et al. Scand J Gastroenterol. 2020
Bahin et al, Endoscopy, 2016

ACHIEVING SUSTAINABLE ENDOSCOPY

Education & Research

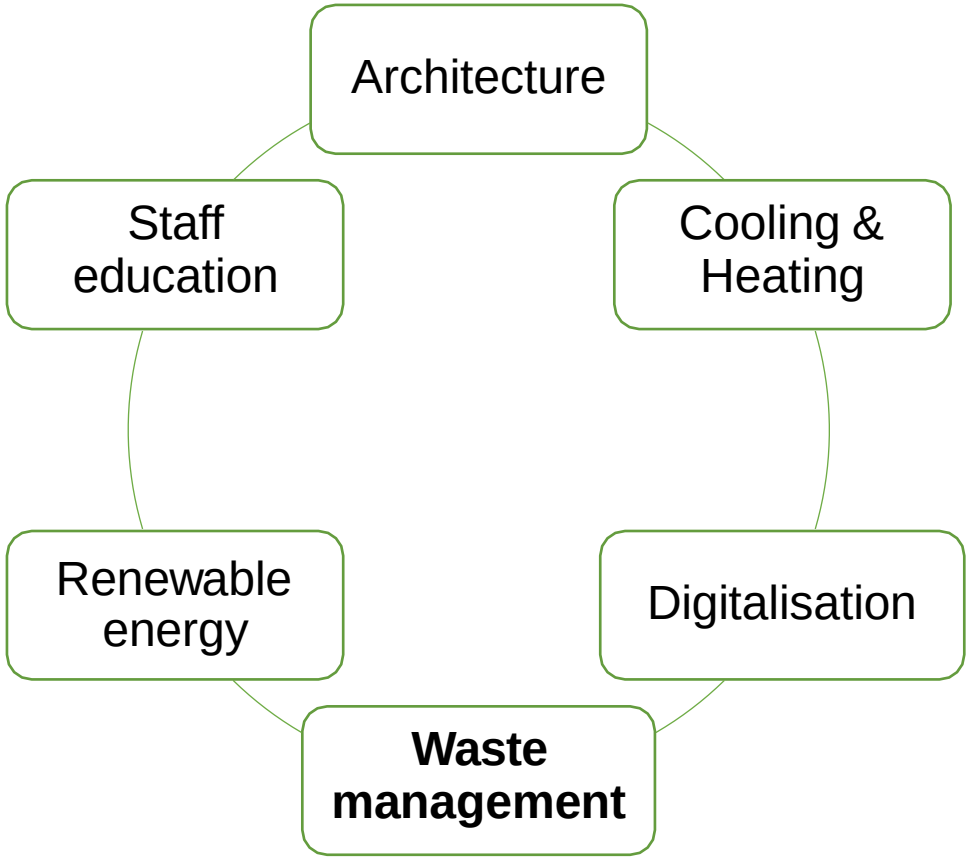
Green Quality



Endoscopy logistics

Single-use products

SUSTAINABLE INFRASTRUCTURE



SEGREGATING WASTE

- **Survey:** 783 endoscopy staff members and 352 gastroenterologists
- High rate of inadequate disposal
- Only 0.6% understood disposal costs
- 98% felt that more education/information is required

Agrawak D, et al. Gastroenterol Nurse. 2017

Endoscopy Waste Segregation

Figure 1 Waste segregation in endoscopy. NG, naso gastric; PEG, percutaneous endoscopic gastrostomy.

Sebastian S et al, Gut, 2022

Oxford University Hospitals NHS Trust

Positive outcome(s) of project:

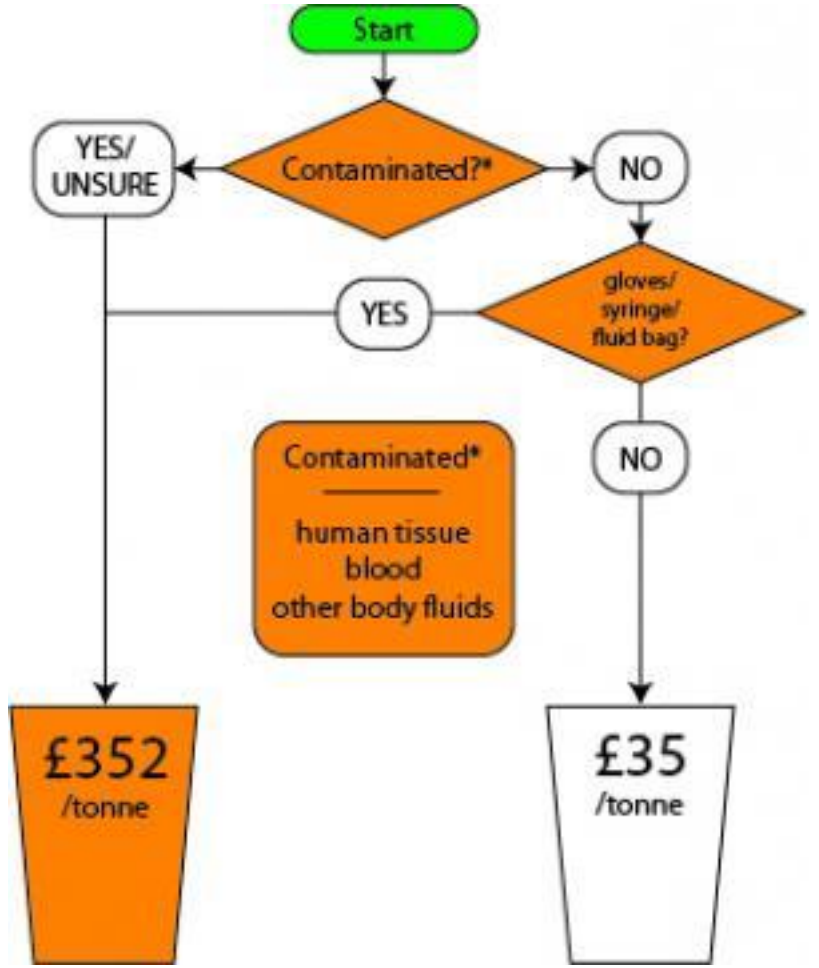
- Diversion of waste from landfill and incineration to recycling, saving money and carbon; engaged and empowered theatre staff across the OUH Trust in a successful change management project.

