An economic evaluation of subcutaneous and intramuscular interferon beta-1a in multiple sclerosis using a direct head-to-head study

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Introduction

- Multiple sclerosis (MS) is a chronic immune-mediated disease that causes neuronal damage in the central nervous system, resulting in a wide range of troublesome or disabling symptoms including mobility problems, visual impairment, pain, fatigue, and cognitive dysfunction. These symptoms can limit employment and social functioning, and may reduce patients’ quality of life.

- Relapsing forms of MS are characterized by the occurrence of clinical attacks (also known as relapses or exacerbations), which are episodes of subacute worsening of neurologic symptoms.1 Symptoms occurring during a relapse can range from mild (e.g., numbness to severe (e.g., vision loss).2

- Because there is no cure for MS, the aim of treatment is to manage symptoms, reduce the frequency of relapses, and delay the accumulation of physical disability.3

EVIDENCE study

- The head-to-head EVIDENCE (Evidence of Interferon Beta-1a Dosage Response: European North American Comparative Efficacy) study was an assessor-blinded, sandwired, multicenter trial that compared the efficacy and safety of two interferon beta (IFN) therapies for treatment of relapsing forms of MS.1

- The study enrolled patients with relapsing MS who had Expanded Disability Status Scale scores of 0.5-5.5 and who had experienced at least two relapses in the prior 2 years.

- Patients were randomized to receive IFN β-1a 44 mcg subcutaneously (SC) three times weekly (tqw; n=329) or IFN β-1a 30 mcg intramuscularly (IM) once weekly (n=338).

- Patients received study treatment for an average of 16 months.

- A relapse was defined as the appearance of a new symptom or worsening of an old symptom, accompanied by an appropriate objective finding on neurologic examination by the blinded evaluator, lasting at least 24 hours in the absence of fever, and preceded by at least 30 days of clinical stability or improvement.

- In EVIDENCE, significantly more patients receiving IFN β-1a 44 mcg SC tiw achieved the primary endpoint of remaining relapse-free at 24 weeks than patients receiving IFN β-1a 30 mcg IM qw (76% vs 63%, p=0.001).4

Objective

- To use health economic modeling techniques to quantify and compare the clinical and economic outcomes associated with the use of IFN β-1a 44 mcg SC versus IFN β-1a 30 mcg IM qw in the treatment of relapsing forms of MS from a U.S. healthcare payer perspective.

Methods

Decision analytic model

- A decision analytic model was constructed using a 2-year time horizon.

- The model was populated with IMS LexiPlus. Plus prevalence and treatment data.

- The model was also populated with disease-modifying drug (DMD) efficacy data that were calculated from level 1 evidence obtained from the EVIDENCE study.

- The 44 mcg tiw dose regimen of IFN β-1a SC was used in the model, as this is the most commonly prescribed dosage.

- The rate of relapse for untreated patients with MS was obtained from the placebo arms of the pivotal clinical DMD trials.

- The model assumed a linear relationship between adherence and efficacy. The base case analysis assumed a medication adherence rate of 100%.

- One-way sensitivity analyses were conducted on key parameters using alternate plausible values, including the rates of real-world DMD adherence.

Cost assumptions

- All costs used in the base-case analysis are listed in Table 1.

| Table 1. Costs used in the base-case analysis. |
|-----------------|-----------------|------------------|--------------------------|
| Costs of disease-modifying drug* | Monthly cost, $ | Unit cost, $ |
| IFN β-1a 44 mcg SC qw | 3129 | 313.00 |
| IFN β-1a 30 mcg IM qw | 3139 | 104.67 |
| Costs of tests and procedures | Unit cost, $ |
| LUMBAR puncture cost | 175.00 |
| Lumbar magnetic resonance imaging | 269.47 |
| Office visit - level 1 | 175.00 |
| Office visit - level 2 | 329.37 |
| Office visit - level 3 | 534.00 |

- Costs of relapse by level of severity

<table>
<thead>
<tr>
<th>Relapse severity</th>
<th>Cost per relapse, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>78</td>
</tr>
<tr>
<td>Moderate</td>
<td>276</td>
</tr>
<tr>
<td>Severe</td>
<td>48</td>
</tr>
</tbody>
</table>

- Mild: short lasting (≤1 week); Moderate: lasting 1-4 weeks; Severe: lasting >4 weeks.

- Costs of medication-taking drug were based on U.S. average wholesale costs.

- The model was created with the ability to customize the rate of copayment, as well as to incorporate contractual discounts, if desired. Copayments for both DMDs in the base case were set at 25%.

DMD efficacy data

- The annualized relapse rate over 16 months was 0.54 in patients treated with IFN β-1a 44 mcg SC qw and 0.65 in those treated with IFN β-1a 30 mcg IM qw.5

- Relapse data from the 16-month EVIDENCE results were extrapolated for the 2-year model.

- Extrapolating these data produced the following estimates:

  - 1.08 relapses over 2 years with IFN β-1a 44 mcg SC qw
  - 1.30 relapses over 2 years with IFN β-1a 30 mcg IM qw.

Results

- For a hypothetical health plan with 1 million members, it is estimated that 911 patients with MS would be treated with DMDs.

- For untreated patients with MS, a weighted relapse rate was determined to be 2.15 over 2 years.

- Over 2 years, more relapses were avoided with IFN β-1a 44 mcg SC qw (579) than with IFN β-1a 30 mcg IM qw (778).

- The average cost-effectiveness cost per relapse avoided of IFN β-1a 44 mcg SC qw was lower (more favorable) than the average cost-effectiveness of IFN β-1a 30 mcg IM qw (base-case analysis).

Conclusions

- Assessments of cost-effectiveness may facilitate decision making when selecting treatments for relapsing MS.

- Using the highest-quality clinical data (level 1, from the randomized, head-to-head EVIDENCE study), the cost-effectiveness of IFN β-1a 44 mcg SC qw was shown to be favorable compared with IFN β-1a 30 mcg IM qw.

References


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Disclosures

All authors, except are employees of EMD Serono, Inc. NCE is a health economics and outcomes research consultant.

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Figure 3: Cost-effectiveness of IFN β-1a SC qw and IFN β-1a IM qw in the treatment of relapsing multiple sclerosis (base-case analysis).

Figure 4: Cost-effectiveness of IFN β-1a SC qw and IFN β-1a IM qw in the treatment of relapsing multiple sclerosis: sensitivity analysis in which the medication adherence rate was assumed to be 10% lower than in the base case.

Figure 5: Cost-effectiveness of IFN β-1a 44 mcg SC qw and IFN β-1a 30 mcg IM qw in the treatment of relapsing multiple sclerosis: sensitivity analysis in which costs of relapses were adjusted by –10% and 10%.

Figure 6: Cost-effectiveness of IFN β-1a SC qw and IFN β-1a IM qw in the treatment of relapsing multiple sclerosis: sensitivity analysis in which DMD costs were adjusted by –10%, –15%, and –20%.

Figure 7: Cost-effectiveness of IFN β-1a SC qw and IFN β-1a IM qw in the treatment of relapsing multiple sclerosis: sensitivity analysis in which MAC was adjusted by –20%, –30%, and –40%.

Figure 8: Cost-effectiveness of IFN β-1a SC qw and IFN β-1a IM qw in the treatment of relapsing multiple sclerosis: sensitivity analysis in which MAC was adjusted by –20%, –30%, and –40%.