Environmental Impact of Aflibercept for the Treatment of Neovascular Age-Related Macular Degeneration and Diabetic Macular Oedema in The Netherlands

Poster HSD123

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Introduction

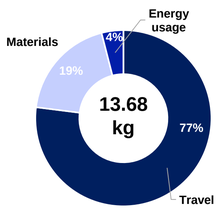
The environmental impact of the healthcare sector

- Healthcare plays a considerable role in carbon emissions and transitioning towards sustainable practices is essential for achieving climate goals.
- In the Netherlands, the healthcare sector contributes approximately 7% of global greenhouse gas emissions [1].
- The footprint of the healthcare system consists of medical procedures and the effects of the production of goods and services used in healthcare.

The environmental impact of anti-VEGF treatment

- With the increasing prevalence of neovascular age-related macular degeneration (nAMD) and diabetic macular oedema (DME), the use of anti-vascular endothelial growth factor (anti-VEGF) treatments through intravitreal injections has become more common.
- Each injection of anti-VEGF treatment is estimated to generate 13.68 kg of carbon dioxide equivalent (CO_2eq) and therefore, this regimen strongly impacts the carbon footprint.
- Aflibercept 8mg allows treatment in extended intervals without compromising efficacy or safety and therefore can contribute to a lower burden on the environment.

The environmental impact of intravitreal injections [2]



Study aim

This study aims to calculate the environmental impact of the reduced treatment regimen of aflibercept 8mg, marking the initial step towards incorporating carbon analyses into the purview of HTA bodies.

Discussion and conclusions

Main findings

- Our study shows the substantial impact of the treatment regimens of anti-VEGFs on CO_2eq emissions.
- Switching from the 8-weekly regimen of aflibercept 2mg to the 16-week dosing regimen of aflibercept 8mg contributes to the reduction of the carbon footprint within the healthcare system by reducing the CO_2eq emission with 35.9% and 43.5%.

Discussion

- Analysis like this are an important first step in improving sustainability in healthcare.
- However, it is important to extend this analysis further by including the impact on medication and medication-related adverse events in the analysis.

Future steps

- To factor in medication's environmental impact in decision-making, we should create guidelines for measuring CO_2eq emissions in treatments, evaluating environmental effects in cost-effectiveness analyses, and managing health-environment trade-offs.

Methods

Base case analysis

- We developed a model to estimate the CO_2eq emissions related to treatment with aflibercept 2mg (using an 8-week dosing regimen) and aflibercept 8mg (using a 12-week [Q12] or 16-week [Q16] dosing regimen) in the total population of Dutch treatment-naïve nAMD and DME patients, over a two-year time horizon.
- The base-case analysis was performed based on the assumption that all treatment-naïve patients started with either aflibercept 2mg, aflibercept 8mg Q12, or aflibercept 8mg Q16.
- Input parameters were based on trial data and literature (Table 1). CO_2eq emissions were based on travel, materials (i.e., production and waste), and energy usage.

Additional analyses

- In addition to the base analysis, we calculated the impact of a mix of aflibercept 2mg with aflibercept 8mg Q12 and aflibercept 8mg Q16 to simulate potential market shares.
- Moreover, we performed a sensitivity analysis in which we variated the injection frequency with a 25% interval.

Table 1. Overview of model inputs

Parameter	Input		Source
Number of patients			
Incidence nAMD in the Netherlands	4,680		Zinnige zorg [3]
Incidence DME in the Netherlands	4,304		Calculated based on Vzinfo and Li et al. [4,5]
CO_2eq emission per intravitreal injection, excluding anti-VEGF agent			
Travel	10.49 (77%)		Power et al. [2]
Materials	2.54 (19%)		
Energy usage	0.59 (4%)		
Number of injections			
	Year 1*	**Year 2**	
Aflibercept 2mg in nAMD	7.5	6.4	PULSAR trial [6]
Aflibercept 8 mg Q12 in nAMD	6.6	3.9	
Aflibercept 8 mg Q16 in nAMD	5.6	3.3	
Aflibercept 2mg in DME	8.6	6.4	PHOTON trial [7]
Aflibercept 8 mg Q12 in DME	6.5	3.8	
Aflibercept 8 mg Q16 in DME	5.4	3.0	

