

## **ENVIRONMENTAL SUSTAINABILITY IN CURETTE AND CAUTERY SKIN SURGERY: A QUALITY IMPROVEMENT PROJECT ON SINGLE-CENTRE TRANSFORMATION TO SUSTAINABLE PRACTICES**

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### **ABSTRACT**

In this sustainability quality improvement project, we proposed a new lean pathway for performing curette and cautery minor skin surgery and evaluated our project's social, patient, economic, environmental and population outcomes. If the new lean pathway is embedded into routine clinical practice, this could potentially lead to £4.08 (excluding VAT) and 1.24 kgCO<sub>2</sub>e per procedure of costs and carbon emissions savings, respectively. Surgical site infection rates for procedures performed with sterile gloves ( $n = 12$ ) and non-sterile nitrile gloves ( $n = 8$ ) were both at 0%. Our small single-centre study demonstrated that transforming to sustainable practices for curette and cautery procedures can lead to significant triple-bottom-line benefits with no obvious adverse

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postoperative infection risks. We encourage dermatology staff from the public and private sectors, as well as staff from other specialties, to consider adopting the recommendations from the British Society of Dermatological Surgery sustainability guidance when performing curette and cautery procedures.

**Keywords:** skin surgery, curette and cautery, carbon emissions

## INTRODUCTION

There is a paucity of national guidance specifying how skin surgery should be conducted. This led to significant heterogeneity in the setup, conduct and delivery of minor skin surgery services in the United Kingdom (Shearman et al., 2023), including the environment of procedure rooms (British Association of Dermatologists, 2014; British Society for Dermatological Surgery, 2016), practitioner selection of equipment and consumables (Lee et al., 2022) as well as procedure steps (Tso, 2023).

The British Society for Dermatological Surgery (BSDS) sustainability guidance 2022 (Ali et al., 2022) provided the first UK-wide recommendations on environmentally sustainable skin surgery that compliments existing national guidance on safe skin surgery. The BSDS recommendations could be broadly categorised under reducing activities, low-carbon alternatives, optimising operational resource usage and research and innovation. Transforming to sustainable skin surgery practices as per BSDS sustainability guidance could have implications on the environmental, social and financial aspects of the skin surgery service.

Curette and cautery minor skin surgery procedure is one of the most commonly performed procedures at the Dermatology Department at the South Warwickshire University NHS Foundation Trust (SWFT), Warwick, United Kingdom (estimated up to 1,000 procedures per year). It is standard practice for staff to perform this procedure using sterile gloves (the same as in all other minor skin surgeries such as excisions and diagnostic biopsies). This type of procedure has been identified by the project team as having the most potential scope for transformation to a more sustainable practice and with the least perceived barriers (out of all types of skin surgery procedures) for practitioners to change their behaviours.

The aim of the project was to:

- Educate dermatology staff (clinical, nursing and support staff) who undertake and assist with minor skin surgery at SWFT about the BSDS sustainability guidance.
- Develop consensus on transforming to sustainable skin surgery (low-carbon alternatives and lean pathway) for curette and cautery procedures ('the change').

## ENVIRONMENTAL SUSTAINABILITY IN CURETTE AND CAUTERY SKIN SURGERY

- Examine the cost and carbon footprint savings associated with the change in practice.
- Conduct surgical site audit to evaluate the clinical impact of the change in practice.

## METHODS

### *SOCIAL SUSTAINABILITY*

The project team conducted an informal discussion with 15 staff (clinicians, nursing and support staff) within and outside of the SWFT to explore their views and perceived barriers on transformation to sustainable skin surgery practices. The dermatology department's standard practice is to perform all types of minor skin surgery procedures using sterile gloves regardless of infection control risks. The project team informed the dermatology department on the recommendations from the British Society of Dermatological Surgery Sustainability Guidance (BSDS) 2022 at a departmental meeting in May 2023. The department discussed and debated about the evidence and recommendations stated in the guidance. The department discussed an area of skin surgery practices that would be amenable to change.