Savings per year:

- **£**1319.38 (NB this is a partial result, based on only 1 out of the 3 participating theatre suites) (Estimated)

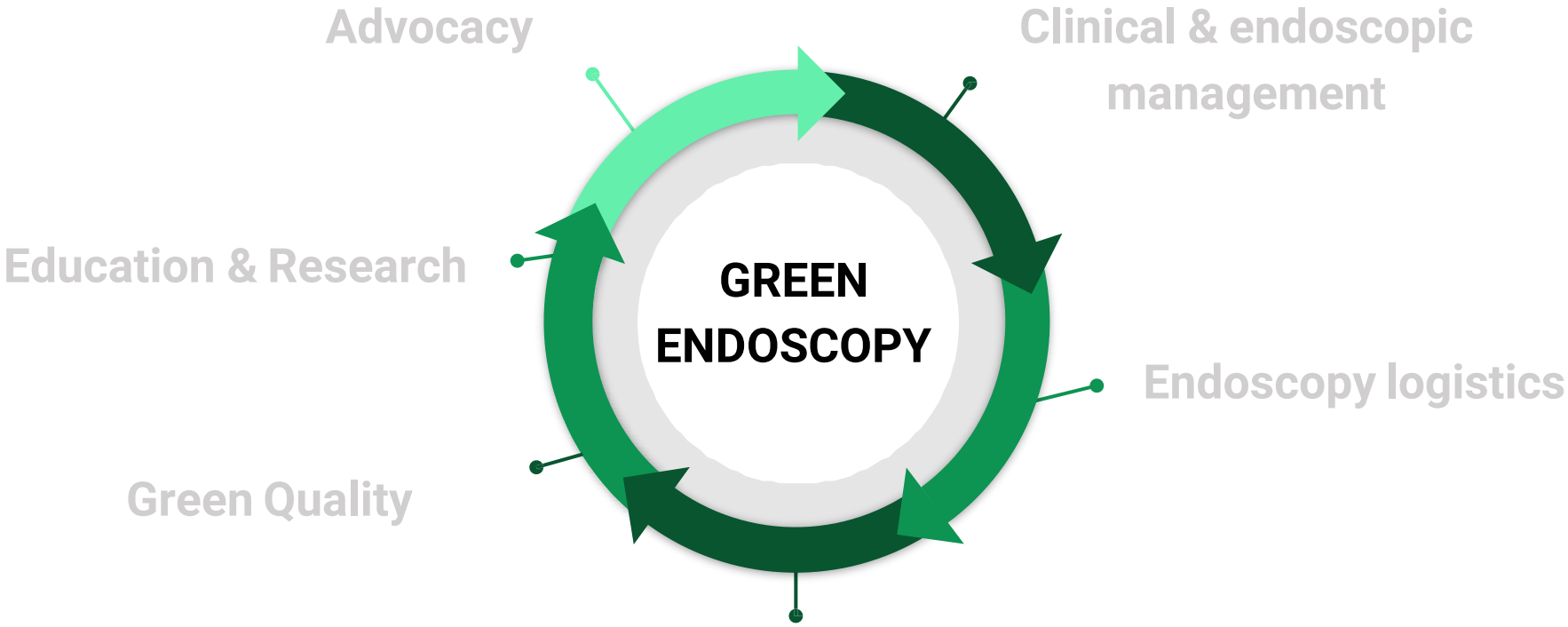
CO2 savings per year:

- 8,886 kg CO2e (NB this is a partial result, based on only 1 out of the 3 participating theatre suites) (Estimated)



https://map.sustainablehealthcare.org.uk/oxford-radcliffe-hospitals-nhs-trust/introducing-recycling-operating-theatres

SINGLE USE PRODUCTS



Single-use products

WEIGHING THE BURDEN OF SINGLE USE… RATIONALISE USE

Safety

Economic cost

Environmental cost

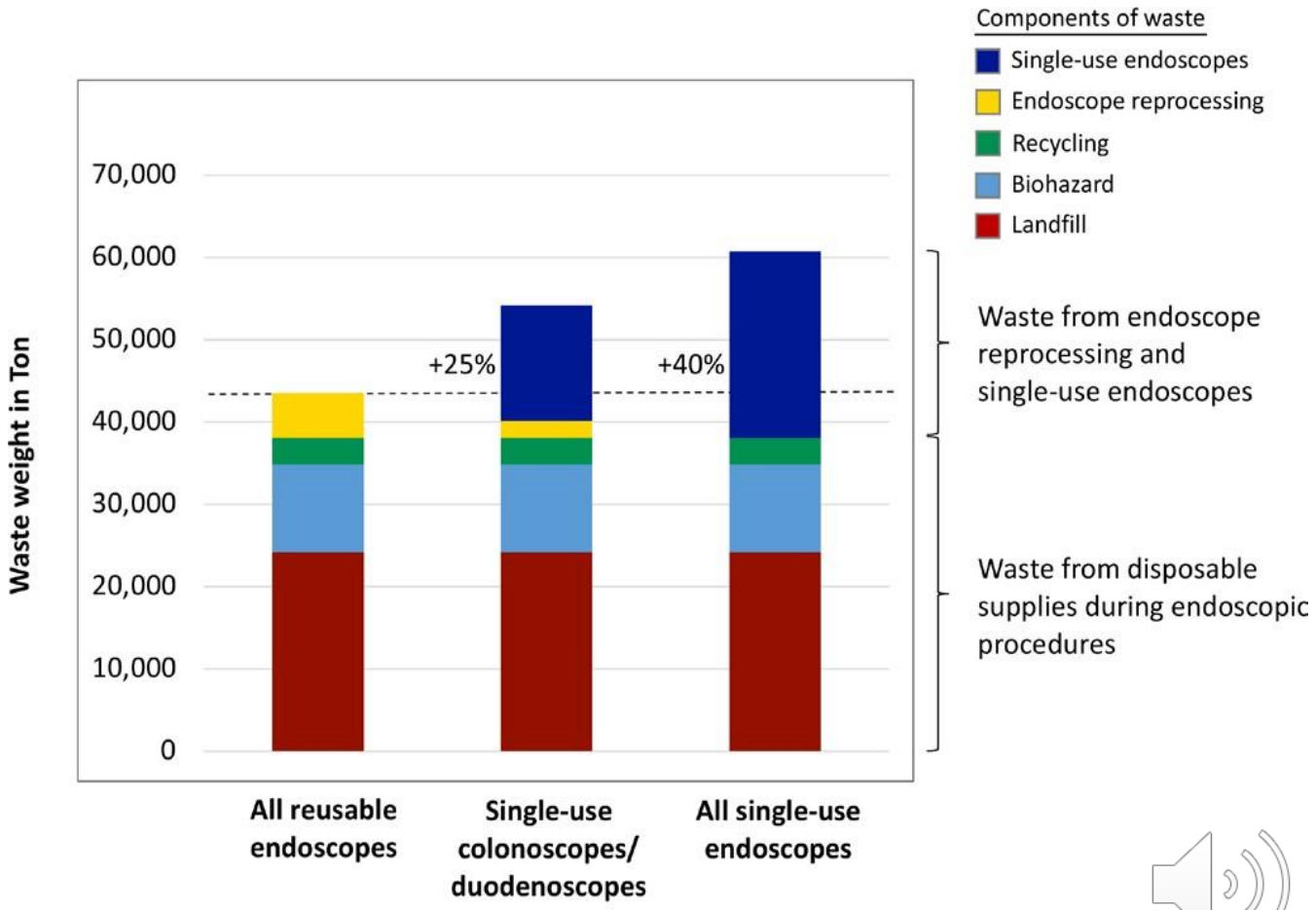
Societal cost

Always consider whether there is an equally effective re-usable device

SINGLE USE ENDOSCOPES

The cost of single use scopes:

