

Nachhaltigkeit in der Endoskopie. Nur ein Schlagwort?

H. Messmann, Augsburg





Disclosure of Conflicts of Interest

I herewith declare the following paid or unpaid consultancies, business interests or sources of honoraria payments for the past three years, and anything else which could potentially be viewed as a conflict of interest:

- Consultant: Olympus, Erbe, Ambu, Boston Scientific, Lumendi
- Honorararia: Lectures (Olympus, Norgine, Boston Scientific, Falk)

Position Statement: “GREEN ENDOSCOPY” (ESGE 2022)

Position Statement

 Thieme

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

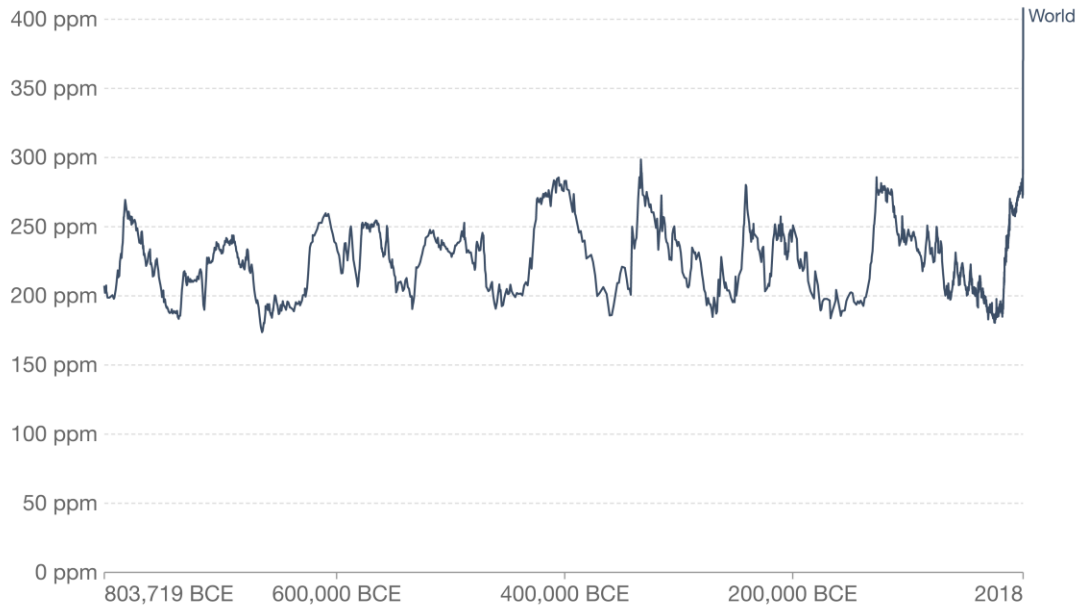
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Introduction: Climate change

CO2 x 2

Atmospheric CO₂ concentration

Global average long-term atmospheric concentration of carbon dioxide (CO₂), measured in parts per million (ppm). Long-term trends in CO₂ concentrations can be measured at high-resolution using preserved air samples from ice cores.



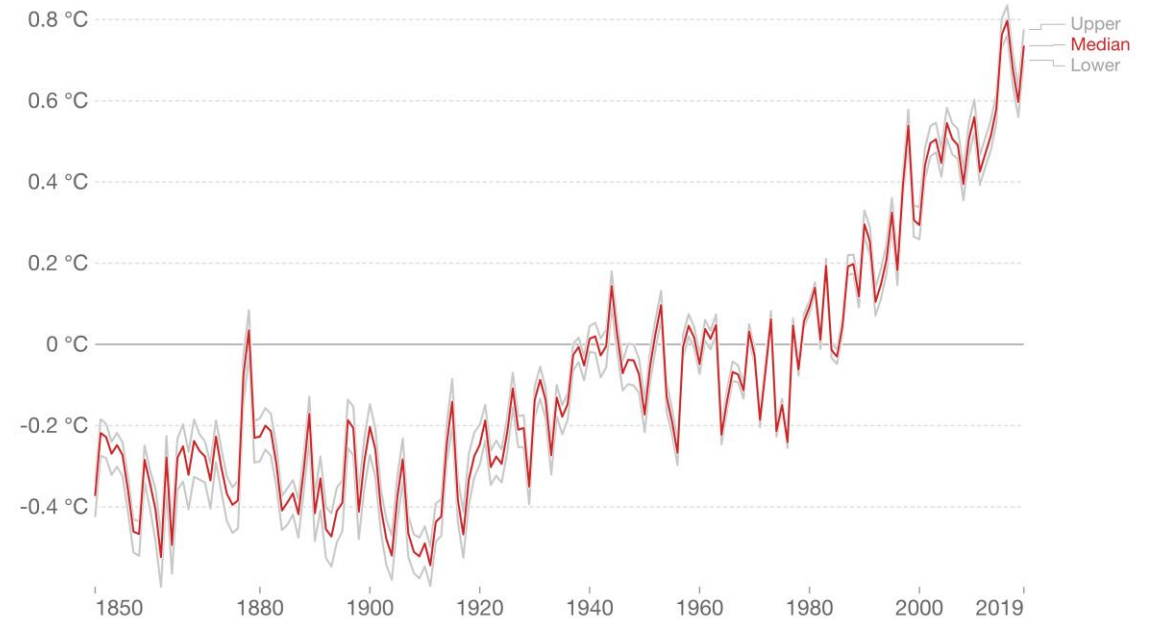
Source: EPICA Dome C CO₂ record (2015) & NOAA (2018)

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

+ 1.2 °C in the last 100 years

Average temperature anomaly, Global

Global average land-sea temperature anomaly relative to the 1961-1990 average temperature.



Source: Hadley Centre (HadCRUT4)

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

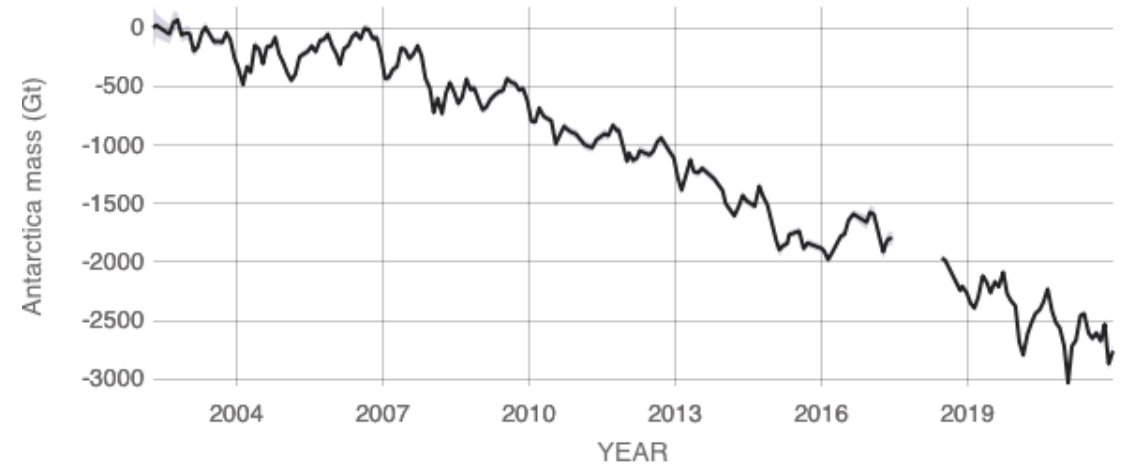
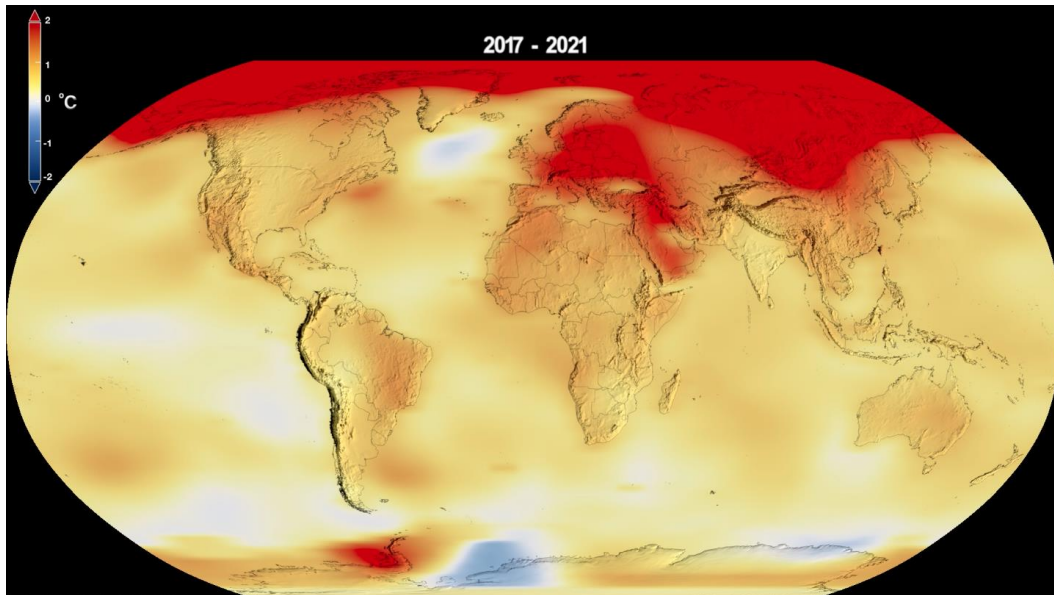
Note: The red line represents the median average temperature change, and grey lines represent the upper and lower 95% confidence intervals.



Introduction: Climate change

+ 4-5 °C in the 21st century

Glaciers-antartic sea are retreating



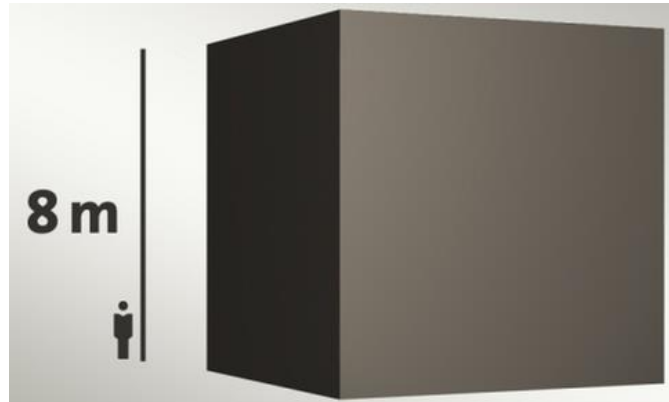
Source: climate.nasa.gov

Basics



1 Tonne CO₂e

≈



- ≈ 5.000 km Auto fahren
- ≈ 4.000 km Flugzeug economy class
- ≈ 80.000 km Zug fahren
- ≈ 80 Jahre Wachstum einer Buche

CO₂e Fußabdruck pro Kopf in D



Quelle: Umweltbundesamt CO₂-Rechner (Stand 2022)
© Kompetenzzentrum Nachhaltiger Konsum

Basics: CO₂ Fußabdruck des Gesundheitswesens

- Der eCO₂ Fußabdruck des Gesundheitssystems macht 4.4% der globalen Emissionen aus (in Deutschland 6,7%*, Platz 8)
- Wenn das Gesundheitssystem ein Land wäre, dann wäre es der 5 größte Treibhausgasproduzent weltweit
- Die EU ist verantwortlich für 12% des CO₂ des Gesundheitssystems, repräsentiert aber nur 6% der Weltbevölkerung

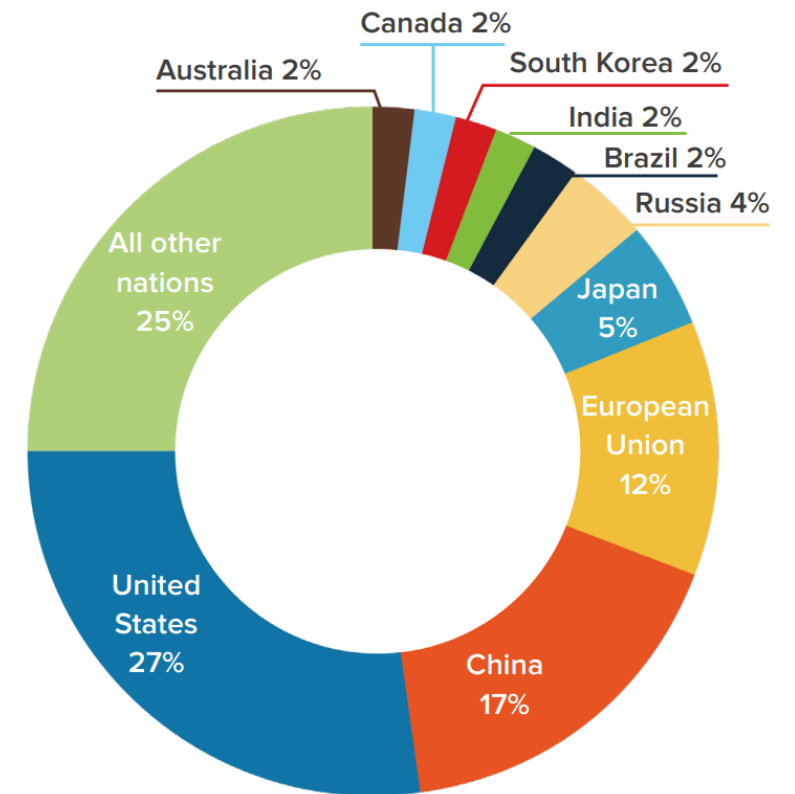


Figure 8: Top ten emitters as percentage of global health care footprint.

*International comparison of health care carbon footprints, Peter-Paul Pichler et al, 2019 Environ. Res. Lett. 14 064004

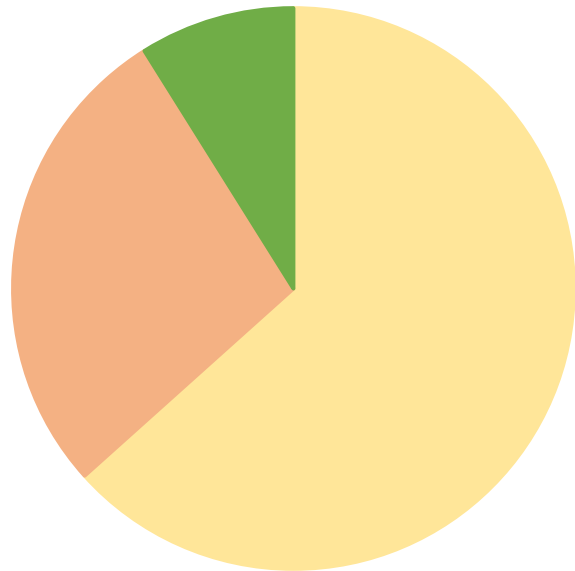
#Health Care Without Harm: Health Care's Climate Footprint: How the health sector contributes to the global climate crisis and opportunities for action.

