Appraisal of Environmental Impact of Hospital Activities

ULS de Braga
Portugal

AstraZeneca

Sustainable Healthcare Coalition

Title	Environmental impact of ULS de Braga, Portugal
Organisation	AstraZeneca UK Limited
Organisation's role	AstraZeneca UK Limited initiated and funded this work, but it was not involved in collecting and analysing the hospital data. AstraZeneca UK Limited saw only the final aggregated output.
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Completion date	September 2023
Assurance	Internal assurance
Supporting information	Operational data from Unidade Local de Saúde (ULS) Braga, Portugal
Data gathering and analysis contact	Michael Collins, Partner, ERM (michael.collins@erm.com)
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Conformance with Care Pathways: Guidance on Appraising Sustainability[1]	Adheres to the principles of the Guidance
Care pathway description	Overall hospital activities at ULS de Braga
Environmental issues appraised	Global warming potential (IPCC, CO_2 eq, 100-year), water use, waste

Google Maps. (2025). ULS de Braga, Portugal. Satellite Map. Retrieved September 2025

[1] Care Pathways: Guidance on Appraising Sustainability. (SHC, 2023). https://shcoalition.org/sustainable-care-pathways-guidance/

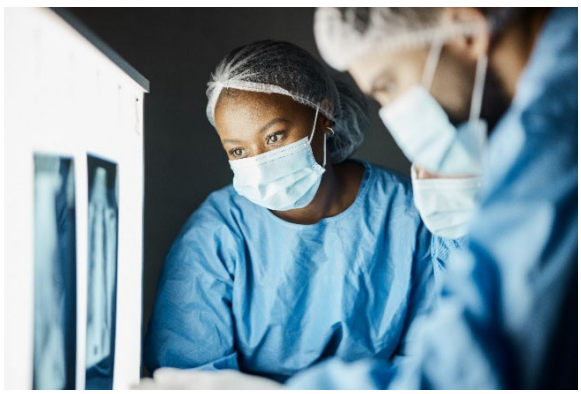
Study overview

It is recognised that health and care systems are undergoing transformative global change to adapt to the needs of patients and communities, with increasing pressure to be financially, socially and environmentally sustainable. Appraising the sustainability of care pathways is seen as a crucial step to enabling a more sustainable health system[1]. To facilitate the completion of care pathway assessments, it is necessary to generate data that characterises the impact of the common care pathways activities. In generating these data, valuable insight is provided into the environmental hotspots associated with each activity.

AstraZeneca UK Limited sponsored this environmental assessment of ULS Braga for the purpose of facilitating care pathway assessments and to assist ULS Braga in understanding its environmental impact. Data collection and analysis were completed by Environmental Resource Management (ERM). AstraZeneca UK Limited had no involvement in the data collection and analysis of the hospital data and only saw the final aggregated output.

Conclusions

This study appraised the environmental impact of activities undertaken by three clinical departments in ULS Braga, located in Braga, Portugal: emergency department, general ward and intensive care ward. Across the departments, staff travel (commuting) and electricity use were identified as the main hotspots.



These high-level findings, as well as the underlying data, will be used by ULS Braga to focus activities to reduce environmental impacts. The results will also be used to inform future care pathway assessments and care pathway innovation for patients in Portugal.

Study Limitations

There are challenges associated with generating the data required for a comprehensive care pathway assessment and data generated in this study can be improved in the future. In particular, more detailed descriptions of consumables and pharmaceutical products consumed for hospital activities would enable more accurate assignment of material emission factors. Several of the impact values for pharmaceutical products rely on spend-based emission factors (85% of pharmaceutical product spend), which results in a higher degree of uncertainty then results generated using material and activity-based emission factors. Where a spend-based approach is required, US-based emission factors are used as these provide the widest range of industry spend values. It is noted that a European/ Portugal focus may result in different spend values. These limitations should be considered when applying results elsewhere. The results may not accurately characterise the activities and associated emissions at another hospital. However, the

[1] Care Pathways: Guidance on Appraising Sustainability. (SHC, 2023). https://shcoalition.org/sustainable-care-pathways-guidance/

scale of impact contributions, the learnings and insight into impact drivers will have wider resonance and applicability.

Scope

This assessment appraises the environmental impacts of three hospital activities at ULS de Braga.

Care pathway module	Hospital activity	Reference unit
Emergency Department	Attendance at the Emergency Department by the patient for consultation with a clinician	per patient contact
Inpatient Bed Day (low-intensity)	Patient hospitalisation in a General Ward	per inpatient bed day (24 hours)
Intensive Bed Day (high-intensity)	Patient hospitalisation in an Intensive Care Ward	per inpatient bed day (24 hours)

Approach

The appraisal of each hospital activity accounts for clinical activity in 2021 and includes utilities; waste management; manufacture and use of consumables, equipment, pharmaceutical products and medical gases; and staff commuting journeys. Under the definitions of the Care Pathways Guidance[1], patient travel is a standalone activity and was not included in the scope of this assessment.

Data were sourced from ULS Braga relating to the included consumptions, plus data for the hospital estate (building layout and floor area) and hospital staff numbers, broken down by hospital activity. ULS Braga also provided data on patient throughput numbers for each hospital activity. Emissions for staff commutes were sourced from secondary data for an average commuting journey in the UK, based on an average commuting distance of 16.1 km, undertaken in an average European passenger car.