- High cost: US$1900- 4000
- ↑↑Net waste mass by 40%
- Single-use duodenoscope: **29.3 kg** of CO2
  - (x20 more than re-usable)



Das A, et al. TIGE 2021
Namburar S, et al. Gut. 2021
Hernandez LV, et al. Gastrointestinal Endoscopy. 2021

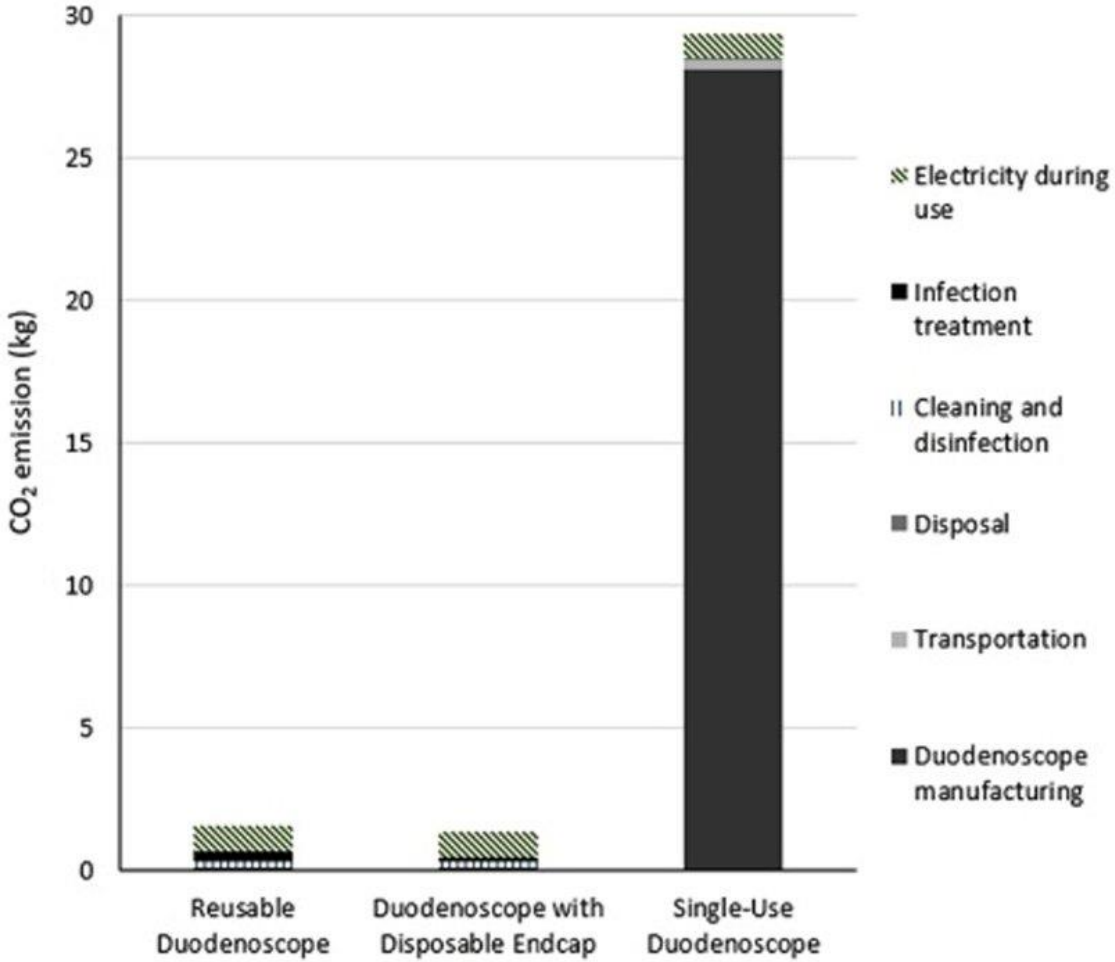
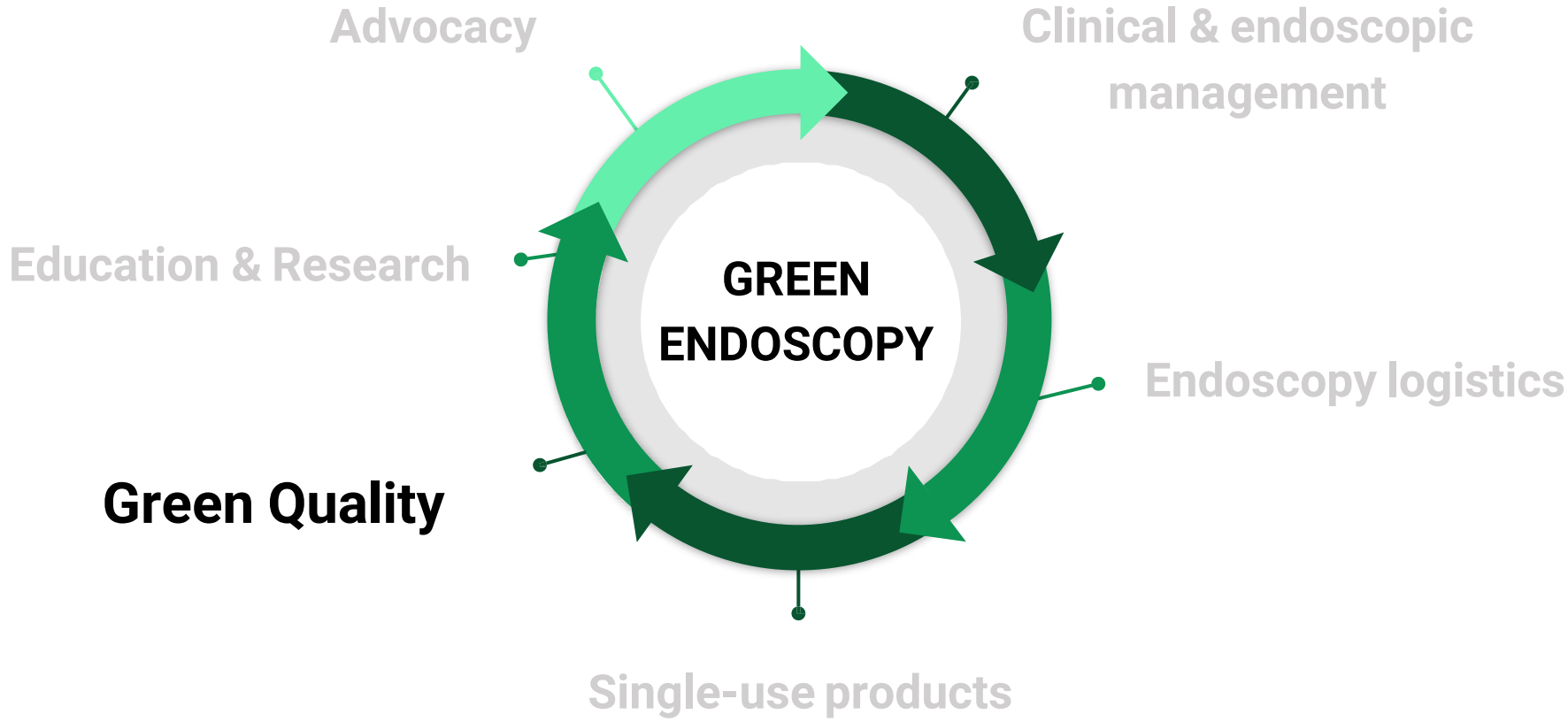


