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Pharmacoeconomic analysis of switch to faricimab for neovascular age-related macular degeneration in real clinical practice

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ABSTRACT

Introduction: Neovascular age-related macular degeneration (nAMD) is one of the leading causes of severe vision loss among older adults. This condition impairs patients' quality of life and imposes a significant economic burden on the healthcare system. This study aims to determine the difference in direct healthcare cost (DHC) after switching the current pharmacological treatment in patients with nAMD, under a treat-and-extend regimen, to faricimab.

Methods: Treatment interval data obtained after switching to faricimab in 225 eyes with nAMD was used to calculate total DHC in comparison with the theoretical DHC had if patients remained on their previous treatment (drug and treatment interval). An "optimal responder" was defined as a patient whose interval between intravital injections was extended by more than 8 weeks relative to the baseline treatment interval.

Results: The theoretical DHC of treatment for this series of nAMD eyes would have been €2,351,241.90, compared with an actual DHC after switching to faricimab of €1,718,015.83, representing a saving of €633,226.06 for 225 eyes. The mean theoretical DHC would have been €10,449.96 ± 4,340.18 (from 1,423.75 to 23,695.20), compared with a mean actual total cost of €7,635.62 ± 2,465.07 (from 2,571.88 to 15,431.28). The mean actual DHC was €8,499.74 ± 2,678.42 in the "non-optimal responder" group versus €6,593.59 ± 1,674.91 in the "optimal responder" group ($p < 0.001$).

Conclusion: Switching to faricimab in patients with nAMD on a treat-and-extend regimen with a treatment interval of less than 12 weeks resulted in a significant reduction in total DHC, particularly in the "optimal responder" group.

Keywords: Anti-VEGF therapy, Direct healthcare costs, Drug substitution, Health care quality, access, and evaluation, Intravitreal injection burden, Retinal disease

Introduction

Age-related macular degeneration (AMD) is the leading cause of vision loss worldwide, with a multifactorial etiology, a complex interplay between aging, genetic susceptibility, and environmental risk factors (1,2). The number of European patients with advanced AMD is expected to increase from 2.7 million in 2013 to 3.6-4.8 million by 2040 (3). Currently, the first-line treatment for the neovascular age-related macular degeneration (nAMD) is the administration of intravitreal injections (IVIs) of anti-vascular endothelial growth factor (anti-VEGF) drugs.

Although anti-VEGF agents have revolutionized the current therapeutic framework (4,5), they require frequent injections, placing a substantial burden on patients and their caregivers (6,7), straining healthcare systems, and are costly (8,9). As the global population ages, the incidence of nAMD is projected to rise, with the worldwide prevalence expected to reach 288 million by 2040, further exacerbating its social and economic impact (10).

Over the years, various anti-VEGF treatment strategies have been introduced to reduce the number of IVIs, while maintaining comparable visual outcomes. Compared with fixed regimens, the treat-and-extend (T&E) regimen, in which injection intervals are gradually extended or shortened based on individual treatment response, reduces both overtreatment and undertreatment by adjusting treatment intervals (TI) to patients' disease activity, and is therefore

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recommended as the standard treatment regimen for nAMD in a large number of clinical practice guidelines (11,12).

If effective disease control could be maintained with less frequent IVIs, substantial benefits could be attained for both patients and healthcare systems, while simultaneously reducing costs (13). Extending TI would decrease the clinical workload and optimize the use of healthcare resources by reducing the frequency of ophthalmology visits, thereby improving overall patient management (6,14,15).

Faricimab received European marketing authorization in 2022 (16,17). Although all anti-VEGF agents have been shown to induce similar visual outcomes, the number of injections required to achieve and maintain this effect varies among different anti-VEGF agents and treatment regimens (18,19). A reduced injection frequency decreases the burden associated with anti-VEGF treatment. Consequently, studies have shown that patients prioritize treatment efficacy; however, given the same clinical effect, they prefer treatment regimens with fewer hospital visits (20).

Direct healthcare costs (DHC), including both treatments and healthcare services, are an important factor when selecting anti-VEGF agents to help reduce the financial burden of ophthalmic care.

This study aims to determine the difference in DHC following a switch from the current pharmacological treatment of patients with nAMD to faricimab, considering real-world data and insights from routine clinical practice.

Material and methods

Study design

The study was approved by the Ethics Committee of Puerta de Hierro University Hospital (Protocol number 31/25) and conducted in compliance with the principles of the Declaration of Helsinki, International Council for Harmonization guidelines, Good Clinical Practice standards, and applicable Spanish laws. To ensure patient confidentiality, all identified data were encrypted or appropriately anonymized. The patients or the public were not involved in the design, conduct, reporting, or dissemination plans of our research.