Utilities and waste management data were allocated to each hospital activity based on the floor area occupied. Procurement data on consumables, equipment, pharmaceutical products and medical gases were categorised by cost centres linked to each hospital activity.

Greenhouse gas (GHG) emissions, water consumption and waste generated have been considered in this appraisal using the approach set out in the "Care Pathways: Guidance on Appraising Sustainability" guidance document[1]. As specified by the guidance, water use includes direct and indirect, and waste includes hazardous and non-hazardous direct waste. The environmental impact was calculated by multiplying the consumption and waste data with a relevant emission factors for GHG emissions, water consumption and waste. For consumables, equipment, pharmaceutical products and medical gases, material-based life cycle emission factors were applied where possible. Where sufficient detail was not available in the data to assign a material-based emission factor, a spend-based approach was taken, estimating the impact based on the expenditure associated with the consumed item. Material-based emission factors were primarily sourced from the ecoinvent[2] database. Spend-based emission factors were sourced from the US

[1] Care Pathways: Guidance on Appraising Sustainability. (SHC, 2023). https://shcoalition.org/sustainable-care-pathways-guidance/
[2] Ecoinvent. 2024, ecoinvent.org/.
[3] United States Environmental Protection Agency. "US Environmentally-Extended Input-Output (USEEIO) Models." Www.epa.gov, 5 May 2020, www.epa.gov/land-research/us-environmentally-extended-input-output-useeio-models.

Input-Output Database[3]. Patient throughput numbers for each hospital activity were used to scale the environmental impact to the defined reference unit.

Further detail for each care pathway module is available as supplementary material, available at https://shcoalition.org/https-shcoalition-org-appraisal-of-environmental-impact-of-hospital-activities-at-uls-braga/

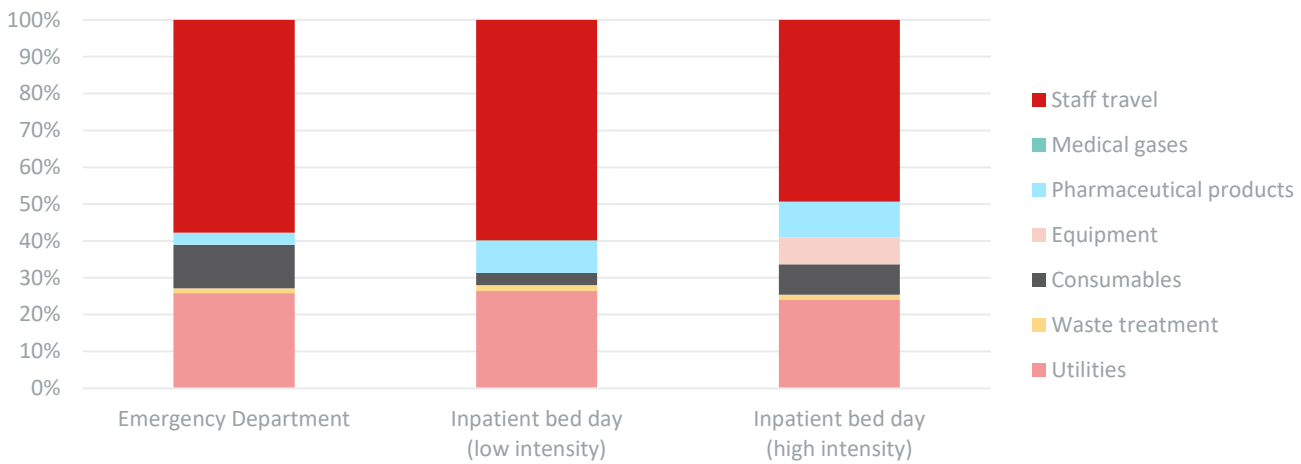
Results

Module	GHG kg CO_2 eq	Water m^3	Waste kg	Reference unit
Emergency Department	*7.9*	*34.7*	*0.7*	*per patient contact*
Inpatient Bed Day (low intensity)	*18.8*	*6.2*	*2.0*	*per inpatient bed day*
Inpatient Bed Day (high intensity)	*102.1*	*51.7*	*9.7*	*per inpatient bed day*

GHG emissions per hospital activity

Staff travel, to the hospital from their homes, is a key driver across all hospital activities. This is related to the number of staff members associated with each hospital activity.

- For the Emergency Department, staff travel is the main contributor, followed by grid electricity consumption (utilities) and consumables.
- For the Inpatient Bed Day (low intensity), staff travel is the main contributor, followed by grid electricity consumption (utilities) and pharmaceutical products.
- For the Inpatient Bed Day (high intensity), staff travel is the main contributor, followed by grid electricity consumption (utilities) and pharmaceutical products. Consumables and equipment are also a notable contribution. The contribution from pharmaceutical products is higher than for the low intensity bed day, reflecting the nature of care provided in the intensive care ward.



Acknowledgements

This document has been developed collaboratively with ULS de Braga and the Sustainable Healthcare Coalition. The coalition comprises a range of organisations within the healthcare sector, including pharmaceutical and medical device companies, trade bodies, procurement, government organisations and other stakeholders. The Sustainable Healthcare Coalition operates with the aim of facilitating the journey towards good health and wellbeing on a finite planet, through open-minded collaboration across public and private healthcare.