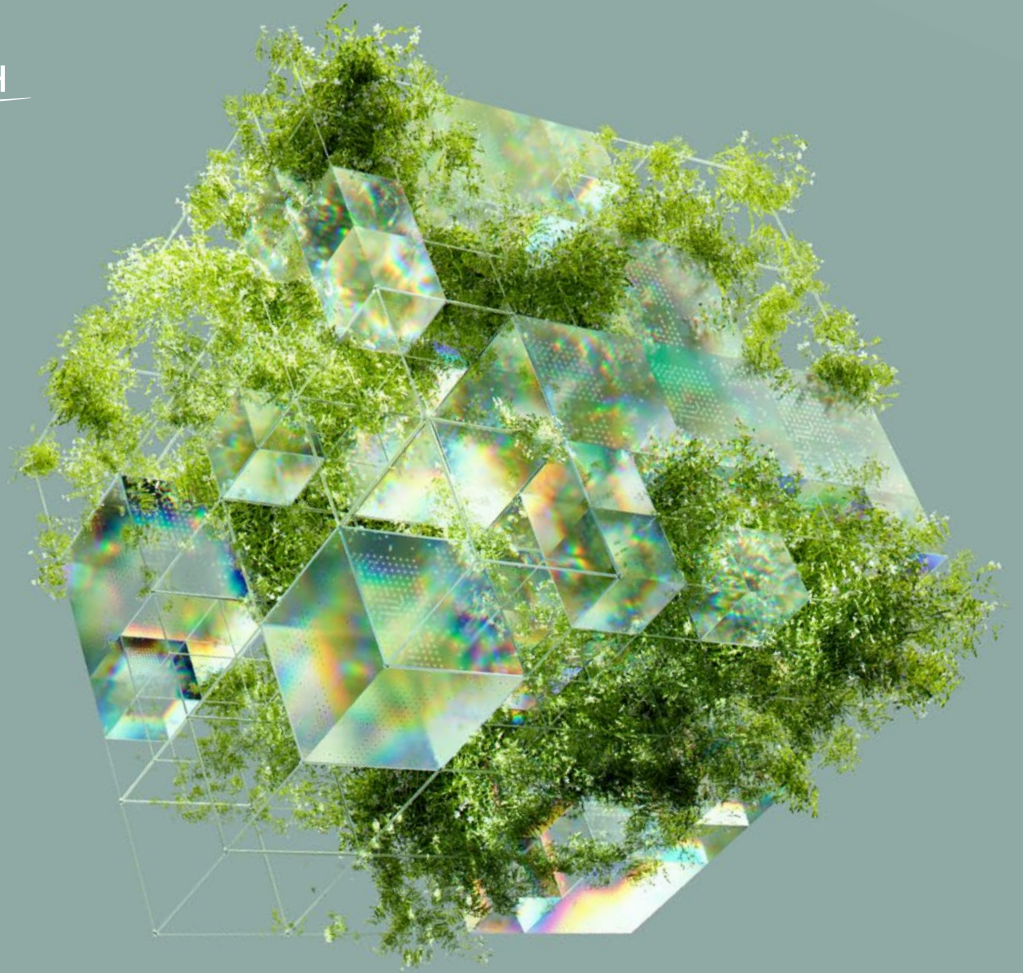




MICRO-TECH
ENDOSCOPY



NHS Environmental Impact Project

Endoscopy Department, Queen Alexandra Hospital,
Portsmouth Hospitals University NHS Trust



NHS Environmental Impact Project

Project Foreword

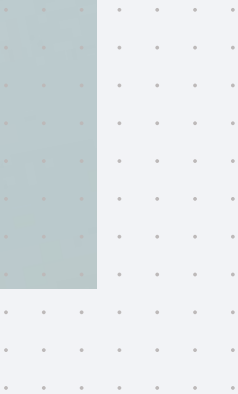
We would like to extend special thanks to:

Endoscopy Department, Queen Alexandra Hospital. The welcoming and engaging nature of the QAH endoscopy team, led by Professor Bhandari and Dr Htet was instrumental, gratefully received and allowed us the gathering of data and ideas for review.



Micro-Tech UK with the cooperation of Prof Bhandari and his endoscopy team at Queen Alexandra Hospital, commissioned a feasibility study to understand the amount and type of waste generated through endoscopy procedures. How that waste is handled and methods of reducing the impact on the environment.

The NHS has an ambition to reduce carbon emissions, that they can influence, by 80% before 2028 (NHS England).



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Scope of the Feasibility Study

PHU - NHS Trust - Endoscopy

Hospital departments or activities included in agreed project scope.



