NHS England

GIRFT
GETTING IT RIGHT FIRST TIME

GIRFT Greener Pathways: A practical guide to decarbonising the skin lesion pathway

September 2026

We are grateful to the clinicians and patients who engaged with the production of this guide through visits and stakeholder discussions.

BRITISH ASSOCIATION OF DERMATOLOGISTS
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GIRFT Greener pathways identify opportunities for the NHS to improve or maintain the quality of patient care while mitigating its environmental impact. These pathways are developed using the cross-specialty, clinically-led GIRFT 'Environmental Lessons Learned and Applied' (ELLA) approach, which uses the clinical pathway as its starting point. We support trusts to build a Greener NHS and meet their commitment to deliver a net zero health service. Find out more at www.gettingitrightfirsttime.co.uk/greener-pathways

Get involved

If you have suggestions or comments on this pathway, or could contribute to making other clinical pathways greener, we encourage you to share these on our FutureNHS discussion page or by email to girft.academy@nhs.net

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Foreword

This is the fourth Greener Pathways guide developed and released by the Getting It Right First Time (GIRFT) programme, supporting the NHS in its target to reduce greenhouse gas emissions while consistently pursuing improvements in care quality. Opportunities to modify the skin lesion pathway have been demonstrated which offer major reductions in greenhouse gas emissions.

The analysis that has guided the recommendations in this document was carried out in accordance with the Environmental Lessons Learned and Applied (ELLA) framework. The modelling undertaken is informed by contemporary data, including the NHS England Model Health System. Taking a fresh look at clinical data with environmental sustainability in focus has outlined where substantial opportunities exist to improve care, not only from an environmental perspective but in terms of clinical outcomes, patient experience, reducing inequalities and value for money.

As always, this GIRFT initiative has benefited from the expert input of a range of collaborators, spanning primary to tertiary care, including GIRFTs clinical lead for dermatology Professor Nick Levell, and representing different national organisations. It has built on the hard work of a dedicated group of dermatologists with a strong commitment to improving sustainability. It has also benefited from the involvement of patients, who have provided valuable insights and shaped the recommendations. This workstream has the support of UKRI and NIHR funding through the Sustainable Health Systems Hub based at the University of Exeter. This work was also supported by South Warwickshire University Foundation Trust, Health Innovation West Midlands and the British Association of Dermatologists. This support, coupled with engagement and dialogue from across the NHS, will help us to understand how to further improve the ELLA methodology and accelerate our sustainable transition.

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Introduction

Who should use this guide?

This document is designed for healthcare professionals and managers who deliver and support care for patients on the skin lesion pathway.

Why use this guide?

- The NHS produces 4-5% of the UK's carbon emissions (20-25 million tonnes CO_2e).
- The NHS has a legal net zero target by 2045. Meeting this target is needed to avoid the most severe health impacts of climate change.
- The recommendations described within this guide offer the largest greenhouse gas emissions reductions across the skin lesion pathway.
- The adaptations described often offer co-benefits that support the NHS core purpose; to promote health and deliver safe, efficient and cost-effective care for all.

How to use this guide

The guide describes best practice, alongside estimates of the associated greenhouse gas emissions for a typical UK hospital, to guide prioritisation. Each recommendation is intentionally deliverable on a relatively short timescale. Delivery will involve multiple team members. Support from operational hospital management, sustainability teams and executives is vital for successful delivery. Within each recommendation, we have set out a list of actions to be taken. The actions can inform hospital green plans, guiding the NHS net-zero transition. The recommendations contained in this guidance are intended to be tailored for local implementation and further considerations for each are discussed.

This guide assumes competent surgical practice within an appropriately governed service. It should be read alongside the standards for dermatological surgery published by the British Society for Dermatological Surgery and the British Association of Dermatologists. The wider requirements for patient safety, infection prevention, competency and surgical quality are set out in those documents and are not repeated here.

Patient, clinical and scientific acceptability

This guidance has been co-developed with a wide group of stakeholders to ensure appropriate recommendations and reasonable 'best estimates' of environmental impact.

Addressing climate change – a work in progress

The recommendations described below are not an exhaustive list of all the actions that can be taken to deliver sustainable skin cancer care. The intent is that these high impact actions can be updated as new innovations and research on best practices become available.

List of the highest impact recommendations

Highest impact clinical recommendations to decarbonise the skin lesion pathway	Annual estimated emissions reduction across England (t CO_2e) *
Community care and referral/triage of skin lesions	
1. Key actions to prevent skin cancer	414
2. Optimise the use of advice and guidance (A&G) for routine skin lesions	321
3. Adopt teledermatology for urgent suspected cancer skin lesion assessment	568
Treatment decisions	
4. Avoid unwarranted diagnostic and therapeutic surgical procedures	502
5. Incorporate frailty assessment into treatment decisions for the management of skin lesions	52
6. Use a risk-stratified approach for the management of actinic keratoses	236
Streamlined pathway	
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10. 'Action-set' to decarbonise skin surgery procedures	328
11. Low carbon management of surgical waste	40
Follow up	
12. Offer personalised stratified follow-up (PSFU) for cutaneous SCC (cSCC) when suitable	323
Total	4322

*Tonnes of carbon dioxide equivalent

1. Key actions to prevent skin cancer

Actions

- Appoint a member of the dermatology team as skin cancer prevention lead/liaison to link with local authorities, organisations and schools and support local prevention programmes. Dedicated time for this role should be allocated in the person's job plan.
- Support early education of sun safe behaviour through programmes like Sun Safe Schools.
- Use each clinical interaction (primary and secondary care) to offer consistent, tailored messaging on sun safety and awareness of skin cancer (see below).
- Identify high-risk groups who may benefit from more intensive prevention and screening measures that do not confer benefit to the general population.

