

Appraisal of the Environmental Impact of Hospital Activities

St Joseph's Healthcare
Hamilton



AstraZeneca 



**Sustainable
Healthcare
Coalition**

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Title	Appraisal of the environmental impact of hospital activities, St. Joseph's Healthcare, Hamilton Charlton Campus, Ontario, Canada
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 output.
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Completion date	June 2026
Assurance	Internal assurance
Supporting information	Operational data from St. Joseph's Healthcare, Hamilton
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Conformance with Care Pathways: Appraising Sustainability Method	Adheres to the method ¹
Care pathway description	Appraisal of St. Joseph's Healthcare, Hamilton Charlton Campus hospital activities for: emergency department visits; low- and high-intensity ward stays; respiratory outpatient appointment; haemodialysis session stay; and surgical procedure
Environmental issues appraised	Global warming potential (IPCC AR6, CO ₂ eq, 100-year), water use, waste



¹ Sustainable Healthcare Coalition (2026). Sustainable Care Pathways Method. Available at: <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. To facilitate the completion of care pathway assessments, it is necessary to collect data that characterise the impact of common care pathway activities¹.



In collecting and collating these data, valuable insight is provided into the environmental hotspots associated with each activity.

AstraZeneca UK Limited sponsored this environmental assessment of the Charlton Campus Hospital to facilitate care pathway assessments and to assist St Joseph's Healthcare in understanding its environmental impact. Data collection and analysis were completed by Environmental Resources Management (ERM). AstraZeneca had no involvement in data collection and analysis of the hospital data. AstraZeneca saw only the final output.

Conclusions

This study appraised the following activities undertaken by clinical departments at St Joseph's Healthcare Hamilton, Charlton Campus, located in Ontario, Canada: emergency department visits; low- and high-intensity ward stays; respiratory outpatient appointments; haemodialysis sessions; and surgical procedures.

Across the departments, the dominant drivers of impact were utilities, consumables and staff travel. For all environmental impact results, the high-intensity ward had the highest impacts, followed by the low-intensity ward and by surgery. These outcomes were due to resource use per bed day, natural gas consumption for heating, higher staff presence and extensive use of single-use infection-prevention, patient-care and wound-care consumables. These findings will be used by St Joseph's Healthcare Hamilton to focus environmental impact reduction activities. The results will also be used to inform future care pathway assessments.

Study Limitations

There are challenges associated with collecting the data required for a comprehensive care pathway assessment and data collated in this study can be improved in the future. In particular, more detailed descriptions of consumables and pharmaceutical products consumed in undertaking hospital activities

¹ Sustainable Healthcare Coalition (2026). Sustainable Care Pathways Method. Available at: <https://shcoalition.org/sustainable-care-pathways-guidance>.

would enable more accurate assignment of material emission factors. Several of the impact values for consumables (49%), equipment (93%) and pharmaceuticals (92%) rely on spend-based emission factors, which lead to greater uncertainty than those generated using material- and activity-based emission factors. The use of spend-based emission factors did not disproportionately affect any of the studied modules. The utilities and waste data were only available for the whole hospital and, therefore, were allocated on a floor-space basis to clinical departments. 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 scale of impact contributions, and the learnings and insights into impact drivers will have wider resonance and applicability.

Scope

This assessment appraises the environmental impacts of hospital activities at the Charlton Campus.

Care pathway module	Hospital activity	Reference unit
Acute ED	Attendance at the acute emergency department (ED) by the patient for consultation with a clinician	per visit
Psychiatric ED	Attendance at the psychiatric emergency department (ED) by the patient for consultation with a clinician	per visit
Average ED	Attendance at the emergency department (ED) by the patient for consultation with a clinician	per visit
Respiratory outpatient	Patient attendance at an outpatient respiratory appointment	per patient appointment
Low- intensity ward	Patient hospitalisation in a general ward	per inpatient bed day (24 hours)
High- intensity ward	Patient hospitalisation in an intensive care ward	per inpatient bed day (24 hours)
In-centre haemodialysis	Patient haemodialysis session	per dialysis treatment
Surgical procedure	Patient undergoing a surgical procedure	per hour of surgery

¹ Sustainable Healthcare Coalition (2026). Sustainable Care Pathways Method. Available at: <https://shcoalition.org/sustainable-care-pathways-guidance>.