Fig 1. Comparison of the CO_2 emission of an ERCP procedure using three types of duodenoscope, showing the contribution of different life-cycle-stages (manufacturing, transportation, disposal, cleaning, infection treatment, and electricity during use).

Hernandez L, et al, GIE 2021

GREEN QUALITY



GREEN QUALITY

Sustainability as a domain of quality GI endoscopy

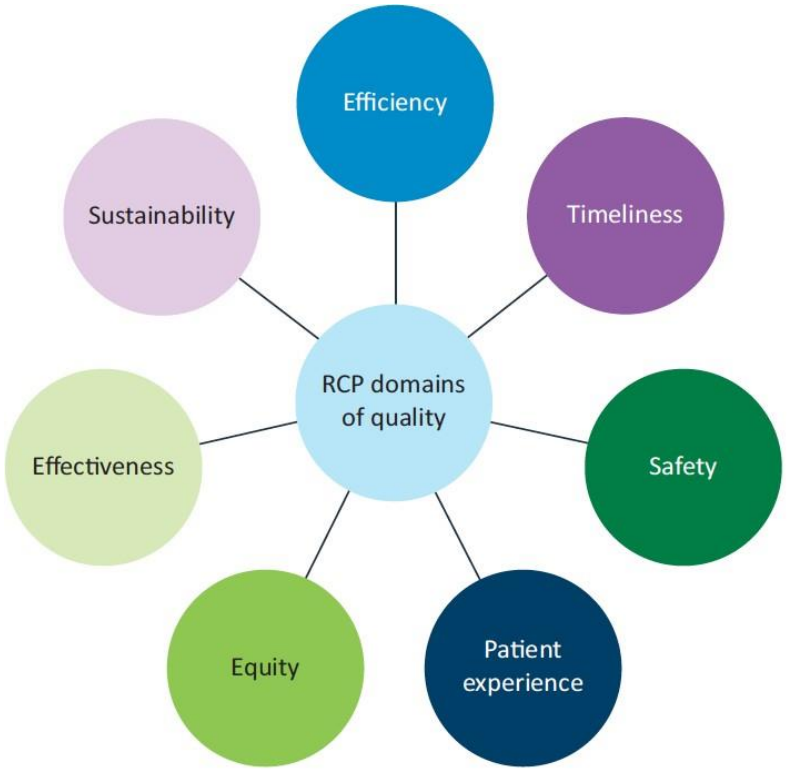
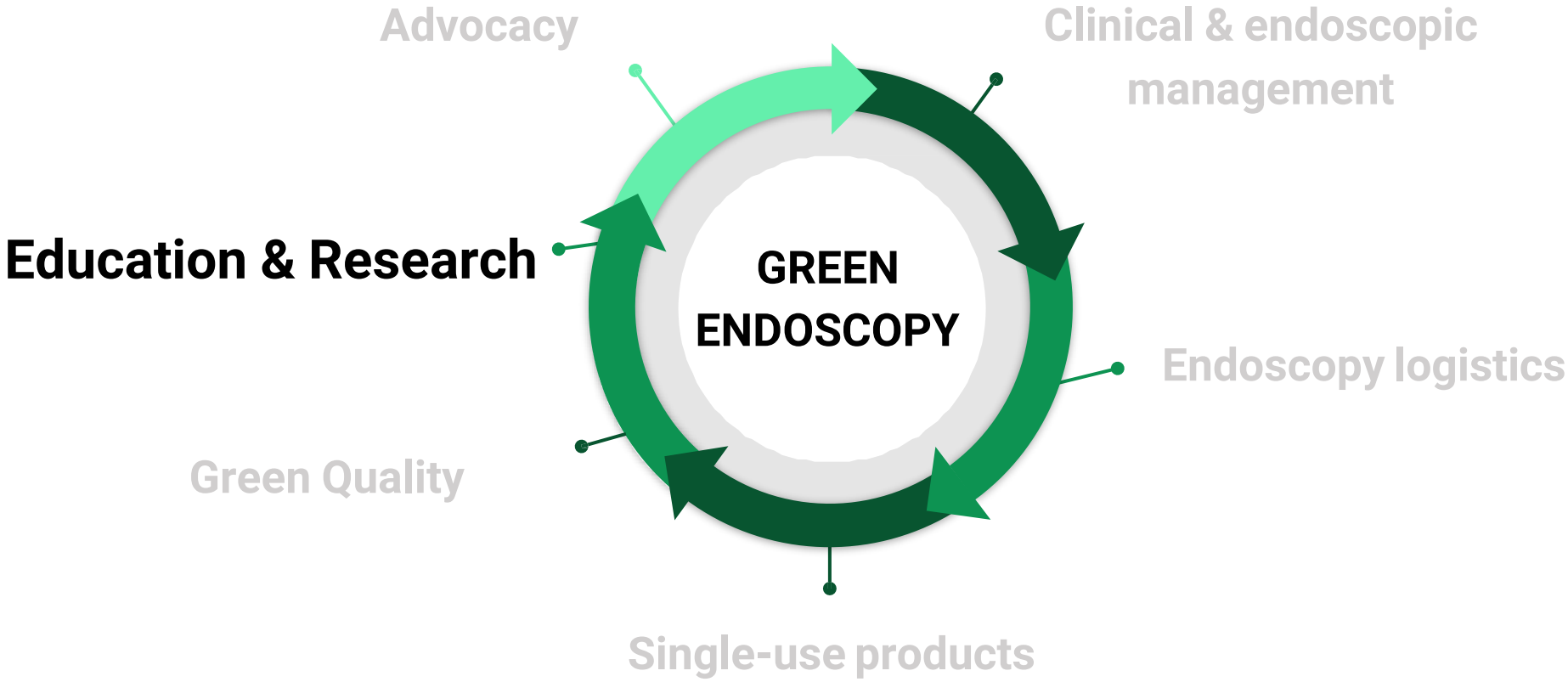