Key messaging for sun safety:

- Approaches to protecting the skin: shade, clothing, correct application of sunscreen and regular wearing of wide-brimmed hats for those with hair thinning/loss.
- Information on times of day and year when sunlight is strongest.
- Advise all patients and the public against the use of artificial UV tanning devices.
- How to check for possible signs of skin cancer.

Rationale

Ultraviolet radiation is a key modifiable risk factor in the aetiology of skin cancer, and skin cancer is the main preventable diagnosis within dermatology. Prevention is a core concept of sustainable healthcare and is a key focus in the government's 10-Year Health Plan. Preventing skin cancer can decrease demand on the health service, reducing costs and its carbon footprint. While interventions focused on education and sun safety in early life are essential, evidence suggests a minority of schools have a sun safety policy[1]. Identifying a named prevention lead within the dermatology team can help support local initiatives to embed sun safety into primary school curricula.

There are complex cultural and aesthetic considerations affecting attitudes and behaviours towards sun safety and tanning, and consistent, accurate messaging is key. Social media, fashion trends and misinformation can all drive high risk sun behaviours. Messaging should be tailored based on ethnicity, culture and improving health literacy. Dermatologists should support initiatives to reduce commercial sunbed use and increase regular sunscreen use.

Further considerations

Messaging around skin cancer prevention must balance the benefits (such as vitamin D synthesis) and risks of sun exposure. Advice must be tailored according to patient's skin type, as patients with skin of colour are at a higher risk of vitamin D deficiency and generally at lower risk of skin cancer. Emphasising the short-term benefits of sun protection (such as avoiding sunburn) may be more accessible for people on low incomes than discussing long-term benefits, as affordability is recognised as a barrier to sunscreen use. Opportunistic screening and offering outreach clinics in trusted locations can improve access for underserved groups.

Benefits

Patients	Empowered with reliable knowledge to protect themselves from UV damage Avoidance of skin cancer and the associated investigation and treatments Avoidance of premature skin aging		
Health service	Relieves pressures and in demand dermatology appointments Cost savings		
Environment	52.4	kg CO_2e per case	
	3.4	tonnes CO_2e per average unit* annually	**average sized NHS trust with average performance relative to defined optimal practice.*
	414	tonnes CO_2e across England annually	

2. Optimise the use of advice and guidance (A&G) for routine skin lesions

Actions for primary care

- Use A&G with attached high-quality clinical images (including dermoscopic images when possible) for skin lesions where there is diagnostic uncertainty and suspicion of skin cancer but the urgent suspected skin cancer criteria are not met.
    - Use specific steps for photography of skin of colour to ensure high-quality photos in all skin types[2].
- Use the Academy of Medical Royal Colleges criteria thresholds to avoid referring benign lesions not requiring secondary care input. When referring symptomatic benign lesions, clearly state the criterion met.

Actions for secondary care:

- Dedicated training and allocated time in job plans for A&G are needed.
- Use GIRFT A&G response templates for actinic keratosis, Bowen's and benign lesions.
- Use A&G super clinics for senior decision and peer-review of uncertain cases.

Rationale

Using A&G with attached high-quality images allows a substantial proportion of patients to be safely managed without need for in-person dermatology review. Our estimates confirm that the carbon footprint associated with electronic referrals is negligible in comparison to hospital outpatient appointments. Co-benefits include reduced patient and staff travel, compatibility with flexible work patterns, reduced burden on patients' time and faster access times for specialist advice.

Appropriate risk management is crucial for triaging lesion referrals. A&G super clinics (one or more senior clinicians simultaneously overseeing multiple clinicians) can enable supervision, education and collaborative working and minimise risk-averse approaches where most requests are converted to outpatient appointments. Clear criteria for referring and treating benign skin lesions are needed to minimise misdirection of resource.

Further considerations

Thresholds for secondary care input and appropriate lesion review by primary care must be maintained to avoid increasing numbers of A&G requests and to ensure secondary care time is balanced with other clinical priorities. A&G offers reduced scope for wider skin examination. Referring information should include pertinent risk factors for skin cancer and specify if other atypical lesions are seen. If necessary, consider arranging a face-to-face review to perform a full skin examination. A&G should minimise inappropriately redistributing workload to primary care while ensuring locally delivered care is maximised, and the educational opportunities with A&G should be utilised to support primary care clinician confidence in lesion diagnosis and decision making.

Benefits

Patients	Reduced travel/worry Review in the right clinic, first time	
Health service	Efficient use of secondary care resources Faster pathway performance	
Environment	12.8	kg CO_2e per case
	2.6	tonnes CO_2e per average unit annually
	321	tonnes CO_2e across England annually

3. Adopt teledermatology for urgent suspected skin cancer skin lesion assessment

Actions

- Where available, capture images of all skin lesions of potential concern at first contact in primary care.
- Consider establishing community photographic hubs with trained staff and dedicated equipment if images cannot be taken in primary care.
- Train appropriate local staff members in taking a full, high-quality image set with regional, macroscopic and dermoscopic images. Utilise BAD training resources.
- Include a relevant clinical history with all teledermatology referrals.
- Avoid triaging patients to teledermatology clinics if lesions are likely to also require an outpatient review, based on BAD or locally agreed exclusion criteria.
- Teledermatology referrals should be reviewed by suitably trained or supervised clinicians with dedicated job-planned time.
- Undertake collaborative review or, where necessary, in-person assessment in a one-stop clinic for indeterminate cases.
- Follow the BAD service guidance and standards for the use of teledermatology to ensure consistent governance.

Rationale

Teledermatology uses digital images to remotely triage and diagnose skin lesions. Established services can direct patients straight to treatment or discharge in the majority of cases[3-5], avoiding additional travel and appointments. Our carbon footprint estimates associated with taking, storing and sending high-quality images confirm it to be significantly lower than attending an outpatient attendance (0.08 vs 12.84kgCO_2e). Remote lesion review has been shown to be faster than in-person, allowing more lesions to be reviewed with the same clinical workforce[6,7].

