**In-Centre Haemodialysis Care Pathway Evaluation and Carbon impact report**

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**Executive summary**

Sheffield Teaching Hospitals NHS Foundation Trust (STH) has developed a carbon impact report with the aim of minimising the environmental impact of its renal services.

The aim of this project was to:

* Undertake a comprehensive evaluation to understand the environmental impact of Haemodialysis (HD) delivery for services at Sheffield Teaching Hospitals NHS Foundation Trust.
* Identify common metrics to develop Key Performance Indicators (KPI’s) to demonstrate performance and improvement.
* To use the available toolkit to develop a baseline measurement and to identify opportunities for reduction.
* Development of a more sustainable care pathway for patients with End-Stage Kidney Disease (ESKD).

This report includes the evaluation of outpatient In-centre Haemodialysis (ICHD) services at the Northern General Hospital which includes the wards Renal Unit G, Peter Moorhead unit and Vickers 1.

The findings of this evaluation will support the STH delivery of the NHS targets1

* For the emissions that the NHS control directly (the NHS Carbon Footprint), we will reach net zero by 2040, with an ambition to reach an 80% reduction by 2028 to 2032.
* For the emissions the NHS can influence (our NHS Carbon Footprint Plus), we will reach net zero by 2045, with an ambition to reach an 80% reduction by 2036 to 2039.”

1 [Greener NHS » Delivering a net zero NHS (england.nhs.uk)](https://www.england.nhs.uk/greenernhs/a-net-zero-nhs/)

**Overall greenhouse gas emissions impacts breakdown**

The total Green House Gas emissions (GHG) for ICHD at Sheffield Teaching Hospitals NHS Foundation Trust are calculated to be **827,947 kgCO2e** during the year of **2023**.

There was a total of **48,204** dialysis sessions which equates to GHG emissions of **17kg CO2e** per session.

The GHG emission are broken down in figure 1 below. These activities can be grouped into four broad categories.

* Utilities (electricity, heat and water supply)- 25 %
* Travel (patients & staff)- 40%
* Equipment, consumables & pharmaceuticals- 30%
* Clinical and domestic waste - 5%.

