Digital Adherence Monitoring in Poorly Controlled Paediatric Asthma

Care Pathway Case Study

AstraZeneca

Sustainable Healthcare Coalition

Environmental Impact of Digital Adherence Monitoring in Poorly Controlled Paediatric Asthma

Title	Digital adherence monitoring in poorly controlled paediatric asthma
Organisation	AstraZeneca, Adherium
Company website	www.astrazeneca.com/
Contact details	Nigel Budgen (Nigel.Budgen@astrazeneca.com)
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Assurance	Internal assurance
Supporting information	Tickner C, Budgen N, Brooks A, Care pathway for digital adherence monitoring in poorly controlled paediatric asthma, (2017) AstraZeneca, Adherium.
Conformance with 2012 Greenhouse Gas Protocol Pharmaceutical and Care Pathways: Guidance on Appraising Sustainability ("the Guidance")	Adheres to the principles of the Guidance
Care pathway description	Prevention of asthma exacerbations by use of the Smartinhaler™ device, an intelligent digitally connected Dry Powdered Inhaler (DPI)
Environmental issues appraised	Global warming potential (IPCC, CO_2 eq, 100-year) Water consumption (m^3) Waste generation (kg)

Conclusions

This study estimates for a patient with poorly controlled asthma a reduction of overall greenhouse gas (GHG) emissions by around **50%**, from improved adherence when using a DPI Smartinhaler™ device. Waste production and water consumption were estimated to be similarly reduced by Smartinhaler ™ device use, by around **60%** and **32%** respectively.

Learnings

This study demonstrates good asthma treatments, effectively delivered and adhered to, result in reduced environmental impacts. The most impactful effect on the environment from children controlling asthma with a Smartinhaler™ device is through reduced reliever use and reduced hospital admissions. The relative impact reduction estimated in this study, is based on reliable published peer reviewed data. This impact reduction is directly proportional to change in behaviours provided in clinical studies. The reported relative impact reduction is therefore well founded and is not reliant on derived factors.

However, in this study the absolute GHG emission, water consumption and waste generation values are reliant on secondary data and emission factors. This introduces a degree of uncertainty for the final absolute footprint value estimates. A more in depth and specific life cycle assessment of all the standard procedures that are specifically deployed to control asthma would be needed to provide a definitive measure of the absolute values.

The use of digital technology in asthma is relatively new and is still evolving. It promises to revolutionise the management of the disease. Further adherence studies are needed to confirm the key conclusions provided here. Using technology to improve a patient's control of asthma, to reduce the need for health care interventions and to prevent exacerbations are all steps towards a more sustainable approach to control the disease.

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 system[1].

Scope

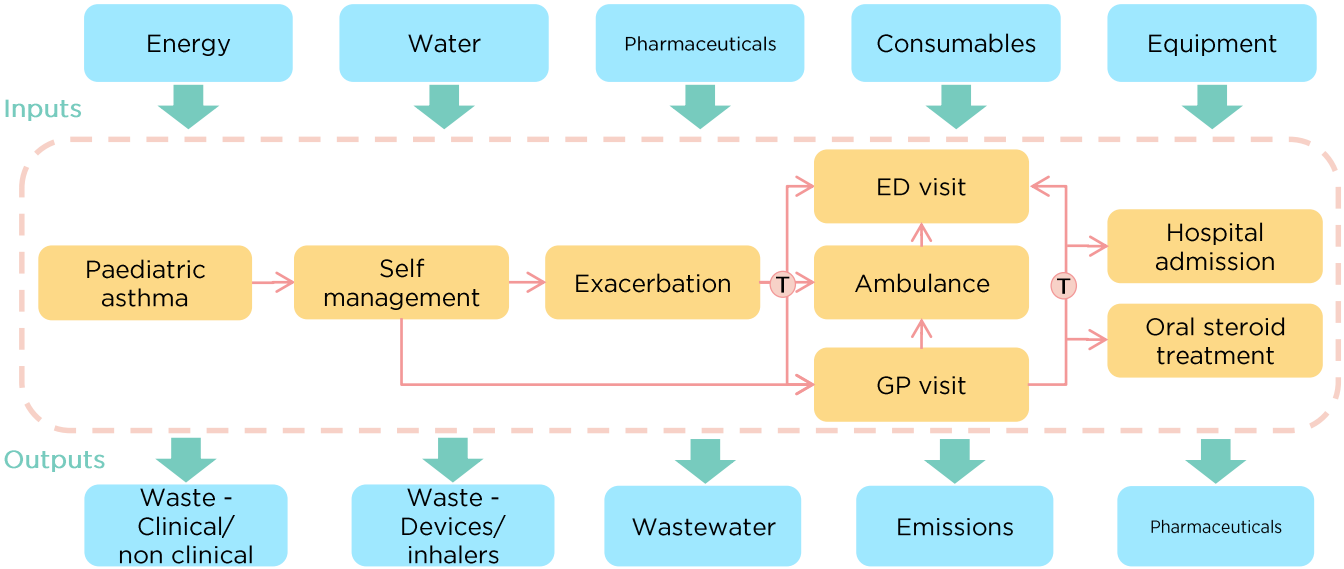
This appraisal considers the environmental impacts of poor control and improved control of paediatric asthma by use of intelligent digitally connected Dry Powdered Inhalers (DPI). The unit of analysis for this appraisal is:

"the annual management of a child with asthma aged 6 to 16 years old in the United Kingdom, taking regular inhaled steroids, typically with poorly

The overall environmental burden was assessed of using an intelligent inhaler with digital connectivity to control paediatric asthma. The patient population appraised have poorly controlled asthma, assessed by ACQ scoring or healthcare history. The study is based on a patient using Smartinhaler™ Turbu+ device with Symbicort DPI, as detailed by Morton el al[2] and Chan et al[3]. Typically, the children would be classed as at British Thoracic Society (BTS) level 3.

