Health Innovation Network

Transforming Wound Care Programme:
Carbon (Net Zero) Impact Report

1. Executive Summary

In England, there is considerable variation in leg ulcer practice and outcomes, which can lead to increased healing times, increased comorbidities and amputations, as well as increased costs of care. This unwarranted variation offers major opportunities to improve healing rates and reduce recurrence rates, thus reducing individual suffering, spending on inappropriate and ineffective treatments and the amount of clinical time spent on care. The National Wound Care Strategy Programme (NWCSP) was launched in 2018 to address the issue of sub-optimal wound care. Evidence points to marked unwarranted variation in UK wound care services, underusing evidence-based practices and overuse of ineffective practices.

In 2022, the Health Innovation Network implemented the Transforming Wound Care (TWC) programme, a real-world evaluation of the implementation of the lower limb recommendations developed by the NWCSP. Eight Test and Evaluation Sites (TES) participated in the TWC programme. The data generated by the TES sites has been used to estimate the potential carbon benefit of this programme.

Based on analysis, it is reasonable to assume that a healed wound has a lower carbon impact than an unhealed wound (annual variance of 656 kg CO2e). In addition, the total estimated carbon impact of caring for **2,936** patients, using best practices, is **928,346 kg CO2e**[1].

A scenario has been modelled which shows that if all patients currently having best practice care were managed sub-optimally, the estimated carbon impact would have been **2,504,254 kg** CO2e; an annual net impact (i.e. more carbon-intensive) of **1,575,908 kg** CO2e, equivalent to 5,876,580 miles driven and would take **64,000** planted trees (an area the size of 10 football pitches) a year to absorb.

Although the current data is limited, it is considered important to demonstrate the potential carbon impact of good patient care to continue developing new delivery models and support the adoption of best practices.

It is recommended that this evaluation be used to demonstrate early impact, and once data continues to be collected, further analysis be undertaken to increase the accuracy of the analysis and the assumptions.

2. Background to Prioritising Wound Care:

In England, there is considerable variation in leg ulcer practice and outcomes, which can lead to increased healing times, increased comorbidities and amputations, as well as increased costs of care.

[1] Includes estimated recurrent wounds

This unwarranted variation offers major opportunities to improve healing rates and reduce recurrence rates, thus reducing individual suffering, spending on inappropriate and ineffective treatments and the amount of clinical time spent on care.[2] Leg ulcers are ulcers on the lower leg that have not healed within two weeks.

England has an estimated 739,000 leg ulcers, with estimated associated healthcare costs of £3.1 billion per year, placing a significant burden on NHS services.[3]

The National Wound Care Strategy Programme (NWCSP) was launched in 2018 to address the issue of sub-optimal wound care. Evidence points to marked unwarranted variation in UK wound care services, underuse of evidence-based practices, and overuse of ineffective practices.

The NWCSP developed several recommendations to provide clear advice to health and care practitioners, service managers and commissioners about the fundamentals of evidence-informed care for people with lower limb leg ulcers. Implementing these recommendations aimed to achieve better individual outcomes and more effective use of healthcare resources. The recommendations outline a pathway of care for people with lower limb wounds that promotes early assessment and diagnosis, enabling fast access to evidence-informed therapeutic interventions, with escalation of treatment or service provision for people requiring more complex care.[4]

Seven Health Innovation Networks tested the implementation of the lower limb recommendations across eight Test and Evaluations Sites (TES) in a scaled real-world evaluation. The implementation support was provided between April 2022 and March 2024, with the evaluation concluding in the Summer of 2024.

3. Background to prioritising Carbon Impact

In October 2020, the NHS became the world's first health service to commit to reaching carbon net zero in response to the profound and growing threat to health posed by climate change. The "Delivering a Net Zero Health Service" report sets out carbon reduction targets set out in legislation, along with a number of areas of focus[5]. One of these areas is *Sustainable Models of Care*. If the NHS is to reach net zero emissions, that new service model must include a focus on sustainability and reduced emissions[6].

4. Quantifying the Carbon (Net Zero) Impact of the NWCSP Lower Limb Recommendations

The Health Innovation Network TWC central team worked with the National Net Zero Lead to explore the potential carbon impact of implementing the NWCSP lower limb recommendations. Early discussions highlighted limitations to quantifying impact based on currently collated metrics. The TWC programme aimed for sites to collect key metrics to

2 https://www.nationalwoundcarestrategy.net/

3 https://www.nationalwoundcarestrategy.net/wp-content/uploads/2023/08/NWCSP-Leg-Ulcer-Recommendations-1.8.2023.pdf
4 https://www.nationalwoundcarestrategy.net/wp-content/uploads/2023/08/NWCSP-Leg-Ulcer-Recommendations-1.8.2023.pdf

5 https://www.england.nhs.uk/greenernhs/
6 https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2022/07/B1728-delivering-a-net-zero-nhs-july-2022.pdf

demonstrate patient impact. These metrics could also be used to quantify the programme's carbon impact.

