Cost-effectiveness of Fingolimod, Teriflunomide, Dimethyl Fumarate and Int Interferon Beta-1a in Relapsing-remitting Multiple Sclerosis

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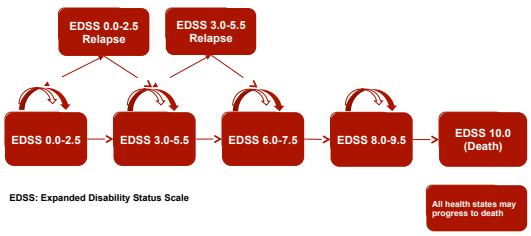
Objective

To compare the cost-effectiveness of fingolimod, teriflunomide, dimethyl fumarate and IM IFN β-1a as first-line therapies in treatment of patients with relapsing-remitting multiple sclerosis (RRMS).

Methods

- A Markov model was developed to simulate the disease progression and evaluate the cost-effectiveness of disease-modifying drugs from a US societal perspective. Time horizon in base case was 5 years [Figure 1].
- Model parameters were obtained from randomized controlled trials, natural history studies of multiple sclerosis, cross-sectional surveys and federal supply schedule drug prices.
- Outcomes included quality-adjusted life years (QALYs), incremental net monetary benefit (INMB) and incremental cost-effectiveness ratio (ICER). The societal willingness-to-pay (WTP) threshold was assumed to be $150,000 per QALY.
- Costs were reported in 2012 US dollars and both costs and outcomes were discounted at 3% annual rate in base case.
- One-way sensitivity analyses and probabilistic sensitivity analyses were conducted to test the robustness of the model results.

Figure 1. Markov model for disease progression of multiple sclerosis



EDSS: Expanded Disability Status Scale

Results

Base case

- The 5 years' total costs per patient were estimated at $322,694, $339,457, $324,512 and $298,875 for IM IFN β-1a, fingolimod, teriflunomide, and dimethyl fumarate, respectively. The accumulated QALYs associated with each drug were 3.34, 3.69, 3.68 and 3.72, respectively [Table 1].
- Compared with IM IFN β-1a, at the WTP of $150,000, INMBs were estimated at $36,146, $50,441, and $80,970 for fingolimod, teriflunomide, and dimethyl fumarate, respectively. Compared with IM IFN β-1a, ICERs were $47,523 and $5,218 for fingolimod and teriflunomide, respectively [Table 1].
- Dimethyl fumarate dominated all other drugs over the range of WTPs from $0 to $180,000 [Figure 2].

Sensitivity analysis

- One-way sensitivity analyses found model results were robust to most parameter variations. The only exception is when the monthly cost of fingolimod was beyond $5,121, fingolimod would no longer be cost-effective compared with IM IFN β-1a [Figure 3]. Other one-way sensitivity analysis comparison figures are available on request. For all of the three oral therapies versus IM IFN beta-1a, INMB increased as the time horizon became longer [Figure 4].
- Probabilistic sensitivity analysis showed that for more than 90% of the simulations, dimethyl fumarate was the optimal therapy across all willingness-to-pay values [Figure 5].

Table 1. Base case results, compared with IM IFN β-1a (WTP=$150,000)

	Cost	QALY	NMB	INMB vs. IM IFN β-1a	CER	ICER vs. IM IFN β-1a
IM IFN β-1a	$322,694	3.34	$177,656		$96,741	
Fingolimod	$339,457	3.69	$213,802	$36,146	$92,034	$47,523
~~Teriflunomide~~	~~$324,512~~	~~3.68~~	~~$228,097~~	~~$50,441~~	$88,085	$5,218
Dimethyl fumarate	$298,875	3.72	$258,626	$80,970	$80,415	Dominant

Figure 2. INMB of oral drugs vs IM IFN β-1a

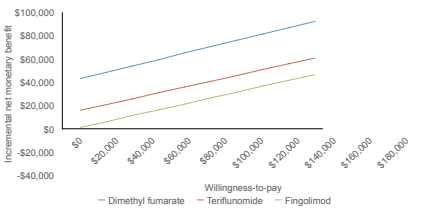


Figure 3. One-way sensitivity analysis

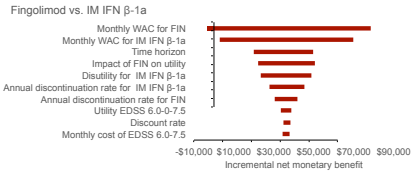
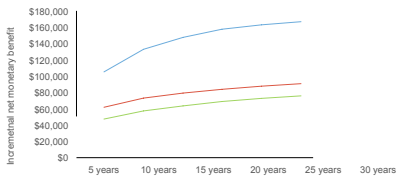


Figure 4. INMB vs IM IFN β-1a over time



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