### *PATIENT OUTCOMES*

The project team examined the procedure steps involved in performing curette and cautery skin surgery and proposed a new lean pathway for the Dermatology Department at SWFT. To determine the clinical impact of our project, we examined the surgical site infection rate of curette and cautery procedures in our department. We have registered the clinical audit with the Trust's audit and clinical effectiveness department. The data collection period was 8 May to 7 July 2023 (two calendar months). A convenience sample of patients who underwent curette and cautery procedures that were performed with non-sterile nitrile gloves or sterile gloves was included in the audit. A member of the clinical team conducted telemedicine consultations with patients 1 week following their procedure to determine if there were surgical site infections requiring systemic antimicrobial therapy. It is noted that a meta-analysis of surgical site infection rate from skin surgery (four randomised controlled trials and five comparative observational studies) reported a surgical site infection rate of 2.2% from procedures undertaken with non-sterile gloves and 2.2% with sterile gloves (Brewer et al., 2016). Thus, a surgical site infection rate of 2.2% or below was set as our local audit standard.

### *ECONOMIC SUSTAINABILITY*

The project team examined the non-NHS commercial costs of consumables used to perform curette and cautery skin surgery before and after the change in practice.

### *ENVIRONMENTAL SUSTAINABILITY*

The project team examined the carbon footprint of curette and cautery skin surgery before and after the change in practice. Published Life Cycle Assessment (LCA) data from the literature were included whenever available.

### *POPULATION OUTCOMES*

The project team disseminated study findings with our network from the Dermatology Sustainability UK Group.

## **RESULTS**

### *SOCIAL SUSTAINABILITY*

#### **OUTCOME FROM THE SERVICE USER INVOLVEMENT IN THE DEVELOPMENT OF THE PROJECT**

The emerging themes from the discussions included strong staff interest in transforming to sustainable skin surgery practices, lack of awareness of the BSDS sustainability guidance 2022 and its evidence base, the need to comply with local infection control processes and perceived conflict between sustainable skin surgery practices (especially low-carbon alternative such as non-sterile gloves instead of sterile gloves) and management of surgical site infection risks. Curette and cautery procedures were perceived as of lower infection risks and practitioners would be more prepared to transform to sustainable skin surgery practices as per BSDS sustainable guidance.

#### **THE PROJECT'S SOCIAL IMPACT AT THE DERMATOLOGY DEPARTMENT, SOUTH WARWICKSHIRE UNIVERSITY NHS FOUNDATION TRUST**

The departmental consensus was reached in relation to curette and cautery skin surgery procedures performed under local anaesthetic as suitable for change to more sustainable practice. The departmental consensus was reached that the use of either clean non-sterile nitrile gloves as well as sterile gloves (i.e., a low-carbon alternative) is acceptable from an infection control point of view.

ENVIRONMENTAL SUSTAINABILITY IN CURETTE AND CAUTERY SKIN SURGERY

Consensus was further reached to conduct a clinical audit to examine patient outcomes in terms of the surgical site infection rate of curette and cautery skin surgery procedures performed under clean nitrile gloves versus sterile gloves.

Process mapping was conducted to describe the historical pathway amongst departmental staff when performing curette and cautery skin surgery and to propose a new lean pathway alternative as shown in Table 1. A potential best practice pathway that may be acceptable to individual staff but could not reach departmental consensus is also proposed and included in Table 1.

**PROPOSED NEW LEAN PATHWAY CHANGES**

The departmental consensus was reached in relation to curette and cautery skin surgery procedures performed under local anaesthetic as suitable for change to more sustainable practice. The departmental consensus was reached that, based on the practitioner’s risk assessment, they can choose to use clean non-sterile nitrile gloves (a low-carbon alternative) or sterile gloves to perform this type of procedure.

