SUSQI PROJECT REPORT

Sustainable Diathermy Use

Start date of Project: May 2025
Date of Report: August 2025
Team Members:

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Background:

Diathermy pads and cables are vital components in surgical procedures, primarily used for coagulating tissue, controlling bleeding, and cutting through tissue during operations. The diathermy pads are placed on the patient's skin, while the cables connect the pads to the diathermy machine, which generates the high-frequency electrical current required for these functions.

Due to their direct contact with patients, diathermy pads (and at times the cables) are typically single-use items, disposed of after each procedure to prevent any risk of cross-contamination or infection. Prior to use of the single-use pads, patients' skin must be prepped to ensure the pad maintains good contact with the skin. Skin must be clean, and some patients require shaving to ensure the pad adheres effectively. The adhesive also does not allow the pad to be reused, meaning that if the pad is placed incorrectly on the patient, it often involves the use of a second pad.

Generally, there are no issues with the usage of the single use pads. However, if they get wet, the pad needs to be disconnected from the generator, and another pad will need to be placed. This will be positioned on an accessible part of the patient's skin (e.g. on their thigh to prevent re-positioning during surgery). In rare instances, if the pad doesn't have good contact with the skin, or is placed in an incorrect position, or there is an incomplete circuit (tested before surgery), a second pad may be required.

Reusable pads offer benefits by eliminating some of the above considerations. Skin prepping is not required and the pads can get wet without causing risk to the patient. They can be safely used in patients with multiple tattoos, multiple joint replacements and poor skin quality that would otherwise make diathermy pad citing difficult. Additionally, reuse offers benefits by reducing waste and carbon emissions.

Wrightington, Wigan and Leigh (WWL) is a major acute Trust with theatres across three sites.

- Royal Albert Edward Infirmary (Wigan): 7 theatres including emergency, maternity, trauma and elective care
- Leigh Infirmary Hospital: 4 theatres as a dedicated day case unit
- Wrightington hospital: 12 Theatres as a tertiary orthopaedic centre

Multiple diathermy products are in use in the Trust. In Royal Albert Edward Infirmary and Leigh Infirmary, the product is a single use pad and single use cable. In Wrightington a combination of single use pad with reusable cable or a single use pad with single use cable is used.

Specific Aims:

To replace single use diathermy pads with a reusable alternative across all theatres at WWL with the aim of reducing the trust's reliance on single use products and reducing the associated carbon footprint in line with the Trusts aims at making surgery more environmentally sustainable.

Methods:

Fortunately, diathermy matts had previously been trialed in the Trust 2 years prior to the green initiative and therefore we already had data available on what would be compatible with the equipment already available in the Trust and the human impact of the devices (i.e. staff feedback surveys) which were available from the theatre co-ordinator. Results of this are outlined later in the report. Initial delays to project progression following trial were largely due to changes in senior management preventing follow through with change. This is something that we are hoping to overcome with support from senior surgical consultants and theatre management and procurement team members.

With guidance from the theatre co-ordinators from each site on the number of mats that would be needed to replace the current diathermy usage and details of the pricing of the preferred mats from the procurement department, we were then able to calculate the financial and environmental impact of this change. From a logistics point of view, the reusable mats are compatible with the current diathermy machines utilised at WWL and can be stored in theatre alongside the machines. They are lightweight and not overtly bulky therefore storage should not be an issue.

Our next step is to present this data at the monthly green surgery meetings to push forward with the change from single use diathermy pads to reusable mats, such as the WWL greener steering group meeting and surgical cabinet meeting where it may be approved financially. We will present the data at the next cabinet meeting where the appropriate stakeholders will be present who can approve the change. Following this, procurement have already agreed a price with the suppliers and would be able to order the diathermy matts as soon as. These are compatible with our current equipment and so would be able to be utilized immediately in all theatres.

Measurement:

Patient outcomes:

Switching to reusable diathermy pads offers potential reductions in risks to patient safety, which are outlined in the results section. Patient safety could be monitored via incident reports, however it is important to note that risks with single use are already low.

Any incidents within surgery would already be reported and closely monitored so it would be noted if there were to unexpectedly be incidents related to use of the reusable pads. No negative impact is expected.

Environmental sustainability:
We collected data from the NHS supply chain and from the theatre supplies team on the usage of diathermy in each individual hospital within the Trust over one calendar year. Data and projected savings were calculated for Wrightington separately to Wigan and Leigh as the Trust has two separate procurement teams (The trust was previously two separate organisations).

A cradle-to-grave process-based carbon footprint analysis was used to estimate the GHG emissions associated with the disposable diathermy pads, reusable cables and the reusable diathermy pads. The analysis included GHG emissions associated with raw materials, transport, disposal and for the reusable items, cleaning.

