



SUSQI PROJECT REPORT

Reducing CO₂e waste through implementing remanufactured harmonic scalpels in laparoscopic surgery and replacing disposable surgical gowns with reusable surgical gowns

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Team Members: Laura Vale, Senior Operating Department Practitioner,

laura.vale@hhft.nhs.uk

Krithea Baker, Recovery Nurse Practitioner,

krithea.baker@hhft.nhs.uk

Gemma Beckett, Clinical and Operational Lead

gemma.beckett@hhft.nhs.uk



Background:

The operating theatre environment is a resource intensive area of the NHS with a high demand for specialist medical equipment and single use items. Through optimising the supply chain and looking at medical equipment, which are huge contributors to NHS emissions (NHS England, 2022), we can try to mitigate the contribution of operating theatres to overall carbon footprint. We have identified this abundant use of single use items as one of the major problem areas in our workplace and we plan to implement a circular economy for some commonly used single use items, with the aim to reduce waste and preserve raw materials (Ellen MacArthur Foundation, n.d). We had hoped to implement a 'green surgery' pathway but due to time restraints have decided to focus on two items that have suitable and well established alternatives and aim to replicate this looking at other products in the future. The two items we have chosen to look at are; remanufactured harmonic scalpels and reusable rather than disposable surgical gowns.

1. Harmonic Scalpel

A Harmonic scalpel is a laparoscopic surgical instrument that uses ultrasonic vibrations to simultaneously cut and cauterise tissue. The ultrasonic energy is converted to mechanical energy at the active blade, allowing for precise dissection as well as haemostasis (Dutta & Dutta, 2016). Currently we purchase these devices from Ethicon, the original equipment manufacturer (OEM). As of July 2022, we began to send these devices for remanufacturing via a company called Vanguard, for which we have been reimbursed £5 per device. From July 2022-2023 we have made £830 from this process and redirected 34.86kg waste from landfill (appendix 1). The next phase is to purchase the remanufactured devices from Vanguard instead of buying new from the OEM.

The Intercollegiate Green Theatre Checklist (2022) (Appendix 2) has made the recommendation to switch to remanufactured medical devices; a process which involves disassembly of the device, testing of component parts, reassembly, testing for functionality, sterilisation and recertification to be compliant with EU regulatory requirements (Vanguard, 2023). As a requirement, MHRA stipulates that legal responsibility and liability lies with the remanufacturer (MHRA, 2016) which has been assured by Vanguard, including post-market surveillance, laser tracking of devices and a process for incident reporting (Vanguard, 2023). We anticipate the benefits of employing a circular economy for this single use device (SUD) to be multifactorial, offering carbon

savings through preservation of raw materials, redirection of waste from landfill, reduction in emissions related to manufacturing as well as considerable economical savings. We aim to implement this project at Winchester, with the intention to roll this out trustwide to the Basingstoke site following a successful trial.

2. Surgical Gowns

Surgical gowns exist to protect patients from being exposed to microorganisms and also to serve as personal protective equipment (PPE) for surgical staff (Vozzola, Overcash & Griffing, 2020). They are a vital part of surgical care, helping to maintain the sterile field, with several gowns used for every surgical procedure (Atay et al., 2021). There are a range of surgical gowns on the market with varying levels of protection, with options for reusable and disposable. A surgical gown must be fluid resistant, suitable for sterilisation, fire resistant, comfortable and non-toxic (Atay et al., 2021). Further considerations on gown selection should include cost, any contractual agreements in place, usability and sustainability (Vozzola et al., 2020).

Across our theatre departments at HHFT, a high volume of surgical gowns are used annually, with multiple gowns used for every surgical case. Due to this, there is great potential for significant carbon and financial savings whilst also enabling staff to practise in line with their sustainability values. As a trust we have already begun to explore reusable gowns in our theatre department and a trial of these has already taken place prior to the project. We aim to make further progress towards full implementation of reusable gowns into our department during the project. We hope that in combination with the remanufactured Harmonic devices, HHFT will be one step closer to a 'green surgery'.

Specific Aims:

Harmonic Scalpel

1. Calculate the carbon savings of using a remanufactured Harmonic scalpel versus a new device from the OEM.
2. Calculate the cost savings of using a remanufactured Harmonic scalpel versus a new device from the OEM.
3. Evaluate the clinical feedback of the remanufactured Harmonic scalpel.

