Green Endoscopy and Sustainable CRC Screening

*Why we need to change our approach to CRC prevention and how*

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Dartmouth Geisel School of Medicine, Hanover, NH
Conflict of interest statement

Research Grants: Steris, Cosmo Pharm.

Carbon Footprint (travel): 1.8 tCO2 eq.
Vermeer
Girl with a Pearl Earing
1665
Landfill waste generated during endoscopy
VA WRJ and DHMC 2020
“Climate change is the greatest global health threat facing the world in the 21st century”
Mortality worldwide

- **Colorectal cancer (2020)** 0.9 M
- Cancer (2020) 9.5 M
- Ischemic heart disease (2019) 8.9 M
- **Related to air pollution (2019)** 8.7 M
- Stroke (2019) 6.5 M
- Covid-19 (2020) 3.7 M
- Diarrhea (2017) 1.7 M, 0.9 M children
- Diabetes (2019) 1.5 M

WHO
Vohra et al. EnvResearch 2021
Drivers of Climate Change?

Industrial age → GHG → Climate change
Drivers of Climate Change?

- Industrial age
- GHG
- Climate change

**HEALTHCARE SYSTEM**

- 8.5% of GHG in the US
- 4.4% worldwide

If Healthcare were a country, if would be the fifth largest GHG emitter
How do we value CRC screening?

Incidence benefit?
Mortality benefit?
Current Value of Care

**Patient**
Detection/Resection

$\downarrow$ CRC death

\[
\text{Value} = \frac{\text{Benefits}}{\text{Harms}}
\]
Efficacy/Safety
(Personal Health)

**Society**
CRC Prevention

$\downarrow$ CRC mortality

\[
\text{Value} = \frac{\text{QALY}}{\text{Financial impact}}
\]
Effectiveness/cost
(Population Health)
WEO CRC Screening Committee

- FIT for Screening
- Approach to surveillance
- Interval cancers
- Image enhanced endoscopy
- Screening trials
- Reduce inequities

The GOOD:
- Efficacy
- Effectiveness
- Safety
- Equity

The BAD:  → We assume
- For all now and ever
- Unlimited resources
- National perspective

Solution? Global/planetary perspective
Sustainable Value of Care

**Patient**
Detection/Resection

\[ \downarrow \text{CRC death} \]

**Society**
CRC Prevention

\[ \downarrow \text{CRC mortality} \]

**Global**
CRC Prevention for all

\[ \downarrow \text{Global CRC mortality} \]

\[
\text{Value} = \frac{\text{Benefits}}{\text{Harms}}
\]

Efficacy/Safety (Personal Health)

\[
\text{Value} = \frac{\text{QALY}}{\text{Financial impact}}
\]

Effectiveness/cost (Population Health)

\[
\text{Value} = \frac{\text{Patient & Population outcomes}}{\text{Environmental + Social + Financial impacts}}
\]

Sustainable effectiveness/global harms (Global, planetary Health)

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**Goal:** to reduce CRC death for all and be able to afford it!  ➞ **Sustainability**
Sustainable Care needs to include Planetary Health
Principles of Sustainable Healthcare

<table>
<thead>
<tr>
<th>Patient empowerment and self-care</th>
<th>Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support patients to take a bigger role in managing their own health and healthcare</td>
<td>- Promoting health</td>
</tr>
<tr>
<td></td>
<td>- Preventing disease</td>
</tr>
<tr>
<td></td>
<td>- Reduce the need for healthcare</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Lean service delivery</th>
<th>Low carbon alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Services where people need them</td>
<td>&gt; Preferential use of effective treatment and</td>
</tr>
<tr>
<td></td>
<td>medical technologies with lower environmental</td>
</tr>
<tr>
<td></td>
<td>impact</td>
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<tr>
<td>&gt; Streamlining care to minimise low value activity</td>
<td>&gt; Minimising waste of medications, consumables</td>
</tr>
<tr>
<td></td>
<td>and energy</td>
</tr>
</tbody>
</table>

Mortimer et al. FutureHealthCareJ 2018
UK NHS – its strategy towards sustainable care

• Single largest payer healthcare system in the world

• Directly controlled net zero by 2040

• 2030 no purchase from suppliers that do not meet our commitment to net zero.

Core components
• Getting it Right First Time (GIRFT) approach
• Prevention
• Addressing inequality of care
In the US Department for HHS:

“Making decarbonizing the federal healthcare system a priority...”
(Undersecretary Admiral Rachel Levine at COP26 11/09/2021)
How do we get there?