Note: *Including loading dose consisting of three, monthly injections

Results

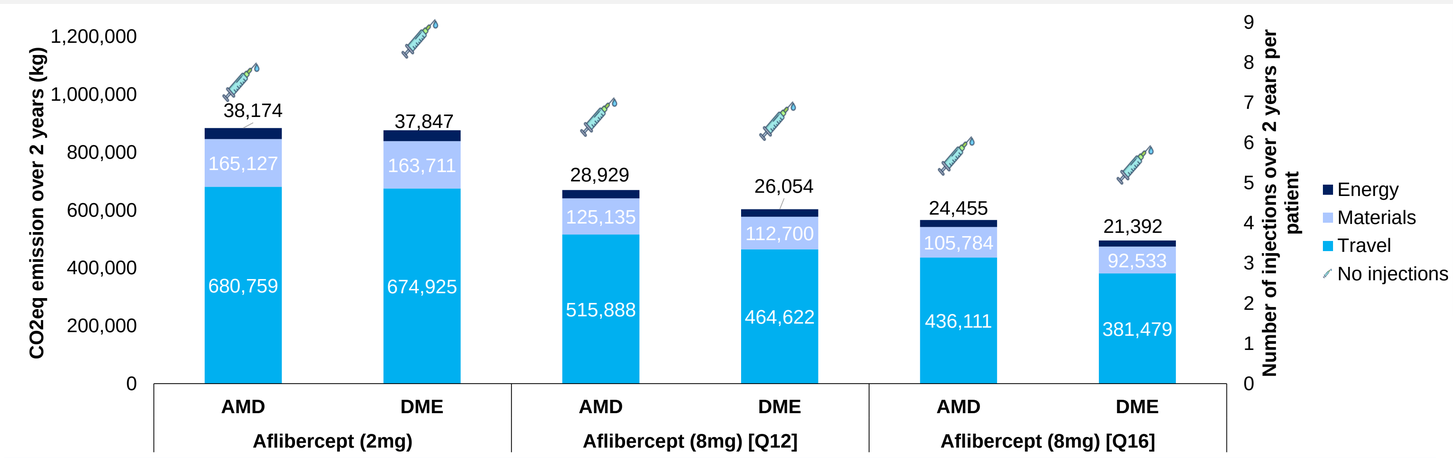


Figure 1. CO_2eq emission over for total patient population over a 2-year time horizon and related number of injections (assuming a 100% market share)

Base case analysis

- Switching from aflibercept 2mg to aflibercept 8mg in treatment-naïve nAMD patients lowers the carbon emissions by 45.7 kg CO_2eq (24.2%) and 63.5 kg CO_2eq (35.9%) in a 12-week and 16-week dosing regimen, respectively (Figure 1).
- In treatment-naïve DME patients, the switch from aflibercept 2mg to aflibercept 8mg results in an even larger reduction, with carbon emissions decreasing by 67.9 kg CO_2eq to 88.5 kg CO_2eq (31.2% to 43.5%) (Figure 1).
- As expected, the CO_2eq emission is directly related to the injection frequency.

