

Environmental Impact of Outpatient Parenteral Antimicrobial Therapy

Care Pathway Case Study



Baxter



**Sustainable
Healthcare
Coalition**

This case study has been developed by Environmental Resource Management (ERM) and the Sustainable Healthcare Coalition (SHC). Baxter has reviewed the content for factual accuracy only.

Document Overview	Care Pathway for Outpatient Parenteral Antimicrobial Therapy (OPAT)
Organisation	Baxter
Company website	https://www.baxterhealthcare.co.uk/healthcare-professionals
Contact details	Ann Cole (ann_cole@baxter.com)
Completion date	August 2024
Assurance	Internal assurance
Supporting information	The environmental impact of intravenous antimicrobial therapies: a comparison of OPAT and inpatient administration care pathways ¹ .
Conformance with Care Pathways: Guidance on Appraising Sustainability ²	Adheres to the principles of the guidance to appraise greenhouse gas (GHG) emissions, water use and waste generation.
Care pathway description	Care Pathway for Antimicrobial Therapy, including delivery to inpatients and three outpatient parenteral antimicrobial therapy scenarios.
Environmental issues appraised	Global warming potential (IPCC, CO ₂ eq, 100-year), water use, waste

Globally, it is recognised that health and care systems are undergoing transformative 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 system².

Conclusion

Four scenarios for treatment of adult patients with intravenous antibiotics, for whom Outpatient Parenteral Antimicrobial Therapy (OPAT) was a viable treatment, were appraised: (i) self-care OPAT, (ii) nurse assisted OPAT, (iii) outpatient OPAT and intravenous (iv) inpatient administration. The inpatient scenario was found to have significantly higher climate change, water use and waste impact per patient than all other scenarios. OPAT self-administered in the patient’s home resulted in a CO₂ eq reduction of 85%, when compared with the traditional inpatient treatment pathway. Nurse administered OPAT, either in the home or outpatient department, resulted in higher impacts than self administration due to additional patient and nurse travel. However, the results for these scenarios still deliver a significant reduction compared to inpatient administration. The average inpatient stay for intravenous antibiotic administration was 15.3 days. OPAT, where appropriate, offers significant potential for reducing environmental impact and reducing the need for prolonged hospital stays¹.

Learnings

This study has demonstrated the value of appraising the sustainability of care pathways. The assessment has identified the environmental hotspots in the care of a patient requiring intravenous antimicrobial therapies. Some of the environmental impact values are estimated

¹ Cole, A., Aspin, J., Laird, S., Acri, F., Galley, S., & Collins, M. (2025). The environmental impact of intravenous antimicrobial therapies: a comparison of OPAT and inpatient administration care pathways. *JAC-Antimicrobial Resistance*, 7(2). <https://doi.org/10.1093/jacamr/dlaf030>

² Care Pathways: Guidance on Appraising Sustainability. (SHC, 2023). <https://shcoalition.org/sustainable-care-pathways-guidance/>

from literature which introduces a degree of uncertainty with the final absolute footprint value given here. The accuracy of the assessment would be improved with specific data relating to the manufacture and supply of Ceftriaxone antibiotic and consumables; patient travel, and the material, energy and staff requirements associated with patients being treated as inpatients with intravenous antimicrobial therapy.

Scope

This assessment appraises the environmental impacts of four scenarios for antimicrobial therapy. The unit of analysis is 10 adult patients requiring intravenous antibiotics for which OPAT is viable.

Scenario	Description
1 Self administration	The patient is sent home with medication and equipment to facilitate daily self-administration of the course of antibiotics using an elastomeric pump device (15.3 days)
2 Nurse administration	The patient is sent home and a nurse visits daily (15.3 visits over course of treatment) to administer the course of antibiotics using an elastomeric pump device
3 Hospital outpatient	The patient travels to the hospital outpatient ward daily (15.3 visits over course of treatment) to receive the course of antibiotics using an elastomeric pump device
4 Inpatient	The patient remains hospitalised to receive the course of antibiotics via intravenous bolus (15.3 days over course of treatment)

Data

The antimicrobial therapy treatment has been determined using secondary data in the literature, supplemented by estimates and assumptions. The course of antibiotics (length of treatment) is assumed to be 15.3 days, sourced from the BMJ paper “Outpatient parenteral antimicrobial therapy (OPAT) versus inpatient care in the UK: a health economic assessment for six key diagnoses”¹. The rate of re-hospitalisation for unsuccessful treatment was assumed to be 6.4% of patients¹. For this study, patient outcomes and treatment length for each scenario are assumed equal.

