Cost-Effectiveness Analysis of Ferric Carboxymaltose Versus Iron Sucrose for the Treatment of Iron Deficiency Anemia in Patients with Inflammatory Bowel Disease in Spain

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Introduction

- Approximately one in 1,000 people in developed countries have inflammatory bowel disease (IBD), an umbrella term used to describe disorders that involve chronic inflammation of the digestive tract, the most common of which are Crohn's disease and ulcerative colitis.[1]
- The EpidemIBD study aims to provide a detailed nationwide analysis IBD in Spain, with early analyses of the cohort finding an annual incidence of 14.3–16.0 cases per 100,000 population per year.[2,3]
- An analysis of 1,871 people with newly diagnosed IBD in Europe found that 49% of people with Crohn's disease and 39% of people with ulcerative colitis experienced anemia in the first year after diagnosis.[4]
- Iron deficiency anemia (IDA) subsequent to IBD can result in reduced quality of life and increased healthcare costs.[5]
- IDA is treated through iron supplementation, with IV iron representing the first-line treatment option for many patients.

Objectives

- Ferric carboxymaltose (FCM) and iron sucrose (IS) are the IV iron formulations currently available in Spain.[6]
- This study assessed the cost-effectiveness of FCM compared with IS, in terms of additional cost per additional responder in patients with IDA subsequent to IBD in the Spanish setting.

Methods

- A cost-effectiveness model was developed in Microsoft Excel to assess treatment costs and the proportion of patients with IBD-associated IDA achieving a response over one cycle of treatment with FCM and IS from a Spanish healthcare payer perspective.
- Response to treatment was defined in accordance with ECCO guidelines as normalization of hemoglobin or an increase of ≥2 g/dL in hemoglobin.[7]
- Data on the efficacy of FCM and IS were taken from the head-to-head FERGIcor randomized clinical trial.[8]

Equation 1: Ganzoni formula

*Iron requirement (mg) = body weight * (target hemoglobin - current hemoglobin) * 2.4 + iron stores*

Target hemoglobin and iron stores assumed to be 15 g/dL and 500 mg, respectively, in all patients

Table 1: Simplified dosing table

Hemoglobin	Body weight		
	<35 kg	35 to 70 kg	≥70 kg
<10 g/dL	500 mg	1,500 mg	2,000 mg
10 to 14 g/dL	500 mg	1,000 mg	1,500 mg
≥14 g/dL	500 mg	500 mg	500 mg

The table shows the IV iron requirement based on patient body weight and hemoglobin.

- The dosing of IV iron treatment was calculated based on a simplified dosing table in the FCM arm and the Ganzoni formula in the IS arm, in line with the product labels (Table 1 and Equation 1, respectively).[9,10]
- The number of infusions needed to deliver the required dose was estimated based on the dosing schedules described in the product labels and used in the FERGIcor trial, with FCM administered in doses of up to 1,000 mg iron per infusion while IS dosage was restricted to 200 mg iron per infusion.
- Costs of treatment were calculated in 2021 Euros (EUR) using a microcosting approach, capturing the iron formulation, healthcare professional time and consumables.
- The cost-effectiveness of FCM versus IS was expressed as the additional cost per additional responder, with the difference in the mean cost of treatment divided by the difference in percentage of responders.

Results

- FCM was more effective than IS, with 84% of patients achieving a response compared with 76%, a difference of 8%.
- When expressed as number needed to treat, 13 patients would need to switch treatment from IS to FCM in order to achieve one additional responder, that is, treating 13 patients with FCM yields 11 responders instead of 10 responders if treated with IS.
- A mean iron dose of 1,423 mg was required in the FCM arm, compared with a mean dose of 1,321 mg in the IS arm, resulting from the different methods used to calculate the iron requirement.

Table 2: Results of the base case modeling analysis

	Ferric carboxymaltose	Iron sucrose
Responders (%)	84 (2)	76 (3)
Iron dose (mg)	1,423 (435)	1,321 (437)
Number of infusions	1.7 (0.5)	7.1 (2.2)
Cost per course of treatment (EUR)	323 (96)	470 (148)
Additional cost per additional responder	Ferric carboxymaltose more effective and less costly	

EUR, 2021 euros. Response was defined as a patient who achieved normalization of hemoglobin levels or an increase in hemoglobin of ≥2 g/dL. Values are mean (standard deviation).

- In order to deliver these doses, a mean of 1.7 infusions were required with FCM compared with a mean of 7.1 infusions with IS, due to the differences in dosing schedules.
- The mean total cost of a course of treatment was EUR 323 in the FCM arm compared with EUR 470 in the IS arm, giving a cost saving of EUR 147 with FCM (Table 2).
- Costs savings with FCM were driven by the reduced number of infusions required, resulting in a reduced requirement for hospital-based healthcare professional time and use of consumables compared with the IS arm.
- When cost-effectiveness was assessed, the analysis suggested that FCM was more effective and less costly than IS. Therefore FCM was considered dominant versus IS, and no calculation of an incremental cost-effectiveness ratio was required.
- The conclusions of the analysis remained unchanged when alternative model inputs were applied in sensitivity analyses (Table 3).

Conclusions

- The present analysis suggests that FCM is a more effective treatment option than IS for the treatment of IBD-associated IDA.
- FCM was associated with lower overall treatment costs from a Spanish healthcare payer perspective, as doses of up to 1,000 mg of iron can be administered in a single infusion compared with a limit of 200 mg per infusion with IS.

Table 3: Results of the sensitivity analyses

	Additional cost per additional responder
Base case	Ferric carboxymaltose more effective and less costly
Ganzoni formula used in both arm	Ferric carboxymaltose more effective and less costly
Simplified dosing table used in both arms	Ferric carboxymaltose more effective and less costly
Body weight increased by 10 kg	Ferric carboxymaltose more effective and less costly
Body weight decreased by 10 kg	Ferric carboxymaltose more effective and less costly
Hemoglobin increased by 1 g/dL	Ferric carboxymaltose more effective and less costly
Hemoglobin decreased by 1 g/dL	Ferric carboxymaltose more effective and less costly

EUR, 2021 euros. Response was defined as a patient who achieved normalization of hemoglobin levels or an increase in hemoglobin of ≥2 g/dL.

- This resulted in fewer infusions with FCM, and therefore cost savings as a result of reduced requirement for nursing time and use of consumables associated with administration of infusions.
- FCM improved outcomes at a cost saving compared to IS, and therefore was considered dominant from a healthcare payer perspective in Spain.
- Use of FCM to treat IBD-associated IDA is likely to be an appropriate use of scarce healthcare resources in Spain.

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