Surgical Gowns

1. Calculate carbon savings of using reusable versus disposable surgical gowns.
2. Calculate financial costs of using reusable versus disposable surgical gowns.
3. Evaluate clinical feedback of using reusable surgical gowns.

Methods:

1. Harmonic Scalpel

Time Frame

Organisation and coordination of the project started in June 2023. Product trial and data collection took place through July and August 2023.

Engagement

Prior to implementing any changes, we identified stakeholders we needed to engage and gain support from. These individuals/departments were procurement, clinicians, scrub practitioners, clinical governance and theatre management. We found that the most important factor was to gather research and make contact with others that had implemented similar projects. Their experience was invaluable to us in getting the project off the ground and helping to resolve issues. The company rep from Vanguard was also heavily involved through this process. Once we could provide detailed information and research on the proposed project, and could answer all questions fully we found that all of the stakeholders were engaged and willing to begin a trial.



Clinical implementation and analysis

Initially we identified which surgeries would use the harmonic scalpel of which we found they would predominantly be used in laparoscopic gynaecology and colorectal surgery. Specifically this appeared to mainly be laparoscopic hysterectomy and bowel resection and so we decided to focus our trial in these theatres. Once we had the green light to proceed, we placed the initial order for the remanufactured devices from Vanguard. We then provided simple feedback forms (Appendix 3) to the team leaders for the theatres that would be using the Harmonic Scalpels. This would provide us with both the number of scalpels used during the trial period and also for clinician feedback. The start of the trial was communicated to the relevant practitioners and clinicians. No financial investment was required.

2. Surgical Gowns

Time Frame

The original trial for the reusable surgical gowns took place in January 2023 in Winchester and were also rolled out across the Basingstoke and Andover sites in March 2023.

Engagement

Initially it was important to engage the key stakeholder from across the trust to obtain their support with the trial and the implementation of the gowns. This was done by presenting the evidence and supporting information at a divisional governance meeting. This was met with a positive response and support for the project. Clinical engagement was required for the trial to take place and will be key for the implementation of the gowns into practice. When organising the implementation for the gowns into practice the logistics of storing the gowns and delivery/collection was required and has involved engagement from procurement, porters and the linen room.

Clinical implementation and analysis

Due to price negotiations between the manufacturing company and procurement it wasn't possible to implement the use of the reusable surgical gowns within the project time. Negotiations are recently complete and we predict implementation to start soon. All measurements and results are therefore based on the previous trialling of the product alongside projections.

Measurement:

Patient/clinician outcomes:

1. Harmonic Scalpel

A feedback form was provided to us by Vanguard and completed by the surgical team after each use (Appendix 3).

2. Gowns

Clinician outcomes were measured via responses to feedback forms collated during the trial period. Patient outcomes were considered by looking at incidence of surgical site infections and any published recommendations.

Environmental sustainability:

1. Harmonic Scalpel

We calculated the carbon footprint of the remanufactured Harmonic device compared with the single use device from the OEM using data obtained from a recently completed life cycle analysis (LCA) performed by a company offering remanufacturing for the same device in the USA. Transportation carbon emissions were then calculated considering the estimated distance between manufacturing location to our hospital for the original device and estimated distance from the remanufacturing location to our hospital for the



remanufactured device, alongside carbon emissions factors from the UK Government GHG conversion factor database. We used Winchester as the end site which is 22 miles from the Basingstoke site. The total carbon footprint was then obtained from combining this information and projected annually based on our estimated annual usage.

We have included data for a 50:50 and 67:33 ratio of using new/remanufactured devices. A proportion of new devices would still need to be used to ensure enough devices are in circulation for remanufacturing; a 50:50 ratio is currently considered to be the steady state in mature remanufacturing markets, however whilst speaking with other trusts who are achieving a higher ratio, we have included data for a 67:33 scenario, as this should reflect a sustainable market based on the ability to remanufacture twice per new device. Annual projections have been based on data obtained from our procurement department on usage for the financial year 2022-2023. These calculations account for each Harmonic scalpel being remanufactured twice per device.