Study participants

This prospective, single-center study was based on a real-world clinical practice registry. A cohort of 188 patients with nAMD, with a mean age of 79.6 ± 7.4 years were included from the Puerta de Hierro-Majadahonda University Hospital. A total of 225 eyes were analyzed. This study included male and female subjects aged ≥18 years with nAMD who had undergone prior treatment with anti-VEGF agents, had a TI of <12 weeks, and a minimum follow-up of 24 weeks in a T&E regimen, as previously published (21). Data was collected between September 1, 2023, and December 1, 2024.

All patients underwent a complete ophthalmological examination, including best-corrected visual acuity, slit-lamp examination of the anterior segment, intraocular pressure measurement using Goldmann tonometry, indirect fundus ophthalmoscopy, and multimodal imaging (fundus color photography and spectral domain optical coherence tomography (SD-OCT) using Heidelberg Spectralis or Topcon (SS Triton)). These examinations were performed on both eyes if they met the inclusion criteria.

Treat-and-extent regimen

In summary, according to the protocol design, the initial TI corresponded to the last interval prior to switching to faricimab. In subsequent visits, if the retina was dry, TI was extended by 2 or 4 weeks at the investigator's discretion, with IVIs of faricimab administered according to the T&E regimen. Before switching to faricimab, patients were treated with ranibizumab, aflibercept, brolucizumab or bevacizumab.

Study outcomes

The pharmacoeconomic analysis was conducted from the healthcare system perspective. The primary endpoint was the total DHC of the treatment for each patient after switching. All costs were valued in 2024 euros (€) in line with the data collection period.

To calculate economic study costs, TI for drug administration was considered based on clinical practice data from Puerta de Hierro-Majadahonda University Hospital, as obtained in the aforementioned study (21).

DHC associated with treatment administration included: cost of OCT examination (€125.95), cost of follow-up medical visit (€91.81, treatment and monitoring), and cost of IVI administration (€225.00). Additionally, notified ex-factory prices for the drugs used were considered (ranibizumab, aflibercept and brolucizumab €742.00 each, faricimab €843.18 and €31.82 for each fractionated dose of bevacizumab from a vial of 16 mL).

Initially, the number of administrations per patient was calculated by dividing the follow-up duration (in weeks) by the initial TI duration (in weeks). However, the actual number of administrations after switching to faricimab treatment was also considered. Each administration was assigned a total cost (examination, visit, IVI administration) of €442.76, along with the corresponding drug cost according to the treatment received by the patients.

Thus, the incremental DHC per patient associated with switching to faricimab was calculated (the difference between total DHC after switching and total estimated DHC with current treatment).

An "optimal responder" was defined, based on clinical experience, as a patient whose interval between IVIs was extended by more than 8 weeks relative to the previous/initial TI.

Statistical analysis

Statistical analyses were conducted using R statistical software (version 4.4.1, Vienna, Austria). Costs were compared between the optimal and non-optimal groups. Given the inherently right-skewed distribution of healthcare cost data, a Generalized Linear Model with a Gamma distribution and log link function was used to assess differences in visits, treatment costs, and total costs between groups. This

approach is recommended for strictly positive cost data as it avoids the assumptions of normality required by conventional parametric tests. The total cost difference between groups was analyzed using linear regression, as this variable can take negative values and therefore does not meet the requirements for a Gamma distribution model. Mean actual visit and treatment cost after switch was identical across all patients (fixed unit cost) and was therefore reported descriptively without inferential testing. Results are presented as mean and standard deviation (SD). Statistical significance was set at $p < 0.05$.

One-way sensitivity analysis was performed to evaluate the robustness of the study by varying unit treatment administration costs by ±20%. Additionally, a multivariate deterministic sensitivity analysis was performed by simultaneously varying all cost parameters within ±20%, defining a pessimistic scenario (lower bound) and an optimistic scenario (upper bound).

Results

The projected DHC for these patients, based on the drug, IVI interval, and follow-up period, would have been €2,351,241.90. In contrast, the actual DHC for the same patients after switching to faricimab over the same period was €1,718,015.83. Thus, the resulting savings amounted to €633,226.06 for 225 eyes, with a mean follow-up of 51.4 ± 11.8 weeks (from 24 to 88); see Figure 1. 79.11% of the eyes showed cost savings.

