Modelling the costs and outcomes associated with sequence of treatment with and without tofacitinib for the moderate to severe rheumatoid arthritis in the US


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Introduction

- Rheumatoid arthritis (RA) is a chronic inflammatory condition associated with long-term morbidity, increased mortality and reduced quality of life.
- In the US, the estimated prevalence of RA is between 0.5–1.6%, representing a significant economic burden.
- Methotrexate and tumour necrosis factor inhibitors (TNFi) are commonly used therapies for RA but may not be effective for all patients or may be associated with potential adverse effects.
- Tofacitinib is an oral Janus kinase inhibitor for the treatment of RA.
- The objective of this analysis was to estimate incremental cost-effectiveness ratios (ICERs) of tofacitinib, after failure of methotrexate, or failure of methotrexate and TNFi, in a sequence of treatments compared with similar sequences without tofacitinib, from a US third-party payer perspective.

Methods

- A patient-level computer model simulated the costs and outcomes of RA treatment with (containing tofacitinib) and without (alternative) tofacitinib for four scenarios:
  - Two scenarios in patients with an inadequate response to treatment and comparator arms of the model.
    - Patients baseline characteristics (Table 1) were based on tofacitinib clinical trials, OPAI, Step (ACTG550),4 OPAI, Scan (ACTG550) and OPAI and Standard (ACTG550).5
    - All biologics DMARD-IR (SC/MAB) were assumed to be used in combination with methotrexate.

Treatment scenarios

- A patient-level computer model simulated the costs and outcomes of RA treatment with and without tofacitinib. After failure of methotrexate, or failure of methotrexate and TNFi, in a sequence of treatments compared with similar sequences without tofacitinib, from a US third-party payer perspective.

Results

- The probability of death per cycle was related to the patient’s HAQ-DI score.
- The probability that patients would discontinue and switch to the next treatment was the sequence was based on:
  - Insufficient change in HAQ-DI score
  - Incidence of an adverse event
  - The model also assumed the patient discontinued the current treatment and moved onto the next treatment in the sequence if any of the following occurred:
    - Inadequate response to therapy at 6 months
    - Subsequent line of response
    - Serious infection event

Healthcare costs and outcomes

- The model used the patient’s HAQ-DI score to predict resource utilisation, which, in turn, predicted the total lifetime costs of treatment.
- Total costs were taken from published data mapping HAQ-DI onto healthcare resource utilisation in US patients with RA (Figure 1, Table 2).
- Health outcomes were estimated as the number of quality-adjusted life-years (QALY) resulting from a given treatment sequence.
- ICERs were calculated by comparing the total lifetime costs and health outcomes of a given treatment sequence vs those of the comparator sequence.
- Indirect costs, such as the cost of early retirement and long- and short-term work loss due to RA, were not considered.
- One-way sensitivity analysis was implemented in the model to account for uncertainty in key parameters, including:
  - Initial, medium and long-term HAQ-DI change for tofacitinib
  - Long-term HAQ-DI change for salvage therapy
  - HAQ-DI switching threshold
- Annual cost of tofacitinib
- HAQ-DI utility
- HAQ-DI cost and HAQ-DI-mortality relationships.

Table 1. Treatment scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st cycle</td>
<td>Methotrexate</td>
<td>Tofacitinib</td>
<td>Etanercept</td>
<td>Adalimumab</td>
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<tr>
<td>2nd cycle</td>
<td>Tofacitinib</td>
<td>Etanercept</td>
<td>Adalimumab</td>
<td>Abatacept</td>
</tr>
<tr>
<td>3rd cycle</td>
<td>Tofacitinib</td>
<td>Abatacept</td>
<td>Abatacept</td>
<td>Rituximab</td>
</tr>
<tr>
<td>4th cycle</td>
<td>Tofacitinib</td>
<td>Abatacept</td>
<td>Rituximab</td>
<td>Rituximab</td>
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</tbody>
</table>

Table 3. Health outcomes and resource use for all treatment scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total discounted costs</th>
<th>Total discounted costs</th>
<th>Total discounted costs</th>
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<tbody>
<tr>
<td>Scenario 1</td>
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<td>$47 370</td>
<td>$40 053</td>
<td>$49 361</td>
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<tr>
<td>Scenario 2</td>
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<td>$42 367</td>
<td>$39 418</td>
<td>$41 456</td>
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<td>Scenario 3</td>
<td>$48 356</td>
<td>$50 150</td>
<td>$53 142</td>
<td>$53 650</td>
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<td>Scenario 4</td>
<td>$5940</td>
<td>$6002</td>
<td>$5380</td>
<td>$5792</td>
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Table 4. Table 6. ICER and net benefit of treatment for all treatment scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>ICER</th>
<th>Net benefit</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$100 000</td>
<td>$27,000</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>$100 000</td>
<td>$27,000</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>$100 000</td>
<td>$27,000</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>$100 000</td>
<td>$27,000</td>
</tr>
</tbody>
</table>

Discussion

- Based on model predictions using simulated data, therapy with tofacitinib following failed therapy with methotrexate, or failed therapy with methotrexate and TNFi, is a cost-effective alternative vs comparative therapy without tofacitinib.
- Sensitivity analyses reiterated the robustness of these findings and cost-effectiveness of including tofacitinib as second- or third-line therapy in the treatment sequence, from a US third-party payer’s perspective.

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Disclosure of Interest

LCL and DM have been on the board of several patient groups receiving funding from Pfizer Inc for health economics consultancy. DM, SG and AJS are employees and shareholders of Pfizer Inc. These data were presented previously at International Meeting - ISPOR 2015.

References


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