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Cost-effectiveness of ferric carboxymaltose in patients with iron deficiency and chronic heart failure in Austria

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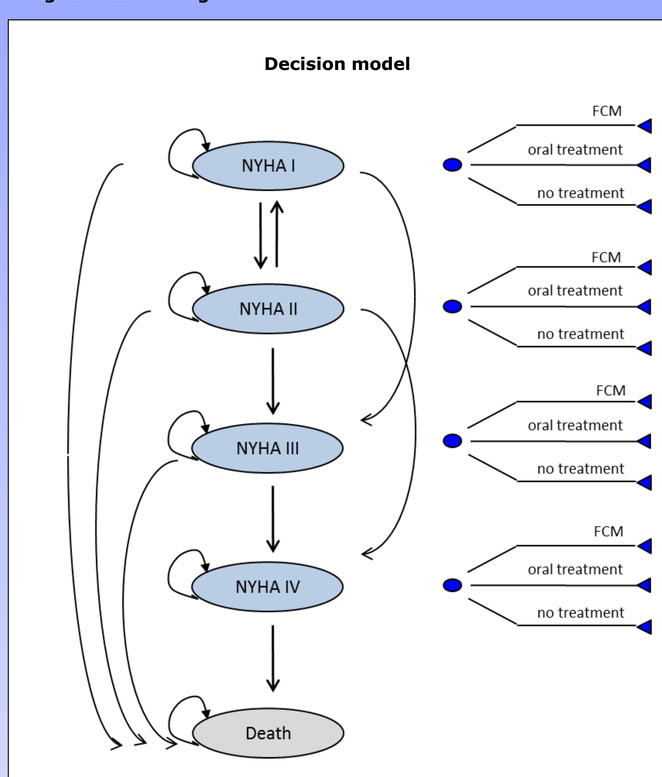
Objectives

Iron deficiency (ID), a non-cardiovascular comorbidity, is highly prevalent in chronic heart failure (CHF) patients and imposes a significant disease burden for CHF patients with enormous impact on their outcome and health care costs. Two pivotal studies (FAIR-HF and CONFIRM-HF) showed that the iron deficiency with ferric carboxymaltose (FCM), an iv iron, results in clinical meaningful benefits. The purpose of this study was to evaluate the cost-effectiveness of FCM versus no-treatment and oral iron supplementation in CHF patients with iron deficiency with and without anemia.

Methods

We developed a Cost-Utility-Model to simulate disease progression in CHF patients using different strategies of iron deficiency management. Markov modelling techniques were used to estimate disease progression, based on health states, defined by NYHA classes and death. Monte Carlo simulation accounted for uncertainty. The model includes 5 states and monthly transitions. Probabilities were derived from clinical and epidemiological studies. The cohort definition was adapted from the FAIR-HF study. Direct costs (NYHA, inpatient, outpatient and iron treatment costs) from published sources were used and expressed in Euro (2014) from the payer's perspective. QALYs and total costs were projected over a 4-year time horizon and discounted at 5% p.a.

Fig. 1: Model Design



FCM = ferric carboxymaltose

Model description:
A simulated cohort of 1,000 patients aged 67 entered the Model. The breakdown of NYHA classes of the starting cohort represents the Austrian distribution (calculated based on Klip et al. 2013 and Klip et al. 2014). Patients progress through the model in 1 month cycles for a duration of 4 years. After 1 month, patients either remained in NYHA class, improve or deteriorated. Patients could die in each health state.

CHF patients could receive 3 different strategies: FCM, oral treatment or no iron treatment.

Source: own developed

Clinical Data

Transition probabilities for movement between NYHA classes of heart failure for the no treatment strategy were estimated from the published literature (Yao et al. 2008, Ford et al. 2012). Changes of NYHA classes of the ferric carboxymaltose group and the placebo group were derived from the FAIR-HF trial (odds ratio for improvement by one class, 2.40; 95% CI,1.55 to 3.71; P<0.001). Changes of NYHA classes for the alternative „oral treatment„ is based on secondary endpoint results of the placebo arm of RCTs (range: 0.04 – 0.08) (Ghali et al. 2008, Van Veldhuisen et al. 2007).

Resource Use and Costs

Data on the resource use of the included iron deficiency and CHF was collected in two steps. First, the medical resources were derived by literature (e.g. clinical trials like FAIR-HF, cohort studies including patients with CHF, treatment guidelines etc.). In a second step this literature review was transferred to the Austrian setting.
The following direct medical costs were included:

- NYHA costs: patients in NYHA II have about 14% increased costs compared with NYHA I, NYHA III by 48% and NYHA IV by 71%.
- Medication costs: dosage equivalents of FCM and oral treatments were calculated based on the Ganzoni formular.
- Outpatient costs: GP consultations and blood count
- Inpatients costs: hospitalization due to iron deficiency

Austrian costs were derived from a number of publicly available sources like the DRG catalogue (LKF), official price lists for the Austrian Health insurances funds and the Austrian official drug price list (Warenverzeichnis). When necessary, prices were adjusted to 2014 prices using the consumer price index.

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Results

Over a 4-year timeframe, costs and outcomes associated with FCM would amount to €18,797.39 and 2.46 QALYs. Costs associated with oral treatment are €17,307.06 and 2.37 QALYs (ICER per QALY gained: €16,921.62). Costs and outcomes associated with no-treatment are €17,934.15 and 2.3 QALYs (ICER per QALY gained: €5,411.23). Due to a delayed disease progression in the FCM group NYHA costs are lower than with oral replacement and no-treatment.