**Total Haemodialysis care pathway CO2e emissions**

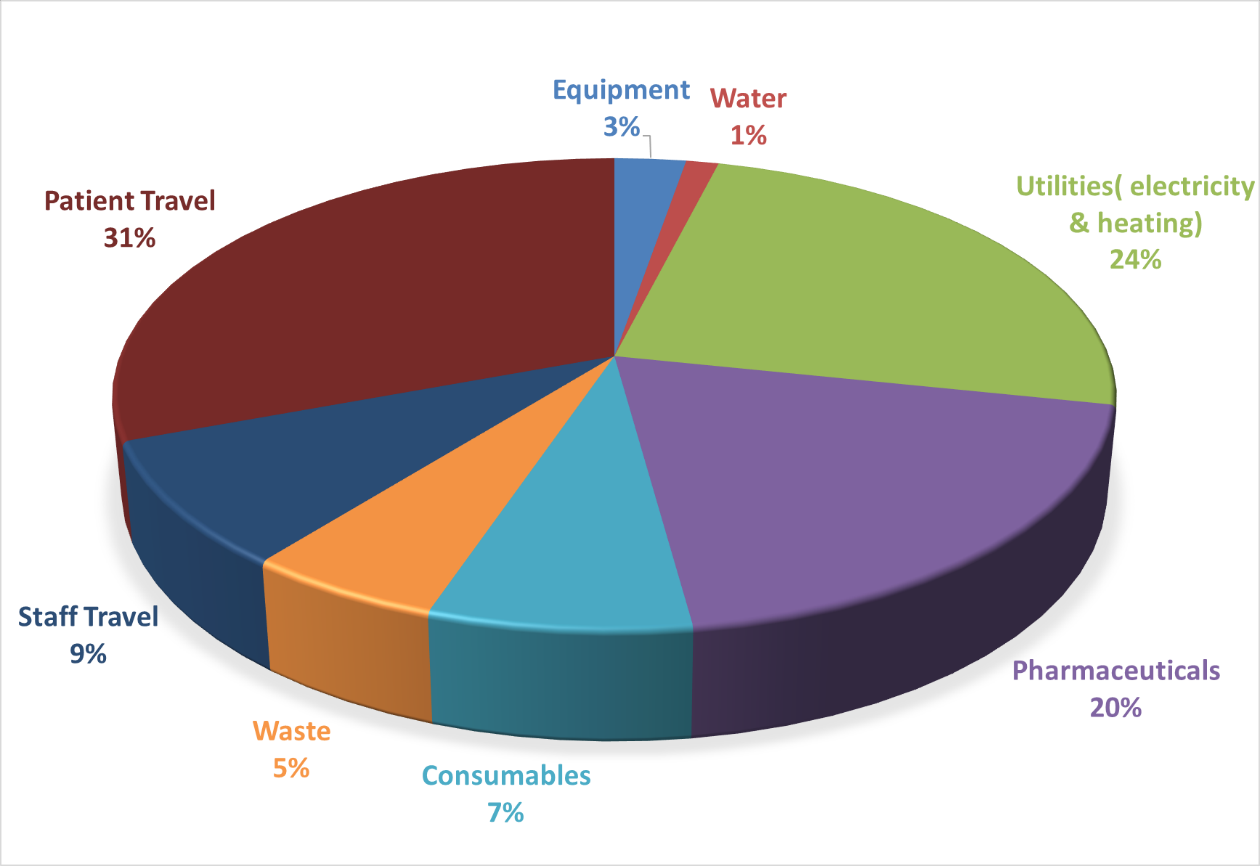


Figure 1

**Conclusions and recommendations**

This evaluation aimed to provide the first step in developing a roadmap to deliver a net-zero renal care pathway. The environmental impacts of haemodialysis at Sheffield Teaching Hospitals during 2023 have been calculated and an understanding of which activities contribute to the overall carbon emissions has been achieved. The evaluation was undertaken using the Sustainable healthcare coalitions’ ICHD carbon calculator. This calculator presented limitations, such as the use of generic footprints for pharmaceutical, consumables and equipment. This highlighted the requirement to improve the data metrics to give a more accurate baseline to work from. Following this, Key Performance Indicators (KPI) can be agreed and tracked as actions are completed. The action plan is included in the closing section below. To support this work, a project team with clinical, corporate, estates and facilities members will be required.

The following **key findings** can be drawn from the ICHD pathway evaluation.

* The total GHG impact of providing **48,204 sessions** of ICHD at Sheffield Teaching Hospitals is estimated to be **827,947 kgCO2e** and can be expressed as **17 kg CO2e** per dialysis session.

A contribution analysis of the above GHG impact reveals:

* The impacts associated with fossil fuel production and combustion to power both patient travel and staff commutes makes the largest contribution, 40% of the total.
* The impacts associated with the manufacture, packaging and distribution of the used pharmaceuticals, consumables, and equipment makes the second largest contribution, 30% of the total.
* The utilities required, and the impacts associated with their energy and water consumptions, makes a significant contribution, 25% of the total.
* The impacts associated with treatments of generated solid waste, have a smaller contribution of 5% of the total.

The following **recommendations** will be explored to help reduce the environmental impacts associated with providing ICHD care.

* **Undertake a deep dive into patient travel arrangements**.
* **Explore opportunities to move patient treatment closer to home.**
* **Review the current “Do Not Attend” (DNA) rates.**
* **Undertake a specific travel survey of the staff working within the Renal wards at STH.**
* **To work with the Sustainable Healthcare Coalition to improve the metrics.**
* **Evaluation of the manufacture, packaging and distribution of consumables and pharmaceuticals**.
* **Engage with Estates to assess whether utilities metering could be undertaken.**
* **Improve waste streams and introduce recycling**.
* **Collaboration with estates to improve the baseline metric for water usage.**
* **Review opportunity to reduce flow through dialysis machines to reduce water usage.**
* **Agree KPI’s and metrics to support the roadmap to net zero.**

**Further recommendations**

During the data collection and staff engagement phase of the project, patient engagement was identified as an area that needed specific focus. Gaining insight from our patients is key to drive any social value initiatives that populate the action plan. This also fits with the organisation’s strategic aim of providing a patient centred service and creating a sustainable organisation. Engaging with patients will also allow the “what matters to you” to feature in the planning and delivery of haemodialysis in the future. The recommendation is:

* **Conduct a patient survey to assess social value and thoughts on sustainable healthcare.**

**2- In-Centre Haemodialysis Care Pathway Evaluation and Carbon impact report**

* 1. **Introduction and reason for study**

Sheffield Teaching Hospitals NHS Foundation Trust (STH) has developed a carbon impact report with the aim of minimising the environmental impact of its renal services.

The aims of this project were to:

* Undertake a comprehensive evaluation to understand the environmental impact of Haemodialysis (HD) delivery for services at Sheffield Teaching Hospitals NHS Foundation Trust.
* To use the available toolkit to develop metrics and a baseline measurement and to identify opportunities for reduction in carbon intensity of the service.
* Development of a more sustainable care pathway for patient with End-Stage Kidney Disease (ESKD).

This report includes the evaluation of outpatient In-Centre Haemodialysis (ICHD) services at the Northern General Hospital including the three wards, Renal Unit G, Peter Moorhead unit and Vickers 1. It was undertaken in compliance with the guidance on appraising sustainability of care pathways2.

It is hoped that the findings from this evaluation, in addition to the implementation of outlined recommendations, will help support the NHS with its carbon reduction targets, as detailed below:

* “The NHS aims to achieve carbon net zero emissions by 2045 (with an 80% reduction by 2036 – 2039)
* Ensuring that suppliers decarbonise their own processes, the NHS will no longer purchase from suppliers who do not meet or exceed NHS outlined targets, by the end of the decade.”