2. Surgical Gowns

To calculate the carbon footprint of a disposable versus reusable gown, we collated the weights and materials used for the gowns and packaging in both the disposable and reusable options. We used a standard large sized gown for these measurements. Transportation distances and modes were also considered for both options from manufacturer to distributor and then to our trust, again using Winchester as the end site. The carbon footprint was calculated by collating this data and projecting carbon and financial savings annually based on usage numbers gathered from procurement. Based on manufacturer guidelines it was assumed that each gown could be reused 75 times before disposal.

Economic sustainability:

1. Harmonic Scalpel

We obtained data from the trust procurement department on annual usage and cost for the financial year 2022-2023 for the currently used Harmonic from the OEM. We then used these numbers to calculate estimated annual savings if we were to use the remanufactured devices, assuming no changes in ordering habits of this device going forward. We anticipate this project to be rolled out trust wide and so have projected this data to include both Winchester and Basingstoke sites. We have included data for a 50:50 and 67:33 ratio of using new/remanufactured devices.

2. Surgical Gowns

The economic data for both the reusable and disposable gown options was sourced from the trust procurement department. During the covid-19 pandemic, gowns were provided to the trust free of charge and this was extended until recently and so up to date data on cost was not available. We have therefore used the data from FY 2019-2020 to try to represent the financial cost of the disposable gowns. Due to the wide range of different types of gowns and different companies providing them at hugely varied cost, it has been difficult to obtain a price per gown and so we have not included this. The 12-month contract value provided to us from procurement has been used as the economic data for the reusable gown. The data we have included is based on the trust usage across all theatres.

Social sustainability:

1. Harmonic Scalpel

Measured using the responses on feedback forms completed following each use of the remanufactured device during the trial period.

2. Surgical Gowns

Measured from the response on the feedback forms completed during trial/project period.

Results:



Patient/Clinician outcomes:

1. Harmonic Scalpel

During the trial we used 16 remanufactured Harmonic scalpels. As anticipated, patient outcomes were unchanged as a result of using the remanufactured device compared with a new device from the OEM. The clinician feedback was positive, with all clinicians reporting that they were acceptable for clinical use. A sample of direct comments are included below.

“unable to differentiate from a new device”

“ Couldn’t tell the difference”

2. Surgical Gowns

Clinician

During the trial period, the feedback from users was largely positive. Users noted the environmental benefits and comfort as advantages over the current disposable gowns. There were some negative/neutral comments from users regarding the fit and queries regarding donning and doffing. Overall, 98.6% of users found them to be clinically acceptable.

“Really nice gowns, great that they are reusable & cheaper”

“Much better than the current disposable gowns. Would be happy to use again”

“Slightly big (Wore Large) will try Medium”

Patient

Patient outcomes were considered in the context of surgical site infections. The World Health Organisation (WHO, 2016) recommends either using disposable non- woven or reusable woven surgical gowns during surgical procedures to prevent surgical site infections.

Environmental sustainability:

1 Harmonic scalpel

The estimated annual carbon emissions of both the remanufactured and new device from the OEM are shown in table 1. Per device, the carbon footprint of the remanufactured scalpel was found to be 49.6% lower than that of using a new device from the OEM each time. During the trial period we used a 0:100 ratio of remanufactured scalpels and saved a total of 31.52kg/CO₂e. We have then taken into consideration the ratio of remanufactured to new devices we would realistically use and calculated the data based on both a 50:50 and 67:33 scenario. This resulted in a projected saving of 295.75kg/CO₂e or 873 miles driven for a 50:50 ratio and a saving of 394.6 kgCO₂e or 1165 miles driven for a 67:33 ratio. This data accounts for each new device being remanufactured twice per life cycle.

This reduction in carbon emissions for the remanufactured project is likely due to a reduction in extraction of raw materials per each device's life cycle, and also a reduction in transportation associated emissions as the OEM is manufactured in Mexico (14,125km) versus remanufacturing which takes place in Germany (1,292km).