**Table 1. Historical pathway, new lean pathway and potential best practices pathway to perform curette and cautery procedures, colour coded where the same colour refers to similar steps**

| Step | Historical Pathway   | New Lean Pathway   | Potential Best Practices Pathway   |
|------|--|--|--|
| 1    | One clinician wears relevant PPE (1x single-use plastic apron, 1x Type IIR fluid-resistant mask worn through a surgical list of five patients); one support staff wears 1x Type IIR fluid-resistant mask through a surgical list of five patients) | One clinician wears relevant PPE (1x single-use plastic apron, 1x Type IIR fluid-resistant mask worn through a surgical list of five patients); one support staff wears 1x Type IIR fluid-resistant mask through a surgical list of five patients) | One clinician wears relevant PPE (1x single-use plastic apron, 1x Type IIR fluid-resistant mask worn through a surgical list of five patients); one support staff wears 1x Type IIR fluid-resistant mask through a surgical list of five patients) |
| 2    | Mark Surgical Site with 1x surgical marker pen (single use)  | Mark Surgical Site with 1x surgical marker pen (reuse throughout a surgical list of five patients)   | Mark Surgical Site with 1x surgical marker pen (reuse throughout a surgical list of five patients)   |
| 3    | Disinfect skin (surgical site; patient) with one Clinel 2% chlorhexidine in 70% alcohol skin wipe  | Hand disinfection (clinician) with alcohol gel prior to the procedure<br>Wear new non-sterile nitrile gloves   | Hand disinfection (clinician) with alcohol gel prior to the procedure<br>Use the nitrile gloves from within the surgical pack stated in step 6   |

*(Continued)*

**Table 1. (Continued)**

| Step | Historical Pathway   | New Lean Pathway   | Potential Best Practices Pathway  |
|------|--|--|---|
| 4    | Local Anaesthetic drawn from a 2.2-mL glass vial of lignocaine and applied to the surgical site using a BD Safety Glide insulin syringe (also requires 1/5 pack of non-women swab) | Disinfect surgical site (patient) with Sterets solution 1 pack   | Disinfect surgical site (patient) with Sterets solution 1 pack  |
| 5    | Hand disinfection (clinician) with soap and water prior to the procedure Wear new sterile gloves   | Local Anaesthetic drawn from a 20-mL glass vial of lignocaine and applied to the surgical site using a BD Safety Glide insulin syringe                       | Local Anaesthetic drawn from a 20-mL glass vial of lignocaine and applied to the surgical site using a BD Safety Glide insulin syringe                          |
| 6    | Disinfect surgical site (patient) with Sterets solution 1pack  | Perform procedure using 1x 7-mm curette (sharp), 1x hyfreicator tip (sharp), 1x non-woven swab, 1x single-use surgical pack<br>Radio music in the background | Perform procedure using 1x 7-mm curette (sharp), 1x hyfreicator tip (sharp), 1x non-woven swab, 1x single-use surgical pack<br>No radio music in the background |
| 7    | Perform Procedure using 1x 7mm curette (sharp), 1x hyfreicator tip (sharp), 1x non-woven swab, 1x single-use surgical pack<br>Radio music in the background                        |  |   |

*Note:* In the new lean pathway, one of the steps (step 3 from the historical pathway) was eliminated, and this has reduced the use of consumables (i.e., one Clinel 2% chlorhexidine in 70% alcohol skin wipe). In the process map, steps 2, 3 and 5 (as stated in the new lean pathway) involved a reduction in the use of consumables (i.e., reuse one surgical marker pen over one skin surgery list, if deemed appropriate) or the use of a low-carbon alternative (i.e., switch from sterile gloves to clean nitrile gloves; switch hand washing technique from soap and water to alcohol gel and switch from using a 2.2-mL glass vial to a 20-mL glass vial of a local anaesthetic). For the purpose of this report, the new lean process of performing curette and cautery procedures, including the use of low-carbon alternatives, constitutes ‘the change’ in our practice being evaluated for its clinical, environmental, financial and social impact. The new lean pathway and potential best practices pathway differed in relation to steps 3 and 6 where the new lean pathway involved the use of a new pair of non-sterile gloves and playing radio music in the background, whereas the potential best practices pathway avoids the use of a new pair of non-sterile gloves by utilising a pair of gloves that is already available in a surgical pack (step 6) and without playing radio music in the background. A single-use surgical pack contains a standard-size pair of sterile nitrile gloves, which may or may not fit the hands of staff members. Thus, the new lean pathway proposed that staff could obtain a new pair of non-sterile nitrile gloves with the correct size for use for safety and comfort.