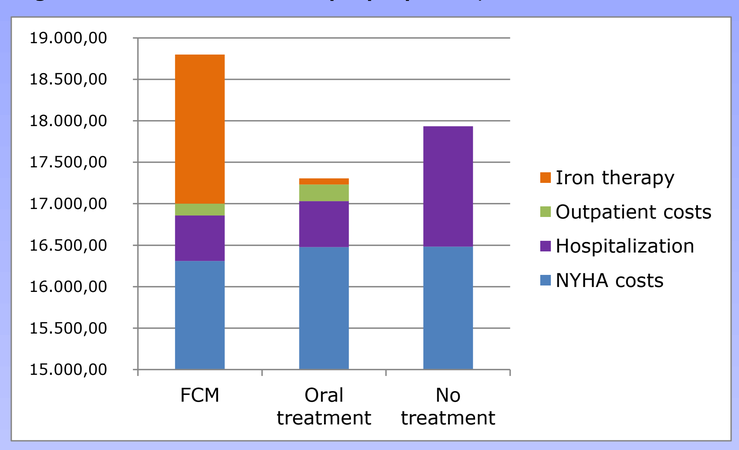
Tab. 1: Results, 2014

Strategy	Costs per patient (€)	Cost difference	QALYs per patient	QALY difference	ICER
FCM	18,797		2.46		
Oral treatment	17,307	1,490	2.37	0.088	16,922
No treatment	17,934	863	2.30	0.160	5,411

Source: own calculations

The analysis shows that iron deficiency therapy leads to reduced NYHA and hospitalization costs. Iron treatment costs are partly offset.

Fig 2: Breakdown of total costs per per patient , 2014



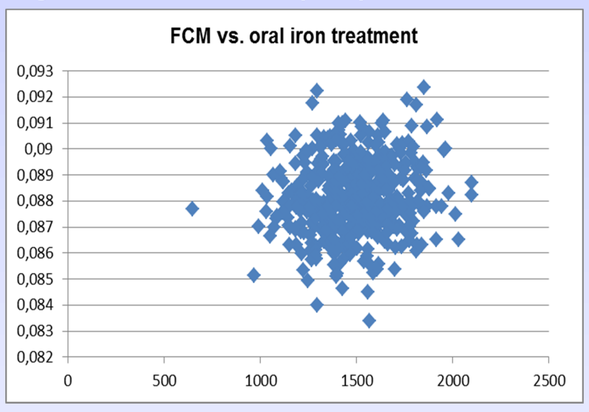
Source: own calculations

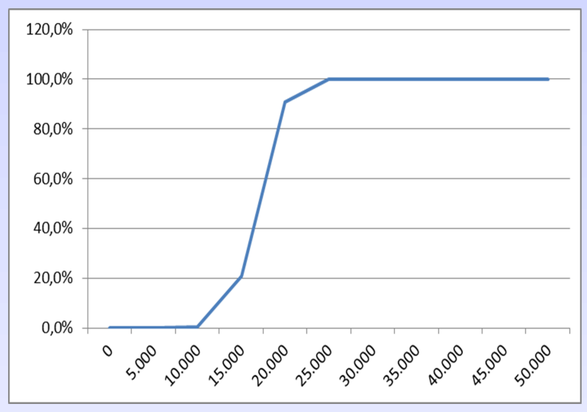
Patients with oral treatment face a quality of life reduction of 1 month in perfect health compared to FCM; with no treatment 2 month in perfect health are foregone.

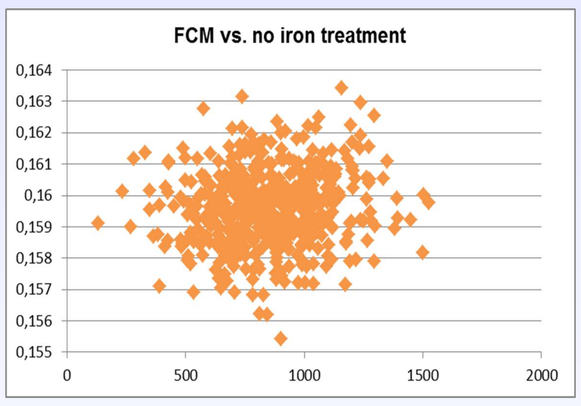
Sensitivity Analysis

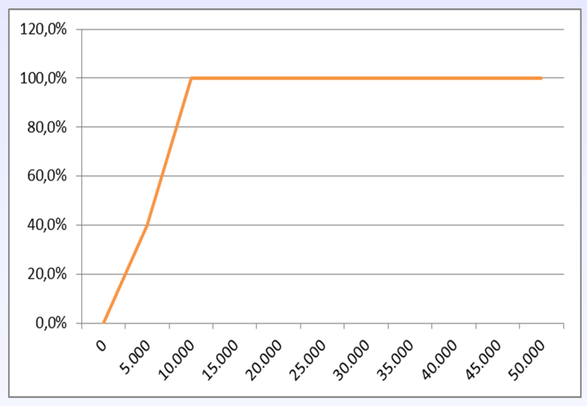
Uncertainty is addressed in the model using probabilistic sensitivity analysis. Statistical distributions were assigned to key model parameters to examine second-order uncertainty in the estimation of the parameter. Uncertainty was propagated through the model using Monte Carlo simulation, drawing parameter values at random 500 times from the particular distributions.

Fig. 2: Probabilistic sensitivity analysis









Source: own calculations

Conclusion

Iv iron treatment with FCM compared with oral iron in iron deficient CHF patients is clearly below the CE threshold of € 22,200 - € 33,300/QALY typically used by the UK NICE and hence can be considered a cost efficient treatment strategy.

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Additional Literature with the author

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