Table 1: Carbon footprint of Harmonic: OEM vs remanufactured device	KgCO2e/device	KgCO2e/year (based on 300 devices used)		Savings/year (kg/CO2e)
Harmonic Scalpel from OEM (Mexico)	3.97	0:100 remanufactured/OEM	1191.58	
Remanufactured Harmonic Scalpel from Vanguard (Germany)	2.00	50:50 remanufactured/OEM	895.83	295.75
		67:33 remanufactured/OEM	797	394.6

2 Surgical Gowns

The number of surgical gowns used annually in our trusts theatre departments is 67,949. This figure was provided to us by the procurement team and has been used to obtain quotations for the reusable gowns. We have used this to project carbon savings for both the reusable and disposable gown options annually, as displayed in table 1.1. The reusable gowns offer a 70% carbon saving when compared with the disposable gown option, with a saving of 52,455.7 kgCO2e equivalent to 155,194.4 miles driven in an average car.

Whilst the raw materials used for the reusable gown are far more carbon intensive, after considering the number of uses per gown in addition to the reduced transportation associated emissions, significant savings are predicted for making this change.

Table 1.1 Carbon footprint of disposable gowns vs reusable gowns per use	KgCO2e/gown	KgCO2e/year (based on 67,949 used annually)	Savings/year (kgCO2e)
Disposable gown (China)	1.1	74,743.9	
Reusable gown (UK)	0.328	22,287.3	52,455.7

Economic sustainability:

1 Harmonic Scalpel

During the trial period we used a 0:100 ratio, using 16 devices and calculated a financial saving of £3993.12. During the financial year 2022-2023, we used 300 devices in total- 258 at Winchester and 42 in Basingstoke for a range of laparoscopic procedures, mainly within gynaecological and colorectal specialties. When calculating the financial savings we have taken into consideration the remanufactured and OEM ratio that will be purchased going forward to maintain a mature market.

Table 2: Cost of Harmonic: OEM vs remanufactured device	Cost/Unit	Annual cost (Projected from FY 2022-2023/ 300 units)		Projected savings
Harmonic Scalpel from OEM	£469.57	£140,870.50		
Remanufactured Harmonic Scalpel from Vanguard	£220	50:50 usage	£103,435.50	£37,435.00
		67:33 remanufactured/OEM	£90,707.43	£50,163.07

2 Surgical Gowns

We were only able to obtain annual cost data for the disposable gowns based on data from 2019-2020, encompassing the many types of gowns we purchased from different companies (e.g. standard, reinforced). The individual cost per gown was difficult to estimate, with procurement advising that the costs ranged widely from £1.50 to up to £5 per gown. We therefore used the 2019-2020 data alongside the quoted 12-month contract value for the reusable gowns to look at the prospective financial savings, estimated to be £23,310.28.

Table 2.1: Cost of Surgical gowns: Disposable V's Reusable	Cost per gown	Annual cost	Projected savings
Disposable Surgical gowns (FY 2019-2020)		£131,318.11	
Reusable surgical gown (12 month contract value)	£1.57	£108,007.83	£23,310.28

Social sustainability:

Harmonic Scalpel & Surgical Gowns

This project has sparked lots of interest and conversation around sustainability and the changes that we can implement in the department in future. This has had a positive impact on staff morale and will hopefully be a driver for change in the department going forward.

Discussion:

This project has highlighted that there is potential for significant environmental and economic savings which could be made by using the remanufactured harmonic scalpel compared to the single use harmonic scalpels, as well as using reusable gown instead of disposable. HHFT is a relatively small trust, if we consider remanufacturing of single use devices being done on a national level, the potential for savings are huge. For example, The National Bowel Cancer Audit (2019) noted that 10,187 laparoscopic bowel procedures were completed nationally in 2017-2018. If we hypothetically assume all these used a Harmonic scalpel using a 67:33 ratio of remanufactured to new devices, this would have meant a 13,446 kgCO₂ saving, equivalent to

39,710 miles driven in an average car which equates to 1.6 times around the earth's circumference. The financial savings would also be significant, hypothetically saving £1,703,387.63 for the same ratio. Similarly, the astronomical volume of surgical gowns used across healthcare in the UK provides a huge opportunity for sustainable gain. We consider the implementation of these reusable practices as a meaningful step toward achieving a 'green surgery' in our department in the future.