These metrics were as follows:

- Number of patients referred for new assessment of lower leg wound
- Number of patients with a lower leg wound receiving full assessment in line with NWCSP lower limb recommendations
- Number of patients recorded as healed 0-12 weeks / 12-24 weeks / 24-52 weeks / >52 weeks after identification by a health care practitioner.

In addition to these metrics, there are two key planning documents that were of relevance to determining potential carbon impact, as outlined below;

1. NWCSP Investment Case Model
2. Chronic Lower Limb Wounds Implementation Case[7]

4.1.NWCSP Investment Case Model

The NWCSP Investment Case Model determined the potential impact of implementing the NWCSP recommendations. It estimates the current and future cost of leg ulcer care to the NHS, without any further intervention (the baseline) and the potential impact of implementing the NWCSP recommendations in terms of clinical patient outcomes (healing and recurrence), the prevalence of leg ulcers and the cost of providing leg ulcer care.

4.2. Chronic Lower Limb Wounds Implementation Case

The Preventing and Improving Care of Chronic Lower Limb Wounds Implementation Case includes several estimates, such as:

- *69% of current venous leg ulcer patients are treated with compression therapy (bandaging, hosiery or wraps). Of the 69% at least 74% are expected to heal within 12 months. with only 18% of healed leg ulcers recurring within 12-months*
- *31% receiving 'other care' with 32% will heal within 12 months, and almost half (46%) of healed leg ulcers will recur within 12 months*.

Increasing the proportion of patients receiving evidence-based care could significantly improve clinical outcomes for many patients.[8]

5. Methodology

Appendix A details the methodology used to calculate the estimated annual carbon cost of a healed and unhealed leg ulcer. A mixed activity and spend-based approach was used, which is aligned to greenhouse gas protocol guidance[9] (average and spend-based data method).

A number of different assumptions/calculations were modelled, and the most conservative (lowest) estimate of carbon intensity was used.

[7] https://www.nationalwoundcarestrategy.net/wp-content/uploads/2021/04/NWCSP-Implementing-the-Lower-Limb-Recommendations-15.12.20-1.pdf
[8] https://www.nationalwoundcarestrategy.net/wp-content/uploads/2021/04/NWCSP-Implementing-the-Lower-Limb-Recommendations-15.12.20-1.pdf
[9] https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

The biggest areas of carbon intensity for an unhealed leg ulcer are in medicines (anti-infectives) and nursing care (see Appendix B).

The estimated *annual* carbon cost is as follows:

- Healed leg ulcer – 270 kg Carbon Dioxide equivalent (CO2e)
- Unhealed leg ulcer - 926 kg CO2e
- Variance between healed and unhealed - 656 kg CO2e.

6. Data / Results

April 2023 – March 2024 data was used to model the potential carbon impact; as it provided between 6 and 12 months data across the 8 TWC sites (data collection only started in September 2022 and was not complete across all TES sites until Oct 23).

Table 2 - Patients cared for using NWCSP best practice

	No. Patients	**Est. Kg CO2e emitted**
Healed 0-12 weeks	1,801	112,202
Healed 12-24 weeks	564	70,331
Healed 24-52 weeks	363	98,083
Healed >52 weeks	208	192,733
Total (not inc. Recurrent[10] leg ulcers)	**2,936**	**473,349**
Recurrent wounds	491	454,998
Total (inc. Recurrent leg ulcers)	**2,936**	**928,346**
Carbon Impact per Patient (not inc. recurrent leg ulcers)		161
Carbon Impact per Patient (inc. recurrent leg ulcers)		316

Table 2 - Estimated Baseline – Sub-Optimal Pathway

	No. Patients	**Est. Kg CO2e emitted**
Healed within 12 months	940	253,858
Not healed	1,996	1,849,938
Total (not inc. Recurrent leg ulcers)	**2,936**	**2,103,797**
Recurrent leg ulcers	432	400,457
Total (inc Recurrent leg ulcers)	**2,936**	**2,504,254**
Carbon Impact per Patient (not inc. recurrent leg ulcers)		717
Carbon Impact per Patient (inc. recurrent leg ulcers)		853

[10] The TWC Programme did not track re-occurrence rates, so these are estimates only using the *Preventing and Improving Care of Chronic Lower Limb Wounds Implementation Case.*