While image quality directly relates to the ability to accurately diagnose and triage skin lesions, a balance is needed between optimal images and resources, travel and patient convenience. Capturing images locally in primary care significantly reduces travel, and secondary care community photography hubs have high image quality and fast turnaround times[8]. Patients likely to require an in-person review should be identified at the outset to avoid ‘double activity’. Oversight of teledermatology services by experienced dermatologists is necessary to maintain high standards and avoid increased biopsy rates compared to in-person assessment.

Further considerations

Teledermatology for USC lesions offers reduced scope for wider skin examination and a face-to-face review may be needed to perform a full body skin examination. Diagnostic accuracy from clinical images may be reduced in patients with darker skin tones, particularly for pigmented lesions and erythema-dependent inflammatory dermatoses[9], reflecting limitations in image standardisation and training data. Teledermatology should be used cautiously in these contexts, with a lower threshold for in-person review when visual assessment alone is insufficient.

Benefits

Patients	Access to specialist advice Reduced travel/convenience	Directed to right pathway/service, first time Faster diagnosis
Health service	Educational and collaborative opportunities Service efficiency	
Environment	4 kg CO_2e per case 5 tonnes CO_2e per average unit annually 569 tonnes CO_2e across England annually	

4. Avoid unwarranted diagnostic and therapeutic surgical procedures

Actions

- Avoid over-investigation and treatment of skin lesions where monitoring is safe and a biopsy for histological confirmation is unnecessary.
- Excise lesions likely to require full excision without an initial biopsy at the outset, if consistent with patient wishes.
- If available, use reflectance confocal microscopy (RCM) to reduce biopsy of indeterminate lesions.
- Do not biopsy lesions referred for Mohs surgery if there is high clinical confidence in BCC diagnosis.
- Do not routinely re-excise mildly dysplastic naevi excised with clear surgical margins.
- Do not routinely excise symptomatic benign lesions which do not meet the agreed thresholds (e.g. Academy of Medical Royal Colleges criteria).
- Use NCIP to benchmark individual benign excision rates against national practice.

Rationale

The majority of skin cancers can be identified by dermatologists from their appearance and do not require a biopsy prior to definitive treatment. Furthermore, diagnostic biopsy in pigmented lesions does not enable full evaluation. The GIRFT national report for dermatology and NCIP data demonstrate wide variation in rates of biopsy prior to excision and in the number of benign lesions removed by departments. Appropriate decision-making at triage, teledermatology and in-person clinic assessment are needed to avoid unnecessary procedures and clinicians should routinely benchmark their data against national averages. Avoiding a pre-excision diagnostic biopsy can result in excision of benign lesions or those suitable for alternative treatment and this must be discussed with patients.

Reflectance confocal microscopy (RCM):

RCM is a non-invasive imaging technique. Studies have shown using RCM reduces excision rates compared to clinician and dermoscopic assessment[10,11] and, in doing so, the associated carbon footprint[12]. RCM is incorporated into European melanoma guidelines and it is used by many centres in Europe. More widespread use of RCM in the UK has clear co-benefits for patients by avoiding procedures, and for the health system by reducing pressure from in-demand pathology services, although there are high upfront costs and its use requires training and is operator dependant.

Further considerations

Some patients and clinicians require the evidence from a biopsy prior to planning excision in cosmetically sensitive anatomical sites. Long surgery waiting lists introduce greater potential impact from clinical misdiagnosis. A biopsy may therefore still be required to minimise missed serious or rare cancers (e.g. amelanotic melanoma or Merkel cell carcinoma).

Benefits

Patients		Avoid procedure discomfort/risk of complications Accurate diagnosis Shorter time to curative definitive surgery and delivery of subsequent care/completion
Health service		Less pressure on pathology services enabling faster reporting of other cases Cost savings Reduced surgical waiting lists
Environment	5.3 4.1 502	kg CO_2e per case tonnes CO_2e per average unit annually tonnes CO_2e across England annually

5. Incorporate frailty assessment into treatment decisions for the management of skin lesions

Actions

Primary care:

- Discuss patient wishes, treatment aims and likely management options before referral to secondary care, to determine whether onward referral is suitable.
- Include a validated frailty score with all referrals (e.g. Rockwood clinical frailty scale, electronic frailty index)[13].

Secondary care:

- Discuss management options for skin lesions with all patients in the context of the likely natural progression if untreated, symptoms (pain, bleeding, ulceration, psychological distress, catching) and treatment aims.
- Use shared decision making to:
    - consider active surveillance for selected low-risk lesions;
    - consider symptomatic or less intensive management for patients living with moderate to severe frailty not wishing for active intervention.

Rationale

Treatment guidelines for skin cancer tend to focus heavily on curative intent treatment and have lacked explicit recommendations for treating frail patients with limited life expectancy. Studies show that 1 in 6 patients aged over 80 years die within two years of a BCC diagnosis[14]. While long term cure may be a lesser priority, care is not always adjusted to reflect likely life expectancy[15]. Skin lesion management should be patient-centred, with shared decision making tailored to the individual patient and their preferences.

Skin cancers often have minimal symptomatic impact[16] and for frailer patients the benefit of complete surgical excision may not outweigh the potential surgical complications which occur at a higher rate in frail populations[17]. Frailty assessment is an effective way of identifying patients who may be at greater risk of poorer outcomes after surgery and is a better indicator of risk than age[18]. It can help to identify patients for whom these discussions are most relevant; where treatment benefits may not outweigh the risks and inconvenience caused to patients. Consider symptomatic follow-up, or non-standard, less invasive treatment in this group.

Further considerations

It is important to consider unintended consequences such as the resources for monitoring untreated disease being greater than the resource of a single definitive treatment. Disease progression may occur, where curative treatment is no longer tenable.