[Sustainable Care Pathways Guidance | Sustainable Healthcare Coalition (shcoalition.org)](https://shcoalition.org/sustainable-care-pathways-guidance/)

* 1. **Scope**

This evaluation aims to improve the understanding the environmental impact of Haemodialysis at STH.

The Green House Gas (GHG) emissions, referred to as the carbon footprint were investigated for the three wards at STH that provide Haemodialysis.

* 1. **Description of the care pathway**

The scope of this evaluation covers the activities of the dialysis unit at STH, which delivers long terms HD treatment to out-patients with End Stage Kidney Disease (ESKD). The evaluation was undertaken for the year 2023, which reflects current practice post Covid-19 pandemic.

There are additional patients that receive treatment either at home or in one of the satellite units. The satellite units include Barnsley (Barnsley District General Hospital), Chesterfield (Chesterfield and North Derbyshire Royal Hospitals), Rotherham (Rotherham District General Hospital), and Sheffield (Located at Heeley). Heeley is classes as an STH unit, Rotherham is privately owned. These have not been included as part of this evaluation.

The ward opening times are shown in the table below

|  |  |  |
| --- | --- | --- |
| **Ward** | **Days open** | **Opening hours** |
| Peter Moorhead unit | Sunday- Friday | 06.30am- 21.15pm |
| Renal Unit G | Monday- Saturday | 06.30am- 21.15pm |
| Vickers 1 | Monday/ Wednesday/ Friday | 06.00am-21.00pm |

The typical ICHD pathway would comprise of the following sequence

A diagram of a company

Description automatically generated

The care pathway includes the environmental impacts arising from the manufacture, distribution, use, and end of life treatment of the following:

* Electricity, fuel, and water usage from the ICHD unit.
* Electricity, fuel, and water usage from the shared hospital resources used by the staff/patients associated with the HD unit (such as car parks, restaurants, general management and administration, portering services, and facilities).
* Dialysis machines and water treatment plant equipment.
* Consumable products used, e.g. dialysers and bloodlines; and pharmaceutical products used, e.g. acid dialysis concentrates and other solutions.
  1. **Description of our patients**

All Adult patients (18+ years) undergoing ICHD treatment at STH during 2023.

There were 927 dialysis slots per week with 309 patients undergoing dialysis treatment. This equates to 48,204 dialysis sessions per year.

* 1. **Impacts appraised**

The environmental impacts appraised in this study include:

* GHG emissions, i.e. a measure of the emissions of GHG contributing to climate change, expressed in kg CO2e.
* Direct freshwater use, expressed in m3;
* Direct waste generation, which includes generation of solid waste, expressed in kg.
  1. **Unit of analysis**

Total number of dialysis sessions 48,204 undertaken at STH per annum.

* 1. **Exclusions and limitations**

In line with the Sustainable Care Pathways guidance, some activity data has been omitted from the evaluation. This is due to their expected immateriality in relation to the total calculated environmental impacts. The omitted activity data includes:

* Capital goods (e.g. infrastructure).
* Corporate services.
* Clinical research.
* Staff training; and
* Administrative, regulatory, or other functions not directly connected to the direct provision of ICHD.

The limitations of the study are related to data quality and the use of secondary data and assumptions for some processes and activities, including the following:

* Use of estimated values for waste, energy and water as the dialysis units are not metered.
* Use of generic items for consumables and pharmaceuticals due to the specific STH items not being available on the carbon footprint calculator.
* Omission of some pharmaceuticals and consumables due to options not being available on the carbon footprint calculator.

1. **Data and Analysis**

**3.1- Overview**

The activity data was collected from STH including the total amount of pharmaceuticals, consumables, equipment and utilities used for ICHD renal care on wards Renal unit G, Peter Moorhead unit and Vickers 1 during 2023. This involved selecting an option for each item/ product from a pre-populated list. In some instances, the STH specific option was not available and required the use of the default generic option instead.

For the waste, energy and water usage estimated values were provided by the Estates and Waste management departments.

The following section presents the data used and describes the assumptions used and limitations of each of the activity types.

The analysis of the data provides further understanding of the hotspots within the pathway, allows recommendations to be made to deliver improvements and reduce the carbon intensity of the Haemodialysis service.