Fig 1. Domains of quality (adapted by the Royal College of Physicians from the Institute of Medicine).[1]

F Mortimer, et al. Future Healthc J. 2021

THE PATH TOWARDS SUSTAINABLE ENDOSCOPY

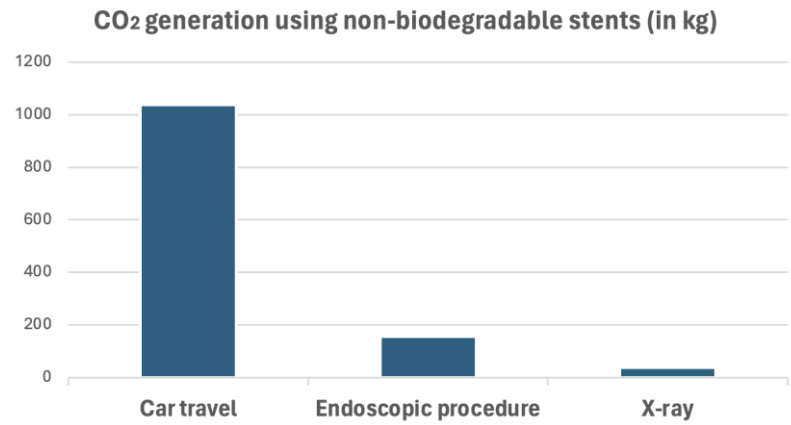


NEW SUSTAINABLE EQUIPMENT

Comparative Carbon Footprint and Environmental Impact of Biodegradable Pancreatic Stent Versus Conventional Plastic Stent Usage in ERCP

D Schneider[1], C Knox[1], H Asmat[2], A Arefin[1], D Joshi[2], B Hayee[2], G Webster[1]
1. Department of Pancreatobiliary Medicine[1], University College London Hospital, London, UK
2. King's Health Partners Institute for Therapeutic Endoscopy, King's College Hospital NHS Foundation Trust, London, UK

- 162 patients
- 94 had BD stents
- Rate of retained plastic stents was 22% (about standard), requiring repeat endoscopy to remove
- Mean excess footprint of plastic stent care, which was **18.08kg CO_2e**
- The total CO_2e for plastic stent follow-up care was **1.229 tonnes.** For BD stent patients there was no additional CO_2e impact beyond the index procedure.



Archimedes Biodegradable pancreatic stent

Zimmon non-biodegradable pancreatic stent

NEW SUSTAINABLE EQUIPMENT

The Cost Implication of a Care Pathway using Biodegradable Plastic Stents in the Prevention of Post-ERCP Pancreatitis

Charlotte Knox, Daniel Schneider, Aamer Rashad Arefin, George Webster
Hepatopancreaticobiliary Department
University College London Hospital

Conventional stent cost per patient	**€747.26**
Biodegradable stent cost per patient	**€735**
Cost difference	**€10.74**

Figure 1.Cost comparison between BD and non BD pancreatic stents

BRINGING SUSTAINABILITY TO CONFERENCES

CSANZ2022

Home Program Sponsors ANZET22 Sustainability Past ASMs Contact

Home / Sustainability

Sustainability

The CSANZ Meeting is committed to sustainability practice and reducing the impact on the environment. We encourage all attendees, sponsors, exhibitors, and suppliers to also consider environmentally friendly options in attending the Meeting.

Our efforts to reduce our carbon footprint:

Please see below some of the initiatives underway with the organisers and suppliers for the 2022 Meeting.

Best practices at GCCEC include:

- Waste minimisation and reduction of consumables
- Integrated communication systems to control energy consumption and building services
- On-site grey water recycling and management system
- Working with supply chains to develop broader sustainable closed-loop systems
- Procurement of environmentally friendly products and packaging.