Benefits

Patients	Patient centred individualised care Fewer procedures and associated complications and inconvenience	
Health service	Potential for reduction in procedure numbers Higher workforce satisfaction	
Environment	15.3	kg CO_2e per case
	0.4	tonnes CO_2e per average unit annually
	52	tonnes CO_2e across England annually

6. Use a risk-stratified approach for the management of actinic keratoses

Actions

- Treat actinic keratoses in primary care unless specialist input is required as outlined in the BAD guidelines.
    - Consider establishing GP with extended role (GPwER) led intermediate care pathways.
    - If referring to secondary care, include high-quality images to support management decisions.
- Educate all patients on sun safety, self-examination and signs suggestive of transformation to invasive skin cancers.
- Offer conservative management for low-risk, isolated lesions.
- Offer topical chemoprevention in those at high risk of transformation to cSCC (actinic field change, multiple actinic keratoses, previous skin cancer, immunosuppression).
  Effective options include:
    - 5-fluorouracil (5-FU) monotherapy[19,20].
    - 5-fluorouracil in combination with calcipotriol ointment (5FU-Cal)[21,22].

Rationale

Actinic keratoses (AK) are common in the UK population, with an estimated prevalence of 19% in those aged over 60 years,[23] and a risk stratified approach is needed to avoid overtreatment. The risk of progression to invasive SCC is low and they do not always require treatment. The risks and discomfort of treatment may outweigh the benefits in many cases, and no treatment with appropriate patient counselling may be the optimal management plan. In general, these lesions can be safely managed in the community.

There are multiple management options for actinic keratoses, including monitoring, topical treatments, cryosurgery, photodynamic therapy and surgical procedures. Topical treatments, particularly those which enable patients to re-treat or extend treatment, have a lower estimated carbon footprint than surgical procedures. Using topical treatments for actinic damage in high-risk cases to prevent secondary transformation to invasive skin cancer has a much lower carbon footprint than the treatment pathway for an SCC. Patients have expressed preference for 5-FU-Cal combination therapy compared to 5-FU monotherapy[24], although further evidence on the longer-term preventive benefit of this combination is needed.

Benefits

Patients	Fewer treatments/procedures and associated complications and inconvenience Topical therapies provide opportunities for self-directed treatment Reduced travel/convenience
Health service	Cost savings Reduced demand for secondary care appointments
Environment	12.84 kg CO_2e per case 1.9 tonnes CO_2e per average unit annually 236 tonnes CO_2e across England annually

7. Implement ‘direct to surgery’ pathways

Actions

- Develop ‘direct to surgery’ pathways for lesions requiring surgical treatment based on teledermatology review.
- Introduce the ‘direct to surgery’ concept at primary care referral.
- Deliver pre-procedure information using telephone or virtual appointments to support informed consent.
- Clinicians triaging ‘direct to surgery’ should ideally perform or supervise the procedure to maximise continuity.
- The surgical skill level, supervision and facilities on the day of surgery should offer flexibility with regards to the procedure performed, lesion prioritised or treatment plan.
- Develop a local protocol to reduce the risk of wrong site surgery.
- The direct to surgery pathway is not suitable for: patients requiring complex surgery or management discussions of alternative treatments, those who would benefit from full skin examination or who have questions/concerns.
- Offer patients an option to opt out of ‘direct to surgery’ pathways, with timely alternative.

Rationale

Many lesions are identified as requiring a surgical procedure directly from A&G requests or teledermatology review. Booking patients ‘direct to surgery’ can achieve high levels of patient satisfaction, streamline the patient pathway and reduce patient travel and clinic appointments[25]. Clear and relevant pre-operative information is central to patient understanding and consent. Telephone appointments and interactive patient communication apps can be used to effectively deliver bespoke procedure information, address common queries and collect relevant patient data with a lower carbon footprint than an in-person review[26]. GIRFT guidance on pre-operative assessment for procedures involving local anaesthetic should be utilised.

The individual patient, procedure and circumstances need to be evaluated to determine suitability for direct surgical booking as it is not suitable for all cases. Continuity, flexibility and clinical judgement from the surgeon on the day are key to successful deployment of this pathway.

Further considerations

Inappropriate treatment may be envisaged through lack of in-person assessment. Virtual consultations may mean it is more difficult to gauge priorities or establish understanding of discussion. If there is concern, a face-to-face appointment should be arranged. More complex treatment discussions are likely to require a face-to-face appointment. Offering the right people the most efficient clinical pathways frees up time and resources for those who need more help and support.

Benefits

Patients		Reduced travel and parking costs Shorter waiting time and reduced anxiety Greater convenience
Health service		Reduced demand for outpatient appointments Reduced administrative burden Cost savings
Environment	12 4.2 511	kg CO_2e per case tonnes CO_2e per average unit annually tonnes CO_2e across England annually

8. Offer one stop ‘see and treat’ dermatology clinics

Actions

- Offer same day procedures for lesions identified as requiring surgical intervention in clinic.
- Inform patients pre-clinic about the potential for same day excision following clinical assessment. Information should outline that not all lesions are suitable for same day excision.
- Offer patients sufficient information, time and opportunities for questions to enable informed consent.
- Resource one stop pathways to offer curative intent surgery where appropriate (i.e. appropriate clinical and surgical skills mix).
- Circumstances less likely to be suitable for same day surgery include: complex surgery, higher bleeding risk, alternative treatment options requiring time to consider, patient capacity, psychological factors, frailty requiring additional home support to be arranged.

Rationale

A significant proportion of skin lesions require further investigation or treatment with a surgical procedure. In one-stop clinics patients are assessed, diagnosed and treated on the same day. Same day skin surgery can be delivered with high levels of patient satisfaction[27,28] and offer reduced time to treatment[29,30]. It can also reduce the risk of wrong-site surgery and loss to follow-up. One-stop clinics offer the greatest benefit when they deliver same day curative surgical treatment and not only biopsy.

One-stop clinics reduce patient travel for multiple appointments. The highest emission savings may be seen in departments that serve poorly connected large geographical areas. Similar models can be used in the community and for lesions referred onwards to surgical specialties[31]. One-stop clinics can promote health equity by reducing the likelihood of people with complex lives and access barriers dropping out of clinical pathways and are often better for those balancing many responsibilities at home or work.