CSH previously estimated the greenhouse gas (GHG) emissions associated with a diathermy pad and reusable cables. Due to time constraints, the emission factors were taken directly from a prior study, with the assumption that the diathermy pads in question had the same material composition as those examined in that study. Material data were converted into GHG emissions using carbon conversion factors from the 2024 UK Government Greenhouse Gas Conversion Factors database. For both types of disposable pads, it was assumed that they were composed of 50% aluminium and 50% PET, with packaging made entirely of PET. For end-of-life treatment, all disposable pads were assumed to be disposed of as clinical waste, with the corresponding emission factor taken from Rizan et al., 2020.

For the reusable diathermy pad, it was assumed that reusable diathermy pads are wiped clean with 1 clinell wipe after each use and each pad lasts for 2 years. To estimate the GHG emissions of the reusable return electrode pad, the supplier was able to provide a high level analysis of the materials and weights e.g 96% gel and water, 1% cable and connector, 2% films etc. CSH made some assumptions about the materials and emission factors required to estimate the carbon footprint.

The emissions savings were translated into equivalent miles driven in an average car with unknown fuel using a factor of 0.3399 kgCO2e per mile, as published in the UK Government Greenhouse gas reporting: conversion factors 2025. This factor is inclusive of fuel and well-to-tank emissions.

Economic sustainability:
We collected data from the NHS supply chain and from the theatre supplies team on the usage of diathermy in each individual hospital within the Trust over one calendar year. This was able to supply both financial costs and information on the amount of single use and reusable products used annually within the trust. This data was then used to calculate the financial and carbon footprint of our current usage. As per environmental impact, financial impact was reported for Writtington separately to Wigan and Leigh as the Trust has two separate procurement teams (The trust was previously two separate organisations).

Costs of reusable pads were provided by the potential supplier.

Social sustainability:
On a previous trial of diathermy mats within the trust in 2022, the mats were trialed in multiple theatres in order to assess their ease of use and compatibility with the needs of staff and patients as well as our current equipment. Feedback surveys were completed at the end of the theatre list trialing the mat in order to assess feedback on components such as design, ease of use, overall performance and whether the users would be happy to use the mats if made available going forwards. A range of specialties surveyed including general surgery, breast surgery and orthopaedics in order to get a broad range of feedback. This included the feedback from surgeons, anesthetists and theatre support staff.

Results:

Patient outcomes:
While risk with the use of single use diathermy is already low, switching to reusable lowers patient risk further. Single use pads cannot get wet, and if they are continued to be used place the patient at risk of burns and/or electric shock. The pads need to be disconnected and new pads applied during a procedure if they become wet and this risks desterilising the sterile field. The risk of diathermy failure, which could delay the control of fluids (e.g. bleeding), is reduced with reusable pads as pooling of fluids will not adversely affect the electrosurgical efficacy of the pad.

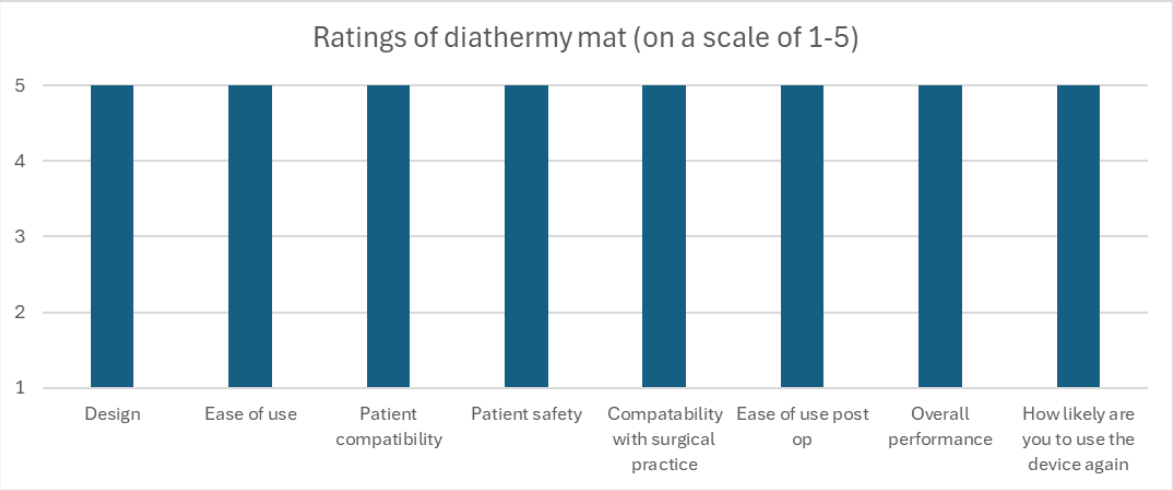
Specific considerations are required when using single use pads with patients who have metalwork, such as hip plates or screws, tattoos, and pacemakers. Reusable pads can be used safely in surgeries involving metalwork and do not pose a risk to patients with pacemakers or tattoos. However, they do need to be positioned away from pacemakers by moving the area of contact below the abdomen.