The mean projected visit and treatment cost was €1,077.44 ± 254.92 (from 474.58 to 1,184.76). The mean actual visit and treatment cost after the switch was €1,285.94 for all patients. The mean projected DHC would have been €10,449.96 ± 4,340.18 (from 1,423.75 to 23,695.20), whereas the mean actual DHC was €7,635.62 ± 2,465.07 (from 2,571.88 to 15,431.28); see Table 1.

When analyzed separately, "non-optimal responders" (120 eyes) versus "optimal responders" (105 eyes) had mean projected visit and treatment costs of €1,054.56 ± 275.95 and €1,103.60 ± 227.03, respectively ($p = 0.153$). Similarly, the mean projected DHC was €9,718.01 ± 4,300.48 versus €11,286.48 ± 4,252.79, respectively ($p = 0.007$). The mean actual DHC was €8,605.08 ± 2,676.70 in the "non-optimal responder" group versus €6,527.68 ± 1,601.93 in the "optimal responder" group ($p < 0.001$). The difference between projected and actual DHC for each group was €−1,112.93 ± 3,772.94 versus €−4,758.80 ± 3,619.19, respectively ($p < 0.001$); see Table 2.

One-way sensitivity analysis was performed to identify the robustness of the base case. The base case was the difference in mean total cost per patient. The analysis showed that IVI administration was the parameter that most influenced the model; nevertheless, all variations are small and did not differ meaningfully from the base case; see Figure 2. The multivariate sensitivity analysis showed that results ranged from €-3,140.60 in the optimistic scenario to €-2,488.07 in the pessimistic scenario, compared to the base case (€-2,814.34).

Discussion

Medical visits and the high number of IVIs required for the treatment of nAMD lead to substantial DHC. A retrospective observational study of 126 patients from tertiary hospitals in Spain reported that a high frequency of monitoring visits and IVIs imposed a significant burden on the health care system (22,23). Therefore, given similar visual outcomes

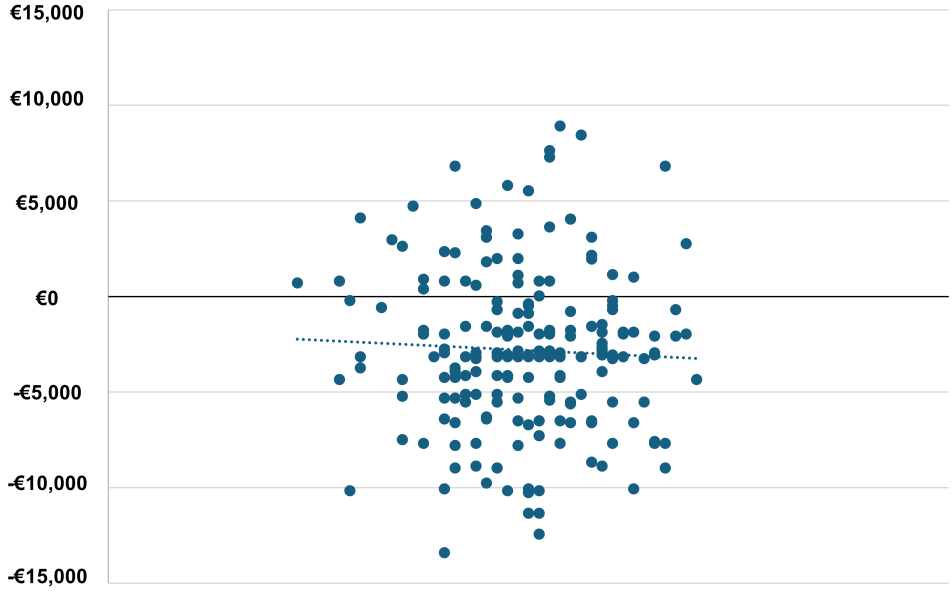

FIGURE 1 - Scatter plot representing the cost differential in every eye after the switch to faricimab.

TABLE 1 - Mean DHCs of the total group, in euros

Cost (€)	Mean	SD	Minimum	Maximum
Mean projected visit and treatment cost	1,077.44	254.92	474.58	1,184.76
Mean actual visit and treatment cost after switch	1,285.94	–	–	–
Mean projected total cost per patient	10,449.96	4,340.19	1,423.75	23,695.20
Mean actual total cost after switch per patient	7,635.63	2,465.08	2,571.88	15,431.28
Difference	–2,814.34	4,119.10	8,924.94	–13,407.68

Notes: Total group (n = 225 eyes).
Abbreviations: SD, standard deviation.