The environmental impact of GI endoscopy





Waste generator

- 2^o-3^o highest waste generator
- ≈ 2 kg per procedure



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

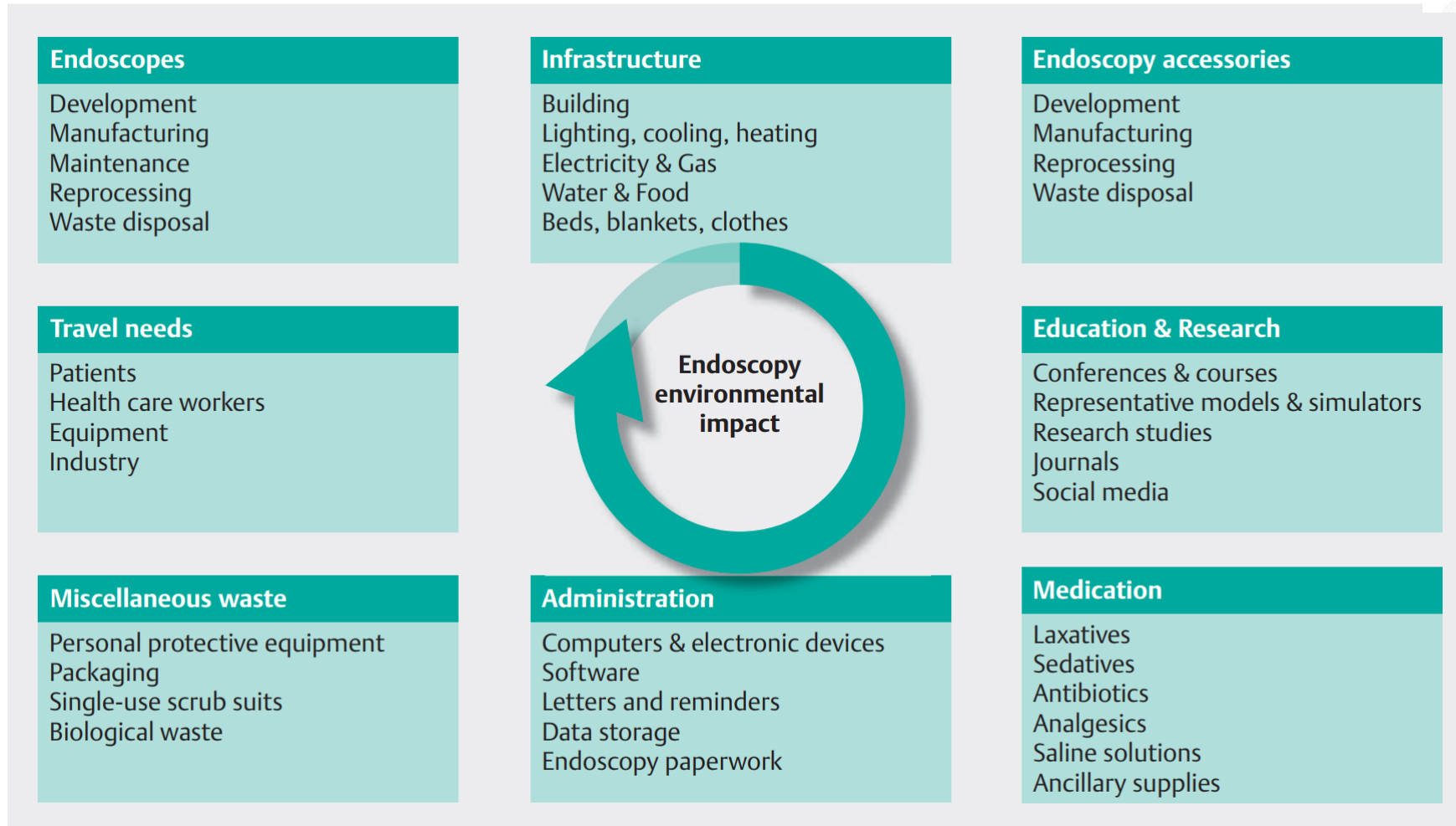
CO2 emissions

- ≈ 5 kg CO2 per endoscopic procedure
- 0.28 kg CO2 per biopsy 
- 85.768 tonnes of CO2 annually 

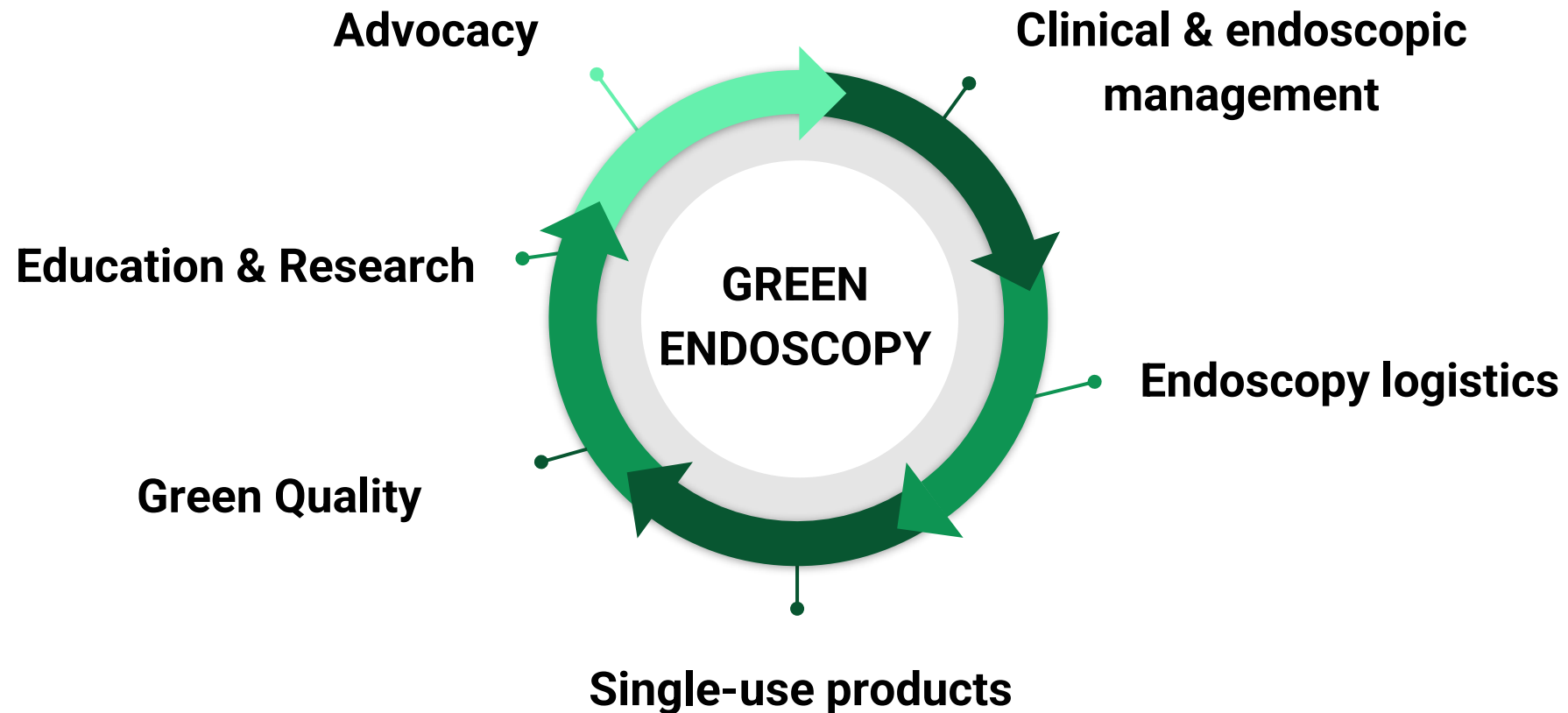




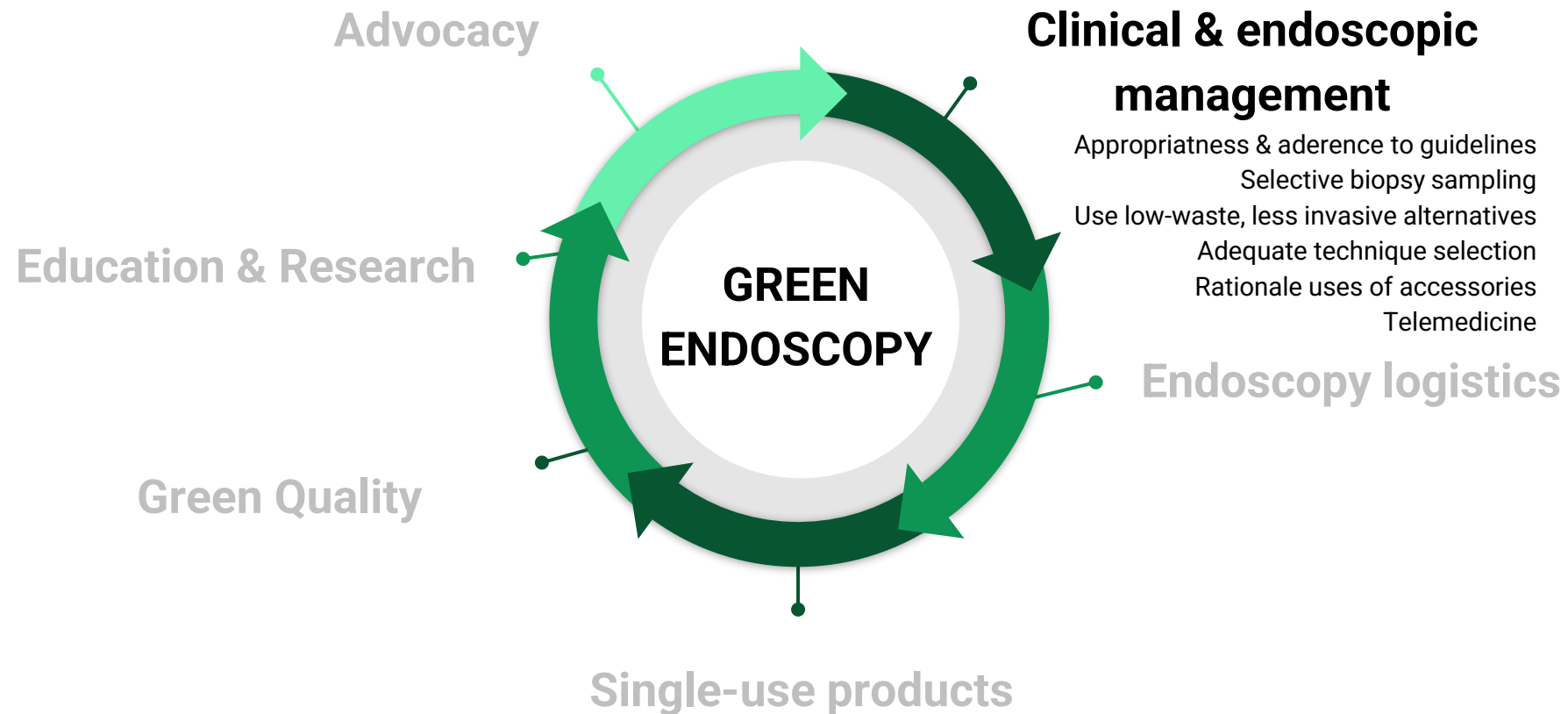
The environmental impact of GI-endoscopy



The path towards sustainable GI endoscopy

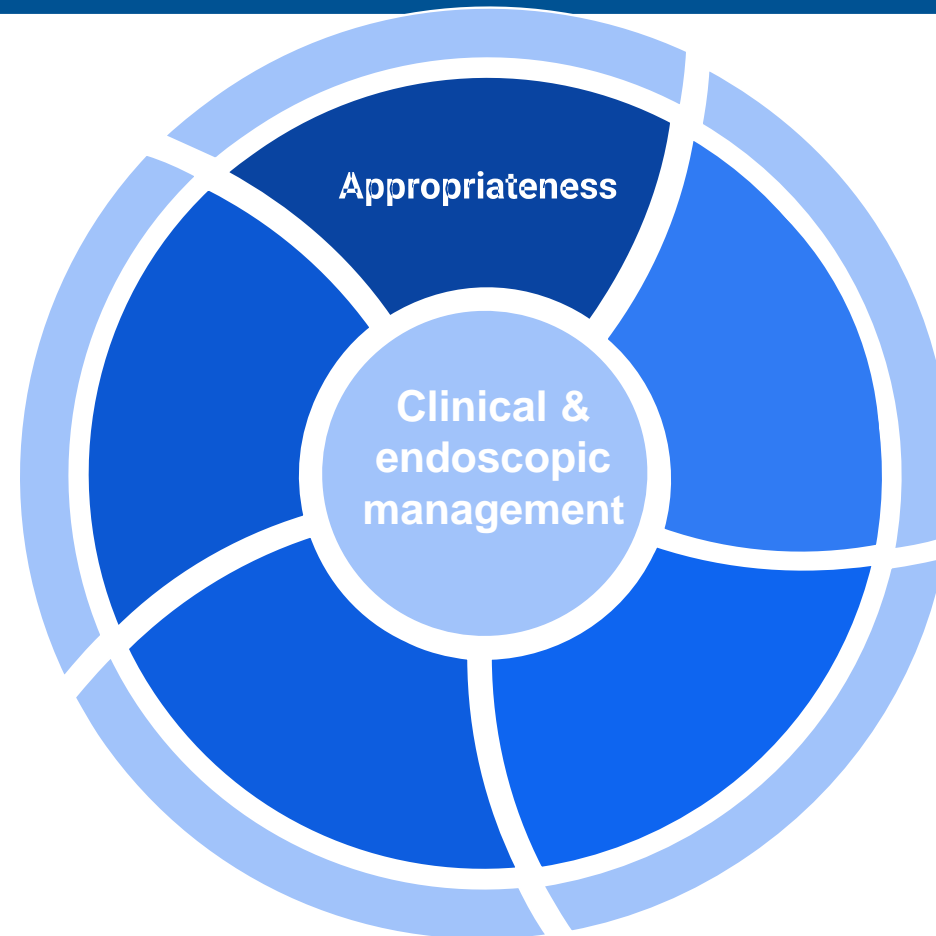


The path towards sustainable GI endoscopy



Clinical & endoscopic management

Adequate GI endoscopy indication



The path towards sustainable GI endoscopy

Rate of inappropriate GI endoscopy: 20% - 30%

- **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

The carbon cost of inappropriate endoscopy

Hintergrund:

- 45 endoskopische Prozeduren werden pro 1000 Einwohner in Italien pro Jahr durchgeführt¹
 - 54% ÖGD
 - 46% Kolo
- Inadäquate Indikation:
 - 22% aller ÖGD²
 - 29% aller Koloskopien³

¹ Buscarini E et al. White Paper of Italian Gastroenterology: Delivery of services for digestive diseases in Italy: Weaknesses and strengths. *Digestive and Liver Disease* 2014; 46. doi:10.1016/j.dld.2014.02.019

² Zullo A et al. Diagnostic yield of upper endoscopy according to appropriateness: A systematic review. *Digestive and Liver Disease* 2019; 51: 335–339. doi:10.1016/j.dld.2018.11.029

³ Frazzoni L et al. Systematic review with meta-analysis: the appropriateness of colonoscopy increases the probability of relevant findings and cancer while reducing unnecessary exams. *Aliment Pharmacol Ther* 2021; 53: 22–32. doi:10.1111/APT.16144



The carbon cost of inappropriate endoscopy

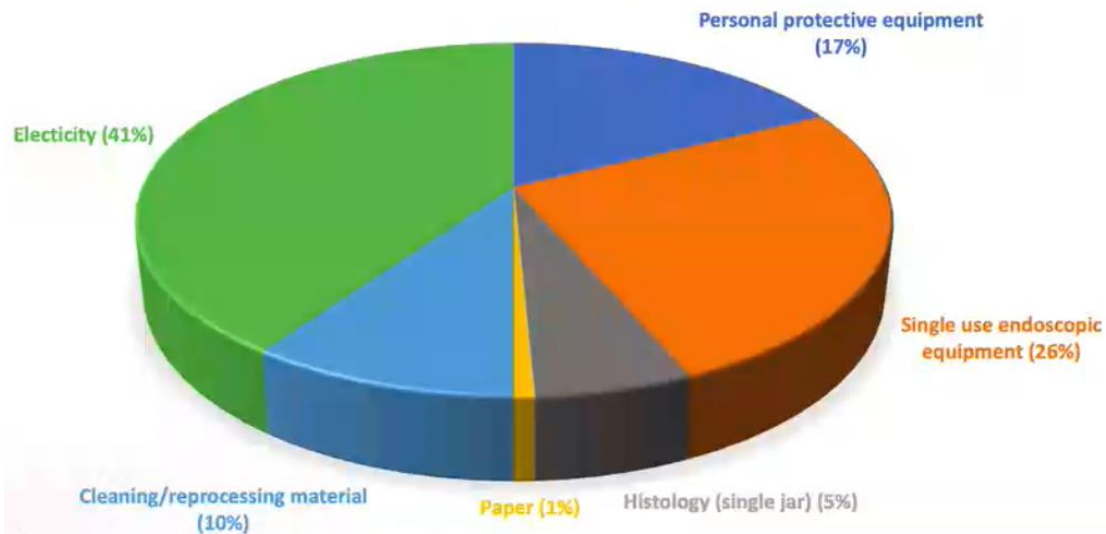
Ergebnisse:

- Bei 60 Mio. Einwohnern in Italien 4.133 Tonnen CO₂ pro Jahr
- Bei 450 Mio. EU-Bürgern 30.804 Tonnen CO₂ pro Jahr
 - = Distanz von 10.760.446 km mit benzinbetriebenen Familienauto
 - = CO₂ Resorption von 70.000 Baumsetzlingen mit 10 Jahre Wachstum

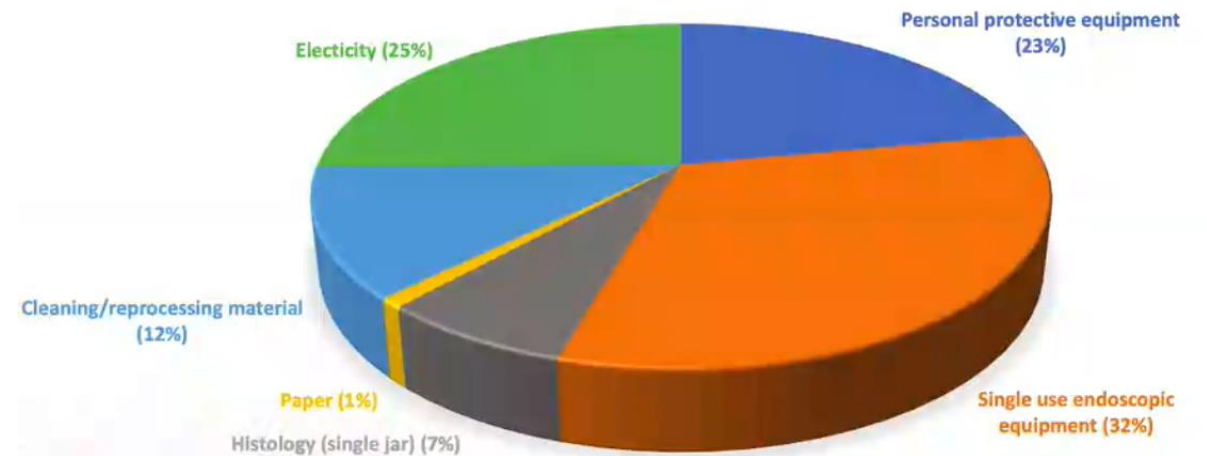
The carbon cost of inappropriate endoscopy

Ergebnisse:

COLONOSCOPY CARBON FOOTPRINT = 6.71 KG OF CO2



ESOPHAGOGASTRODUODENOSCOPY CARBON FOOTPRINT = 5.43 KG OF CO2



Clinical & endoscopic management

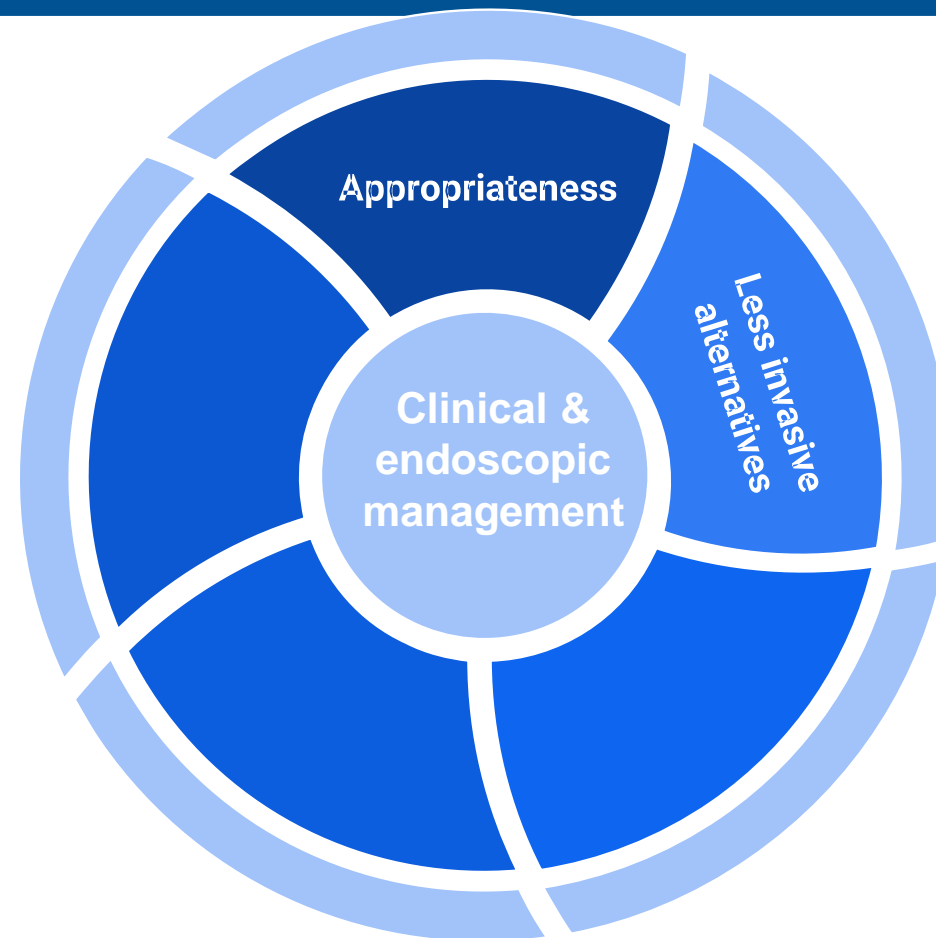
Digestive findings that do not require surveillance

► **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
Colon	Low-risk adenomas	~15% – 30%	No increased risk versus general population

Clinical & endoscopic management

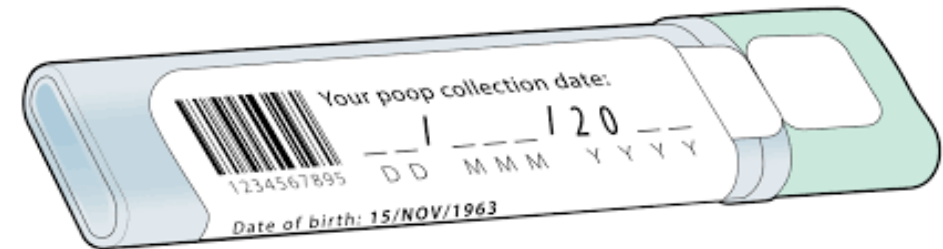
Adequate GI endoscopy indication



Clinical & endoscopic management

Use low waste, less invasive alternatives to endoscopy

- **CRC screening: FIT, DNA stool test**
- ***H. pylori*: Urea breath test**
- **Chronic diarrhea: Fecal calprotectin**
- **Esophageal varices: elastography + platelet count**





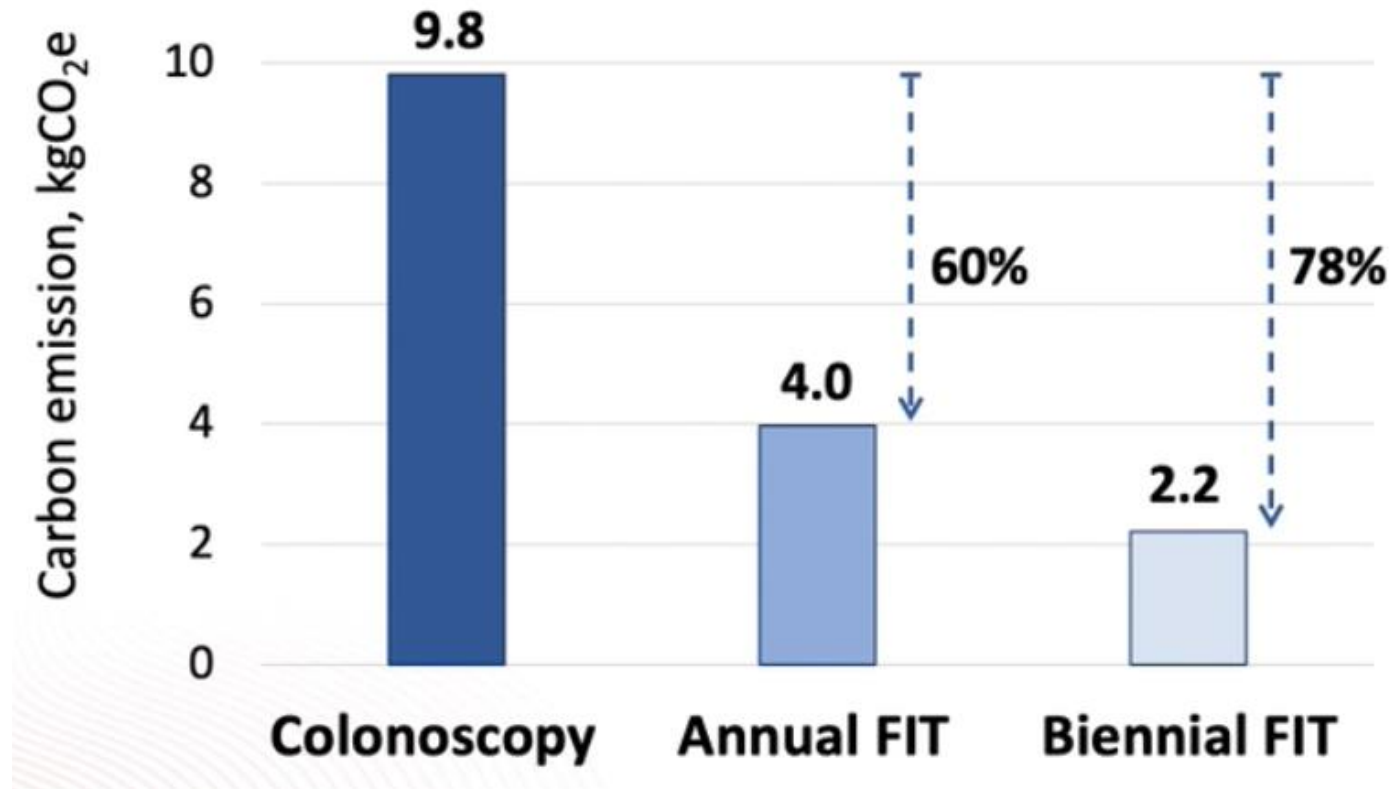
Carbon emissions from a FIT versus a colonoscopy screening program

Ergebnisse: 1. Anzahl der notwendigen Koloskopien

Year	Colonoscopy (n=1000)	Annual FIT (n=1000)	Biennial FIT (n=1000)
0	Colo	FIT	FIT
1		FIT	
2		FIT	FIT
3	Colo	FIT	
4		FIT	FIT
5	Colo	FIT	
6		FIT	FIT
7	Colo	FIT	
8		FIT	FIT
9		FIT	
Total n of colonoscopies	1412	468	260

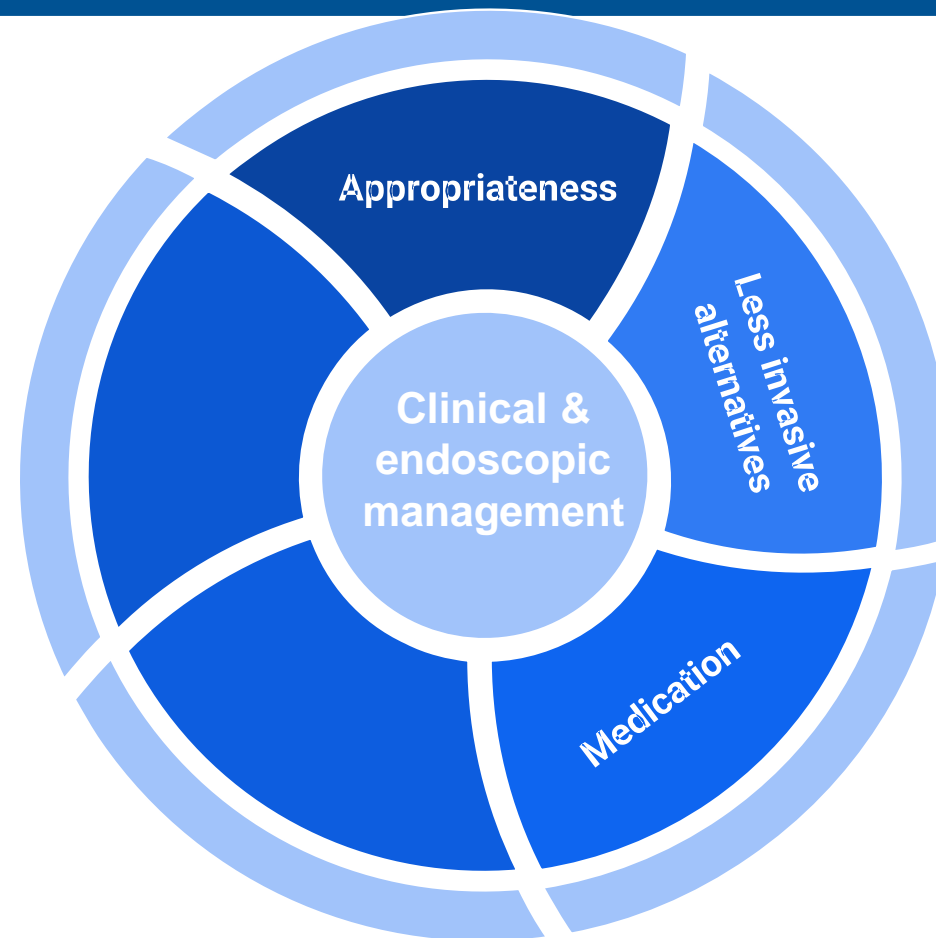
Carbon emissions from a FIT versus a colonoscopy screening program

Ergebnisse: 3. CO₂ Fußabdruck (Reise und Müll) je gescreenter Person



Clinical & endoscopic management

Adequate GI endoscopy indication



Clinical & endoscopic management

Rational use of medication

- Avoid inadequate antibiotic prophylaxis
- Avoid routine saline
- Avoid non-indicated PPI
- Etc.