Number of Procedures



Procedure Packs



Waste Journey



Decontamination

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Research Methodology

Research was carried out through observation over 10 days and detailed the separation and measuring of the different types of waste generated in an endoscopy suite and how it was subsequently dealt with.

A wide range of procedures were observed to ensure an accurate understanding of the normal activities in an endoscopy suite.



The department was observed over **7 full working days** (8am until 6pm)



In total, **52 endoscopy procedures** (of which 4 were colonoscopies). Were observed.



Focus was on **gastroscopy procedures** with a range of clinical complexities involving different practitioners and team members.



Typically, each day had a patient procedure list of between **10 and 15 patients** (there were multiple 'Did Not Attend' (DNAs)).



Throughout each day, the following were noted:

- ✓ Use of bins
- ✓ Use of water
- ✓ Use of medical equipment (e.g.blood pressure monitors)
- ✓ Use of medical consumables(e.g.swabs,sharps,gloves)
- ✓ The 'flow' of the endoscope before, during and after each procedure
- ✓ Processes in the decontamination room

Medical Device Product Journey

Medical devices are the world's 14th most traded product. According to OEC data, medical devices (medical equipment and consumables) are manufactured mainly outside of the EU.

Below is an image and data to denote the transport carbon footprint of just 500KG¹ from a Japanese manufacturer to QAH's endoscopy department.



~ 115 TONNES CO₂



~ 5 TONNES CO₂

¹ Estimated weight of products in the QAH endoscopy storeroom. Estimates do not include actual CO₂ emitted in the manufacturing process (Ref: conservative estimates from multiple sources).

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Typical Product Use

Below is a typical consumables and equipment usage for one gastroscopy procedure, scaled up to show national impacts.

Due to different procedures requiring different consumables, it is not exhaustive, but gives visibility of the CO2 impact from each procedure. Figures are based on available data from medical equipment suppliers and government sources.

Products Used	Units	Use Multiplier	Annual Total UK	CO2 Multiplier	Annual Estimated Kg CO2
Mouth guards	1	2.1 M	21. M	N/A	N/A
Gels and lubricants	4 ML	2.1 M	8.4 M	N/A	N/A
Disinfectant sachets	2	2.1M	4.2 M	N/A	N/A
Tap water(for disinfecting endoscope in procedure room)	500 ML	2.1M	1.1 M	0.289 g	327 KG
Endoscopy flush 'water' (ends in VaxSax containers)	450 ML	2.1 M	960 K	0.289 g	286 KG
Endoscope pre-clean sink water (after procedure, before WD)	30 L	2.1 M	64 M	0.289 g	19,072 KG
Endoscope Washer Disinfector water (old Labcaire system)	35 L	2.1 M	138.6 M	0.289 g	41,302 KG
Moisture absorption mat (under patient head during procedure)	1	2.1 M	2.1 M	N/A	N/A
Surface disinfectant wipes	12	2.1 M	25.6 M	N/A	N/A
Electrical medical equipment incl: monitors, PCs, WDs, lights	~5,200 kWh	2.1 M	11 BN	0.193 KG	3.2 KG
Snares	1	2.1 M	2.1 M	N/A	N/A
Biopsy pots	1	2.1 M	2.1 M	N/A	N/A
Gloves	11 Pairs	2.1 M	23.1 M	N/A	N/A
Aprons	6	2.1M	12.6 M	N/A	N/A

Our Findings

As observers, not undertaking clinical tasks under pressure, it was immediately evident that not all waste products needed to go into the tiger bags, but instead into the general waste black bag.

The below data shows what happened when a single tiger bin trolley was provided to the clinical team.

Waste calculated x 10 patients

x 4 x tiger bags per room per day

x 3.9 Kg each (full bag)



Total : **15.6 Kg**

x 0.25 x black bag per room per day

x 1.8 Kg each (full bag)



Total : **0.45 Kg**



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Packaging Challenge

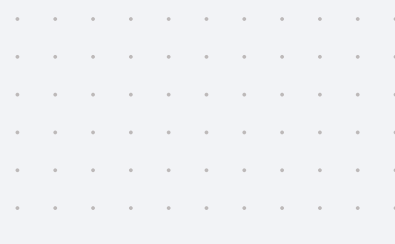
Selecting the right waste product recycling option is a challenge in a busy, high-pressure clinical environment.

Despite MDR-compliant (Medical Device Regulations) packaging there is a level of recycling complexity that could be simplified by suppliers if there was a demand from NHS and EU healthcare providers to instigate change.



Here is an example of a medical product and its instructions for use.

Whilst this example is a sterile product with a 'medical paper' backing (typically made from cellulose fibre) and often recyclable, it makes no attempt at guiding the disposer. This could lead to incorrect disposal, which considered on a national scale, could be huge.