- Within WEO CRC Screening committee
- In our practice

Green Endoscopy

- Clinical/Endoscopy
- Education
- Advocacy
- Sustainable CRC prevention
- Research
- Society (WEO)
- Industry

Within WEO CRC Screening committee
In our practice
Green house gas (GHG) emission sources

**Scope 1:** Direct emissions (burning fuel, anesthetic cases)

**Scope 2:** Indirect emissions (electricity from fossil fuels)

**Scope 3:** Supply chain
Initiatives

• Green Endoscopy Group
• ESGE – Guideline/recommendation
• BSG – strategic plan
• US Multisociety Taskforce (strategic plan)
• ASGE taskforce on climate change/green endoscopy
• WGO working group
Example Green Endoscopy

• Assess current practice
• Identify practice changes
• Implement practice changes
Estimating the environmental impact of disposable endoscopic equipment and endoscopes

Sathvik Namburar, Daniel von Renteln, John Damianos, Lisa Bradish, Jeanne Barrett, Andres Aguilera-Fish, Benoit Cushman-Roisin, Heiko Pohl

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Low endoscopy volume center (VA)</th>
<th>High endoscopy volume center (DHMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoscopic procedures per year, n</td>
<td>15,000</td>
<td>2,000</td>
<td>13,000</td>
</tr>
<tr>
<td>5-day audit, n</td>
<td>278</td>
<td>37</td>
<td>241</td>
</tr>
<tr>
<td>Waste, total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume, n trash bins (20 Ga or 76 L)</td>
<td>190</td>
<td>19</td>
<td>171</td>
</tr>
<tr>
<td>Mass, kg</td>
<td>619</td>
<td>73</td>
<td>546</td>
</tr>
<tr>
<td>Waste per endoscopy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass, in kg</td>
<td>2.11</td>
<td>1.96</td>
<td>2.27</td>
</tr>
<tr>
<td>Direct landfill waste, kg (%)</td>
<td>1.34 (64)</td>
<td>1.33 (68)</td>
<td>1.36 (60)</td>
</tr>
<tr>
<td>Biohazard waste, kg (%)</td>
<td>0.59 (28)</td>
<td>0.64 (32)</td>
<td>0.54 (24)</td>
</tr>
<tr>
<td>Recycled waste, kg (%)</td>
<td>0.18 (9)</td>
<td>0 (0)</td>
<td>36 (16)</td>
</tr>
<tr>
<td>Waste of reprocessing one endoscope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass, kg</td>
<td>0.30</td>
<td>N/A</td>
<td>0.33</td>
</tr>
</tbody>
</table>
Figure 1. Material components of non-biohazard waste of disposable supplies used for endoscopic procedures and potential for recycling (data based on waste audit at the low volume hospital, see methods).

* Potentially recyclable plastic included: PET or Polyethylene terephthalate, HDPE High-density polyethylene, PVC or Polyvinyl chloride, LDPE or Low-density polyethylene, PP or Polypropylene (Resin identification code △ 1-5).
If results were applied to annual number of endoscopies in the US

US: 18 Mio endoscopies/yr
- 11 Mio colonoscopies
- 6 Mio EGDs (incl EUS)
- 117,000 ERCPs
- 119,000 EUS

WASTE in VOLUME: 836,000 cubic meters
Equivalent to
Covering 117 soccer fields with waste to 1 m depth

WASTE in WEIGHT: 38,100 metric tons
Equivalent to
24,900 passenger cars
If results were applied to annual number of endoscopies in the US & Performed with disposable scopes

Components of waste
- Single-use endoscopes
- Endoscope reprocessing
- Recycling
- Biohazard
- Landfill

Waste from endoscope reprocessing and single-use endoscopes

Waste from disposable supplies during endoscopic procedures

Dotted line = 43,500 metric tons (48,000 US ton), equivalent to the weight of 28,400 passenger cars
Green Endoscopy – possible practice changes

Reduce > Reuse > Recycle

Courtesy of Adriaan Volkers, AMC, Netherlands
Green Endoscopy – possible practice changes

Procedure adequate?
• Procedure indicated?
• Surveillance interval appropriate?
• FIT vs colo

Conservation (energy/material)
• Lights (LED, motions sensor)
• HVAC
• Digitize/Printing

Courtesy of Adriaan Volkers, AMC, Netherlands
Green Endoscopy – possible practice changes

Procedure performance?
- Ancillary devices
- Sterile water use
- Need for biopsies
- R & D (leave polyps)

Instruments/devices
- Green purchasing (packaging, CO2)
- Hazardous waste
- Recycling
- Reprocessing

Courtesy of Adriaan Volkers, AMC, Netherlands
Green Endoscopy – possible practice changes

Team approach
- All in
- Educate, engage
- Reassess
- Leadership support

Courtesy of Adriaan Volkers, AMC, Netherlands
WEO CRC Screening Committee & Sustainable/Green Care

• What is our vision?
• What are our goals?
• What steps shall we take to achieve them?