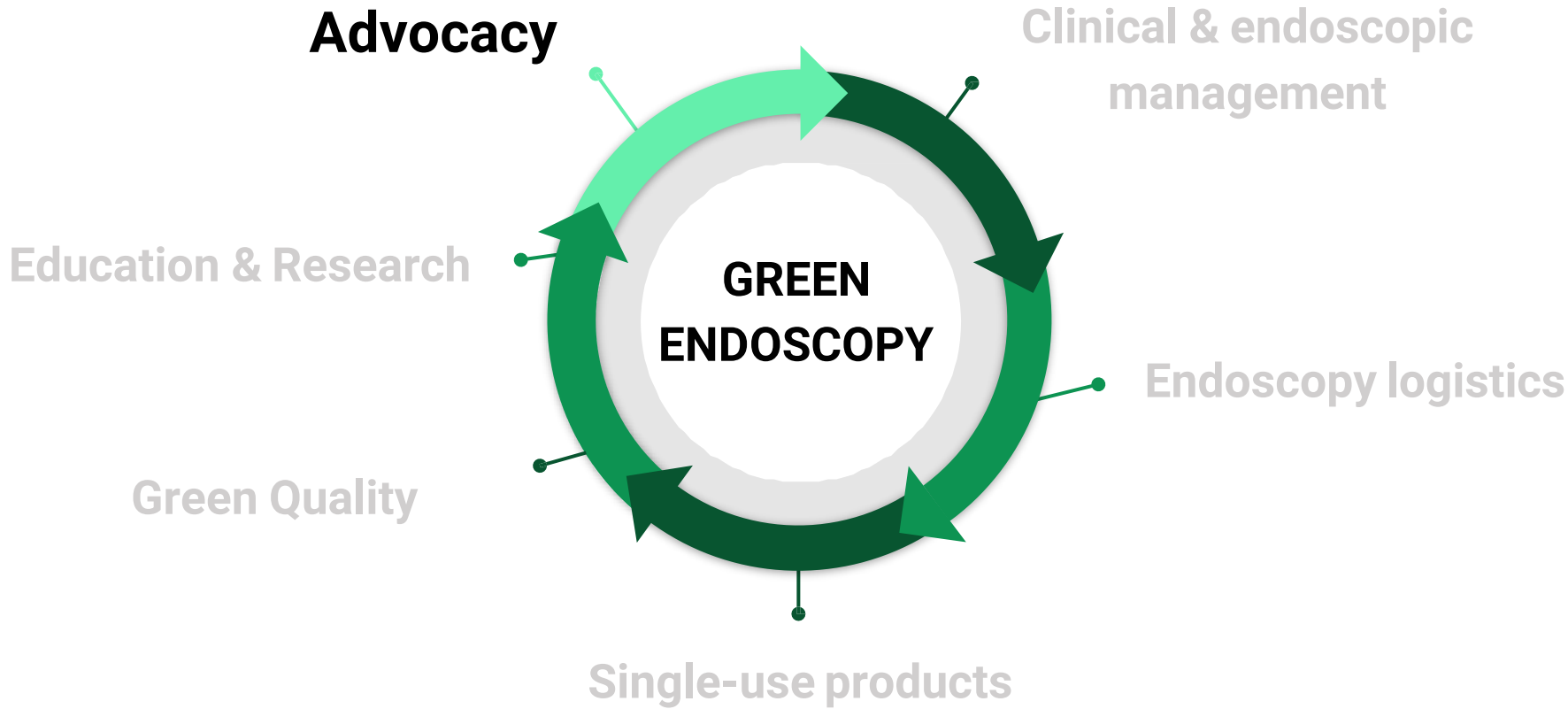
The Meeting

- Printed materials are kept to a minimum, with attendees encouraged to use electronic resources such as the Meeting website.
- Abstract materials are provided electronically only, via the website or app.
- Name badges use paper and lanyards that can be recycled.
- Meeting bags are not provided.
- Sponsors and Exhibitors are requested to reflect positive environmental values and practices in their participation.

What can you do?

- The Hotels selected by the Meeting are all located near to the Convention Centre. Where possible, we encourage you to walk between locations rather than taxi or drive.
- Please follow the waste separation instructions at the venue and at your accommodation.
- Tap water stations are available in the Centre, please bring your own reusable bottle or use the keep cup provided.
- Please bring a reusable bag, if required, to carry your Meeting materials in.

THE PATH TOWARDS SUSTAINABLE ENDOSCOPY



ADVOCACY


INDUSTRY
Sustainability
GOVERNMENTS
Green purchasing
Green funding
PATIENTS
Education/Empowerment
Public transportation
Healthy lifestyle
HEALTHCARE PROVIDERS-PAYORS
Green purchasing
Sustainability
POLICYMAKERS
Engagement
Go Green!

The Royal Melbourne Hospital

Board/Executive

Executive ESG Committee

Facilities
Procurement
Finance
Pharmacy
IT
Infection Control

Corporate Sustainability WG

Clinical Sustainability Working Group

Theatres WG | ICU WG | Wards WG | ED WG | Pathology WG

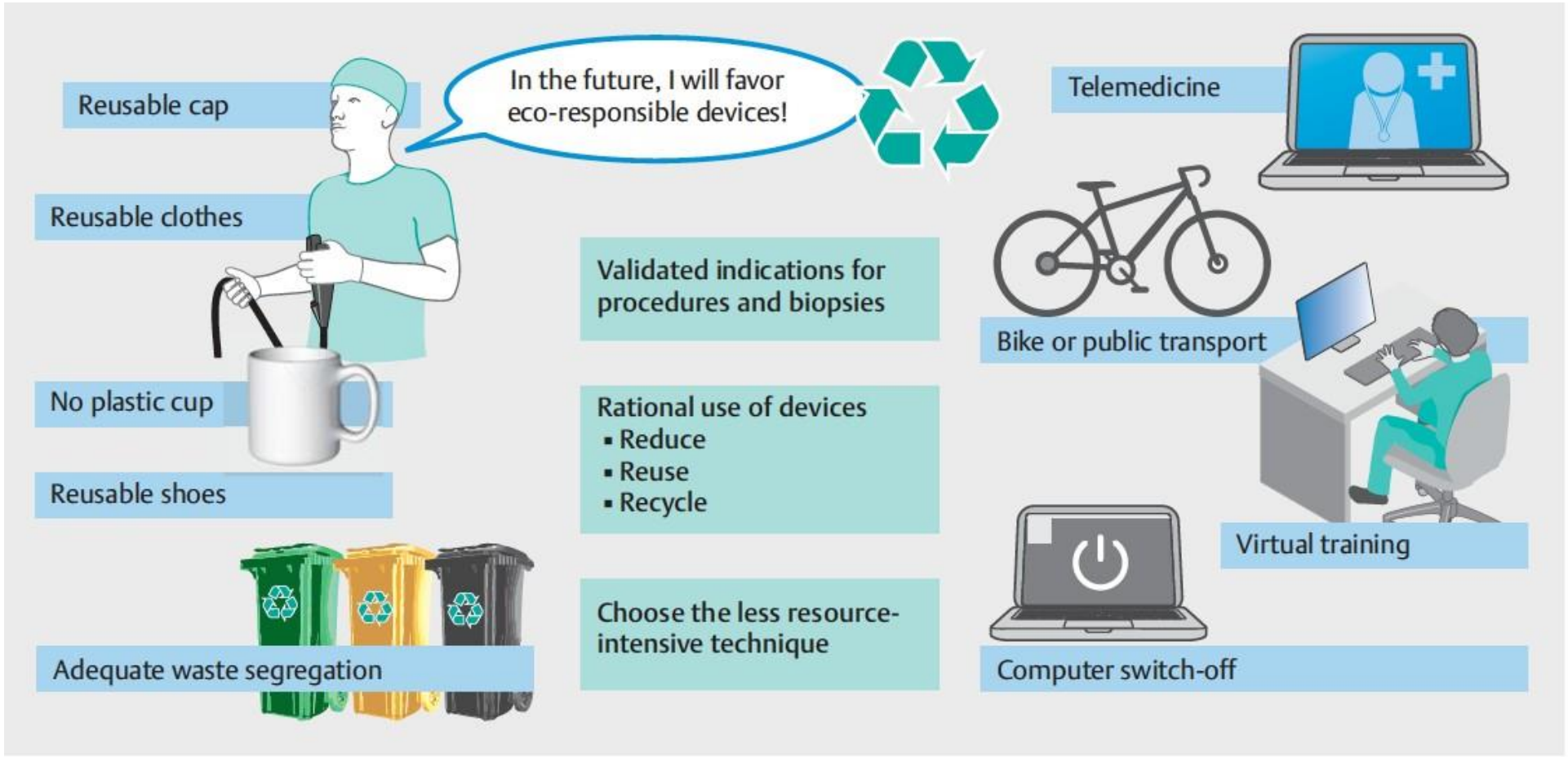
Dialysis WG | Outpatient/Amb Care WG | Radiology WG | Endoscopy WG | Intervention lab WG

ACTIONS

- We know the context
- We know the risks
- We know we need to act

BUT…

- It's such a big problem, what can I do?



▶ **Fig. 3** The "eco-endoscopist."