7. Analysis

- The total estimated carbon impact of caring for **2,936** patients using best practices for wound care is **928,346 kg** CO2e.
- Under sub-optimal care, using the total number of patients (2,936) as the baseline scenario, the estimated carbon impact would have been **2,504,254 kg** CO2e
- By implementing best practices, the estimated carbon impact reduction is = **1,575,908 kg CO2e** which is a **63%** reduction.
- The estimated carbon intensity[11] per patient for best practice is **316 kg CO2e** compared to sub-optimal **853 kg CO2e**, a variance of **537kg CO2e**
- The majority of the carbon impact reduction comes from the faster healing times and the subsequent reduced medical support as well as the estimated lower recurrence rates achieved through best practices. The reduction in prescribing, dressings, and nursing are the main areas of carbon emissions.
- There are potential productivity gains through the reduced number of visits and patient contact time for each healed patient.
- The data suggests that early intervention and adherence to best practices can significantly improve patient outcomes while also reducing the environmental impact of wound care.

8. Limitations of Data / Methodology

The TWC data had a number of limitations including, but not limited to;

- Not all TES sites record all data metrics i.e. some sites may not have been able to record if a patient is having a full assessment in line with the lower limb recommendations but have recorded healing rates.
- Not all TES sites have recorded metrics for the entirety of the reporting period.
- Some TES sites still report that the maturity and confidence of the data has limitations.

Due to these limitations, the above methodology of comparing what the carbon cost of managing these known patients (who had healed) *sub-optimally* was felt to be the most prudent to compare in a fair and transparent way based on the limitations of the data. (**Appendix A – Calculations and Workings)**

9. Carbon Equivalency

It can be difficult to understand carbon intensity based on kg CO2e, so it is often common practice to turn this data into carbon equivalencies. For the purpose of this evaluation, a number of carbon equivalencies were used. This is in an attempt to give some form of scale and frame of reference to how carbon-intensive care is and the associated savings.

The Net Zero impact[12] between best practice and estimated sub-optimal care is equivalent to **5,876,589** miles driven (average car) which is the same as the annual miles of around **923** cars and would take **64,000** planted trees (10 football pitches) a year to absorb.

[11] Carbon Intensity is based on total estimated carbon divided by number of patients treated, therefore is different to the estimated carbon cost for a healed / unhealed wound

[12] Includes estimated recurrent wounds

Table 1 - Carbon Equivalencies

	Best Practice – Total (inc. recurrent leg ulcers)	**Estimated Baseline: Sub-Optimal Pathway – Total** (inc. recurrent leg ulcers)	**Estimated Net Zero Impact** (inc. recurrent leg ulcers)
Equivalent Car Miles (Unknown Fuel/Average Car)	3,461,815	9,338,395	**5,876,580**
Equivalent Avg. UK Cars	543	1,466	**923**
Trees (per year)	37,707	101,716	**64,009**
Football Pitches of Trees	6	16	**10**

10.Conclusions / Recommendations

This evaluation aims to support the emerging accepted assumption that good patient care is also good for the planet and that improving patient care and outcomes can achieve carbon savings.

The data that has been used does have limitations, but it is hoped that as data quantity and quality continue to improve, a review of the carbon impact can be undertaken.

The analysis, whilst attempting to be comprehensive, is still relatively high-level in terms of impact. Depending on the anticipated benefit, it may be prudent to conduct a deeper dive or life cycle analysis on specific products and elements of the pathway. This will need to be weighed up against the resources needed to undertake this work.

It is recommended that this evaluation be used to demonstrate early impact, and once data continues to be collected, further analysis is undertaken to increase the accuracy of the and the assumptions.

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Health Innovation Network

Appendix A – Calculations and Workings

Patients cared for using NWCSP best practice	No. Patients	Est. Kg CO2e emitted	Workings
Healed 0-12 weeks	1,801	112,202	1801 × 62.3
Healed 12-24 weeks	564	70,331	564 × 124.7
Healed 24-52 weeks	363	98,083	363 × 270.2
Healed >52 weeks	208	192,733	208 × 926.6
Total (not inc Recurrent Wounds)	**2,936**	**473,349**	
Recurrent wounds	491	454,998	(1801 + 564 + 363) × 0.18 = 491 × 926.6.
Total (inc Recurrent Wounds)	**2,936**	**928,346**	
Carbon Impact per Patient (not inc. recurrent wounds)		161	
Carbon Impact per Patient (inc. recurrent wounds)		316	