TABLE 2 - Mean DHCs in each group according to response achieved, in Euros

Cost (€)	Group	Mean	SD	P value
Mean projected visit and treatment cost	1	1,054.56	275.95	0.153
	2	1,103.60	227.03	
Mean actual visit and treatment cost after switch*	1	1,285.94	–	–
	2	1,285.94	–	
Total projected cost	1	9,718.01	4,300.48	0.007
	2	11,286.48	4,252.79	
Total cost after switch	1	8,605.08	2,676.70	<0.001
	2	6,527.68	1,601.93	
Difference	1	–1,112.93	3,772.94	<0.001
	2	–4,758.80	3,619.19	

Notes: Group 1, "Non-optimal responders" (n = 120 eyes); Group 2, "Optimal responders" (n = 105 eyes). *Visit and treatment cost represents a fixed unit cost (identical between subgroups; SD = 0. Statistical comparison was not applicable).
Abbreviations: SD, standard deviation.

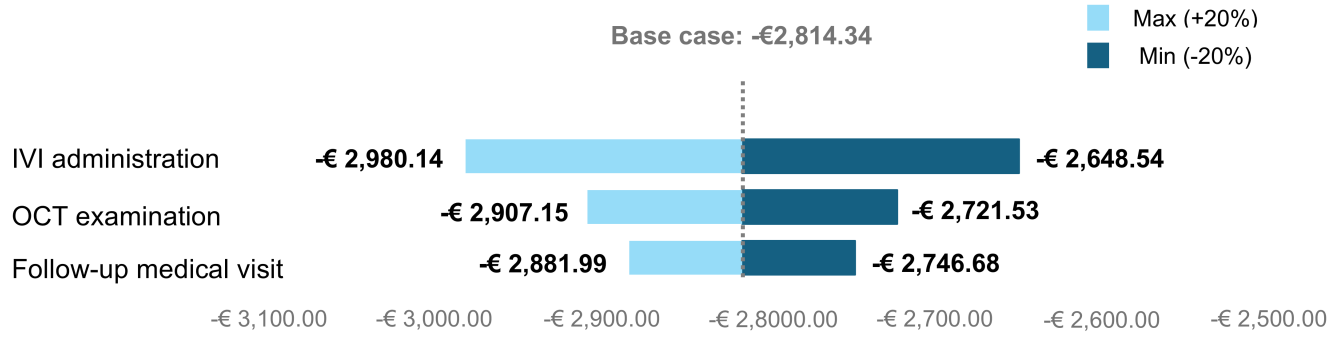

FIGURE 2 - One-way sensitivity analysis (Tornado diagram).
Abbreviations: IVI, intravitreal injection; OCT, optical coherence tomography.

(23), a reduction in the number of IVIs could generate considerable cost savings without compromising patients' functional outcomes.

Similarly, it was found that costs associated with IVIs represented the largest proportion of DHC. The authors hypothesized that the use of more effective treatments could increase TI between IVIs, thereby reducing healthcare resource utilization in nAMD (22,23). Evidence from their study showed that DHC decreased significantly between year one and year three simply because of extending TI (22, 23).

nAMD implies a substantial impact on health resources. Therefore, we designed a pharmacoeconomic study to analyze whether a reduction in the number of IVIs, achieved by increasing TI, as shown in our previous work (21), could have significant economic implications. As the patients remained stable on a known drug, we were able to calculate the projected DHC that treating the study cohort under a T&E regimen would have entailed. We also determined the actual DHC generated by treating these patients with faricimab during the same follow-up period.

According to the National Institute of Statistics, approximately 10.19 million people over 65 years old lived in Spain in 2025. In Europe, the prevalence of nAMD in this group has been estimated to be 2.29% (24). On this basis, approximately 233,351 individuals aged over 65 years are affected by nAMD in Spain. Considering that our series achieved savings of €633,226.06 over a mean follow-up of one year, this corresponds to a mean saving of €2,814.33 per eye annually. Extrapolating this figure to the national level and considering that each patient in this study had an average of 1.2 affected eyes (225 eyes from 188 patients), annual savings in Spain could reach €788.072.064.

Our results are supported by publications from other countries, such as Sweden, where studies show that, even when compared with a lower-cost alternative like bevacizumab, faricimab remains the most cost-effective option for patients with nAMD (25). Evidence has shown the impact of distance and/or travel time on healthcare service access in rural and isolated areas (26). Its extended TI is particularly beneficial for patients living far from clinics, especially if the real-world IVI interval for faricimab extends beyond 12 weeks, which aligns with our findings in the "optimal responder" group. These results highlight the potential of faricimab to reduce the healthcare workload and to treat a broader patient population using existing clinical resources (25).