**Total renal care emissions by activity**

The table below demonstrates the carbon emissions associated with each activity and provides a breakdown of the carbon impact per session and contribution to the overall carbon footprint.

|  |  |  |  |
| --- | --- | --- | --- |
| **Activity** | **Annual Impact kgCO2e** | **Session Impact kgCO2e** | **% Contribution** |
| Equipment | 22,313.10 | 0.46 | 3% |
| Water | 10,146.94 | 0.21 | 1% |
| Utilities (electricity & heating) | 201,772.17 | 4.19 | 24% |
| Pharmaceuticals | 161,990.52 | 3.36 | 20% |
| Consumables | 60,689.99 | 1.26 | 7% |
| Waste | 45,613.79 | 0.95 | 6% |
| Staff Travel | 71,290.68 | 1.48 | 9% |
| Patient Travel | 254,130.28 | 5.27 | 31% |
| **Total** | **827,947.48** | **17.18** | **100%** |

* 1. **Patient travel**

The patient data was calculated using the Haemodialysis winter planning data. This data provided the postcode and method of transport for patients attending for Haemodialysis. The postcodes were used to calculate the distance travelled using google maps. The table below shows the number of patients, mode of transport and average mileage/ km travelled for a round trip.

|  |  |  |
| --- | --- | --- |
| **Transport type** | **Number of patients** | **Average milage** |
| Car/ carer transport | 43 | 14.33 |
| Hospital transport | 266 | 14.33 |
| Total patients | 309 |  |
| Average mileage |  | 14.33 |
| Average in km |  | 22.5 |

The emission factor used to characterise the impact of taxi transport was sourced from the Government conversion factors for reporting of greenhouse gas emissions and is inclusive of both fuel emissions and well-to-tank fuel production. The annual emissions associated with patient travel equates to **254,130 kgCO2e.**

The chart below shows that only 34% of patients travel to their appointment using their own car. 66% of patients are either transported by taxi or ambulance/ Medicar.

At this stage, for patients using their own transport it is unclear what type of vehicle is used, therefore emissions for an average car were used for the calculation. There is a significant proportion of patients who are using hospital transport. The proportion of petrol/ diesel/ electric vehicles is unknown. Therefore, the recommendations made are to:

* **Undertake a deep dive into the travel arrangements to gain a greater undertaking of the use of hospital transport and the type of vehicles that are being used.**
* **Explore opportunities to move patient treatment closer to home, thereby reducing “care miles” associated with Haemodialysis.**

During discussions with the team there was concern over the “Did Not Attend (DNA)” rates and it was felt that this was something to be reviewed to reduce the waste of resources. The recommendation was made to:

* **Review the current DNA rates and gain an understanding of the reasons. Reducing the DNA rate will improve the use of resources and avoid waste.**
  1. **Staff travel**

Primary data was collected via the recent staff travel survey (April 2024). The data for South Yorkshire Regional Services (SYRS) was extracted and used for this calculation as specific data for staff on the renal unit would only have been possible with an additional staff survey and this survey was felt to be representative.

The SYRS data included 49 participants. The table below demonstrates the modes of transport. The average mileage was calculated at 14.5 for a round trip.

|  |  |  |
| --- | --- | --- |
| **Staff Travel Method** | **Number of staff** |  |
| Bus | 7 | 14% |
| Car/van | 33 | 67% |
| Cycle | 2 | 4% |
| Motorcycle | 1 | 2% |
| Walk (or wheel) | 6 | 12% |
| Total | **49** |  |

The annual emissions associated with staff travel equates to **71,291 kgCO2e**. It is encouraging to see that 30% of staff actively travel to work either by bus, walking or cycling.

It can be seen from the data above that for those travel methods contributing to the carbon footprint includes 82% by car/ van/ motorcycle and 17% by bus. There are limitations with this data as the timing coincided with the trust wide travel survey and data from the South Yorkshire Regional Services (SYRS) was used, this is not specific to the staff attending work on the renal units, Therefore the recommendation was made to:

* **Undertake a specific travel survey of the staff working within the Renal units at STH to improve data associated with staff travel.**
  1. **Pharmaceutical data**

The pharmaceutical data was provided by a pharmacy IT specialist. The data was limited to the options available on the calculator, this resulted in other items routinely used being excluded from the calculation. The table below demonstrates those items included in the calculation highlighted in green. Where a specific STH pharmaceutical option was not available the generic option was chosen.