1 g medication

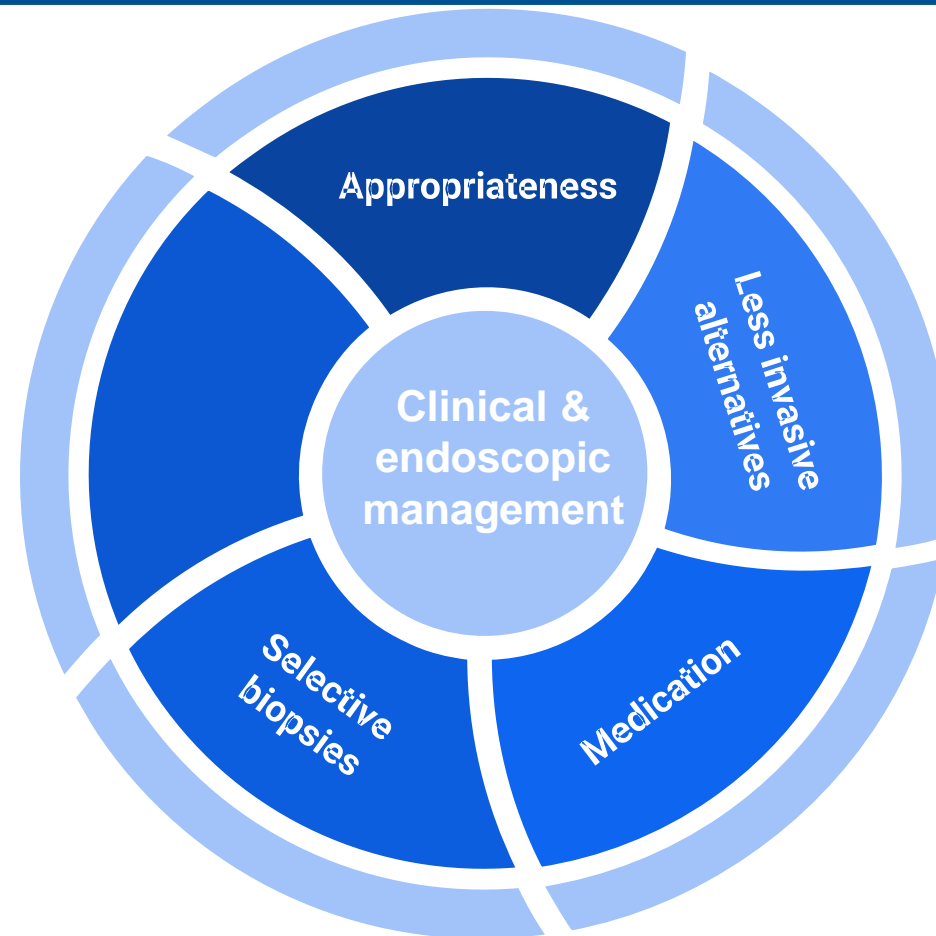


0.1-1 kg CO₂



Clinical & endoscopic management

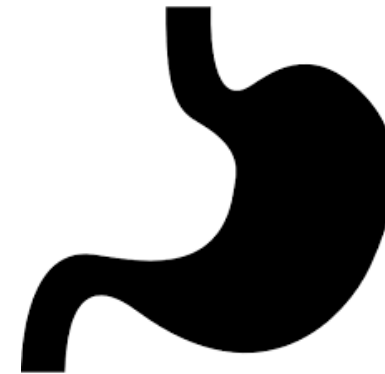
Reduce the number of biopsies



Clinical & endoscopic management

Reduce the number of biopsies

- **Irregular Z line: No biopsy**
- **Candida: Only if therapeutic consequences**
- **Early cancer: Only 1-2 biopsies if resectable**
- **Celiac disease: Same container**



Clinical & endoscopic management

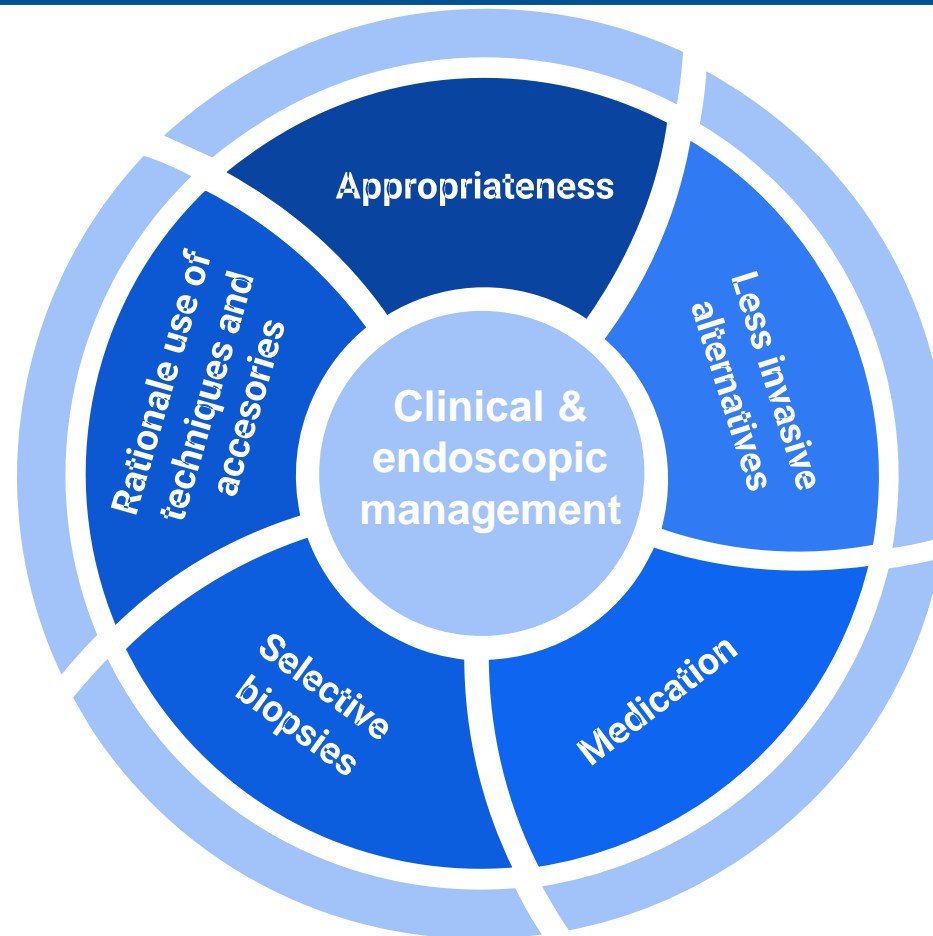
Reduce the number of biopsies

- **IBD: Chromoendoscopy**
- **Resectable lesion: No biopsies**
- **Diagnose-and-leave ?**
- **Resect and discard ?**



Clinical & endoscopic management

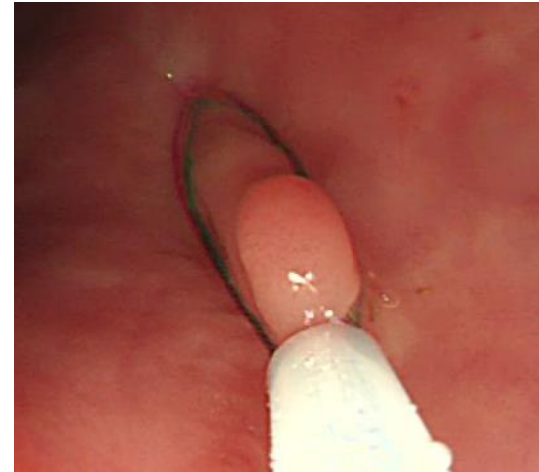
Reduce the number of biopsies



Clinical & endoscopic management

Rational use of techniques and accessories

- **Use the less resource-intensive technique.**
- **Re-use accessories within the same procedure**



Clinical & endoscopic management

Rational use of techniques and accessories

- Use the less resource-intensive technique.
- Re-use accessories within the same procedure
- Do not clip all polyp defects!

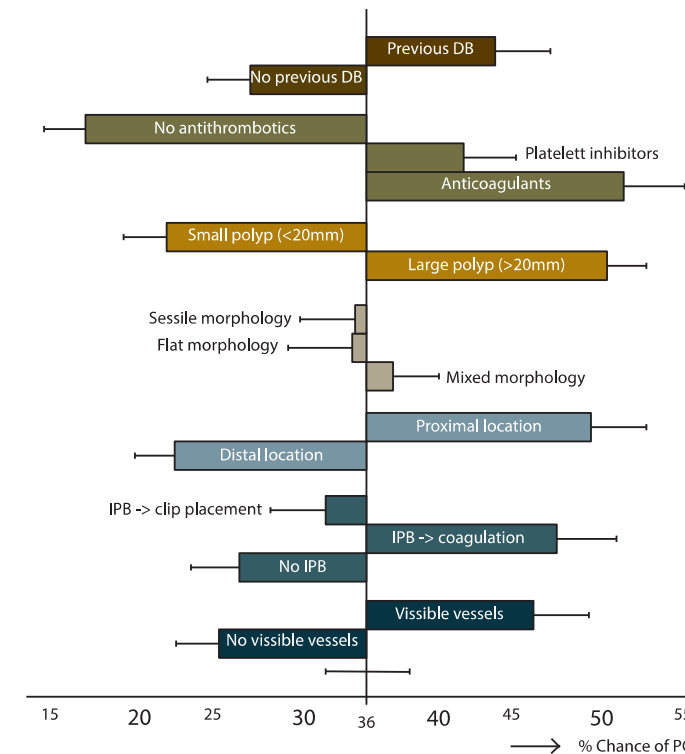


Figure 3. Predictive model for PC. This graph shows the likelihood that an endoscopist would use PC per variable. The chance that an endoscopist would use PC on a random patient with a flat or sessile polyp (reference case) is 36.2%.

Clinical & endoscopic management



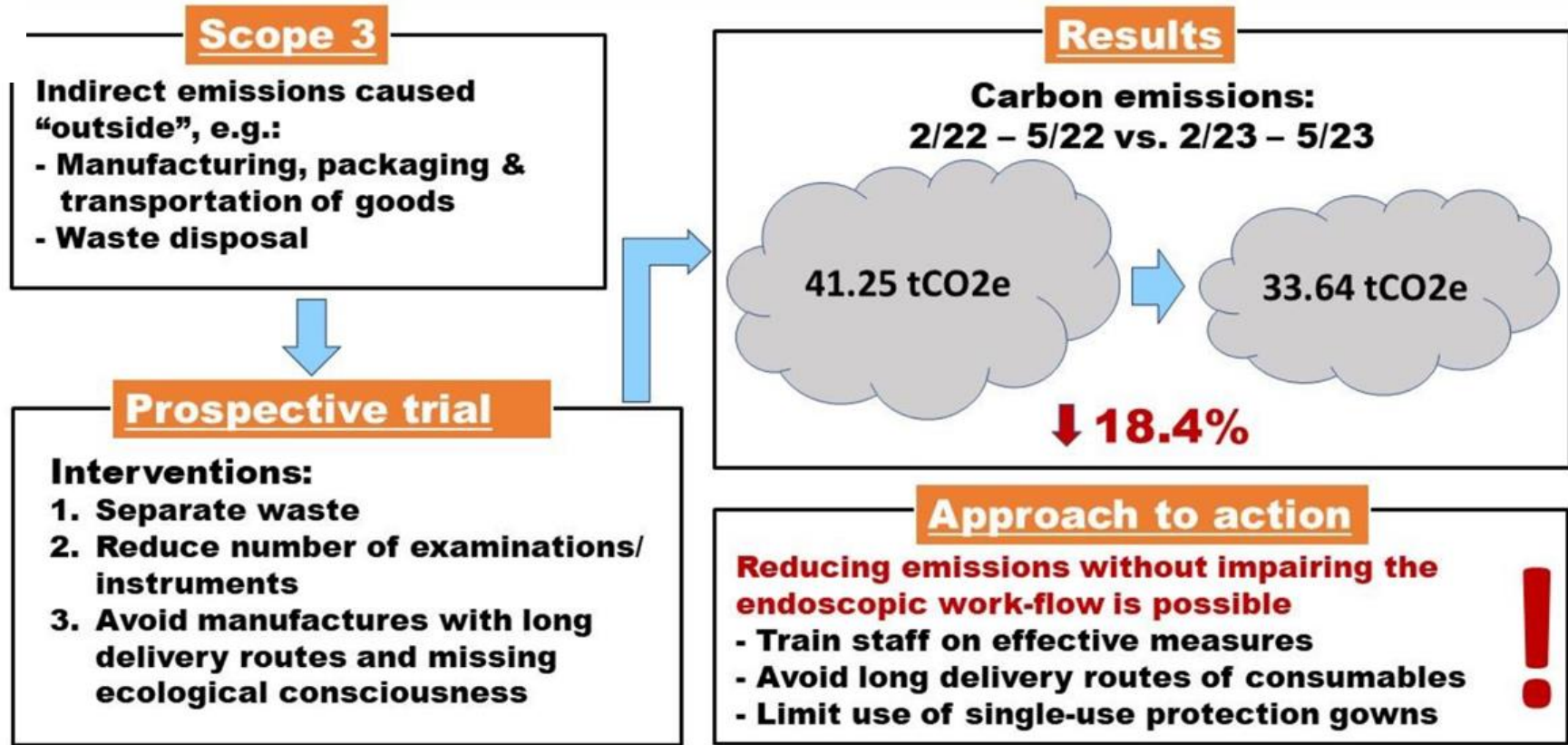
OPEN ACCESS

Original research

Reducing scope 3 carbon emissions in gastrointestinal endoscopy: results of the prospective study of the 'Green Endoscopy Project Würzburg'

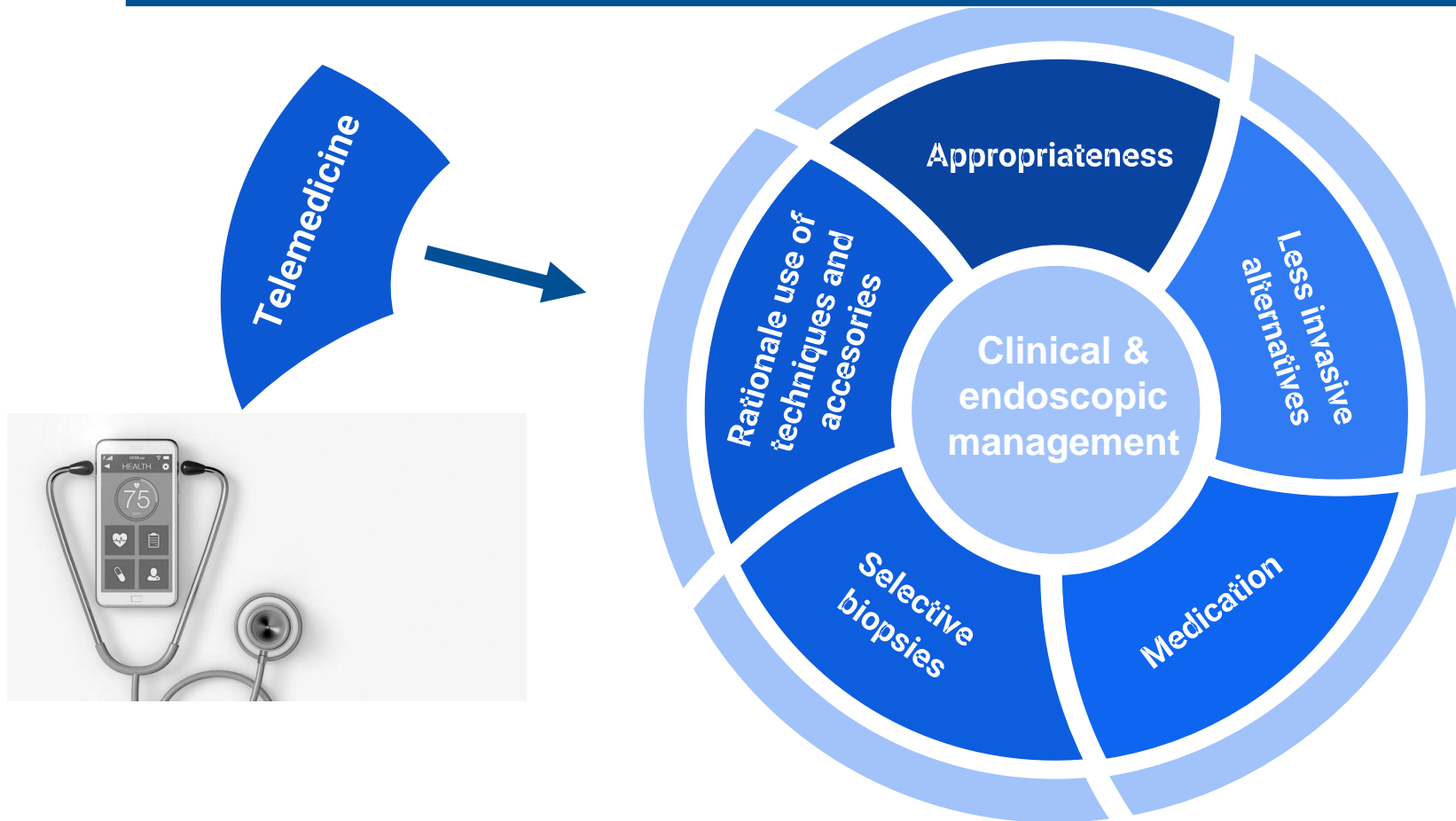
Dorothea Henniger,¹ Thomas Lux,¹ Max Windsheimer,² Markus Brand,¹ Alexander Weich,¹ Theodor Kudlich,¹ Katrin Schöttker,¹ Alexander Hann ,¹ Alexander Meining ¹

Reducing Scope 3 Carbon Emissions in Gastrointestinal Endoscopy Results of the Prospective Study of the "Green Endoscopy Project Würzburg"

