What Impacts the Quality of Comparative Effectiveness Research: A Classification and Regression Tree Analysis Using the GRACE Checklist

Allison Bryant1, Aaron B. Mendelsohn2, Shilpa Viswanathan2, Nancy A. Dreyer3
1Quintiles, Cambridge, MA, USA; 2Quintiles, Rockville, MD, USA

Objectives
The Good ReseArch for Comparative Effectiveness (GRACE) checklist is a tool for evaluating the quality of comparative effectiveness research (CER) studies. The checklist consists of 11 questions on data and methods and was developed through literature review, expert consultation, and testing by 113 raters across five continents. The purpose of the present research was to determine which checklist questions are most predictive in identifying quality CER.

Methods
- Twenty-two volunteers recruited from academia, industry, and government applied the GRACE checklist to 28 CER articles, for a total of 59 assessment of overall quality classified as "sufficient" Composite outcome of all three quality measures CART default settings were altered to vary the penalty for misclassifying sufficient versus insufficient quality articles.

Results
- The use of a composite outcome in the CART analysis yielded on average a higher sensitivity and specificity than any of the outcomes individually.
- Altering the penalty for misclassifying sufficient versus insufficient quality articles had minimal impact on the sensitivity and specificity.
- The use of sensitivity analysis was the strongest predictor of quality.

Table 1. Performance of CART Algorithms Using GRACE Checklist Items in Predicting Quality Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert Assessment</td>
<td>78.1</td>
<td>58.3</td>
</tr>
<tr>
<td>Article Citations</td>
<td>50.0</td>
<td>63.3</td>
</tr>
<tr>
<td>Journal Impact Factor</td>
<td>66.7</td>
<td>85.3</td>
</tr>
<tr>
<td>Composite Outcome</td>
<td>71.4</td>
<td>80.9</td>
</tr>
</tbody>
</table>

*Sensitivity indicates the proportion of articles with sufficient quality outcomes that were deemed sufficient by the volunteer raters. *Specificity indicates the proportion of articles with insufficient quality outcomes that were deemed insufficient by the volunteer raters.

Conclusion
When the GRACE checklist for assessment of the quality of observational CER studies was applied to 28 articles and compared with four external measures of article quality using CART analysis, the strongest predictors of quality included: use of concurrent comparators; accounting for immortal time bias; and use of sensitivity analyses to test how much effect estimates depended on various assumptions. Use of sensitivity analyses in particular was found to be a strong predictor of each of the four measures of quality. The composite outcome had overall higher performance compared to the individual quality measures alone.

* is the total cases in each node; % is the proportion of cases classified as having a sufficient expert quality rating, >2 article citations per year, >2.5 journal impact factor, or sufficient composite outcome, respectively

Figure 1. Expert Quality Assessment

Figure 2. Number of Article Citations per Year

Figure 3. Journal Impact Factor

Figure 4. Composite Outcome

See the checklist and response options at www.graceprinciples.org

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