Environmental sustainability:
Savings for Royal Albert Edward Infirmary (Wigan) and Leigh Infirmary: 570.8 kgCO2e per year
Savings for Wrightington Hospital: 934.6 kgCO2e per year
Combined, the savings of 1,505.4 kgCO2e are equivalent to driving 4,429 miles in an average car.
These calculations include a 20% loss/damage rate

Economic sustainability:
Current financial spend and quotes from the supplier cannot be shared. The transition to reusable diathermy is anticipated to be an annual financial increase of £7,333 across the Trust, as summarised in the Table below:

	Number of single use procured per year	**Projected number of reusable mats required (2-year lifespan)**	**Projected annual cost different**
Royal Albert Edward Infirmary (Wigan) and Leigh Infirmary (11 theatres)	2,100	12	+3,770
Wrightington Hospital (12 theatres)	6,200	12	+3,563
Total	8.300	24	+7,333

Social sustainability:
From a staff point of view, the change requires no significant further training and therefore does not come with any significant learning burden for staff. The diathermy mats were well received and easy to use. There were no incidences of poor feedback and no staff were unhappy to use the diathermy mats when trialed. Staff were surveyed on multiple different components of the mats such as ease of use, patient compatibility, compatibility with current surgical practice and received no negative feedback.



Discussion:

This project, although not a financial saving, is a significant carbon saving.

The change requires upfront financial investment for a 2 year supply, and is a cost increase of over £14,000 across the product's two year lifespan. It may be that going forward we would have to target the highest volume theatres that use the most single use diathermy units in order to make this change more financially sustainable. This is due to the number of uses achieved in the two year lifespan as recommended by the manufacturer. If the product had a longer lifespan or lifespan was based on number of uses, the change would likely bring financial savings. Further discussion would need to take place with the manufacturer to understand the reasoning for a two year lifespan and whether there is any scope for this to be reconsidered in a safe way. This is the main barrier to change that we have encountered.

There are no new patient safety considerations with regards to the mats versus the current diathermy pads as the mats have been proven to be as safe as diathermy pads. In some cases (patients with poor skin quality or pacemakers) are actively safer than the current single use diathermy pads used as they do not interfere with metal and does not require any form of adhesive in order to be utilised.

From a logistics point of view, the reusable mats are compatible with the current diathermy machines utilised at WWL and can be stored in theatre alongside the machines. They are lightweight and not overtly bulky therefore storage should not be an issue.

Initial delays to project progression following trial were largely due to changes in senior management preventing follow-through with change. This is something that we are hoping to overcome with support from senior surgical consultants and theatre management and procurement team members.

Conclusions:

Sustainability of surgical practice is something that is taken seriously at WWL. Green initiatives have been implemented in the past, and this project is an important next step in moving away from single use disposable equipment. Changing from single use diathermy pads to reusable diathermy mats will make a significant saving from a carbon footprint point of view for WWL that has previously been difficult to implement. We hope to use the steps made in this project in order to achieve the widespread adoption of their use at WWL and encourage buy in from senior management at WWL going forward.

Critical success factors

Please select one or two of the below factors that you believe were most essential to ensure the success of your project changes.

People	Process	Resources	Context
☐ Patient involvement and/or appropriate information for patients - to raise awareness and understanding of intervention X Staff engagement ☐ MDT / Cross-department communication ☐ Skills and capability of staff ☐ Team/service agreement that there is a problem and changes are suitable to trial (Knowledge and understanding of the issue) X Support from senior organisational or system leaders	☐ clear guidance / evidence / policy to support the intervention. ☐ Incentivisation of the strategy – e.g., QOF in general practice ☐ systematic and coordinated approach ☐ clear, measurable targets ☐ long-term strategy for sustaining and embedding change developed in planning phase ☐ integrating the intervention into the natural workflow, team functions, technology systems, and incentive structures of the team/service/organisation	☐ Dedicated time ☐ QI training / information resources and organisation process / support ☐ Infrastructure capable of providing teams with information, data and equipment needed ☐ Research / evidence of change successfully implemented elsewhere ☐ Financial investment	X aims aligned with wider service, organisational or system goals. ☐ Links to patient benefits / clinical outcomes ☐ Links to staff benefits ☐ 'Permission' given through the organisational context, capacity and positive change culture.