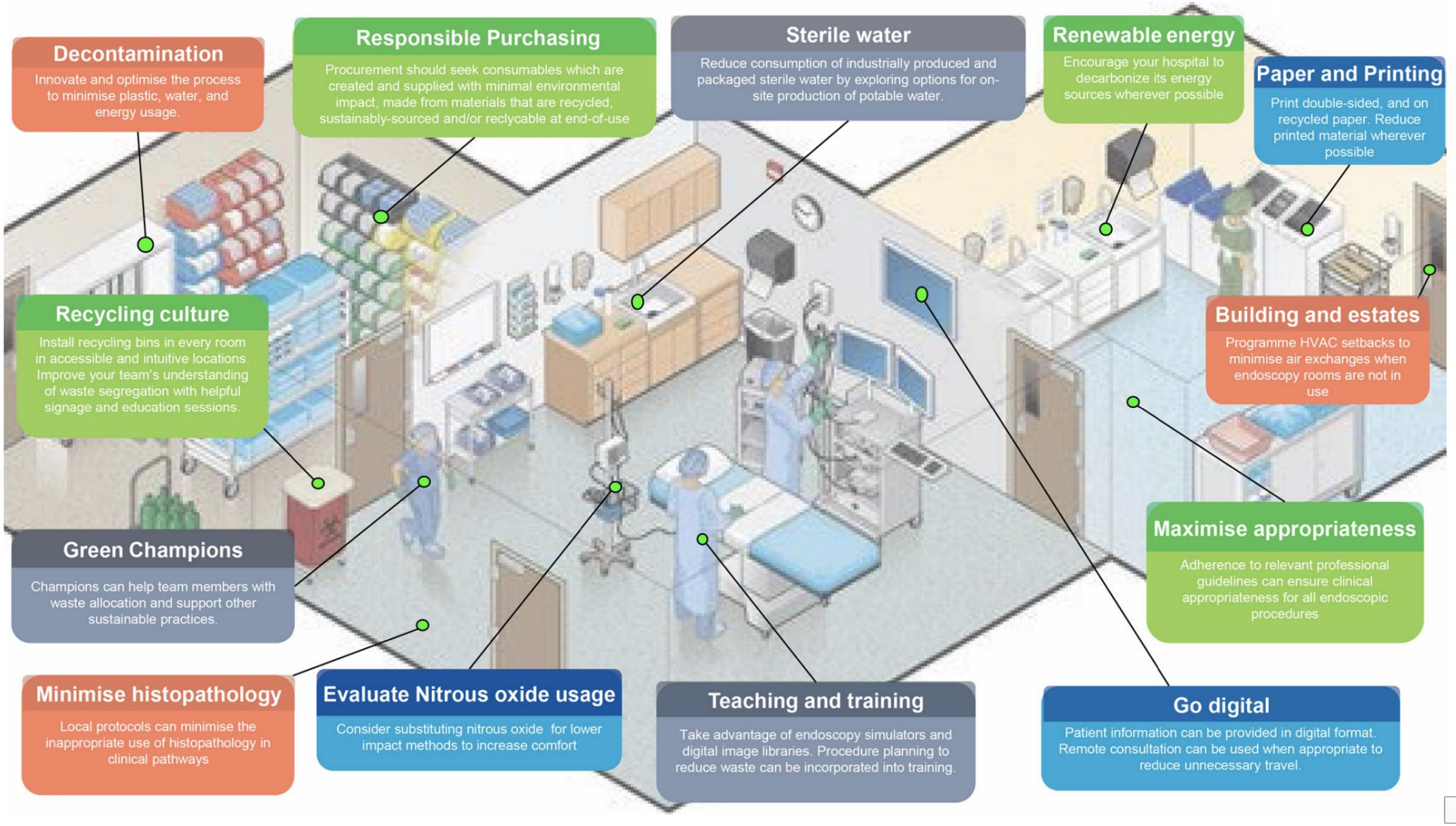


Figure 2 Practical tips for a green endoscopy unit. HVAC, heating, ventilation and air conditioning.