² Government of Canada. Statistics Canada (2024). More Canadians commuting in 2024. [online] Statcan.gc.ca. Available at: <https://www150.statcan.gc.ca/n1/daily-quotidien/240826/dq240826a-eng.htm>.

³ Ecoinvent. 2026, ecoinvent.org/.

⁴ Ingwersen, W. and Young, B. (2025). Supply Chain Greenhouse Gas Emission Factors for U.S. Commodities. [online] Cornerstone Sustainability Data Initiative. Available at: <https://zenodo.org/records/17202747>.

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Approach

The appraisal of each hospital activity takes into account clinical activity in the financial year (FY) 2025 and includes: utilities; waste management; manufacture and use of consumables; equipment; pharmaceutical products; medical gases and anaesthetic gases; and staff commuting journeys. As defined by the Care Pathways Method¹, patient travel is a standalone activity and was not included in the scope of this assessment.

For each hospital activity, FY25 primary data were provided for consumables, equipment, pharmaceutical products, staffing and patient throughput. For the hospital, FY25 primary data were provided for utilities, waste management, patient nutrition, medical gases and anaesthetic gases. The impacts of patient nutrition are included within consumables. Staff commuting impacts were sourced from secondary data²; staff were assumed to commute 25 km each way and to travel by car (82.3%), public transport (12.4%) and active transport (5.2%). The pharmaceutical data does not include prescribed medicines for administration at home.

The impacts of medical gases, utilities, waste management and shared non-clinical hospital services were allocated to each hospital activity based on the floor area occupied. The use of anaesthetic gases was assumed to be restricted to the acute emergency department, low-intensity ward, high-intensity ward and surgery. Of the anaesthetic gases, sevoflurane was assumed to be used only in surgery, whereas nitrous oxide was assumed to be used across all listed departments. Patient throughput numbers for each hospital activity were used to scale the total environmental impact to the defined reference unit.

The assessment appraises the greenhouse gas (GHG) emissions, water use and waste generated per hospital activity. Water use includes direct and indirect use and waste includes only direct waste production. The environmental impacts were calculated by multiplying the quantity of materials used by relevant emission factors. Material-based life cycle emission factors were applied where available and primarily were sourced from the ecoinvent³ v3.114 database. Where material-based emission factors were unavailable, adapted US Environmentally-Extended Input-Output⁴ (EEIO) spend-based factors were applied.

Acknowledgements

This document has been developed collaboratively with St. Joseph's Healthcare Hamilton 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.

Results

Module	GHG kg CO ₂ eq	Water m ³	Waste kg	Reference unit
Acute ED	20.9	141	0.71	per visit
Psychiatric ED	42.9	287	2.78	per visit
Average ED	22.1	150	0.82	per visit
Respiratory outpatient	31.0	269	2.67	per patient appointment
Low-intensity ward	53.6	440	3.99	per inpatient bed day (24 hours)
High-intensity ward	145	952	7.12	per inpatient bed day (24 hours)
In-centre haemodialysis	13.1	62.1	0.51	per dialysis treatment
Surgical procedure	164	402	2.51	per hour of surgery

GHG emissions per hospital activity

Across most departments, utilities and staff travel are the dominant contributors to the total estimated impact. Consumables and equipment play a particularly significant role in surgical services and high-intensity wards, where they represent a much larger share of total emissions. In contrast, pharmaceuticals, medical gases, anaesthetic gases, and waste treatment contribute relatively small proportions of the total impact across most departments, with anaesthetic gases estimated to be material only within surgical settings.