Estimated Baseline – Sub-Optimal Pathway	No. Patients	Est. Kg CO2e emitted	Workings
Healed within 12 months	940	253,858	2,936 × 0.32 = 940 × 270.2
Not healed	1,996	1,849,938	2,936 – 939 = 1,996 × 926.6
Total (not inc Recurrent Wounds)	**2,936**	**2,103,797**	
Recurrent wounds	432	400,457	914 × 0.46 = 432 × 926.6
Total (inc Recurrent Wounds)	2,936	**2,504,254**	
Carbon Impact per Patient (not inc. recurrent wounds)		717	
Carbon Impact per Patient (inc. recurrent wounds)		853	

Analysis		Est. Kg CO2e emitted	Workings
Estimated Net Zero Impact (not inc. recurrent wounds)		1,630,448	C14+C15-C6
Estimated Net Zero Impact (inc. recurrent wounds)		1,575,908	C17-C8
Carbon Impact variance per Patient (not inc. recurrent wounds)		555	C18-C9
Carbon Impact variance per Patient (inc. recurrent wounds)		537	C19-C10

Estimated Carbon Cost (kg CO2e)	Annual	12 weeks	24 weeks	52 weeks
Healed	270.2	62.3	124.7	270.2
Unhealed	926.6			

Carbon Equivalencies

Patients cared for using NWCSP best practice	No. Patients	Est. Kg CO2e emitted	Equivalent Car Miles (Unknown Fuel/Average Car)	Equivalent Avg. UK Cars	Trees (per year)	Hectares of trees	Football Pitches of Trees
Total (not inc Recurrent Wounds)	2,936	473,349	1,765,123	277	19,226	12	3.0
Total (inc Recurrent Wounds)	2,936	928,346	3,461,815	543	37,707	24	6.0
Estimated Baseline – Sub-Optimal Pathway	No. Patients	Est. Kg CO2e emitted					
Total (not inc Recurrent Wounds)	2,936	2,103,797	7,845,084	1,232	85,451	53	13.5
Total (inc Recurrent Wounds)	2,936	2,504,254	9,338,395	1,466	101,716	64	16.1
Estimated Net Zero Impact (not inc. recurrent wounds)		1,630,448	6,079,962	954	66,225	41	10.5
Estimated Net Zero Impact (inc. recurrent wounds)		1,575,908	5,876,580	923	64,009	40	10.1

Preventing and Improving Care of Chronic Lower Limb Wounds Implementation Case includes a number of estimates including:

- *69% of current venous leg ulcer patients are treated with compression therapy (bandaging, hosiery or wraps). Of the 69% at least 74% are expected to heal within 12 months. with only 18% of healed leg ulcers recurring within 12-months*
- *31% receiving sub-optimal care (baseline) with 32% will heal within 12 months, and almost half (46%) of healed leg ulcers will recur within 12 months.*

Appendix B – Estimated Carbon Intensity of Treatment

Resource	Healed	Not healed	Unit	Source	Kg (CO2e)	Healed Kg (CO2e)	Unhealed Kg (CO2e)
GP visits	1.9	4.5	No.	SHC	2.3	4.21	10.2
Specialist nurse visits	0.0	0.0	No.	SHC	2.3	0.04	0.0
Allied health-care visits	0.1	0.2	No.	SHC	2.3	0.24	0.5
Hospital outpatient visits	0.3	2.8	No.	Unit Costs of Health and Social Care 2019	22.2	6.33	63.3
Hospital admissions	0.3	0.5	No.	SHC	37.9	9.51	19.0
Laboratory Tests	£ 102.85	£ 57.99	£	Defra	0.292	30.02	16.9
Devices	£ 33.62	£ 67.06	£	Defra	0.672	22.61	45.1
Prescriptions for analgesics	£ 38.48	£ 154.59	£	Defra	0.621	23.89	96.0
Prescriptions for anti-infectives	£ 85.73	£ 351.22	£	Defra	0.621	53.24	218.1
Dressing pack	£ 5.36	£ 22.13	£	Defra	0.672	3.61	14.9
Saline	£ 6.96	£ 28.71	£	Defra	0.621	4.32	17.8
Foam dressing	£ -	£ -	£	Defra	0.621	0.00	0.0
Foam Adhesive dressing (sub-optimal)	£ 35.98	£ 153.59	£	Defra	0.621	22.34	95.4
Compression bandaging 4-layer	£ 29.78	£ 127.11	£	Defra	0.672	20.02	85.5
Compression hosiery	£ 13.87	£ -	£	Defra	0.672	9.33	0.0
Community nurses	£ 140.71	£ 571.26	£	Defra	0.292	41.08	166.8
Practice nurses	£ 58.59	£ 230.81	£	Defra	0.292	17.10	67.4
Wound Contact Layer	£ 3.38	£ 14.45	£	Defra	0.672	2.28	9.7
					TOTAL	**270.2**	**926.6**