In a distinctly different healthcare setting such as Dubai, similar results have been observed (27). The introduction of faricimab for the treatment of diabetic macular edema and nAMD within the Dubai healthcare system has provided opportunities for both cost savings and improved patient outcomes (27). According to the authors, budget impact analysis clearly demonstrated that extended TI achieved with faricimab contributes to a significant reduction in DHC compared with other anti-VEGF therapies. These savings are primarily attributable to the reduced frequency of IVIs, which lowers not only drug acquisition costs but also the overall DHC by reducing follow-up visits (27).

In New Zealand, the potential impact on DHC of approving faricimab for nAMD was estimated in a study with some similarities to ours (28). A retrospective, single-center cost-analysis study was conducted on intravitreal drugs and TI. Cost estimates were based on internal data and publicly available information. Current care costs were compared in two scenarios: one in which all eyes received faricimab, and the others received aflibercept prior to switching to faricimab. This study included 352 eyes of 292 patients. The local 10-year cost savings were estimated to be $6,776,340 for the first scenario and $5,015,922 for the second. At the national level, the savings amounted to $187,925,737 and $139,104,706, respectively. The analysis indicates substantial DHC, concluding that the approval of faricimab for nAMD could result in significant cost reductions for healthcare systems (28).

Similar conclusions have been drawn when analyzing faricimab in another condition, such as diabetic macular edema. Meunier et al concluded that using long-acting therapies requiring fewer injections, such as faricimab, may reduce costs, improve health outcomes, and enhance health equity (29).

Recent evidence has been published in which the authors evaluated the cost-effectiveness of anti-VEGF treatments for nAMD using a value-based model that considers drug durability, dosing regimens, and real-world administration strategies, including safe vial fractionation. They concluded that combining durable agents and extended dosing intervals can substantially improve cost-effectiveness (30).

According to our results in a series of patients with stable T&E using other drugs (225 eyes with a mean follow-up of 1 year), projected DHC based on follow-up, TI between IVIs, and administered drug was €2,351,241.90, while savings reached €633,226.06, corresponding to €2,814.33 annually per eye.

This result was further optimized when considering the group of "optimal responders" in whom the TI was extended to 8 weeks or more from the previous interval. In this group (105 eyes), the mean projected DHC would have been €11,286.48 ± 4,252.79, compared with an actual mean total DHC of €6,527.68 ± 1,601.93, resulting in a mean saving of €4,758.80 ± 3,619.19 per eye. Our analysis represents a snapshot of potential cost savings in the management of nAMD in the Spanish healthcare system, based on data and evidence from real-life practice and maintaining comparable clinical effectiveness as we have previously published (21).

One-way sensitivity analysis highlighted that the model is robust to potential variations in cost inputs (OCT examination, follow-up medical visit and IVI administration) and changes of ±20% did not alter the overall conclusion.

Our study shows several limitations. DHC are calculated based on a theoretical and stable TI, although TI may change along the course of follow-up in patients under the T&E regimen, whether there is an increase or a decrease in such intervals. The time horizon was limited; therefore long-term outcomes related to a chronic disease may not be fully captured. Our model is based on the Spanish health system, and costs may or may not be comparable to others.

Conclusion

In conclusion, switching to faricimab in nAMD patients on a T&E regimen with a TI of less than 12 weeks resulted in a substantial reduction in DHC, particularly in the "optimal responders" group. These results may provide support for improving the standard clinical practice in the context of nAMD in Spain; however these findings should be interpreted considering the study's limitations.

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Disclosures

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Ethics approval and informed consent: This study involves human participants and was approved by an Ethics Committee and Institutional Board: "Comité Ético de Investigaciones Científicas del Hospital Universitario Puerta de Hierro-Majadahonda" (Protocol number 31/25).

Authors' contributions: Substantial contributions to the conceptualization or design of the work: JR-M, MP, JMR-M. Acquisition of data and investigation: JR-M, MP, MH-G, CM-A. Analysis, or interpretation of data for the work: JR-M, MP, JMR-M. Drafting the work: JR-M, JMR-M. Revising it critically for important intellectual content: JR-M, MP, MH-G, CM-A, JM R-M. Final approval of the version to be published: JR-M, MP, MH-G, CM-A, JMR-M. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: JR-M, MP, MH-G, CM-A, JMR-M. Guarantor: JR-M.

Data availability statement: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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