Introducing new products into a surgical department can be challenging due to the high concentration of professionals involved in the management and participation of patient care. Early identification of stakeholders was important so that discussions could be had to identify any potential problems. Some early questions regarding safety were able to be addressed from the literature and confirmation from the Vanguard representative. We also addressed a query regarding the maintenance of our generators used to power the devices when using a remanufactured handpiece which was raised by the OEM. This was not something we had considered but was fortunately later dismissed as our generators are not maintained by the OEM's company. Negotiations of the cost of the reusable gowns between the manufacturing company and procurement have caused some delays in implementing them into practice. Further delays have been highlighted over collection of the gowns from theatres and where this responsibility lies. We will endeavour to overcome this issue in order to move forward. Overcoming these challenges has been a lengthy process and involved multiple people which has demonstrated to us that implementing change into practice can take time.

Our results from the project period for the remanufactured Harmonic device may have been affected by strikes from both the junior doctors and consultants, affecting a total of 11 days. This caused some elective surgeries to be cancelled and also the types of operations scheduled may have changed due to clinician shortages. We expect that this reduced the number of Harmonics used in the trial period had the strikes not taken place.

Management and procurement support for this project have both been very positive and have contributed to the success of the project. This has highlighted the importance of good relations and interaction with management when trying to implement a quality improvement project in the surgical department. Early estimations of the environmental and potential financial savings of this project has helped to maintain momentum and has been an incentive for all involved to ensure these new processes are embedded into practice.

Conclusions:

Our original plan for this project was to implement a 'green surgery' pathway but it quickly became evident that we would not achieve this within the timeframe. In the future, we plan to continue looking at the overuse of single-use items in the operating department, focussing our efforts on creating a 'green surgery' by implementing further small changes to ultimately work toward this goal.

A key learning point during this project was the number of people and departments we needed support and engagement from. These ranged from procurement to clinicians and clinical governance, and we quickly had to establish relationships with these people to gain support and information. Early identification of these people was key in ensuring the project ran smoothly and that the alternatives were a safe and viable option. In future projects we would take more time, consideration and planning of how to best engage and build relationships with key stakeholders to drive projects forward faster.

Through looking at just two alternative options to single use products, we have identified that significant carbon and financial savings can be made within our operating department by switching to reusable gowns



and using remanufactured devices. During this project, it became obvious that there is a growing market for green alternatives for surgical instruments and single use products and so reviewing these should be a priority.

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Appendices

Appendix 1- Returning Harmonic Scalpels for remanufacturing- waste and financial savings 2022-2023

Vanguard AG Royal Hampshire County Hospital Q4/2022 (Oct - Dec)

Collection	
Quarter	Payment
Q1 - Jan-Mar 2022	£0.00
Q2 - Apr-June 2022	£0.00
Q3 - July-Sept 2022	£190.00
Q4 - Oct-Dec 2022	£255.00
Total	£445.00

Savings via Device Usage		
Quarter	No of Devices	Savings
Q1 - Jan-Mar 2022	0	£0.00
Q2 - Apr-June 2022	0	£0.00
Q3 - July-Sept 2022	0	£0.00
Q4 - Oct-Dec 2022	0	£0.00
Total	0	£0.00

Waste Diversion	
Quarter	Est. Weight Diverted (kg)
Q1 - Jan-Mar 2022	0.00
Q2 - Apr-June 2022	0.00
Q3 - July-Sept 2022	7.98
Q4 - Oct-Dec 2022	10.71
Total	18.69

CO2 Reduction	
Quarter	CO2 Reduction (kg)
Q1 - Jan-Mar 2022	0.00
Q2 - Apr-June 2022	0.00
Q3 - July-Sept 2022	0.00
Q4 - Oct-Dec 2022	0.00
Total	0.00

Remittance Information

Quarter	Device	Purchase Price	Quantity	Credit Note Amount
Q1 - Jan-Mar 2022	Accepted			
	HAR23 - Harmonic ACE+	£8.00	0	£0.00
	HAR36 - Harmonic ACE+	£8.00	0	£0.00
	HARH23 - Harmonic ACE+7	£8.00	0	£0.00
	HARH36 - Harmonic ACE+7	£8.00	0	£0.00
Q2 - Apr-June 2022	Accepted			
	HAR23 - Harmonic ACE+	£8.00	0	£0.00
	HAR36 - Harmonic ACE+	£8.00	0	£0.00
	HARH23 - Harmonic ACE+7	£8.00	0	£0.00
	HARH36 - Harmonic ACE+7	£8.00	0	£0.00
Q3 - July-Sept 2022	Accepted			
	HAR23 - Harmonic ACE+	£5.00	0	£0.00
	HAR36 - Harmonic ACE+	£5.00	0	£0.00
	HARH23 - Harmonic ACE+7	£5.00	0	£0.00
	HARH36 - Harmonic ACE+7	£5.00	38	£190.00
Q4 - Oct-Dec 2022	Accepted			
	HAR23 - Harmonic ACE+	£5.00	0	£0.00
	HAR36 - Harmonic ACE+	£5.00	0	£0.00
	HARH23 - Harmonic ACE+7	£5.00	0	£0.00
	HARH36 - Harmonic ACE+7	£5.00	51	£255.00
Total			89	£445.00