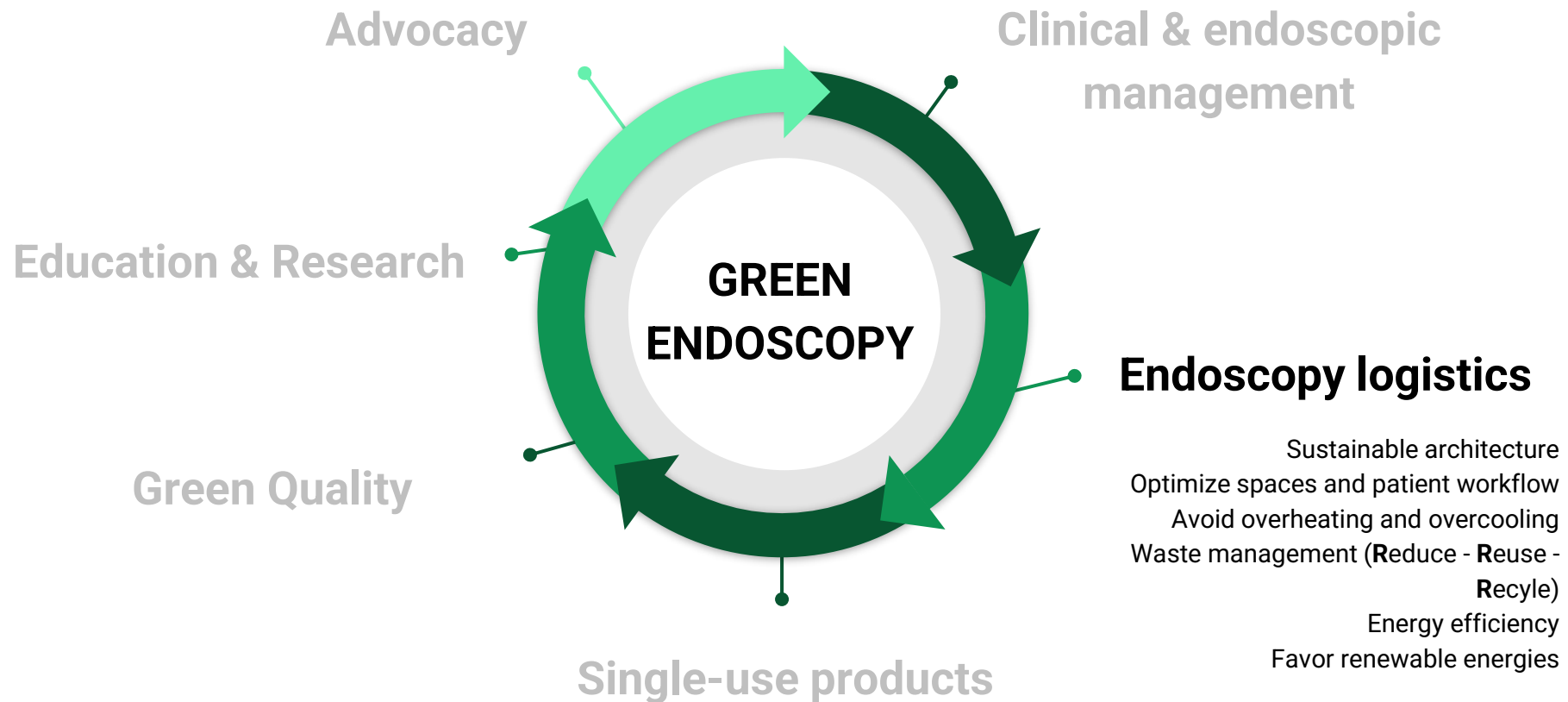


Clinical & endoscopic management

Telemedicine?

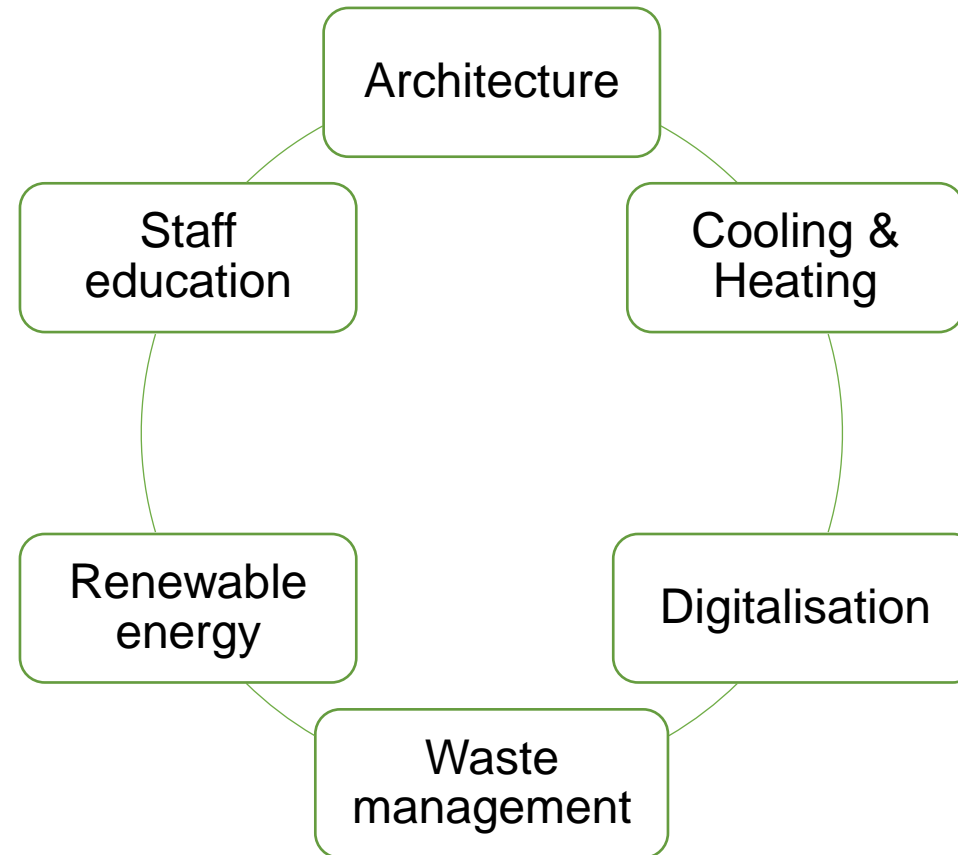


The path towards sustainable GI endoscopy



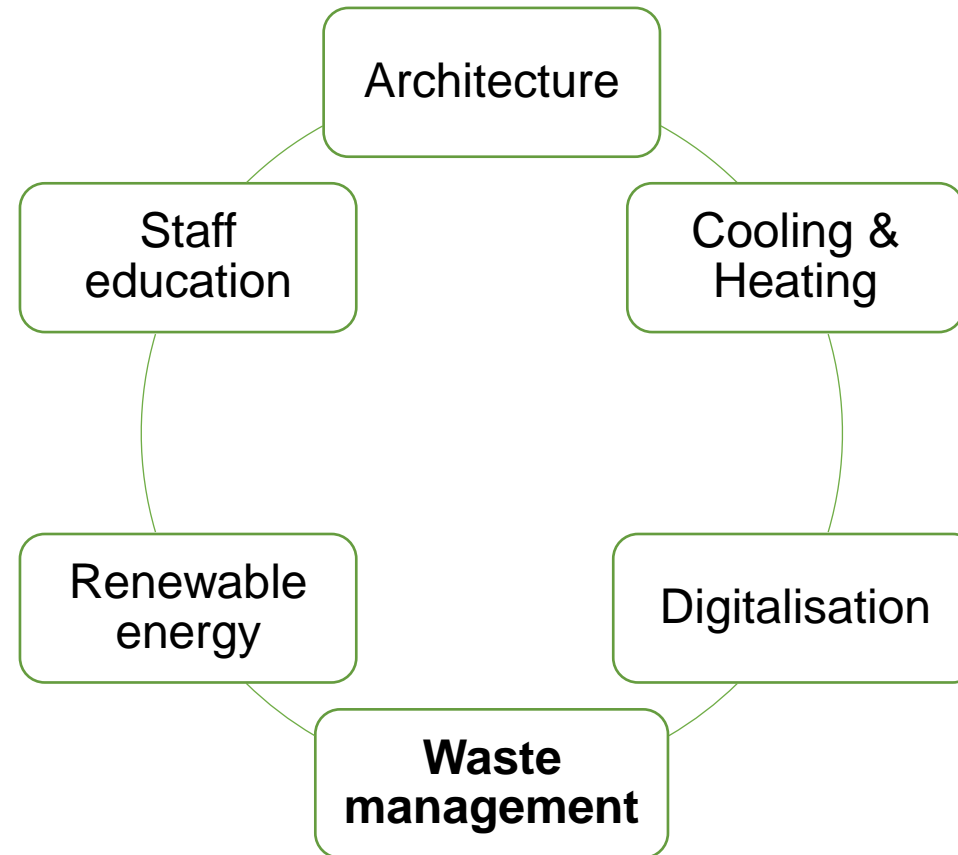
Clinical & endoscopic management

Sustainable infrastructure



Clinical & endoscopic management

Sustainable infrastructure



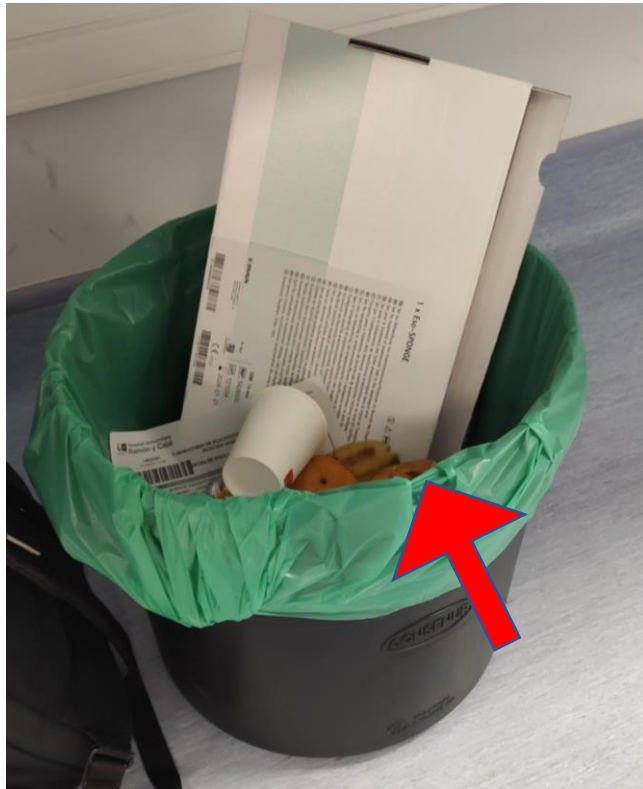
Endoscopy logistics

Do we care about waste?

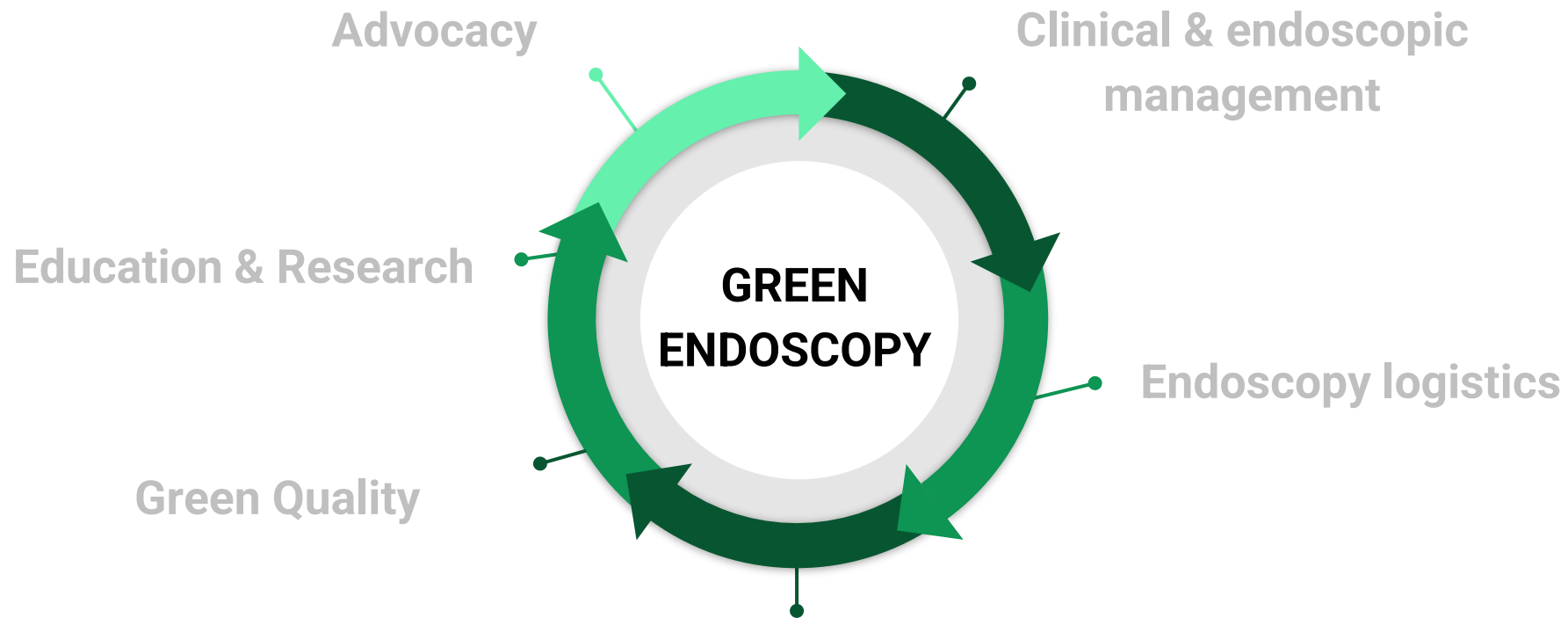
- **Survey: 783 endoscopy staff members and 352 gastroenterologists**
- **High rate of inadequate disposal**
- **Only 0.6% understood disposal costs**
- **98% felt that more education/information is required**

Endoscopy logistics

Ensure adequate waste segregation and processing



The path towards sustainable GI endoscopy



Single-use products

- Be aware of environmental impact
- Ensure adequate waste segregation and processing
- Avoid routine use of single-use endoscopes

Single-use GI endoscopy devices

Revisiting the sustainability of “all single-use”

As
Low
As
Reasonably
Practicable

Safety



Economic cost

Environmental cost

Societal cost

Single-use GI endoscopes

Safety



2008 – 2018: 24 MDRM duodenoscope-related outbreaks
→ 490 patients → 32 deaths



Systematic review including 3 studies (2008-2018).