The device used for OPAT is Baxter’s SV200 elastomeric pump. A streamlined life cycle assessment of the device was conducted to provide specific data for the manufacture, use and end of life treatment of the device, which is used in the OPAT scenarios (Scenarios 1-3).

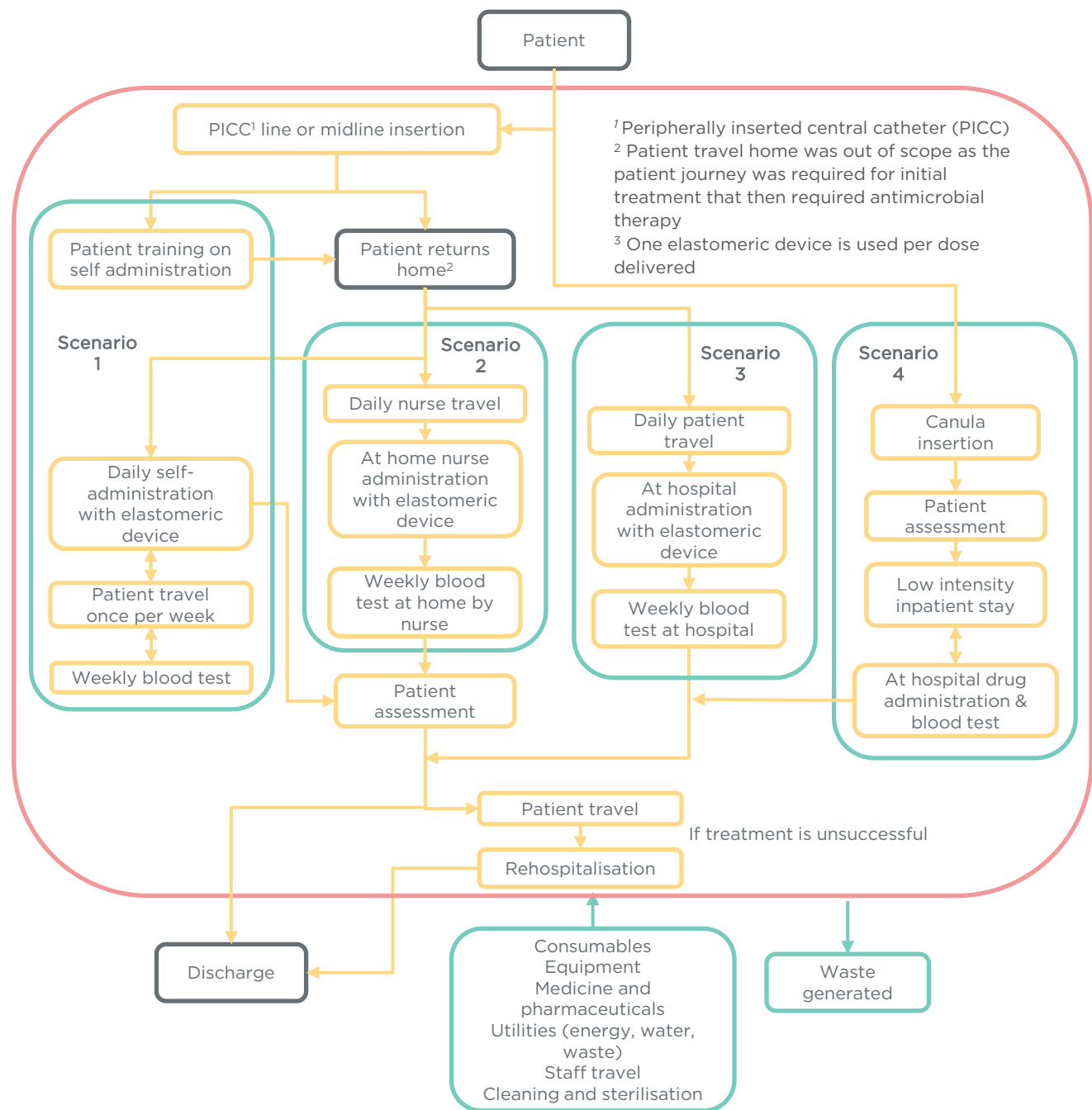
The patient is assumed to travel 17 km to the hospital for each visit in each Scenario. This is based on average National Travel Survey information². The nurse is assumed to travel 11 km to the patient’s home in Scenario 2.

No care pathway modules were excluded from the care pathway for antimicrobial therapy for which OPAT is viable. All known activities were included in the scope of each module.