## POTENTIAL BEST PRACTICES PATHWAY

The project team critically reviewed the new lean pathway and the BSDS sustainability guidance to propose a potential best practice pathway that could

ENVIRONMENTAL SUSTAINABILITY IN CURETTE AND CAUTERY SKIN SURGERY

be acceptable to individuals but could not reach a consensus at the departmental level. The potential best practices pathway further reduces the use of a pair of non-sterile nitrile gloves and avoids playing music during the procedure as compared with the new lean pathway.

*PATIENT OUTCOMES*

The surgical site infection rate post curette and cautery procedure performed with nitrile gloves was (0/8; Table 2) 0% and with sterile gloves was (0/12; Table 3) 0%, indicating no obvious increased risk of infection with the lean pathway as compared with audit standard.

*ECONOMIC OUTCOMES*

The commercial (non-NHS) costs (consumables only; based on July 2023 data) for performing a single curette and cautery skin surgery procedure using the historical pathway are estimated at £12.87 (excluding VAT), new lean pathway at £8.79 (excluding VAT) and potential best practices pathway at £8.73 (excluding VAT). Thus, the change from the historical practices pathway to the new lean pathway results in £4.08 (excluding VAT) per procedure of cost savings. The dermatology department at South Warwickshire University NHS Foundation Trust is estimated to conduct up to 1,000 curette and cautery procedures per year. If the change in practice is embedded into standard practice, this could potentially lead to £4,075.45 (excluding VAT) per annum of cost savings.

**Table 2. The post-operative outcome of six patients following eight curette and cautery minor skin surgery procedures**

| <b>Curette and Cautery Procedures Performed With Nitrile Gloves</b> |             |  |
|---|-------------|--|
| <b>Case Number</b>  | <b>Site</b> | <b>Post-operative Surgical Site Infection Requiring Antibiotics?</b> |
| 1   | Scalp       | No   |
| 2   | Scalp       | No   |
|   | Chest       | No   |
| 3   | Face        | No   |
| 4   | Lower limb  | No   |
| 5   | Face        | No   |
|   | Face        | No   |
| 6   | Face        | No   |

Note: The surgical site infection rate was (0/8) 0%. One case is one patient, and one patient may have undergone more than one procedure.

**Table 3. Post-operative outcome of nine patients following 12 curette and cautery minor skin surgery procedures**

| <b>Curette and Cautery Procedures Performed With Sterile Gloves</b> |             |  |
|---|-------------|--|
| <b>Case Number</b>  | <b>Site</b> | <b>Post-operative Surgical Site Infection Requiring Antibiotics?</b> |
| 1   | Face        | No   |
| 2   | Face        | No   |
| 3   | Upper limb  | No   |
| 4   | Face        | No   |
|   | Torso       | No   |
| 5   | Lower limb  | No   |
| 6   | Face        | No   |
|   | Neck        | No   |
| 7   | Lower limb  | No   |
|   | Torso       | No   |
| 8   | Scalp       | No   |
| 9   | Upper limb  | No   |

Note: The surgical site infection rate was (0/12) 0%. One case is one patient, and one patient may have undergone more than one procedure.