|  |  |
| --- | --- |
| **Pharmaceutical** | **Sum of Total** |
| ALFACALCIDOL 0.25 microgram Capsules 30 capsule pack | 44 |
| ALFACALCIDOL 1 microgram Capsules 30 capsule pack | 20 |
| ALTEPLASE 10 mg Injection 10 mg vial | 8 |
| ALTEPLASE 20 mg Injection 20 mg vial | 2 |
| CHLORHEXIDINE (PINK) (BOTTLE) 2 % in 70% IPA Solution 200 ml bottle | 1352 |
| CHLORHEXIDINE (PREVASE) 0.5 % in spirit 70% (PINK) Solution 200 ml pack | 3 |
| CHLORHEXIDINE 0.2 % Mouthwash 300 ml pack | 1 |
| CITRIC ACID 50% (899) 6 litre Solution 6000 ml pack | 1087 |
| ENOXAPARIN (CLEXANE) 20 mg in 0.2ml Injection 10 unit. pack | 36 |
| ENOXAPARIN (CLEXANE) 40 mg in 0.4ml Injection 10 x 0.4ml syringe pack | 11 |
| ENOXAPARIN (INHIXA) 20 mg in 0.2ml Injection 10 unit. pack | 15 |
| ENOXAPARIN (INHIXA) 40 mg in 0.4ml Injection 10 x 0.4ml syringe pack | 11 |
| PARACETAMOL (100ML) 10 mg per ml I/V infusion 100 ml pack | 32 |
| PARACETAMOL (100ml) 250 mg in 5ml Suspension (sugar-free) 100 ml pack | 2 |
| PARACETAMOL 500 mg Tablets 32 tablet pack | 256 |
| PARACETAMOL SOLUBLE 500 mg Soluble Tabs 24 tablet pack | 1 |
| SODIUM CHLORIDE 0.45% (VIAFLO) (FE1313) 500 ml Infusion 500 ml bag | 6 |
| SODIUM CHLORIDE 0.9% (BRAUN Semi rigid) 100 ml Infusion 100 ml bag | 1000 |
| SODIUM CHLORIDE 0.9% (BRAUN Semi Rigid) 250 ml Infusion 250 ml bag | 401 |
| SODIUM CHLORIDE 0.9% (VIAFLO) (FE1306G) HADU NOT GENERAL USE 50 | 3 |
| SODIUM CHLORIDE 0.9% (VIAFLO) (FKE1323) 500 ml Infusion 500 ml bag | 1701 |
| SODIUM CHLORIDE 0.9% (VIAFLO) (FKE1324) 1000 ml Infusion 1000 ml pack | 48802 |
| SODIUM CHLORIDE 0.9% (VIAFLO) HADU / NOT GENERAL USE 100 ml | 3 |
| SODIUM CHLORIDE 10ml (PLASTIC AMPOULE) 0.9 % Injection 20 x 10ml | 15 |
| SODIUM CHLORIDE 20ml (PLASTIC AMPOULE) 0.9 % Injection 20 x 20ml | 2 |
| SODIUM CHLORIDE 5ml (PLASTIC AMPOULE) 0.9 % Injection 20 x 5ml | 6 |
| SODIUM CHLORIDE 600 mg SR tablets 100 tablet bottle | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Product** | **RUG** | **PMU** | **V1** |
| Citric Acid 50% 6L | 503 | 481 | 85 |
| Sodium Bicarbonate 760g (packs of 10) | 2192 | 1916 | 281 |
| Renalyte A10 5L | 25 | 341 | 28 |
| Renalyte A17 5L | NIL | 3 | NIL |
| Renalyte A6 1L | 93000 | 54000 | NIL |
| Renalyte A6 5L | 3826 | 3398 | 1560 |
| Renalyte A8 5L | 1087 | 2680 | 660 |

The annual emissions associated with pharmaceutical use equates to **161,991** **kgCO2e.**

It can be seen from the data above that there are a number of items routinely used for patient care which were unable to be included in the calculation, and others where generic and not specific to STH items were used. The pharmaceuticals make up 20% of the overall carbon footprint, a carbon hotspot at 161,991 kgCO2e. With improved metrics this figure will be higher than currently shown. Therefore, the recommendation made is:

* **To work with the Sustainable Healthcare Coalition (SHC) to improve the metrics for pharmaceuticals. Improving the metrics and including all STH pharmaceuticals routinely used will be more representative of the carbon intensity of these products. This will then allow progress with assessing whether there are any lower carbon alternatives that STH could use**.
  1. **Consumables data**

The consumable’s data was collected using a ward stock inventory and orders placed via the cost centres for Renal Unit G, Peter Moorhead Unit and Vickers 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reference numbers |  |  |  |  |
| NEEDLES | DIALYSER | BLOODLINES | GLOVES | SYRINGES |
| AV2P1525 HT 30GT | F00001592 | 7211511 | EB201 | IVL03 |
| AV1520 HTC30RGT | F00001590 | 7211125 | GS690 | IVL05 |
| AV1532HTC30RGT | 7107366 |  |  | 305959 |
| SGN1525HTC15RBGT | F00001594 |  |  | 300629 |
| 7023256NP | F00001591 |  |  | 300865 |
| AV1720HTC15RGT |  |  |  |  |

|  |  |
| --- | --- |
| Consumables | kgCO2e |
| Average Dialysers | 2,000.02 |
| Average Haemodialysis bloodline | 52,542.14 |
| Average Needle | 813.55 |
| Average Syringe | 5,334.28 |
| Total kgCO2e | 60,689.99 |

The annual emissions associated with consumable use equates to **60,690** **kgCO2e.**

The consumables are all single use items and come with a significant amount of packaging. The data for gloves was unavailable, this is due to the NHSE supply of Personal Protective Equipment during the Covid pandemic. The consumables make up 7% of the overall emissions. When coupled with pharmaceuticals and equipment this represents 30%. To reduce the impact, working with procurement, the manufacture, packaging, and distribution of these items should be reviewed. The following recommendation was made:

* **Evaluation of the manufacture, packaging and distribution of consumables and pharmaceuticals. This could be done by sourcing the life cycle impact data from suppliers to fully understand the carbon impact. Collaboration in the procurement process with the supplier to optimise the packaging to reduce the amount of waste generated.**
  1. **Equipment**

The equipment included in the calculation includes 66 hospital beds, 120 dialysis machines and 4 water treatment plants.