¹ Dimitrova M, Gilchrist M and Seaton RA. Outpatient parenteral antimicrobial therapy (OPAT) versus inpatient care in the UK: a health economic assessment for six key diagnoses. *BMJ Open* 2021;11:e049733. doi:10.1136/bmjopen-2021-049733

² Care Pathways: Guidance on Appraising Sustainability, Patient Travel Module (SHC 2015). <https://shcoalition.org/wp-content/uploads/2019/10/2.-Sustainable-Care-Pathways-Guidance-Patient-Travel-Module-Oct-2015.pdf>

OPAT care pathway map



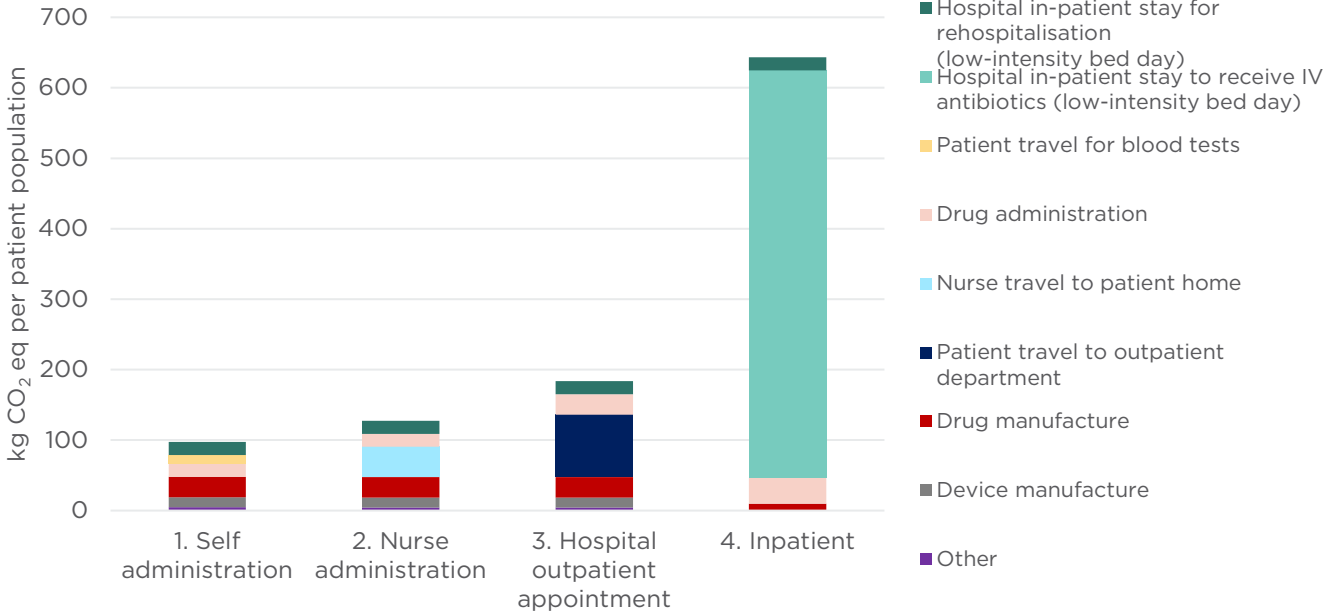
Results per patient

Scenario Results per patient		GHG kg CO ₂ eq	Water m ³	Waste kg
1	Self administration	97.2	241	5.5
2	Nurse assisted administration	127	241	5.4
3	Hospital outpatient appointment administration	184	292	7.5
4	Inpatient administration	643	1,085	59.2

Results per patient

Inpatient antimicrobial therapy has a significantly higher greenhouse gas (GHG) impact than all other forms of treatment, 643 kg CO₂ eq per patient. The OPAT scenarios had a GHG impact of 184 kg CO₂ eq per patient (hospital outpatient); 127 kg CO₂ eq per patient (nurse at home); and 97.2 kg CO₂ eq per patient (self administration). The analysis identified that the most substantial contributions to the antimicrobial therapy care pathway footprint are inpatient low intensity bed stay to receive IV antibiotics and travel (patient and nurse). Inpatient care is primarily associated with the use of energy and consumables and is therefore directly related to the hospital length of stay. The impact for patient and nurse travel is primarily associated with passenger vehicle transport.

Results per patient population



Scenario 1: self-administration - the most significant environmental contributor is the device manufacture, which accounts for 65% of the water use, 22% of waste and 15% of CO₂ eq emissions.

Scenario 2: nurse assisted administration - nurse travel to the patient has the highest contribution to the climate change impact (34%).

Scenario 3: hospital outpatient appointment administration - patient travel to the hospital has the highest contribution to the climate change impact (48%).

Scenario 4: inpatient administration - the most significant environmental contributor is the low-intensity bed stay, which accounts for 85% of the water use, 85% of waste and 90% of CO₂ eq emissions.

Acknowledgements

This document has been developed collaboratively with Baxter and the SHC. 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 SHC 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.