### *ENVIRONMENTAL OUTCOMES*

The carbon footprint for performing a single curette and cautery procedure (inclusive of consumables, electricity and water, but excluding travel) using the historical pathway is estimated at 5.78 kgCO<sub>2</sub>e, new lean pathway at 4.54 kgCO<sub>2</sub>e and potential best practices pathway at 4.41 kgCO<sub>2</sub>e. Thus, the change from historical practices to new lean practices results in a reduction of 1.24 kgCO<sub>2</sub>e per procedure. This is achieved through the reduction of one Clinel 2% chlorhexidine in 70% alcohol skin wipe, reusing one surgical marker pen over one skin surgery list before disposal instead of single usage, switching from sterile gloves to clean nitrile gloves, switching hand washing technique from soap and water to alcohol gel and switching from using 2.2-mL glass vial to 20-mL glass vial of local anaesthetic. The Dermatology Department at South Warwickshire University NHS Foundation Trust is estimated to conduct up to 1,000 curette and cautery procedures per year. If the change to new lean practice is embedded into standard practice, this could potentially lead to a reduction of 1,240 kgCO<sub>2</sub>e per annum, equivalent to driving 3,662.14 miles in an average car.

### *POPULATION OUTCOMES*

We have disseminated our findings to the Dermatology Sustainability UK Group which generated interest and discussions from staff in different sites to



consider adopting a more sustainable way to perform curette and cautery procedures.

## DISCUSSION

Our study identified curette and cautery skin surgery procedures to have lower perceived barriers for practitioners to adopt sustainable transformation of practices. We succeeded in reaching a departmental consensus to enable staff (based on their risk assessment) to adopt low-carbon alternatives and new lean pathways (as described in Table 1) when performing curette and cautery procedures. Our surgical site infection rate audit to date has a small sample, but it has provided valuable initial data to inform staff there are no significant infection control concerns in the new lean pathway. It is anticipated that following the completion of a larger scale surgical site infection rate audit, this will give all staff the confidence to embed the new lean pathway (including low-carbon alternatives such as wearing non-sterile nitrile gloves) as their standard practice and encourage staff to contemplate about adopting lean pathways for other types of skin surgery.

This study has limitations. This is a single-site study with a small study sample. Carbon footprint calculations have been estimated using a hybrid methodology. Where possible published LCA data have been included but due to limited data availability, an environmentally extended input–output analysis (EEIOA) has been used to estimate the carbon footprint of most of the consumables used to perform curette and cautery procedures. The scope of this project focused on the performance of curette and cautery procedure alone. Our project has not implemented changes targeting additional hotspots within dermatology such as travel, how skin surgery appointments are organised and how skin surgery training is delivered to staff (Johnson-Ogbunike et al., 2023). We acknowledge that there are different discourses and methods on how post-operative surgical site infections could be diagnosed, which differ from our study. Nevertheless, our study indicated that there is no major early infection signal detected.

It should be further noted that curette and cautery procedures are also performed by other specialties such as ENT, maxillofacial surgery, plastic surgery teams, and general practitioners. The volume of curette and cautery procedures performed by other specialties is currently unknown – disseminating the findings and learning from this project to other specialties would further increase the impact of this project. Potential methods of disseminating our project findings could include direct discussion with colleagues in other specialties, presentation at multidisciplinary surgical conferences and publication in multidisciplinary surgical peer-reviewed publications. Future studies could evaluate the triple-bottom-line impact of introducing one-stop skin surgery services and artificial intelligence to triage referrals directly for skin surgery.

## CONCLUSIONS

Our study demonstrated that transforming to sustainable practices for curette and cautery procedures can lead to significant triple-bottom-line benefits with no obvious adverse postoperative infection risks. We encourage dermatology staff from the public and private sectors, as well as staff from other specialties, to consider adopting the recommendations from the BSDS sustainability guidance when performing curette and cautery procedures.

## ACKNOWLEDGEMENTS

The authors would like to thank the Centre for Sustainable Healthcare and the South Warwickshire University NHS Foundation Trust for hosting a Green Competition and providing support on project planning and education to the project team on carbon counting.

## CONFLICTS OF INTERESTS

The authors declare that they have no competing interests.

## ETHICAL APPROVAL

This project was registered as a quality improvement project with the Audit and Clinical Effectiveness Department at the South Warwickshire University NHS Foundation Trust.

## AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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ENVIRONMENTAL SUSTAINABILITY IN CURETTE AND CAUTERY SKIN SURGERY

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