One-stop clinics should offer time for appropriate patient reflection and consent to be taken between discussion and procedure. Care should be taken to ensure that on-the-day surgical availability does not increase biopsy rates or result in over-treatment of benign lesions or lesions that would be better managed with alternative treatment modalities.

Further considerations

Unpredictable procedure numbers can lead to unused surgical capacity and monitoring. Adjusting the ratio of clinic to procedure numbers is required. Careful case consideration is needed to avoid procedures undertaken where time might have allowed the lesion to resolve, or when a longer period of planning might have resulted in better informed consent and better post-operative home support or travel arrangements for the patient.

Benefits

Patients	Convenience and patient satisfaction Faster lesion management with reduced risk of pathology progressing Reduced risk of wrong site surgery or changed procedure with future surgical date	
Health service	Educational opportunities (identify surgical cases from clinic) Reduced administrative burden Reduced 'Did Not Attend' (DNA) rates at procedure appointments	
Environment	4.6 5.1 633	kg CO_2e per case tonnes CO_2e per average unit annually tonnes CO_2e across England annually

One-stop clinic design

There are various approaches to setting up a one-stop clinic and key considerations are outlined below:

Planning

The lead clinician should screen patient lists in advance of clinic to determine likely resource requirements and make the surgical team aware of probable cases ahead of clinic.

Pre-clinic patient information

Patients should be aware of the possibility of same-day procedure at the point of referral.

Patients should be aware that following in-person lesion assessment surgery may not be advised or may be advised at a later date.

Give patients practical procedure information:

- INR check if relevant;
- attend the clinic accompanied if possible;
- avoid driving post-procedure.

Consent

Offer a time-gap between the clinic review and the procedure being performed.

Use visual aids to deliver procedure information.

Take consent in a separate area to the procedure room.

Reducing unused surgical slots

Pre-book the first 30-60 minutes of surgical time.

Regularly review the clinic number: surgery number ratio to minimise unused slots.

Performing the range of procedures required

Offer a range of surgical skill mix within the team to deliver range of procedures required.

Separate clinic and theatre teams with flexibility among staff.

9. Use an appropriate setting for skin procedures

Actions

- Perform low risk skin surgery in adapted procedure rooms.
- Higher resource settings should be reserved for complex cases, which dermatologists require regular access to.
- NHS cases being performed in the independent sector should also be performed in a setting appropriate for their complexity.
- Clinicians should regularly review:
  - that case complexity corresponds to setting resource intensity;
  - that wasteful use of equipment is avoided and only what is needed to safely and efficiently perform surgery is used.

Rationale

Surgical operating theatres are resource intensive with a higher environmental impact compared to clinic and procedure rooms. Procedure rooms encompass a range of facilities of varying sophistication where skin surgery can be undertaken. Skin surgical lists have different complexities, and the allocated setting should correspond to this and individual patient factors. Moving skin procedures to a healthcare setting corresponding to their complexity can reduce the associated carbon footprint of the procedure.

The GIRFT Right Procedure, Right Place guide highlights skin procedures are suitable for a non-theatre setting. Most skin procedures can be safely undertaken in a dedicated adapted room with a lower carbon footprint. The BAD has published guidance on adaptations required for procedure rooms for skin surgery that do not require general anaesthetic. Computer access is needed for viewing images and patient notes, and the setting must enable sufficient time and support for post-operative wound care and documentation.

Further considerations

Dermatologists must retain access to theatre space for more complex skin procedures when needed, to ensure continuity of the skillset of dermatology surgery. Access to procedure rooms with sufficient space for access requirements, transfers or additional staff support are needed.

Benefits

Patients		Less daunting clinical setting Reduced overall procedure time
Health service		Cost savings Reduced demand for operating theatres
Environment	3.9	kg CO_2e per case
	3.2	tonnes CO_2e per average unit annually
	394	tonnes CO_2e across England annually

10. ‘Action-set’ to decarbonise skin surgery procedures

Actions

- Avoid routinely wearing sterile surgical gowns for skin procedures. Consider surgical scrubs or plastic aprons.
- For punch/shave/curette biopsies, curettage and cautery and other minor procedures:
  - Use clean nitrile gloves and not sterile gloves.
  - Create a sterile field with items included in surgical packs i.e. the sterile absorbent towel.
  - When needed, use the lowest number of sterile drapes possible and consider a single fenestrated drape where possible.
  - Use a clean towel or sheet to protect clothing and maintain patient dignity.
- Offer absorbable sutures as default for external wound closure.
- Where possible, use re-usable instead of single use surgical instruments.
  - Develop an action plan for establishing a durable supply of re-usable equipment for skin surgery and reprocessing pathways to allow the efficient transfer of equipment to sterilisation facilities.
- Develop procedure specific surgical tray packs to reduce unused items.
- Regularly review and rationalise surgical trays to remove infrequently used instruments, aiming to use the smallest tray dimensions possible.
- Avoid unnecessary waste generation by opening items when required, not ‘just in case’.
- Use BSDS surgical standards for Dermatological Surgery when performing skin surgery.

Rationale

With over 500,000 skin procedures performed in England annually, small consistent changes can have a large impact. The largest opportunities to reduce procedural emissions are above. Clean nitrile gloves used with aseptic non-touch technique (ANTT) are suitable for minor skin procedures[32]. Disposable surgical gowns and drapes have a high carbon footprint[33]. Sterile drapes are not always required in procedures which do not use buried sutures. Absorbable sutures can be preferred by patients due to convenience and smaller diameter sutures can have excellent cosmesis. Use of absorbable sutures avoids patient travel and single-use items for suture removal. Re-usable surgical instruments have a lower carbon footprint than their single-use equivalents[34]. Surgical packs should be regularly reviewed to remove unused items and reduce the tray dimension where possible[35].