**Dialysis machines**

|  |  |  |
| --- | --- | --- |
| Ward/ Unit | Make/ Model | Number |
| Peter Moorhead unit | Dialog IQ+ | 38 |
| Renal Unit G | Dialog IQ+ | 50 |
|  | Dialog Evolution | 15 |
| Vickers 1 | Dialog Evolution | 17 |
| Total |  | 120 |

**Water treatment plant**

|  |  |  |
| --- | --- | --- |
| Ward/ Unit | Make/ Model | Number |
| Peter Moorhead unit | RO DIA 11 2450 | 2 |
| Renal Unit G/ Vickers 1 | RO DIA 11 2800 | 2 |
| Total |  | 4 |

**Hospital beds**

66 Hospital beds were included in the calculation, these were a generic item and not specific to those used at STH.

The annual emissions associated with equipment equates to **22,313 kgCO2e**

The average lifetime for all equipment is 10 years and was assumed and applied to all equipment. Due to the nature of the patients undergoing dialysis at STH they are all cared for in a hospital bed, no dialysis chairs are used on the units.

* 1. **Utilities & Energy**

The renal units do not have specific electricity or gas meters, the figures included in the calculation are shown below and are based on annual consumption figures provided by the energy manager in Estates.

|  |  |
| --- | --- |
| Ward/ unit | Electrical energy consumption kWh |
| Peter Moorhead Unit | 115,920 |
| Vickers 1 | 71,400 |
| Renal Unit G | 130,760 |
| Total | 318,080 |

|  |  |
| --- | --- |
| Ward/ unit | Gas consumption kWh |
| Peter Moorhead Unit | 78,660 |
| Vickers 1 | 48,450 |
| Renal Unit G | 88,730 |
| Total | 215,840 |

There is a solar PV array on the Peter Moorhead unit, and this has been estimated as generating 22,673kWh, which was included in the calculation as 8%.

The annual emissions associated with utilities (electricity & heating) equates to **201,772** **kgCO2e**

With the renal units not having individual meters the figures used in this calculation are estimates. At this time none of the electricity is provided by a green energy supplier, however 8% of the energy is generated via solar panels located around the STH site. Gas is used to provide heating for the renal wards. To enable the reduction in energy use, the following recommendation was made:

* **Engage with Estates to assess whether metering could be undertaken, this will allow improved data metrics and provide a more accurate baseline. Agreement would be required to provide monthly data to demonstrate the impact of any changes made. This would include staff education, ensuring that lights are switched off and machines powered down when not in use.**
  1. **Waste**

The waste was estimated from a bag count on Renal Unit G and extrapolated to include the other wards. The table below demonstrates the waste type and associated emissions factors.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Renal Unit G | Bags per day/ week | average weight kg | Total weight Kg (daily) | Total weight kg ( weekly) | Mixed waste recovery kg | clinical waste kg | paper to incineration kg | Notes |
| Black | 10 | 2 | 20 |  | 6240 |  |  | 312 per annum |
| Tiger stripe | 25 | 3 | 75 |  |  | 23400 |  | 312 per annum |
| small black | 3 | 1 | 3 |  | 936 |  |  | 312 per annum |
| Sharps- S14 | 1.5 | 1.3 |  | 1.95 |  | 101.4 |  | scaled to weekly |
| Sharps-s 22 | 6 | 2.5 |  | 15 |  | 780 |  | scaled to weekly |
| Sharps s-32 | 1 | 6.4 |  | 6.4 |  | 332.8 | 0 | scaled to weekly |
| Confidential waste | 2 | 10 |  | 20 |  |  | 1040 | 4 bags every 2 weeks scaled to weekly |
| Total |  |  |  |  | 7176 | 24614.2 | 1040 |  |
| Peter Moorhead Unit | Bags per day/ week | average weight kg | Total weight Kg (daily) | Total weight kg ( weekly) | Mixed waste recovery kg | clinical waste kg | paper to incineration kg | Notes |
| Black | 10 | 2 | 20 |  | 6240 |  |  | 312 per annum |
| Tiger stripe | 25 | 3 | 75 |  |  | 23400 |  | 312 per annum |
| small black | 3 | 1 | 3 |  | 936 |  |  | 312 per annum |
| Sharps- S14 | 1.5 | 1.3 |  | 1.95 |  | 101.4 |  | scaled to weekly |
| Sharps-s 22 | 6 | 2.5 |  | 15 |  | 780 |  | scaled to weekly |
| Sharps s-32 | 1 | 6.4 |  | 6.4 |  | 332.8 |  | scaled to weekly |
| Confidential waste | 2 | 10 |  | 20 |  |  | 1040 | 4 bags every 2 weeks scaled to weekly |
| Total |  |  |  |  | 7176 | 24614.2 | 1040 |  |
| Vickers 1 | Bags per day/ week | average weight kg | Total weight Kg (daily) | Total weight kg (weekly) | Mixed waste recovery kg | clinical waste kg | paper to incineration kg | Notes |
| Black | 4 | 2 | 8 |  | 1248 |  |  | 156 days per annum |
| Tiger stripe | 3 | 3 | 9 |  |  | 2808 |  | 156 days per annum |
| small black | 1 | 1 | 1 |  | 156 |  |  | 156 days per annum |
| Sharps- S-22 | 3 | 2.5 |  | 2.5 |  | 130 |  | scaled to weekly |
| Confidential waste | 1 | 10 |  | 10 |  | 520 | 520 | 2 bags every 2 weeks scaled to weekly |
| Total |  |  |  |  | 1404 | 3458 | 520 |  |
| **Annual weight kg** |  |  |  |  | **15,756.00** | **52,686.40** | **2,600.00** |  |
| **Annual weight in Tonnes** |  |  |  |  | **15.8** | **52.7** | **2.6** |  |