The care pathway is based on NICE and BTS SIGN guidance *Summary of asthma management – for adults*[4]. A poorly controlled and managed paediatric asthma patient is one who fails to adhere to treatment. The study defines controlled asthma when a child uses the Smartinhaler™ technology with a preventer inhaler.

GHG emissions, water consumption and waste product have been considered in this appraisal by using the approach and impact factors set out in the "Care Pathways: Guidance on Appraising Sustainability" guidance document. The diagram below sets out the process stages included in study.



[1] www.astrazeneca.com/sustainability.html
[2] Morton RW, Elphick HE ,Riby AS. et al. STAAR: a randomised controlled trial of electronic adherence monitoring with reminder alarms and feedback to improve clinical outcomes for children with asthma. Thorax (2017) Volume 72, 347 – 354
[3] Chan, Amy H Y et al. The effect of an electronic monitoring device with audio visual reminder function on adherence to inhaled corticosteroids and school attendance in children with asthma: a randomized controlled trial The Lancet Respiratory Medicine, (2016) Volume 3, Issue 3 , 210 – 219
[4] British guideline on the management of asthma ISBN 978 1 909103 47 4 (First published 2003 Revised edition published 2016)

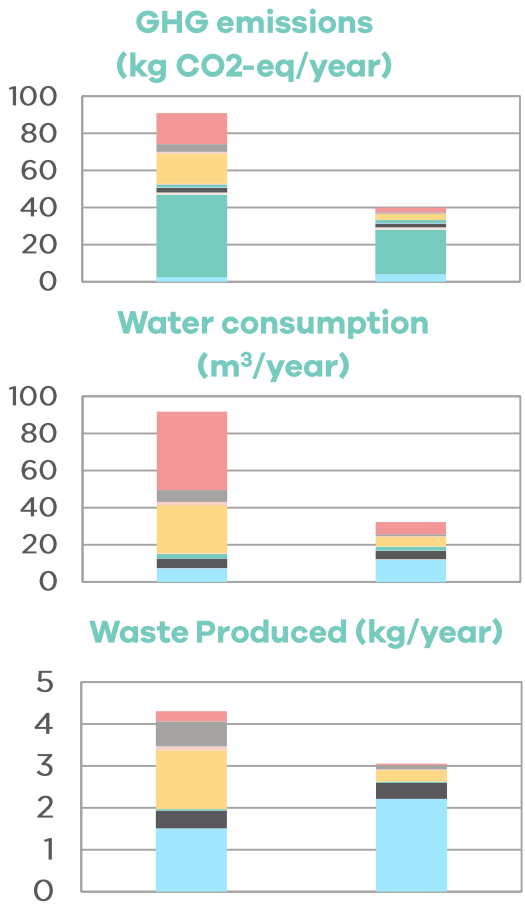
Data

The healthcare frequency and incident rates for the UK asthma patient population are derived from published UK NHS health surveys collected by GPs and health care trusts. The frequency of health interventions were extracted from 2011-2012 NHS datasets; published by Mukherjee et al[1].

Emission factors were taken from the SHC care pathway guidance, AstraZeneca's LCA model for the Symbicort DPI preventer and Smartinhaler™ Turbu+ EMD device[2], GSK Carbon Trust data for a pressurised metered inhaler[3] and AstraZeneca's LCA for an oral steroid tablet [2].

Results

The impacts of each care pathway activity were determined to provide an estimate of the GHG emissions, water consumption and waste generation for a child with poorly controlled asthma, with and without a Smartinhaler™ device.



When a Smartinhaler™ device is used by a patient the estimated GHG emissions, water consumption and waste generated are all determined to be reduced across all activities of the care pathway, despite the increases associated with the manufacture, use and disposal of the device itself.

The highest reduction in GHG emissions were due to less hospital admissions and associated travel, and from reduced reliever use. The reduction in water consumption and waste generation is largely explained by less hospital admissions and associated travel.

This analysis clearly illustrates that the use of Smartinhaler™ technology to control asthma will have a positive benefit to the impacts assessed; from the improved control of the disease resulting in a reduction in the incidence of exacerbations and need for healthcare interventions.

Acknowledgements

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[1] Mukherjee M. Estimating the incidence, prevalence and true cost of asthma in the UK. BMJ Open (2014).
[2] AstraZeneca internal LCA reports For Symbicort and Turbu+. Authored by ERM (2016)
[3] GSK Data: (2014)
http://networks.sustainablehealthcare.org.uk/sites/default/files/media/GSK%20Carbon%20Trust%20Certification%202014.pdf