- Duodenoscope-associated **contamination**: 0.023 – 0.029 %
- Duodenoscope-associated **colonisation**: 0.01 %



Infection risk is associated with inadequate reprocessing



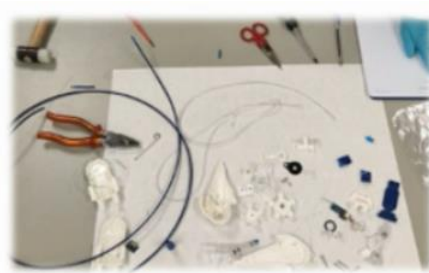
Environmental Footprint and Material Composition Comparison between Single-use and Reusable Endoscopes

Methodik:

Reusable duodenoscope



Single-use duodenoscope



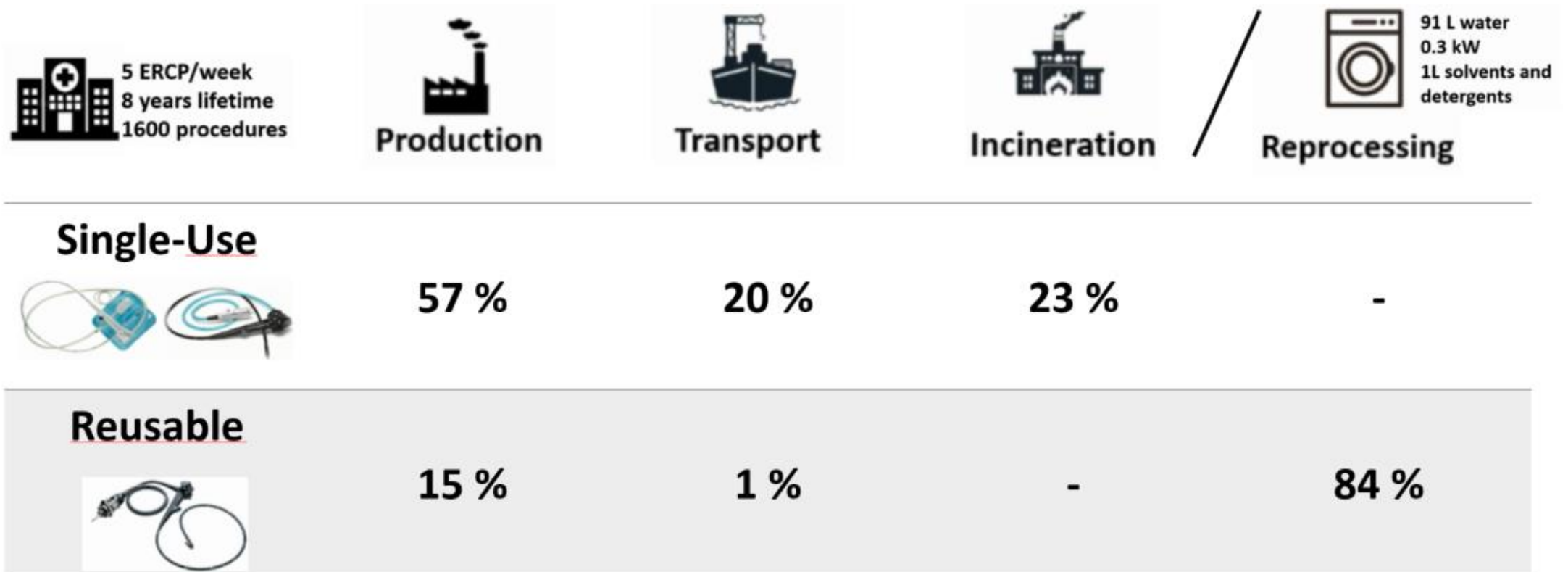
DSC-Differential scanning calorimetry
TGA-Thermogravimetric analysis



WEIGHT AND TYPE OF MATERIAL

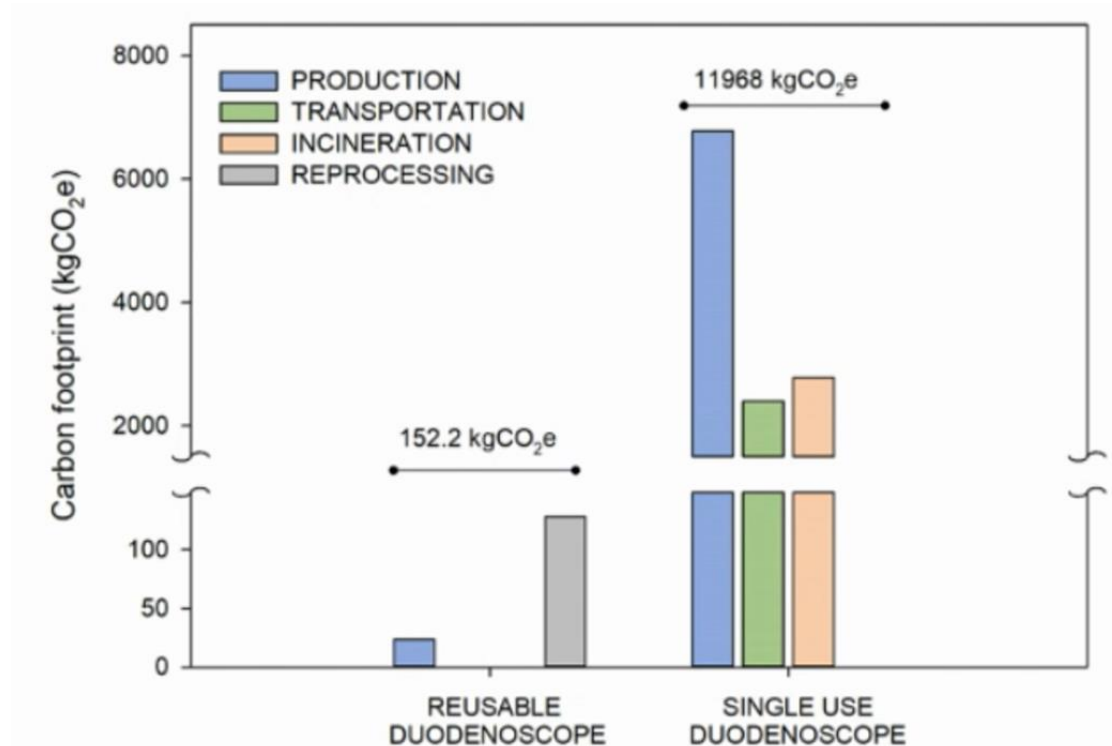
Environmental Footprint and Material Composition Comparison between Single-use and Reusable Endoscopes

Ergebnisse: 2. Life cycle assesment



Environmental Footprint and Material Composition Comparison between Single-use and Reusable Endoscopes

Ergebnisse: 2. Life cycle assesment



5 ERCP/week
8 years lifetime
1600 procedures

- 76x höher CO₂ Fußabdruck
- 3 Mietwohnungen über 10 Jahre heizen

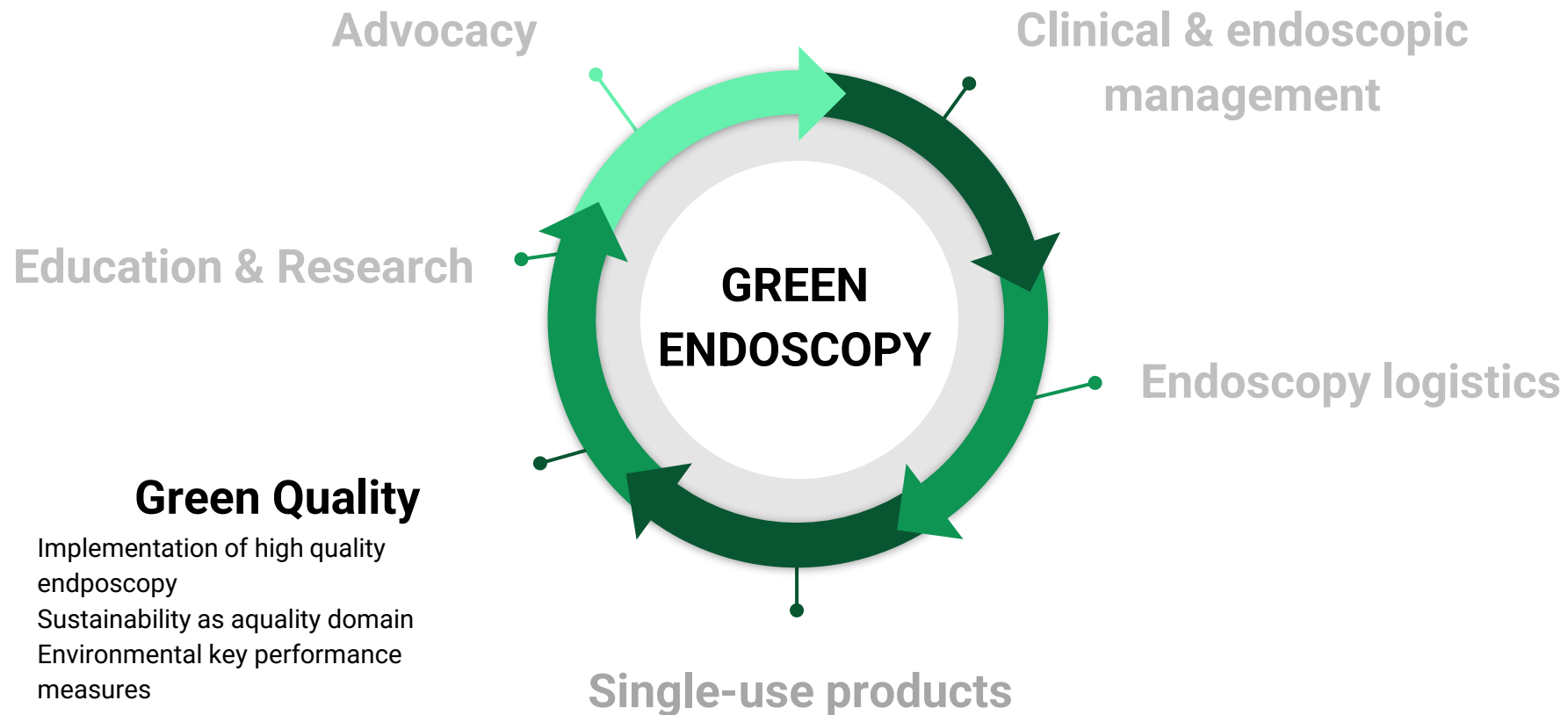
Single-use GI endoscopes

The routine use of single-use endoscopes is not recommended

As
Low
As
Reasonably
Practicable



The path towards sustainable GI endoscopy



Green quality

Sustainability as a domain of quality of GI endoscopy

Doing less but doing it better!!

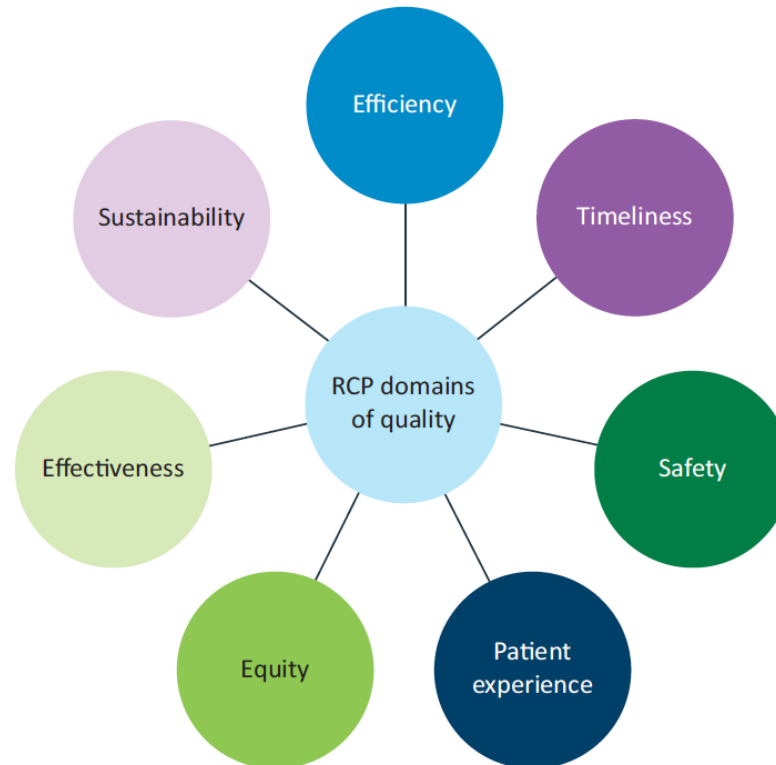
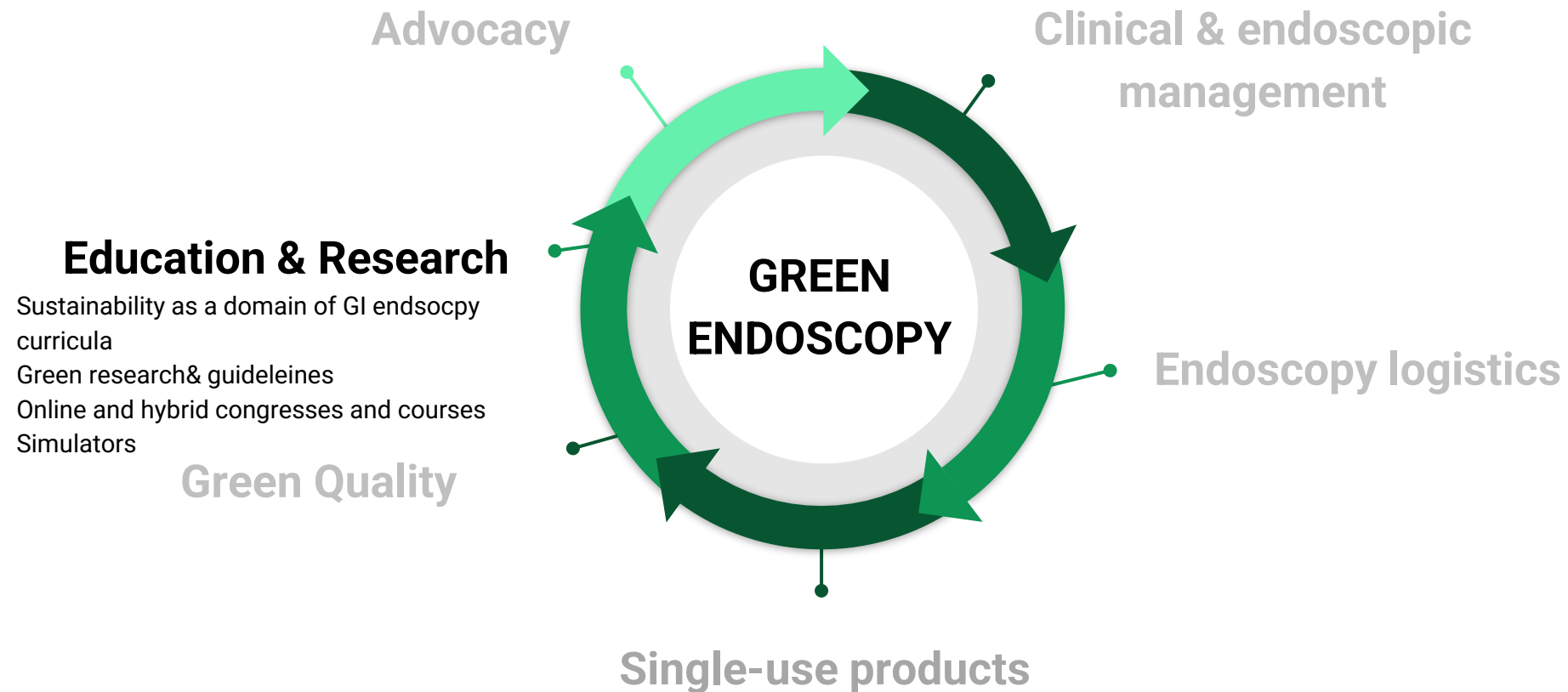


Fig 1. Domains of quality (adapted by the Royal College of Physicians from the Institute of Medicine).¹