The annual emissions associated with waste disposal equates to **45,613 kgCO2e.**

There is a significant amount of clinical waste associated with Haemodialysis, from observed practice staff often place all the packaging into the clinical waste stream which should be disposed of via the recycling waste stream. This is due to this being the easiest option as there is no recycling bins readily accessible in the clinical area. The recommendation made is:

* **Improve waste streams and introduce recycling**. **This would be done by adopting the “bag to bed” system, ensuring there is a recycling option for the packaging. Staff education is key, especially with the separation of paper and plastic packaging to ensure that this can be fully recycled at the disposal centre.**
  1. **Water & water treatment**

The data was provided by the estates department with an estimate of 1,650 m3 per unit/ annum. This totalled 4950 m3 for the Peter Moorhead Unit, Renal unit G and Vickers 1.

|  |  |
| --- | --- |
| Ward/ unit | Water Usage m3 |
| Peter Moorhead Unit | 1,650 |
| Vickers 1 | 1,650 |
| Renal Unit G | 1,650 |
| Total | 4,950 |

The annual emissions associated with water equate to **10,147** **kgCO2e.**

Water use for the renal wards is not metered, therefore the figures provided in this report are estimated. Working in collaboration with the Estates team, options for metering and monthly data collection should be explored. This will allow a more accurate baseline to track any changes. The renal team are currently exploring the option for reducing dialysate flow whilst maintaining clinical outcomes. This will potentially allow for a reduction in water use for dialysis. This may not be suitable for all patients and is currently at the discussion stage. The recommendation made is:

* **Through collaboration with Estates improve the baseline metric for water use to give more accurate data. With more robust data and regular monthly data collection, the impact of changes can be tracked and calculated.**
* **Review opportunity to reduce flow through dialysis machines to reduce water usage. This will require collaboration with the clinical teams providing renal care.**

1. **Comparison with Newcastle upon-Tyne Hospital NHS Foundation Trust**

The table below shows a comparison with Newcastle upon Tyne who undertook the calculation in 2019, prior to the Covid pandemic. STH is performing well showing lower emissions per patient, however it must be remembered that many of the pharmaceutical used at STH were not included in the calculation, when the metrics are improved there will be an increase in the carbon emissions. It is reassuring to see that the percentage split between the activities included in the calculation are similar. For STH one of the hotspots is staff and patient travel, contributing to 40% of the total.

Attention needs to be drawn to the fact that the Newcastle evaluation was undertaken 4 years earlier than STH and prior to the Covid Pandemic, there will have been changes in practice during this time and the impact of this is currently unknown.

|  |  |  |
| --- | --- | --- |
| **Metric** | **STH 2023** | **Newcastle 2019** |
| Total emissions KgCO2e | **827,947** | **833,132** |
| Number of sessions | **48,204** | **38,425** |
| Emissions per patient KgCO2e | **17** | **21.7** |
| Utilities% | **25%** | **32%** |
| Travel- patient and staff % | **40%** | **32%** |
| Materials- Pharmaceuticals and consumables | **30%** | **30%** |
| Waste | **5%** | **6%** |

1. **Conclusion**

This evaluation aimed to provide the first step in developing a roadmap to deliver a net-zero renal care pathway. The environmental impacts of haemodialysis at Sheffield Teaching Hospitals during 2023 have been calculated and an understanding of which activities contribute to the overall carbon emissions has been achieved. The evaluation was undertaken using the Sustainable healthcare coalitions’ ICHD carbon calculator. This calculator presented limitations, such as the use of generic footprints for pharmaceutical, consumables and equipment. This highlighted the requirement to improve the data metrics to give a more accurate baseline to work from. Following this, Key Performance Indicators (KPI) can be agreed and tracked as actions are completed. The action plan is included in the closing section below. To support the work included in the action plan will require a project team with clinical, corporate, estates and facilities members.