Further considerations

Adopting dermatology-specific lower consumption surgical precautions in a setting shared with non-dermatology staff can be challenging and can result in trivialisation of dermatology. There is a risk that clean and careful practice can slip to casual practice; standards and safeguards are needed to ensure the maintenance of good surgical practice. Guidance for surgical standards can be found on the BSDS website and ongoing audits are needed to monitor wound infection rates.

Benefits

Patients	Less daunting Absorbable sutures offer convenience and reduced appointments/travel	
Health service	Cost savings Absorbable sutures free up primary care practice nurse appointments	
Environment	0.7	kg CO_2e per case
	2.7	tonnes CO_2e per average unit annually
	328	tonnes CO_2e across England annually

11. Low carbon management of surgical waste

Actions

- Ensure availability of 'offensive' (yellow-and-black striped bags) and recycling waste streams in skin procedure rooms.
- Provide clear, easily accessible information regarding the correct waste stream for items and packaging used in skin surgery e.g. placed above the bins (see example table below).
- Use the 'offensive' waste stream rather than 'infective' (orange bag) for contaminated items in patients with no known infection risk.
- Clarify at a local level:
  - recycling streams (mixed dry recycling or multi-source segregated recycling);
  - correct waste stream for soft plastics (separate packaging if required);
  - availability of any dedicated single-material streams such as sterilisation wrap.
- Undertake regular periodic waste audits.

Rationale

Each skin procedure is estimated to generate around 0.5kg of non-sharps waste[36]. Different hospital waste streams have different disposal routes, with waste incineration having a significantly higher financial and environmental cost than landfill or recycling[37]. A significant proportion of waste produced in theatres can be recycled. Previous surveys report a wide range of recycling rates in skin surgery and that not all staff are compliant with relevant waste training[36]. Furthermore, not all hospitals have the right bins available where needed for correct waste segregation and there is variable availability of recycling bins in skin surgery rooms[36,39,40].

Providing clear, easily accessible information for staff at the point of waste disposal and availability of the right bins in the right place will enable appropriate waste management, reducing the monetary costs and emissions from skin surgery waste. Preventing waste being generated is of greater environmental and cost benefit than correct waste segregation and this must be regularly reviewed and evaluated.

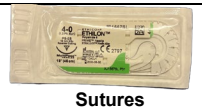
Further considerations

Local differences in waste management and recycling protocols can make it difficult to provide generic advice on waste practices. Consumables often lack explicit labelling on their packaging, making it challenging to determine what is suitable for recycling.

Benefits

Patients	Cost savings passed into healthcare Reduced local air pollution from medical waste incineration	
Health service	Lower costs/energy consumption for waste disposal	
Environment	0.4 0.3 40	kg CO_2e per case tonnes CO_2e per average unit annually tonnes CO_2e across England annually

Higher carbon intensity → **Lower carbon intensity**

	Sharps container High temperature incineration	**Orange (infectious waste)** High temperature incineration	**Tiger stripe (offensive waste)** Recycling, landfill or low temperature incineration	**Black (domestic waste)** Recycling, landfill or low temperature incineration	**Clear (dry mixed recycling)** Recycling, landfill or low temperature incineration	**Soft plastics*** Specialist recycling
Clean nitrile gloves		✓ If infectious patient	✓ If non-infectious patient			
Sterile gloves		✓ If infectious patient	✓ If non-infectious patient		Paper packaging: ✓ 	Soft plastic packaging: ✓
Surgical marker pen			✓ 		Paper packaging: ✓ 	Soft plastic packaging: ✓
Swabs/dressings		 ✓ If infectious patient	 ✓ If non-infectious patient		Paper packaging: ✓ 	Soft plastic packaging: ✓
Surgical blade	Blade: ✓ 			Packaging: ✓ 		
Punch/curette	Punch: ✓ 				Paper packaging: ✓ 	Soft plastic packaging: ✓
 **Sutures**	Suture: ✓ 	Suture material ✓ If infectious patient 	Suture material ✓ If non-infectious patient 		Paper packaging and inner carrier: ✓ 	Soft plastic packaging: ✓
Outer wrapping of sterile packs				✓ If removed pre-procedure and not contaminated		
Single-use surgical tray		✓ If infectious patient	✓ If non-infectious patient			

* Discuss with local waste management team if soft plastic recycling available or if can be recycled with dry mixed recycling. If cannot be recycled use domestic waste.

12. Offer personalised stratified follow-up (PSFU) following cutaneous SCC (cSCC) diagnosis when suitable

Actions

- Offer PSFU (encompassing a range of follow up strategies such as discharge, PIFU, change in follow up interval or duration) for high-risk cSCC based on patient and clinical factors.
- Establish locally agreed criteria for PSFU pathway suitability.
- Patients likely to be suitable for de-escalated follow up (discharge or PIFU) include:
  - those confident, able and willing to self-examine skin and lymph nodes;
  - those able to re-access care including access to technology to take and share images;
  - those with a lower risk of clinical recurrence e.g. one high-risk feature only.
- Ensure discussion and documentation of self-managed or alternative follow-up arrangements, including how to trigger reassessment.
  - Share the written confirmation with the patient and primary care team.
- Ensure appropriate and timely access to review for patients triggering PIFU.
  - Photos can help to enable triage of new concerns.
- NHS England guidance[41] can be utilised by departments to set up PSFU for cSCC.
- Undertake local audits to establish patient experience, time to access review, clinical outcomes and healthcare resource use.

Rationale

Skin cancer is often suitable for self-monitoring as patients can be educated on signs of recurrence or spread. PSFU allows personalisation of follow-up, with some patients moving to a PIFU pathway while others continue with routine scheduled appointments. Several departments have successfully initiated this model for cSCC follow-up. These models have demonstrated a reduction in the number of outpatient clinic appointments over the follow-up period[42]. Patients must be educated on how to check the skin and lymph nodes, signs and symptoms of new cancer, recurrence or spread. Local criteria and the BAD SCC guidelines will help departments identify patients with cSCC that do not require regular review and can be offered a PSFU pathway.