The path towards sustainable GI endoscopy

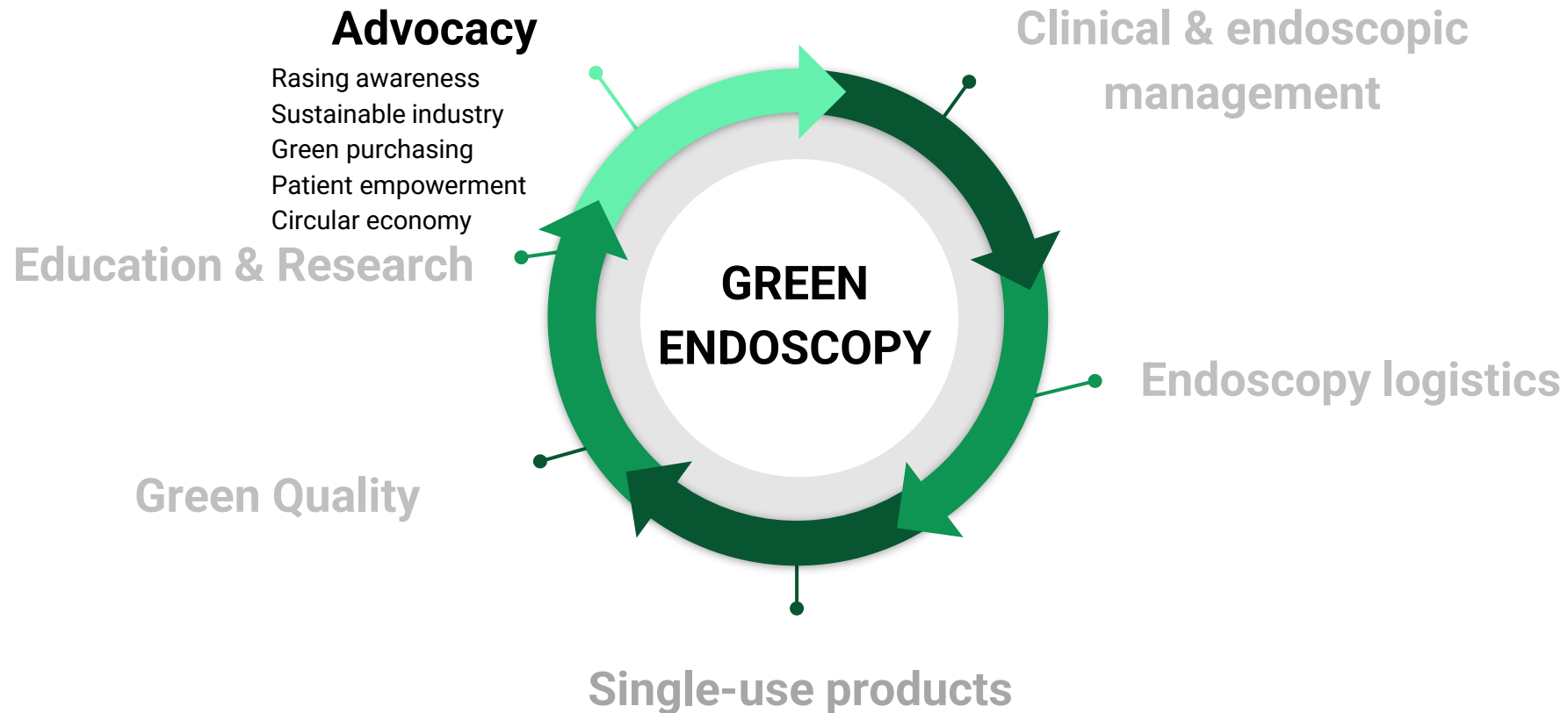


Education & Research

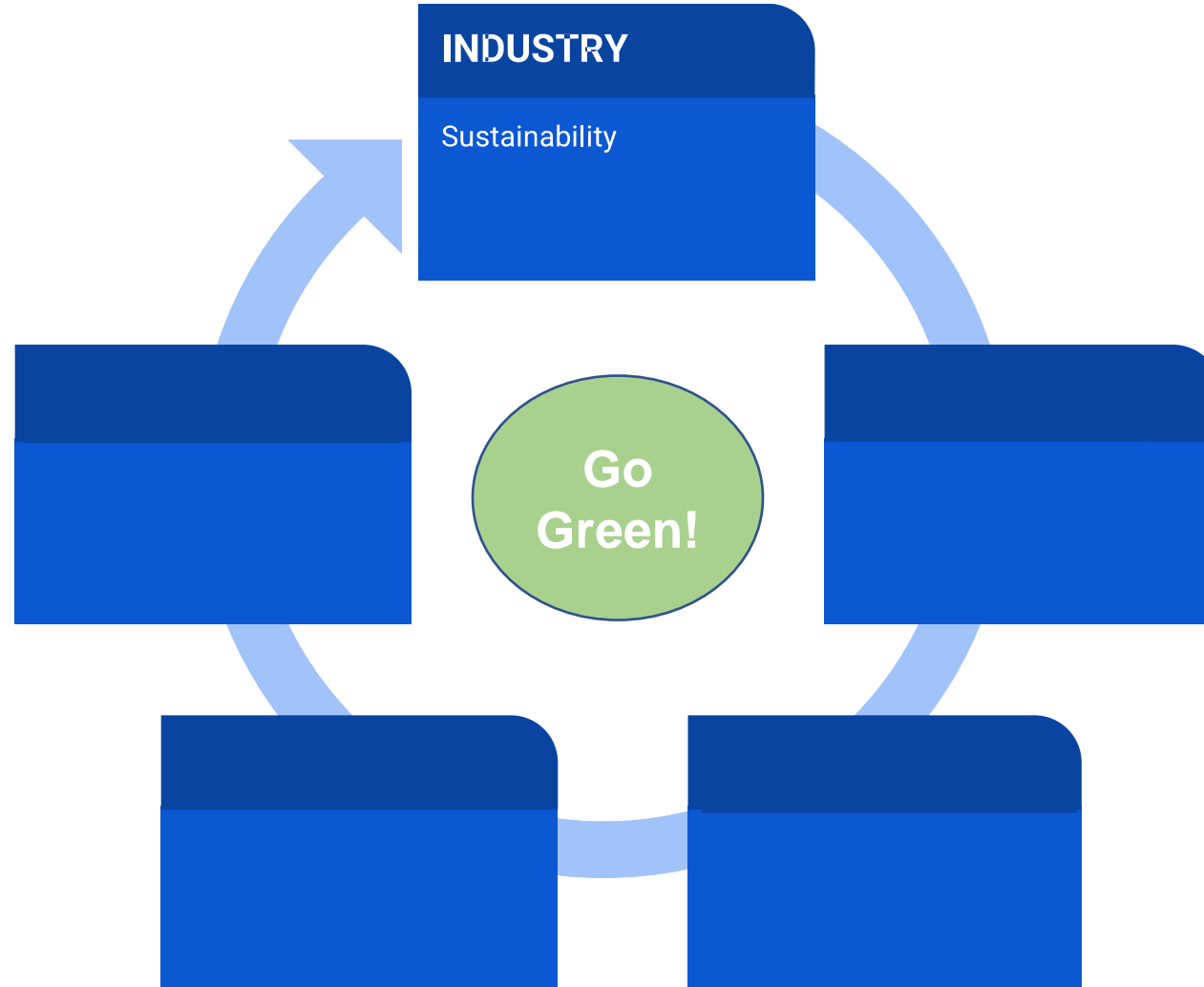
Sustainability in Education, Research Protocols and Guidelines



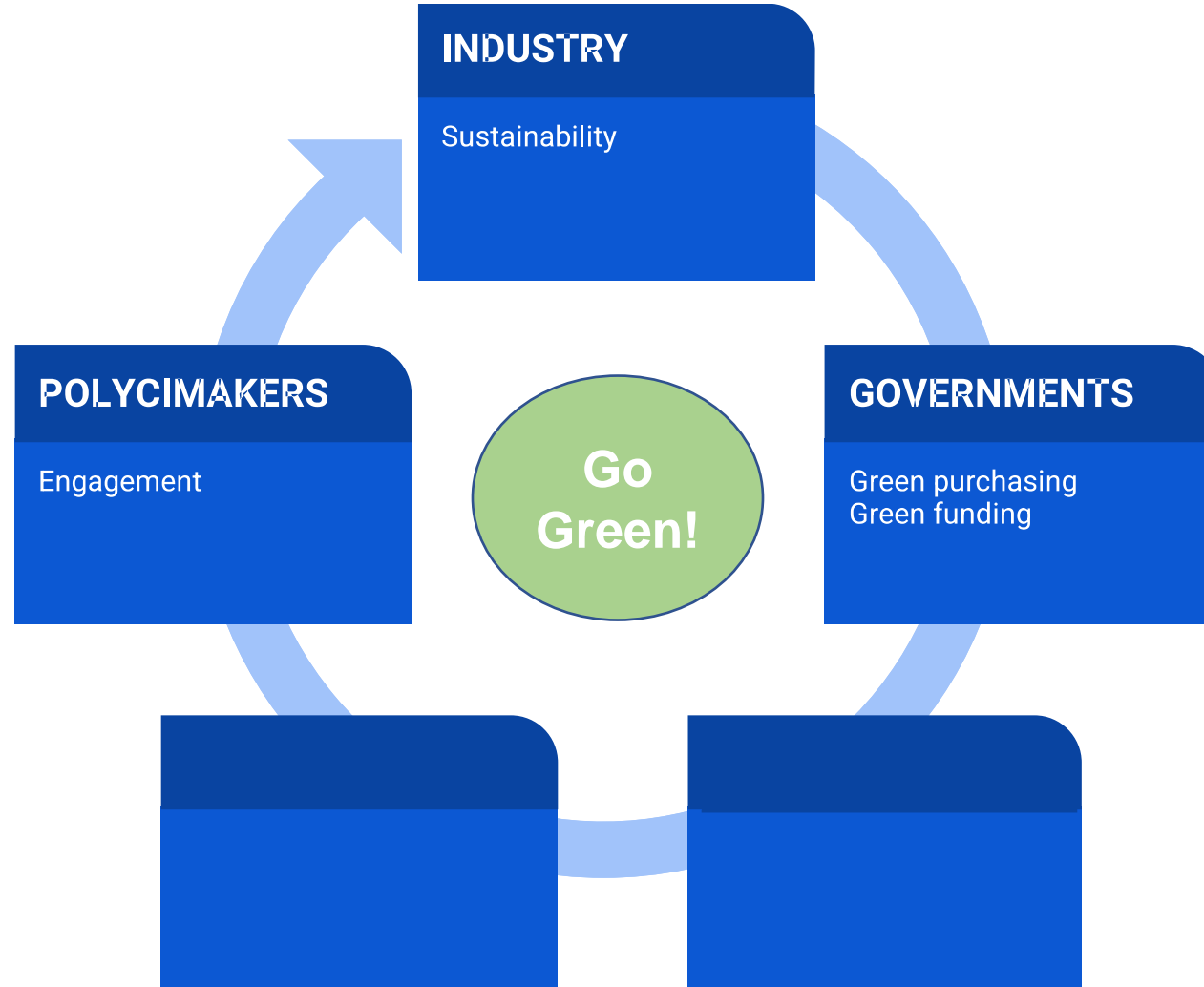
The path towards sustainable GI endoscopy