1. **Key findings and limitations**

The following **key findings** can be drawn from the ICHD pathway evaluation.

The total GHG impact of providing **48,204 sessions** of ICHD at Sheffield Teaching Hospitals is estimated to be **827,947 kgCO2e** and can be expressed as **17 kg CO2e** per dialysis session.

A contribution analysis of the above GHG impact reveals:

* The impacts associated with fossil fuel production and combustion to power both patient travel and staff commutes makes the largest contribution, 40% of the total.
* The impacts associated with the manufacture, packaging and distribution of the used pharmaceuticals, consumables, and equipment makes the second largest contribution, 30% of the total.
* The utilities required, and the impacts associated with their energy and water consumptions, makes a significant contribution, 25% of the total.
* The impacts associated with treatments of generated solid waste, have a smaller contribution of 5% of the total.

1. **Recommendations and improvements**

* **Undertake a deep dive into patient travel arrangements** to gain a greater understanding of the use of hospital transport and the type of vehicles that are being used.
* **Explore opportunities to move patient treatment closer to home,** thereby reducing “care miles” associated with Haemodialysis.
* **Review the current DNA rates** and gain an understanding of the reasons. Reducing the DNA rate will improve the use of resources and avoid waste
* **Undertake a specific travel survey of the staff working within the Renal units** at STH to improve data associated with staff travel.
* **To work with the Sustainable Healthcare Coalition to improve the metrics** for pharmaceutical. Improving the metrics and including all STH pharmaceuticals routinely used will be more representative of the carbon intensity of these pharmaceuticals. This will then allow progress with assessing whether there are any lower carbon alternatives that STH could use.
* **Evaluation of the manufacture, packaging and distribution of consumables and pharmaceuticals**. This could be done by sourcing the life cycle impact data from suppliers to fully understand the carbon impact. Collaboration in the procurement process with the supplier to optimise the packaging to reduce the amount of waste generated.
* **Engage with Estates to assess whether metering could be undertaken,** this will allow improved data metrics and provide a more accurate baseline. Agreement would be required to provide monthly data to demonstrate the impact of any changes made. This would include staff education, ensuring that lights are switched off and machines powered down when not in use.
* **Improve waste streams and introduce recycling**. This would be done by adopting the bag to bed system, ensuring there is a recycling option for the packaging. Staff education is key, especially with the separation of paper and plastic packaging to ensure that this can be fully recycled at the disposal centre.
* **Collaboration with estates improve the baseline metric for water use** to give a more accurate baseline. With an accurate baseline and monthly data collection the impact of changes can be tracked and calculated.
* **Review opportunity to reduce flow through dialysis machines to reduce water usage.** This will require collaboration with the clinical teams providing renal care.

**Further recommendations**

During the data collection and staff engagement phase of the project, patient engagement was identified as an area that needed focus. Gaining insight from our patients is key to drive any social value initiatives that populate the action plan. This also fits with the organisation’s strategic aim of providing patient centred service and creating a sustainable organisation. Engaging with patients will also allow the “what matters to you” to feature in the planning and delivery of haemodialysis in the future. The recommendation is:

* **Conduct a patient survey to assess social value and thoughts on sustainable healthcare.**

1. **Action plan**

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Action | Who | Timescale |
| Deep dive into transport arrangements for patients | Undertake detailed analysis of patient transport arrangements | Project leads  Travel manager | 6 months |
| Work with network to see if there is opportunity to move patients closer to home | Collaborate with the TRUNC HD project and network leads | Project leads  Renal network | 12 months |
| Review DNA rates and reasons | Record and analyse reasons for patient DNA | Clinical leads | 6 months |
| Specific Renal Unit staff travel survey | Undertake specific staff travel survey for renal units | Travel manager | 6 months |
| Work with SHC to improve toolkit metrics | Collaborate with SHC to improve data/ baseline measurements | Project leads | 6 months |
| Evaluation of manufacture, packaging, and distribution of consumables & Pharmaceuticals | Collaborate with procurement and suppliers to undertake life cycle assessment and lower carbon alternatives | Project leads  Procurement | 12 months |
| Engage with Estates to assess whether metering can be undertaken for energy and water use with monthly reporting | Assess possibility of metering and monthly reports with estates | Project leads  Estates | 6 months |
| Improve waste streams and introduce recycling | Waste stream to be agreed, implement “bin to bed” | Renal matrons/ wards sisters and clinical staff | 3 months |
| Review opportunity to reduce flow through dialysis machine to reduce water usage | Clinical team to assess feasibility | Clinical renal team | 12 months |
| Engage with patients via a patient survey | Engage with Patient partnership team to design a patient survey | Project leads | 12 months |
| Agree KPI and track roadmap to net zero | Agree KPI’s and metrics to tack progress | Project leads | 12 months |

1. **Project Infographic**

A close-up of a graph

Description automatically generated