Further considerations

Patients less likely to be suitable for self-monitoring should be excluded from the PIFU pathway, such as those with higher clinical risk of recurrence (multiple previous skin cancers, immunosuppressed), those unable to examine their skin or lymph nodes (due to capacity or physical barrier), those with anxiety/psychological distress that will benefit from the reassurance of clinic review, social factors such as language barriers, complex social circumstance and those who will struggle to trigger the PIFU pathway (e.g. with limited access to technology/phone/emails).

Benefits

Patients	Shared decision making Reduced burden of hospital appointments Appointments scheduled at time of requirement Empowered to self-manage	
Health service	Greater outpatient appointment availability	
Environment	38	kg CO_2e per case
	2.6	tonnes CO_2e per average unit annually
	323	tonnes CO_2e across England annually

Future considerations

The recommendations discussed above are not an exhaustive list of all actions that can be taken to decarbonise the skin lesion pathway. Sentinel lymph node biopsies, radiotherapy and systemic anticancer therapy have not been included in this guidance, due to the smaller number of annual cases receiving these treatments and the materiality assessment which selected recommendations with the biggest potential for environmental benefit. There are decarbonising opportunities within these areas which could also mitigate the environmental impact of skin cancer care. Use of systemic anticancer therapy for melanoma in England is increasing and the economic impact of this is already recognised[43]. Reducing the emissions from pharmaceutical production is a key priority, alongside identifying optimum dosage regimens for efficacy[44]. Studies such as the REFINE trial are currently evaluating reduced intensity immunotherapy for different cancers.

Artificial intelligence-assisted medical devices (AIaMD) in the assessment of skin lesions

Technology is a major focus in the government's 10-Year Health Plan, and the use of digital technologies and AI are rapidly changing and progressing within dermatology. The potential benefit of AI technologies to assess and triage skin lesions has been identified by NICE, who are gathering further evidence on their use via an early value assessment.

Use of AIaMD for lesion assessment has the potential to improve environmental sustainability in dermatology by identifying benign lesions and avoiding their referral or review. There may also be benefits to patients (via quicker diagnosis and treatment) and the health system (via increasing available clinician time). However, it is recognised that digital technologies can contribute to the climate crisis, through extraction and use of critical minerals, high energy and water consumption demands and electronic waste. Considering and minimising the environmental impact is paramount to ensure long-term sustainable use and to promote the net overall benefits that AI can have[45].

Principles to promote sustainable AI practices in healthcare include:

- Using the NHS Evergreen sustainable supplier assessment to ensure technology and AI companies publish carbon reduction plans and align with the Net Zero supplier roadmap requirements.
- Using circular principles for devices, with products that can be reused, remanufactured or recycled to preserve their value for as long as possible.
- Prioritising suppliers which use energy efficient AI models, renewable energy for data centres and reuse wasted heat.
- Prioritising suppliers with optimised models that can minimise processing power and encouraging developers to reduce the Graphics Processing Unit (GPU) where able.
- Prioritising companies with good 'data hygiene' – removing duplicated or redundant data and storing images for the minimum required time as per records requirement.
- Considering the environmental impact of new technologies as compared to current practice via robust life cycle assessments.
- Considering the resilience of AI and digital systems which can be at risk of failure during extreme weather events, potentially creating issues in wider systems.
- Using AI tools which are clinically effective.
- Ensuring AI tools do not introduce health inequalities and seeking to address existing ones.
    - AI-based dermatology diagnostic tools show less accuracy for darker skin tones due to under-represented training data[46].

- More evidence is needed to ensure that AI does not incorrectly detect or miss skin cancer in people with black or brown skin and this is identified by the NICE early value assessment.

Further considerations

NHS Online

A new online hospital planned for use from 2027 will allow patients to digitally connect to clinicians across England. This will enable patients to book virtual appointments if preferred, and investigations and procedures at a date and location convenient to them. There will be opportunities for emissions savings via remote consultation and reduced travel.

Audit checklist

1. Key actions to prevent skin cancer	
• The department has a named skin cancer prevention lead/liaison. • The department is involved in local prevention measures. • The department supports and engages with local school sun safety initiatives.	□ □ □
2. Optimise the use of advice and guidance (A&G) for skin lesions	
• Images are included with A&G requests. • The department has established inclusion/exclusion criteria thresholds for symptomatic benign skin lesions, and these are easily accessible to primary and secondary care. • The department audits the adherence to these thresholds at regular intervals. • The department utilises A&G response templates for common lesion referrals.	□ □ □ □
3. Adopt teledermatology for skin lesion assessment	
• The department has established local inclusion/exclusion criteria for teledermatology for skin lesions. • There is an agreed local protocol for high-quality image and history acquisition for lesions. • Image and history quality is regularly audited and feedback provided to those obtaining them. • Regular audit is undertaken to compare biopsy rates and management outcomes for lesions assessed via teledermatology compared to face-to-face assessment. • Opportunities for collaborative review (formal or informal) of indeterminate teledermatology cases are available. • The BAD service guidance and standards for the use of teledermatology are utilised and used to audit and benchmark services.	□ □ □ □ □
4. Avoid unwarranted diagnostic and therapeutic surgical procedures	
• Consultants engage regularly with NCIP data to benchmark personal practice. • The department monitors pre-excision biopsy rates. • The department discourages routine biopsy pre-Mohs. • The department does not routinely re-excise mildly dysplastic naevi excised with clear margins.	□ □ □ □
5. Incorporate frailty assessment in treatment decisions for the management of skin lesions	
• Frailty scores are included on referrals/calculated where relevant and included in skin cancer MDTs. • Symptoms caused by lesions are explored and documented as standard in skin lesion clinics. • Treatment aims are explored and document in skin lesion clinics.	□ □ □
6. Use a risk-stratified approach for the management of actinic keratoses	
• Referrals to secondary care for actinic keratoses are audited to confirm they meet referral criteria with reason specified: - Hypertrophic actinic keratosis where there is a concern that they might be early invasive SCC - Complex or field actinic keratosis change where topical therapy has not been effective. • For lesions requiring treatment, topical treatment is used first line when suitable.	□
7. Implement 'direct to surgery' pathways	
• Direct to surgery pathways are available. • A clear pathway is available for those wishing to opt-out.	□ □
8. Offer one stop 'see and treat' dermatology clinics	
• Same day surgery is available for suitable cases.	□ □