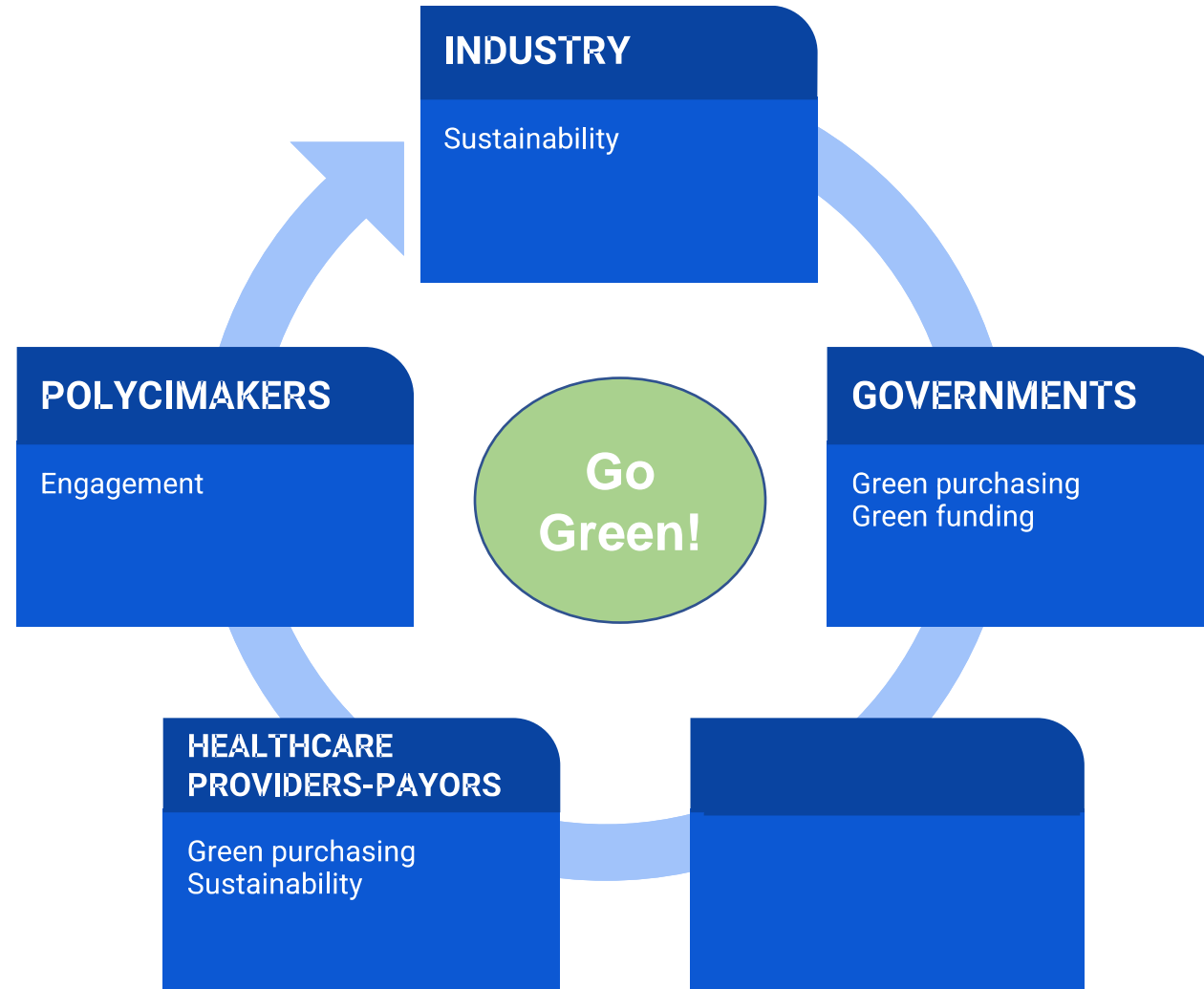
Advocacy



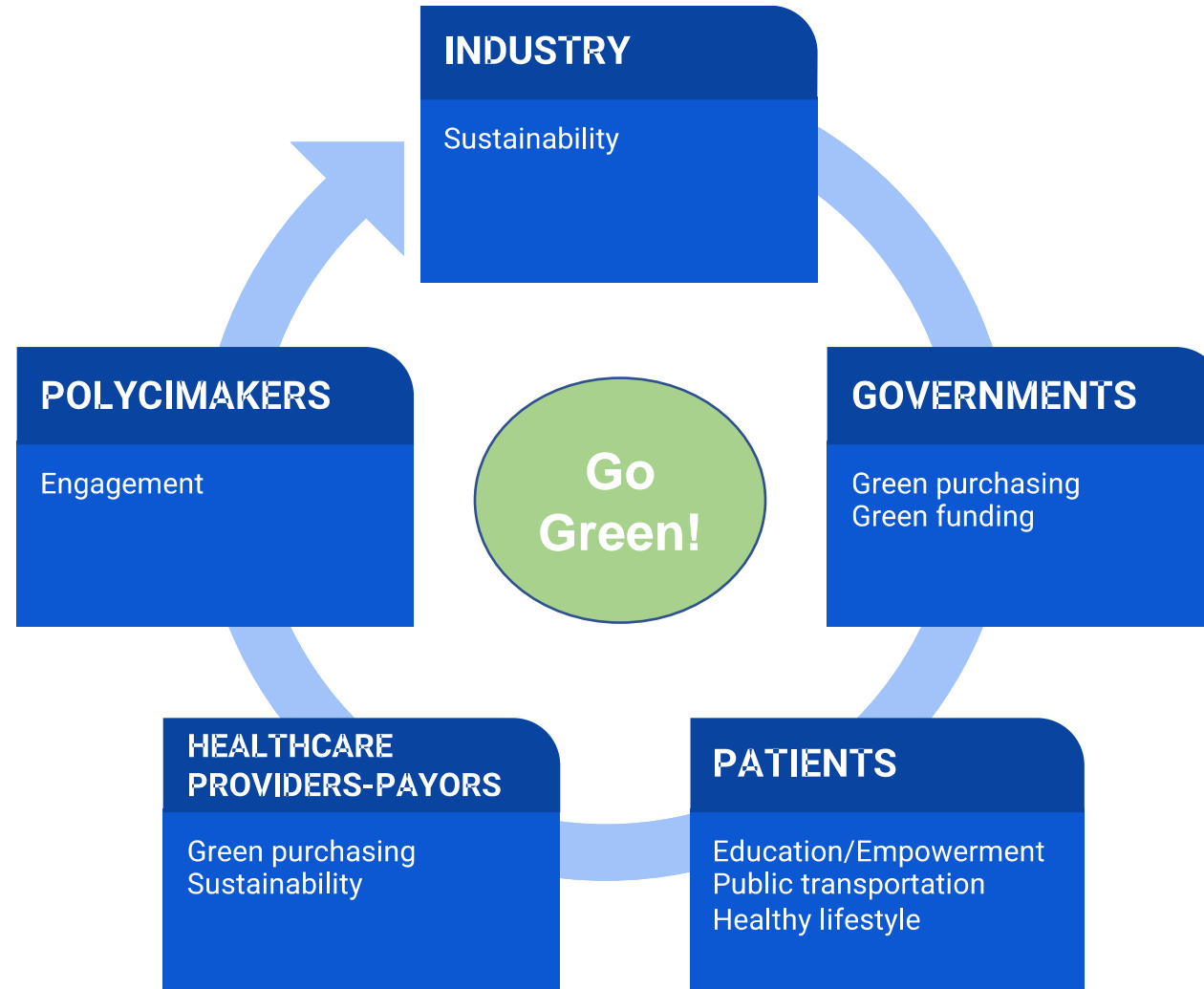
Advocacy



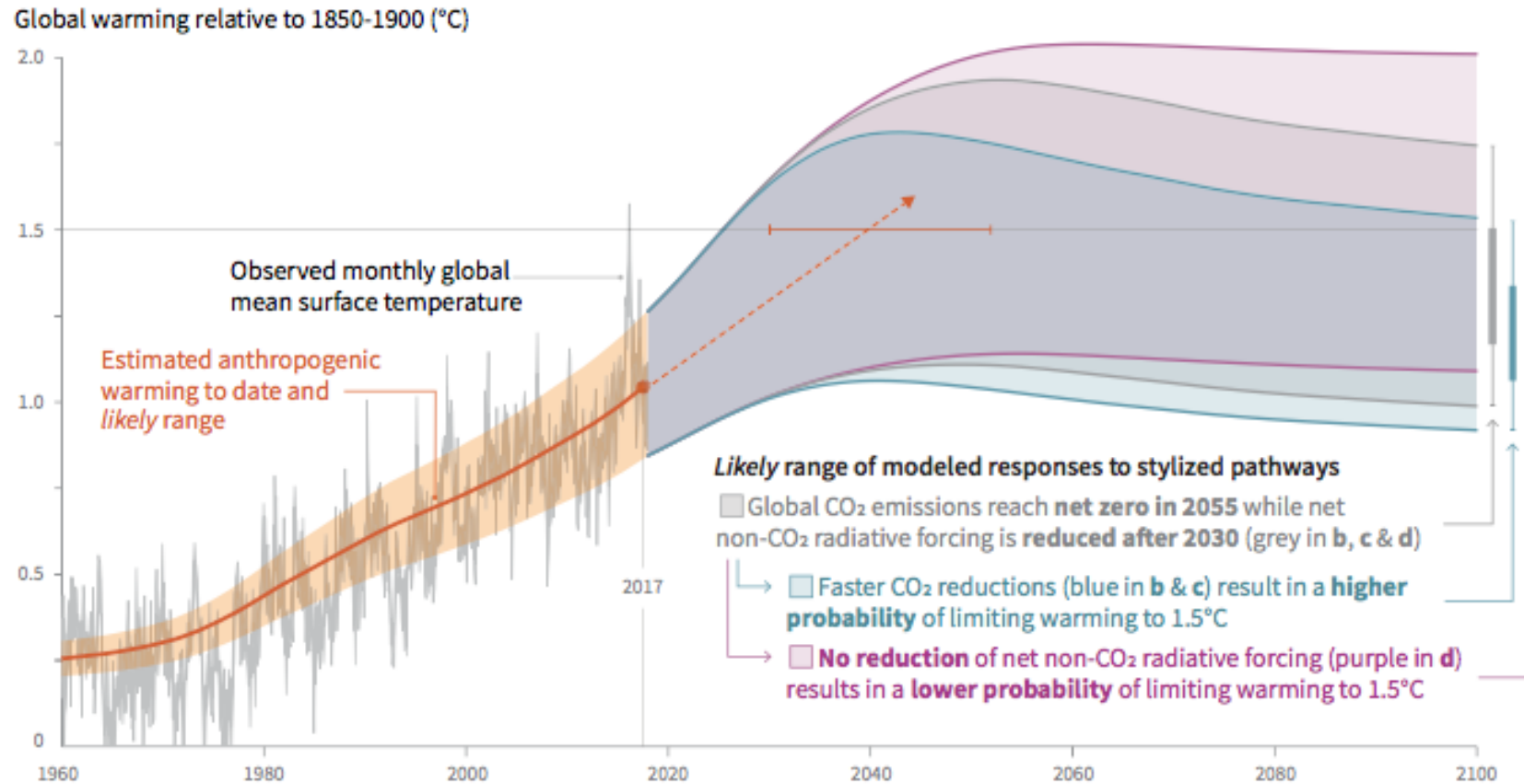
Advocacy



Advocacy



Time to act!



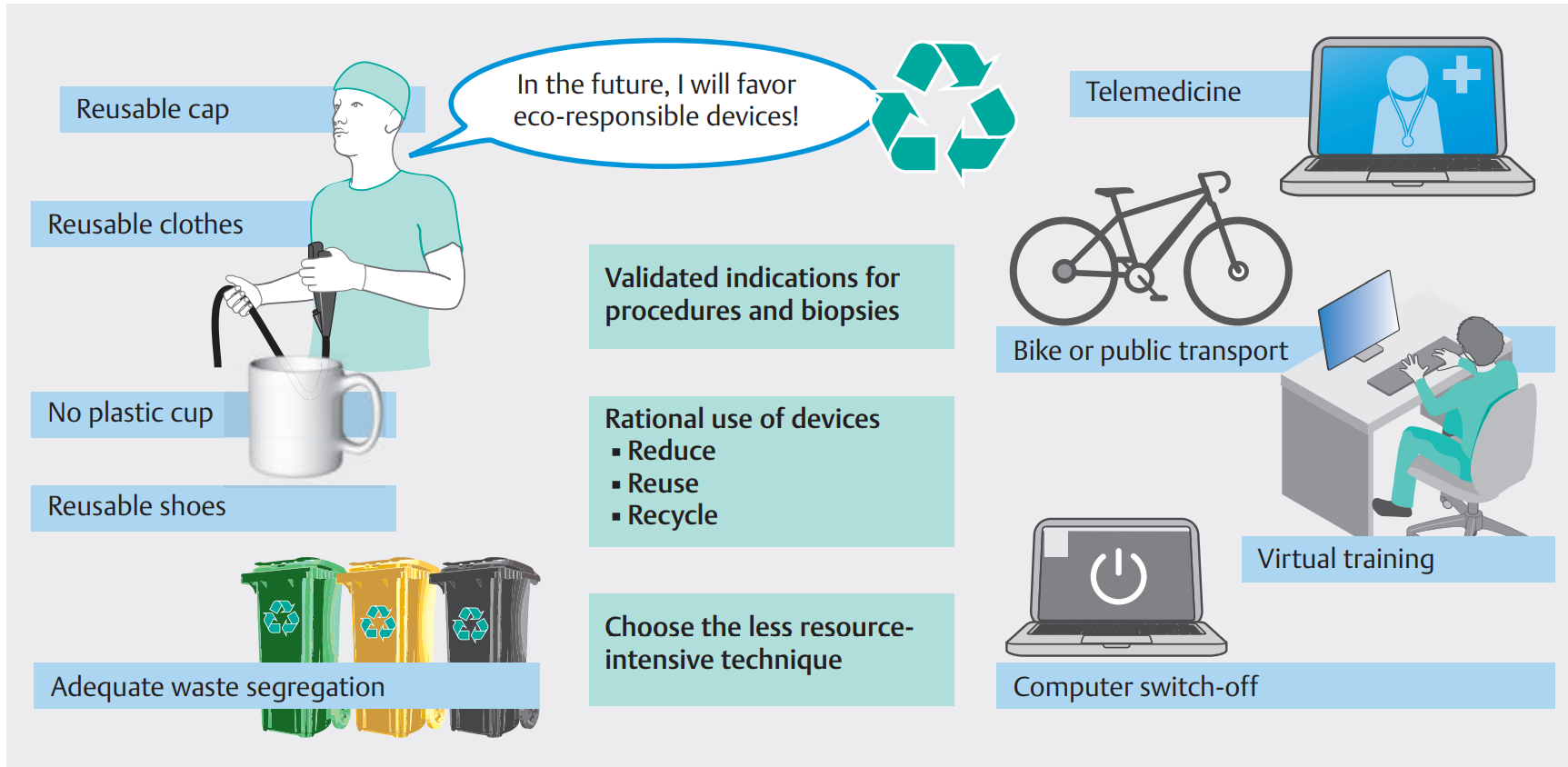


The 5 R's of greener endoscopy

- Reduce** Overall waste production and misclassification
- Reuse** Reduction up to 40% of kgCO₂e per endoscopic procedure
- Recycle** Overuse of unnecessary materials
- Research** Unnecessary biopsies - only when indicated
- Rethink** 1 biopsy jar with 1 specimen = 0.29 kgCO₂e



Take home – ECO Endoscopist



In the future, I will favor eco-responsible devices!

Reusable cap

Reusable clothes

No plastic cup

Reusable shoes

Adequate waste segregation

Validated indications for procedures and biopsies

Rational use of devices

- Reduce
- Reuse
- Recycle

Choose the less resource-intensive technique

Telemedicine

Bike or public transport

Virtual training

Computer switch-off

Wie anfangen?



<https://medium.com/the-andela-way/what-technical-debt-is-and-how-its-measured-ff41603005e3>

► [Hier geht es zur Anmeldung.](#)

TAGUNGSORT

Kongress am Park Augsburg
Gögginger Str. 10
86159 Augsburg

TAGUNGSGEBÜHREN

Anmeldung inkl. Zahlungseingang*	ab 14.10.2023	
Arzt	230 €	Die ersten 20 für 115€ 21-50 für 150€ ab 51 für 180€
Mitglieder DGE-BV, DGVS, DGK, ESGE, SGGSSG*	180 €	
Assistenzarzt	135 €	100€
Endoskopieassistentpersonal*	75 €	50€
Student/Ausbildung*	frei	
Endo-Team-Tickets		
1 Arzt und 3 Endoskopieassistentenz	415 €	
1 Arzt und 5 Endoskopieassistentenz	515 €	

Zugang zur endo-update®
Fortbildungsplattform →



**Prof. Dr. H. Messmann,
Augsburg**

Tagungspräsident

→ mehr Informationen



**Prof. Dr. H.-D. Allescher,
Garmisch-Partenkirchen**

Tagungspräsident

→ mehr Informationen

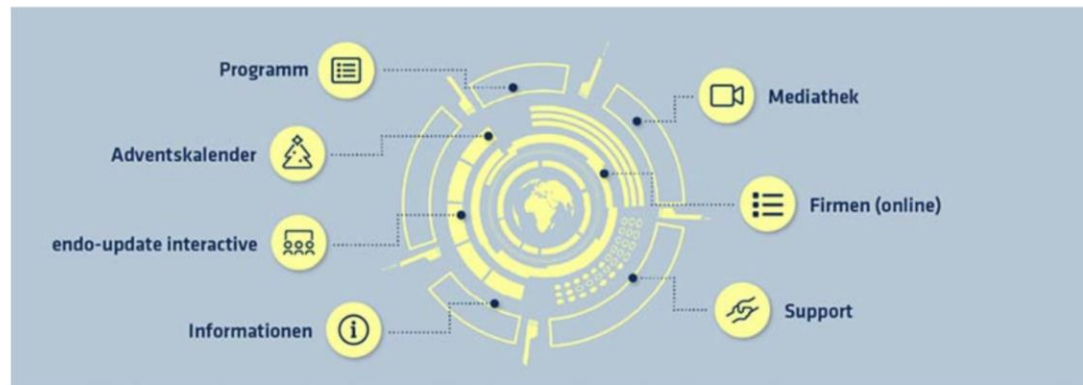
**Liebe Kolleginnen und Kollegen,
liebe Freundinnen und Freunde der Endoskopie,**

zurück in der Normalität, davon gehen wir aus, wenn wir Sie wieder hoffentlich zahlreich beim endo-update 2023 in Augsburg begrüßen dürfen.

FORTBILDUNGSPLATTFORM

live.endoupdate ist die exklusive Online-Fortbildungsplattform der **endo-update®** Veranstaltung.

Hier können sich unsere **endo-update®** Besucher aus dem Vorjahr einfach und schnell Informationen rund um den Kongress holen. In der Mediathek stehen Videos vom vergangenen Kongress sowie von den **endo-update® interactive** Veranstaltungen zur Verfügung.



→ [Zur Fortbildungsplattform](#)

Videofilter

Verwandte Veranstaltung

Select event

Art der Sitzung

Wählen Sie eine Sitzung

Veranstaltungsreihe

Serie auswählen

Etikett

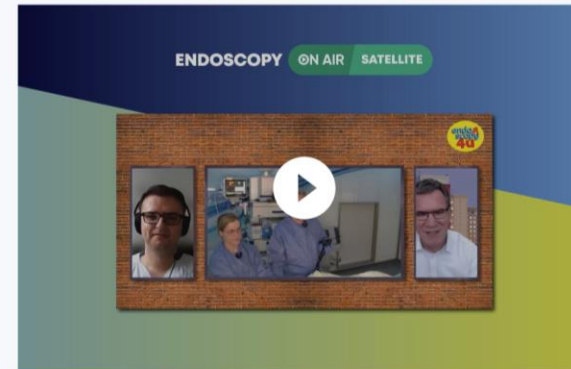
- Achalasia
- ADR
- Advanced Imaging
- AI
- APC
- Barrett
- Bile Ducts



Endoscopy4u – Magendiagnostik

SEPTEMBER 18, 2023

Connected event: Endoscopy4u –
Magendiagnostik



Endoscopy4u – Tipps und Tricks in der Gastrointestinalen Endoskopie

MÄRZ 30, 2023

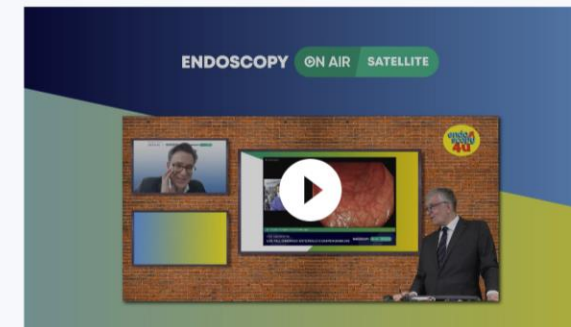
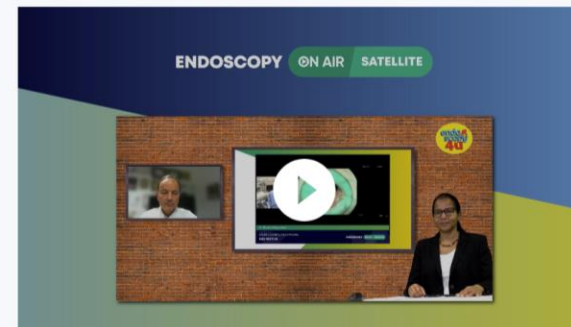
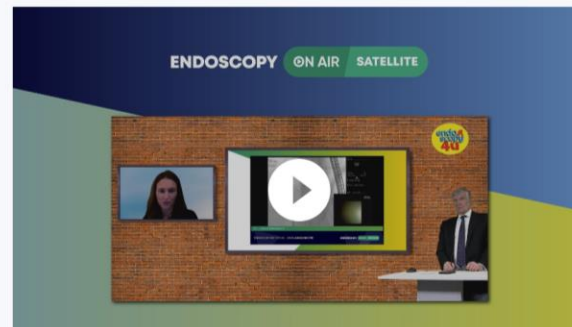
Connected event: Endoscopy4u – Tipps und
Tricks in der Gastrointestinalen Endoskopie



Endoscopy4u – FORUM Neue Schnittstellen ERCP und EUS

DEZEMBER 13, 2022

Connected event: Endoscopy4u – FORUM
Neue Schnittstellen ERCP und EUS



The logo consists of the words "ESGE", "DAYS", and "2024" stacked vertically in a bold, sans-serif font. "ESGE" and "DAYS" are in blue, while "2024" is in red. The logo is contained within a white circle.

**ESGE
DAYS
2024**

**ESGE will be commemorating it's 60th year.
Join us to celebrate our diamond jubilee!**
Estrel Congress Center · Berlin, Germany, April 25 – 27, 2024

**SAVE
THE
DATE**