Labelling could be clearer and more descriptive about how to dispose of each part (i.e. separate the clear plastic front from the backing) A simple labelling system could be applied, similar to that of food packaging.



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Bin Psychology

Our team spent over **70 hours** monitoring activity in the department.

During this time, we identified a notable 'bin psychology' which influenced behaviours. Humans, as we know, generally take the easiest option on most things, particularly when working under pressure. This personality trait can be used to leverage continuous recycling improvements. Providing solutions to facilitate easy recycling is vital.

Observations included:



Bin location is vital to optimal waste management compliance.



Metal foot pedal bins were not regularly used (small, noisy, difficult to use and often not in an accessible location).

Bin type is key.

Open top bins on wheeled laundry trolleys were much more effective and staff visibly 'enjoyed' using them, but...



There was only one tiger bag so all rubbish was incorrectly placed in there at considerable cost and environmental impact.



Not all cardboard was separated for recycling. Our team purposely did not advise clinical staff on which bin to select.






Products (consumables) were not clearly labelled to help the clinical teams decipher recyclability.



Bags were not always compacted to limit bag usage.

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Different Types of Bags & Bins

<div>Offensive Waste</div> <div></div> <div>£340 per Tonne</div>	<table><tr><th>General</th><th>Dry Mixed Recycling</th><th>Offensive Waste</th><th>Infectious waste</th><th>Infectious waste contaminated with medicine and/or chemical</th><th>Cytotoxic / Cytostatic Waste</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	General	Dry Mixed Recycling	Offensive Waste	Infectious waste	Infectious waste contaminated with medicine and/or chemical	Cytotoxic / Cytostatic Waste																																																																														
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1 Graphic taken from NHS Property Services website

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Observations Lead To Change

After sufficient time monitoring the clinical teams in their activities, the team (in collaboration with the clinical team) made a small change to the bin options. Prior to the change, all waste was being placed into the tiger bags. Pedal bins were rarely used.



Save Our Tiger Bags!

The simple action of providing tiger and black bags in an open easy-to-access way, instantly and positively changed the environmental impact of the department.

One Bin, became two.



Our Findings

Before : Per room, Per Day. Waste calculated x 10 patients

x 4 x tiger bags per room per day

x 3.9 Kg each (full bag)



Total : **15.6 Kg**

x 0.25 x black bag per room per day

x 1.8 Kg each (full bag)



Total : **0.45 Kg**

After : Per room, Per Day. Waste calculated x 10 patients

The below data shows what happened when a double bin trolley was provided to give the clinical team member a choice. We observed how users naturally altered their approach and thought about the impact of putting the right product into the right bin.

x 2.5 x tiger bags per room per day

x 3.8 Kg each (full bag)



Total : **9.5 Kg**



Saved : **6.1 Kg**

x 2.75 x black bag per room per day

x 2.2 Kg each (full bag)



Total : **6.05 Kg**



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Small Changes Scale Nationally

When users separated waste into tiger and black bin bags there were notable and immediate benefits. When multiplied up nationally, the impact is sizable.

This change in behaviour was even more prevalent when the team informed the clinical teams about not only the environmental benefits, but the financial benefits. Below are some calculations based on the data collated. Various assumptions have been made to scale to national figures.

	Tiger Waste Before	Tiger Waste After
	15.6 kg	9.5 kg
	Department Annual Saving 1	Department Annual Saving 2
	~4.45 tonnes	£934.92
	Per Patient Annual Saving 3	Per Patient Annual Saving 4
	0.6Kg	£0.13
	National Saving (Gastroscopy) 5	National Saving (Gastroscopy) 6
	~1.28M tonnes	~£2.73M

Calculations:

*Per room, per day

1 - $(15.6\text{Kg} - 9.5\text{Kg}) \times 365 \text{ days} = 2,226.5\text{Kg} \times 2 \text{ rooms} = 4,452\text{Kg}$

2 - $(£350 - £140) \times 4,452 \text{ tonnes} = £934.92$

3 - $4,452\text{Kg} / (20 \text{ gastroscopy patients} \times 365 \text{ days}) = 4,452 / 7,300 = 0.6\text{Kg}$

4 - $£934.92 / 7,300 = £0.1286$

5 - $0.6\text{Kg} \times 2,133,541 = 1,280,124\text{Kg}$

6 - $£0.1286 \times 2,133,541 = £2,743,493$

Assumptions and approach:

- QAH endoscopy department has 6 procedure rooms, but typically only 2 are used for gastroscopy.
- 365 day working per annum.
- Average of 10 patients per room per day (i.e. 20 gastroscopies per day is 7,300 annually) Please alter as you will have access to specific numbers.
- Black bins cost £140 per tonne to reprocess. Tiger bins cost £340 per tonne to reprocess. [Reference NHS bin data, different Trusts will have different pricing].
- Different Trusts will have different patient and procedure room numbers.
- Gastroscopy procedure numbers taken from JAG in 2019 (pre-pandemic numbers of 2,133,541).