Sebastian S et al, Gut, 2022

SUSTAINABILITY IN THE OPERATING THEATRE

Royal College of Surgeons of England
ADVANCING SURGICAL CARE

SUSTAINABILITY IN THE OPERATING THEATRE

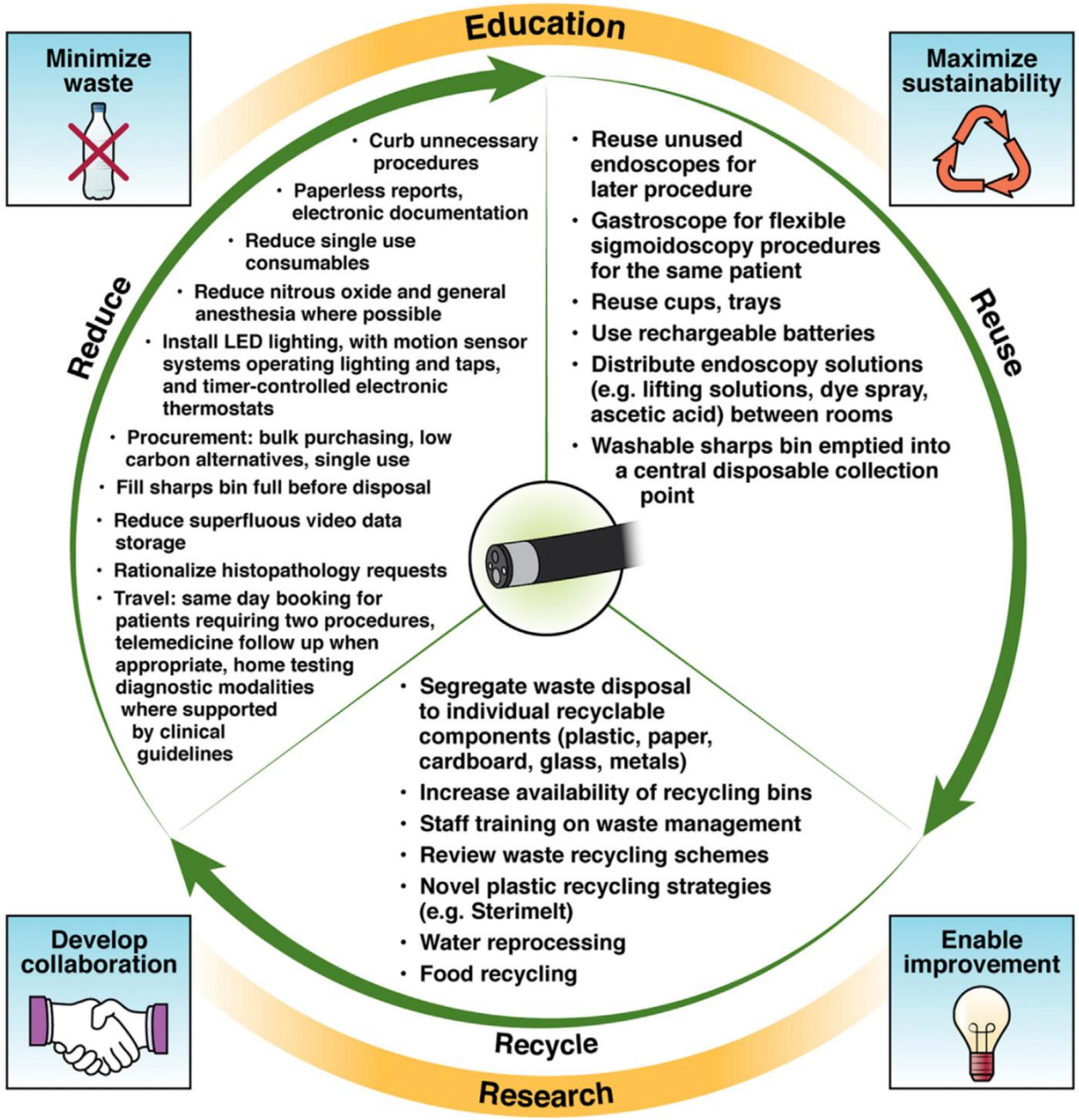
A guide to good practice

May 2022

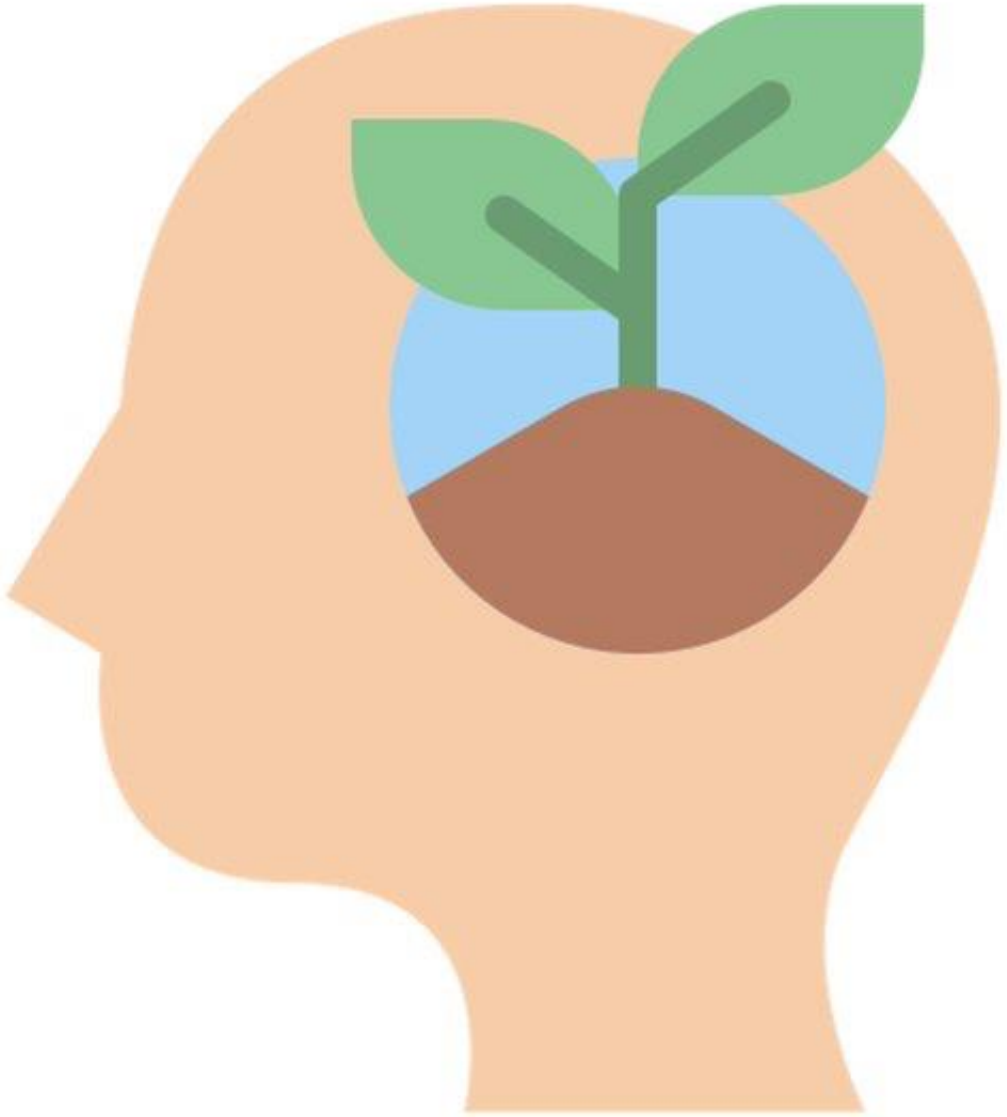
Intercollegiate Green Theatre Checklist Compendium of Evidence

Below are a list of recommendations to reduce the environmental impact of operating theatres. All the relevant guidance and published evidence has been included in the Compendium of evidence, accessed via the QR code:

Anaesthesia		
1	Consider local/regional anaesthesia where appropriate (with targeted O_2 delivery only if necessary)	☐
2	Use TIVA whenever possible with high fresh gas flows (5-6 L) and, if appropriate, a low O_2 concentration	☐
3	Limit Nitrous Oxide (N_2O) to specific cases only and if using: ▸ check N_2O pipes for leaks or consider decommissioning the manifold and switching to cylinders at point of use; ▸ introduce N_2O crackers for patient-controlled delivery.	☐
4	If using inhalational anaesthesia: ▸ use lowest global warming potential (sevoflurane better than isoflurane better than desflurane); ▸ consider removing desflurane from formulary; ▸ use low-flow target controlled anaesthetic machines; ▸ consider Volatile Capture Technology.	☐
5	Switch to reusable equipment (e.g. laryngoscopes, underbody heaters, slide sheets, trays)	☐
6	Minimise drug waste ("*Don't open it unless you need it",* pre-empt propofol use)	☐
Preparing for Surgery		
7	Switch to reusable textiles, including theatre hats, sterile gowns, patient drapes, and trolley covers	☐
8	Reduce water and energy consumption: ▸ rub don't scrub: after first water scrub of day, you can use alcohol rub for subsequent cases; ▸ install automatic or pedal-controlled water taps.	☐
9	Avoid clinically unnecessary interventions (e.g. antibiotics, catheterisation, histological examinations)	☐



R Baddeley et al, Gastroenterology, 2022



"The most wasteful procedure is one that did not need to be done in the first place."

@GreenEndoscopy