• One-stop clinics have suitable supervision to offer curative intent surgery as well as biopsy.	
9. Use an appropriate setting for skin procedures	
• Low risk skin surgery is performed in procedure rooms. • Surgical lists are resourced appropriately for their complexity. • Suitable settings are available for those with additional mobility or support needs.	□ □ □
10. 'Action-set' to decarbonise skin surgery procedures	
• Non-sterile, clean gloves are worn for minor skin procedures. • Single use sterile drapes are not used for minor skin procedures without buried sutures. • Single use surgical gowns are not routinely worn for skin procedures. • Absorbable sutures are offered for external skin closure. • Reusable/sterilisable skin surgery instrument sets have been reviewed and consolidated within the past 12 months.	□ □ □ □ □
11. Low carbon management of surgical waste	
• All staff are compliant with relevant waste training. • Yellow-and-black striped bags are available in skin procedure rooms. • Yellow-and-black striped bags are utilised for skin procedures with no increased infectious risk. • Recycling is available in skin procedure rooms. • Correct waste stream for soft plastics (e.g. domestic/dry mixed recycling) has been identified locally and is used for packaging. • Local waste audits are undertaken at regular intervals.	□ □ □ □ □ □
12. Offer personalised stratified follow-up (PSFU) following cutaneous SCC (cSCC) diagnosis when suitable	
• Local criteria for PIFU pathway for cSCC have been agreed and documented. • Clear routes for those triggering PIFU pathways have been established. • Departmental audit of those on the PIFU pathway has been undertaken, considering patient experience and number of outpatient appointments in follow-up period.	□ □ □

Glossary

Advice and guidance (A&G): A two-way, digital, asynchronous dialogue between requesting and responding clinicians. Images can be attached to the advice request, and the request can be converted to a referral or returned with advice only. Primary care professionals can obtain advice from specialists in secondary care, giving patients advice on their suspected condition more quickly than waiting to be seen in the outpatient department.

Artificial intelligence as a medical device (AIaMD): AI or machine learning software intended for a medical purpose that meets the definition of a medical device and is subject to regulatory approval.

British Association of Dermatologists (BAD): The leading professional body for dermatologists in the UK and a registered charity with the primary aim of improving skin health through education, training, research and setting clinical standards for dermatology services.

High-quality clinical images: Medical photographs that enable reliable remote assessment. The referrer must confirm that the skin lesion looks the same on the screen as it does in real life. They can be taken on a phone camera or digital camera and should include as a minimum:

- one regional view locating the anatomical location;
- at least one close-up image of the whole lesion;
- a lateral close-up image for lesions that are raised from the skin, to show the lesion in profile, if feasible;
- a dermoscopic image

National Consultant Information Programme (NCIP): A free data platform which allows consultants to review their own surgical data.

Patient initiated follow-up (PIFU): allows a patient or carer to book follow-up appointments if and when they need them, rather than at routine intervals.

Teledermatology: A broad range of activities which use digital images to remotely triage, diagnose or monitor skin lesions without the patient being physically present. Within this guideline teledermatology includes:

- images attached to A&G requests. These can be taken by patients directly or in primary care;
- dedicated photography clinics where patients are triaged to following referral to secondary care. Usually, high-quality images are taken including dermoscopic images;
    - the physical setting for the clinics varies and can be in primary care hubs, peripheral hospital sites, main dermatology departments, or community diagnostic centres.
- patients on follow-up pathways after skin cancer diagnosis who develop new lesions of concern may send images to the dermatology team e.g. their skin cancer keyworker.

Urgent suspected skin cancer (USSC) pathway: Used for patients who meet **NICE NG12 criteria** with suspected squamous cell carcinoma, malignant melanoma, and rare skin cancers. This pathway also includes BCC where there is particular concern that a delay may have a significant impact because of factors such as lesion site or size. Following USSC referral patients can be seen in a skin cancer outpatient clinic or in a virtual teledermatology interaction.

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Acknowledgements

We are grateful to the clinicians and patients who engaged with the production of this guide through visits and stakeholder discussions.

This work was supported by the Sustainable Health Systems Hub. One of seven national hubs tasked with helping the NHS to become environmentally sustainable, the SHS Hub brings together a range of university and healthcare partners from across the UK to tackle the challenge of helping the NHS become environmentally sustainable. Led by University of Exeter, it interconnects healthcare leaders, key industry partners and academics from across many social, economic and environmental disciplines to create sustainable health and social care pathways and tackle environmental pollution.

Hub work package 02 – Rapid Action facilitates ongoing development and evaluation of the Environmental Lessons Learned and Applied (ELLA) methodology, designed and used by GIRFT to produce environmentally sustainable care pathway recommendations.

This work is supported by the UK Research and Innovation Building a Green Future strategic theme, The National Institute for Health and Care Research (NIHR), Medical Research Council (MRC), Natural Environment Research Council (NERC) and Engineering and Physical Sciences Research Council (EPSRC) APP29811 MR/U506692/1.

This work was also supported by South Warwickshire University Foundation Trust, Health Innovation West Midlands and the British Association of Dermatologists.

This is the fourth guide in the series and follows the release of the Greener Bladder Cancer, Greener Hip Replacement and Greener Urinary Tract Stones pathway guides.

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