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Key Actions

From our observations our key actions that we would recommend are as follows.



Provide a double laundry trolley bin (one tiger bag and one black bag) in all procedure rooms.



Preferably have a triple trolley with a plastic bin section for cardboard (no bin bags required).



Provide a recycling bin in the staff common room (none was evident).



Create a 'marketing' campaign (Save our Tiger (bags)!) to engage staff and advise them how their individual actions can help!



Identify an 'environmental champion' in each suite to monitor and coach colleagues (this should not be a negative 'Bin Police').



Engage with Infection Prevention teams to see if there is a way to identify and separate 'non offensive' PPE that is going in the tiger bin when it has not come into contact with patients, or other contamination.

- We estimated that 1/3 of all PPE used is 'clean' and could go into black bin bags.

Key Actions



Precut 'tubing' (e.g. VaxSax) to room layout specific uniform lengths that are just long enough for suitable use without stretching.

- We estimated that the department can save 10 to 15% on tubing waste.



Consider removing the linen on the patient beds, because the beds are disinfected in between use anyway.



Mandate that ALL suppliers show their environmental strategy and demand greater clarity for their product's recycling options.



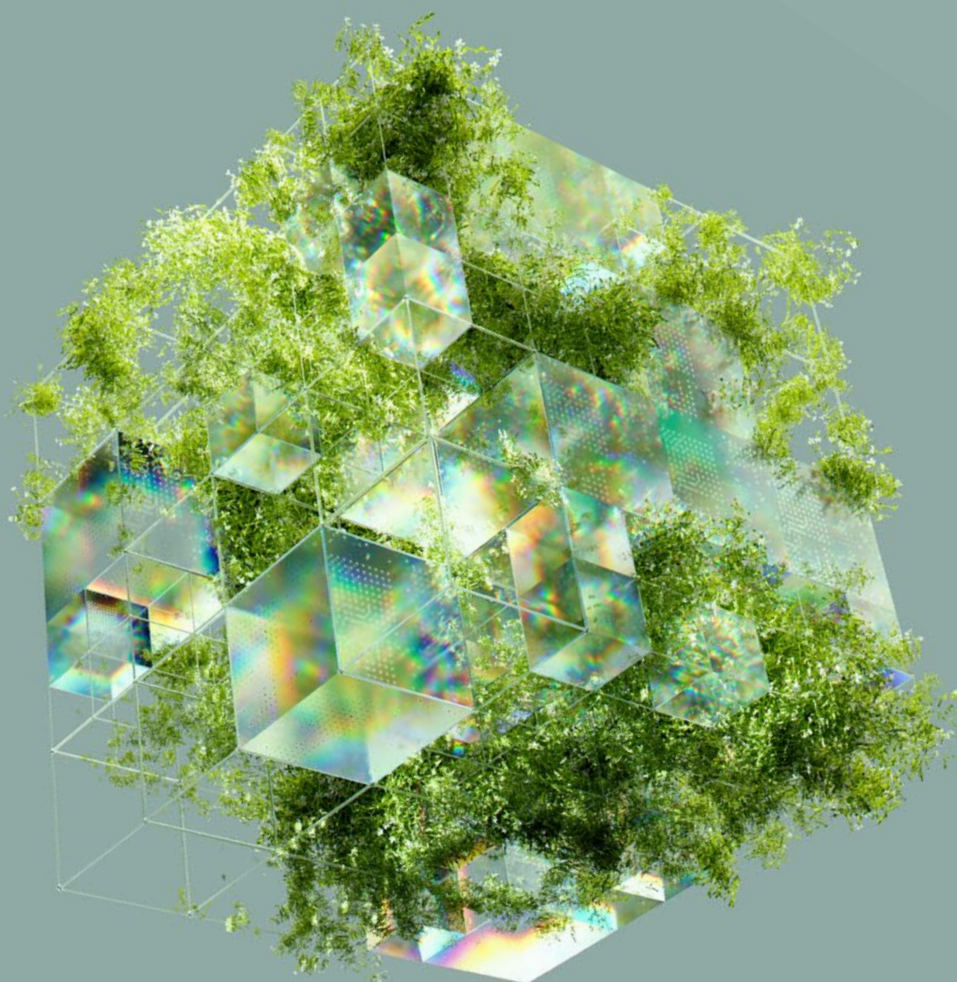
Demand that recyclable materials are used where clinical sterility integrity allows.



Perform an audit on all medical products in the department to double check that they are being disposed of correctly



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