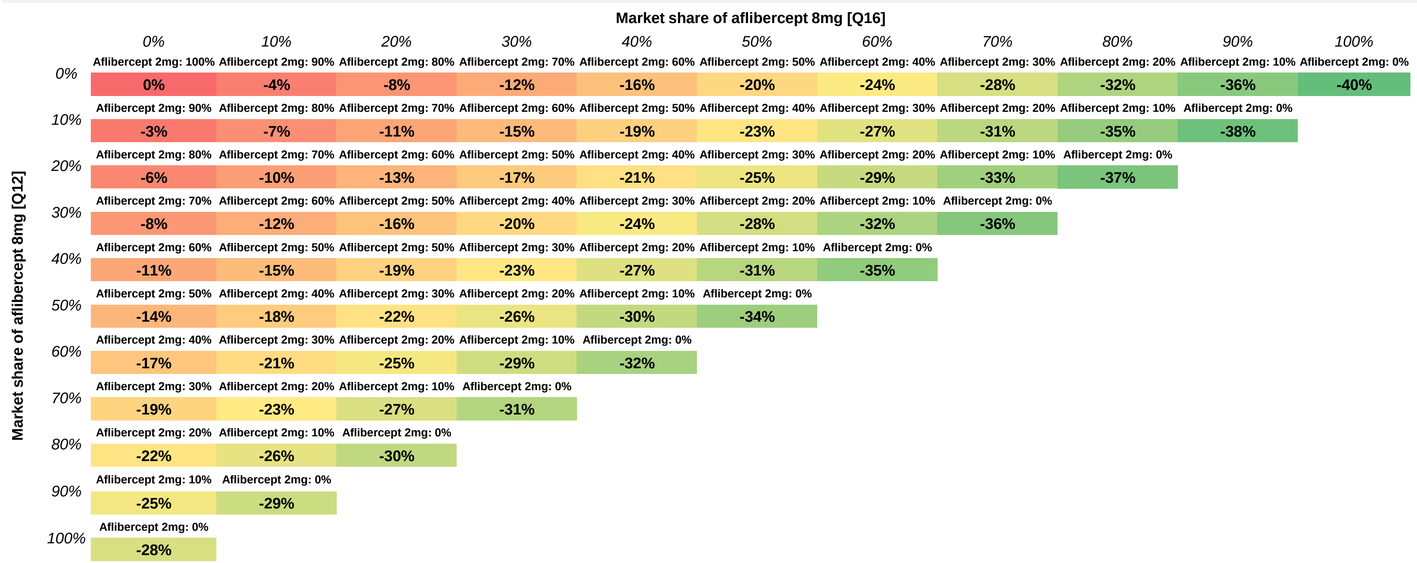


Figure 2. Two-way table presenting the reduction in CO_2eq emission versus 100% aflibercept 2mg, using different market shares

Additional analyses

- Figure 2 shows the CO_2eq emission with different market shares of aflibercept 2mg, aflibercept 8mg Q12, and aflibercept 8mg Q16. It shows a clear decrease towards a larger share of either regimens and how it decreases with a larger share of aflibercept 8mg.
- Figure 3 illustrates overlapping 25% distributions for the included treatments and regimens. The CO_2eq emissions for aflibercept 2mg range from 132.3 to 237.1 kg, while those for aflibercept 8mg Q12 span from 107.8 to 179.7 kg, and for aflibercept 8mg Q16, they range from 91.1 to 151 kg CO_2eq.

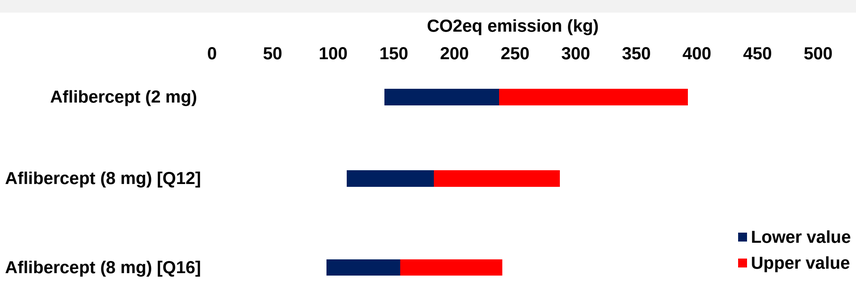


Figure 3. 25% sensitivity analysis of CO_2eq emission (kg) of aflibercept 2mg and 8mg

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