Waste Diversion

Quarter	Boxes Shipped	Est Weight Per Box (kg)	Total Est Weight (kg)	Est Cost Disposal (50p/kg)
Q1 - Jan-Mar 2022	0	0.00	0.00	£0.00
Q2 - Apr-June 2022	0	0.00	0.00	£0.00
Q3 - July-Sept 2022	3	2.66	7.98	£3.99
Q4 - Oct-Dec 2022	4	2.68	10.71	£5.36
Total	7		18.69	£9.35



Vanguard AG

Royal Hampshire County Hospital Q2/2023 (April - June)

Collection	
Quarter	Payment
Q1 - Jan-Mar 2023	£280.00
Q2 - Apr-June 2023	£105.00
Q3 - July-Sept 2023	£0.00
Q4 - Oct-Dec 2023	£0.00
Total	£385.00

Savings via Device Usage		
Quarter	No of Devices	Savings
Q1 - Jan-Mar 2023	0	£0.00
Q2 - Apr-June 2023	12	£2,760.00
Q3 - July-Sept 2023	0	£0.00
Q4 - Oct-Dec 2023	0	£0.00
Total	12	£2,760.00

Waste Diversion	
Quarter	Est. Weight Diverted (kg)
Q1 - Jan-Mar 2023	11.76
Q2 - Apr-June 2023	4.41
Q3 - July-Sept 2023	0.00
Q4 - Oct-Dec 2023	0.00
Total	16.17

CO2 Reduction	
Quarter	CO2 Reduction (kg)
Q1 - Jan-Mar 2023	0.00
Q2 - Apr-June 2023	20.88
Q3 - July-Sept 2023	0.00
Q4 - Oct-Dec 2023	0.00
Total	20.88

Remittance Information

Quarter	Device	Purchase Price	Quantity	Credit Note Amount
Q1 - Jan-Mar 2023	Accepted			
	HAR23 - Harmonic ACE+	£5.00	0	£0.00
	HAR36 - Harmonic ACE+	£5.00	0	£0.00
	HARH23 - Harmonic ACE+7	£5.00	0	£0.00
Q2 - Apr-June 2023	Accepted			
	HAR23 - Harmonic ACE+	£5.00	0	£0.00
	HAR36 - Harmonic ACE+	£5.00	0	£0.00
	HARH23 - Harmonic ACE+7	£5.00	0	£0.00
Q3 - July-Sept 2023	Accepted			
	HAR23 - Harmonic ACE+	£5.00	0	£0.00
	HAR36 - Harmonic ACE+	£5.00	0	£0.00
	HARH23 - Harmonic ACE+7	£5.00	0	£0.00
Q4 - Oct-Dec 2023	Accepted			
	HAR23 - Harmonic ACE+	£5.00	0	£0.00
	HAR36 - Harmonic ACE+	£5.00	0	£0.00
	HARH23 - Harmonic ACE+7	£5.00	0	£0.00
Total			77	£385.00

Waste Diversion

Quarter	Boxes Shipped	Est Weight per Box (kg)	Total Est Weight (kg)	Est Cost Disposal (50p/kg)
Q1 - Jan-Mar 2023	3	3.92	11.76	£5.88
Q2 - Apr-June 2023	2	2.21	4.41	£2.21
Q3 - July-Sept 2023	0	0.00	0.00	£0.00
Q4 - Oct-Dec 2023	0	0.00	0.00	£0.00
Total	5		16.17	£8.09

Savings via Device Usage

Quarter	Item	VG Product Code	Quantity	Savings versus OEM
Q1 - Jan-Mar 2023	VANGUARD Ultrasonic Shear ETM7 (HARH36)	35034	0	£0.00
Q2 - Apr-June 2023	VANGUARD Ultrasonic Shear ETM7 (HARH36)	35034	12	£2,760.00
Q3 - July-Sept 2023	VANGUARD Ultrasonic Shear ETM7 (HARH36)	35034	0	£0.00
Q4 - Oct-Dec 2023	VANGUARD Ultrasonic Shear ETM7 (HARH36)	35034	0	£0.00
Total			12	£2,760.00



Appendix 2: Intercollegiate Green Theatre Checklist



Intercollegiate Green Theatre Checklist



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)	<input type="checkbox"/>
2	Use TIVA whenever possible with high fresh gas flows (5-6 L) and, if appropriate, a low O ₂ concentration	<input type="checkbox"/>
3	Limit Nitrous Oxide (N ₂ O) to specific cases only and if using: <ul style="list-style-type: none"> ▶ check N₂O pipes for leaks or consider decommissioning the manifold and switching to cylinders at point of use; ▶ introduce N₂O crackers for patient-controlled delivery. 	<input type="checkbox"/>
4	If using inhalational anaesthesia: <ul style="list-style-type: none"> ▶ 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. 	<input type="checkbox"/>
5	Switch to reusable equipment (e.g. laryngoscopes, underbody heaters, slide sheets, trays)	<input type="checkbox"/>
6	Minimise drug waste ("Don't open it unless you need it", pre-empt propofol use)	<input type="checkbox"/>
Preparing for Surgery		
7	Switch to reusable textiles, including theatre hats, sterile gowns, patient drapes, and trolley covers	<input type="checkbox"/>
8	Reduce water and energy consumption: <ul style="list-style-type: none"> ▶ 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. 	<input type="checkbox"/>
9	Avoid clinically unnecessary interventions (e.g. antibiotics, catheterisation, histological examinations)	<input type="checkbox"/>
Intraoperative Equipment		
10	REVIEW & RATIONALISE: <ul style="list-style-type: none"> ▶ surgeon preference lists for each operation - separate essential vs. optional items to have ready on side; ▶ single-use surgical packs - what can be reusable and added to instrument sets? what is surplus? (request suppliers remove these); ▶ instrument sets - open only what and when needed, integrate supplementary items into sets, and consolidate sets only if it allows smaller/fewer sets (please see guidance). 	<input type="checkbox"/>
11	REDUCE: avoid all unnecessary equipment (eg swabs, single-use gloves), "Don't open it unless you need it"	<input type="checkbox"/>
12	REUSE: opt for reusables, hybrid, or remanufactured equipment instead of single-use (e.g. diathermy, gallipots, kidney-dishes, light handles, quivers, staplers, energy devices)	<input type="checkbox"/>
13	REPLACE: switch to low carbon alternatives (e.g. skin sutures vs. clips, loose prep in gallipots)	<input type="checkbox"/>
After the Operation		
14	RECYCLE or use lowest carbon appropriate waste streams as appropriate: <ul style="list-style-type: none"> ▶ use domestic or recycling waste streams for all packaging; ▶ use non-infectious offensive waste (yellow/black tiger), unless clear risk of infection; ▶ ensure only appropriate contents in sharps bins (sharps/drugs); ▶ arrange metals/battery collection where possible. 	<input type="checkbox"/>
15	REPAIR: ensure damaged reusable equipment is repaired, encourage active maintenance	<input type="checkbox"/>
16	POWER OFF: lights, computers, ventilation, AGSS, temperature control when theatre empty	<input type="checkbox"/>

DISCLAIMER: These suggestions are based upon current evidence and broadly generalisable, however, specific environmental impacts will depend upon local infrastructure and individual Trusts' implementation strategies.

Intercollegiate Green Theatre Scorecard, November 2022.



Appendix 3 - Device Evaluation - Vanguard

	<p>Vanguard Remanufacturing – Device Evaluation Form</p>	
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Hospital _____

Physician _____

Device _____

Procedure date and time _____

Type of procedure _____

Duration of procedure _____

Clinically, did the device work as you would expect it to? Yes No

Would you be happy to use the device again? Yes No

Any Comments: _____

Vanguard Medical Devices Limited – The Scalpel, 18th Floor, 52 Lime St, London, EC3M 7AF
service@vanguard.de – www.vanguard.de/en

