Personalized Follow-Up: Time-Dependent Nomogram for Risk of Locoregional Recurrence in Early Breast Cancer

Annemieke Witteveen¹, Ingrid M.H. Vliegen², Maarten J. IJzerman¹, Sabine Siesling¹,3

¹ Department of Health Technology and Services Research (HTSR), MIRA institute for Biomedical Technology and Technical Medicine, University of Twente, Enschede, the Netherlands  ² Department of Industrial Engineering and Business Information Systems (IEBIS), Center for Healthcare Operations Improvement & Research, University of Twente, Enschede, the Netherlands  ³ Department of Research, Netherlands Comprehensive Cancer Organisation (IKNL), Utrecht, the Netherlands

BACKGROUND
The objective was to develop and validate a time-dependent logistic regression model for the prediction of locoregional recurrence (LRR) of breast cancer: To make a translation to clinical practice a web based nomogram was made.

PATIENTS AND METHODS
Netherlands Cancer Registry:

37,278 women with early breast cancer in 2003-2006

933 (2.9%) with LRR as first event within 5y after treatment

• Risk factors were determined using logistic regression. The risks were calculated for 5 years and per year, conditional on not being diagnosed with recurrence in the previous year(s).
• Interaction and collinearity were assessed, as well as the discrimination by means of the area under the ROC curve and calibration by the Hosmer-Lemeshow goodness-of-fit test in deciles.
• Internal validation was performed by bootstrapping. Data from 43 Dutch hospitals on primary tumours diagnosed between 2007-2008 was used for external validation of the nomogram (n=12,318).

RESULTS

Analyses

Results from the logistic regression analysis

<table>
<thead>
<tr>
<th>Odds Ratio</th>
<th>Age</th>
<th>Tumour size</th>
<th>Nodal involvement</th>
<th>Grade</th>
<th>Hormone status</th>
<th>Multifocality</th>
<th>Radiotherapy</th>
<th>Chemotherapy</th>
<th>Hormone therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;50</td>
<td>&gt;2 cm, 2-5 cm, &gt;5 cm</td>
<td>0</td>
<td>1</td>
<td>Other, ER&amp;PR neg.</td>
<td>no, yes</td>
<td>no, yes</td>
<td>no, yes</td>
<td>no, yes</td>
</tr>
<tr>
<td></td>
<td>50-59</td>
<td>≤2 cm</td>
<td>&gt;3</td>
<td>2</td>
<td>ER&amp;PR neg.</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>≥70</td>
<td>≤2 cm</td>
<td>&gt;3</td>
<td>3</td>
<td>ER&amp;PR neg.</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Odds Ratio

• <0.001
• 0.05

Discrimination and Validation

Calibration

Predicted risk (%)

Sensitivity

1-Specificity

Modeling group ROC area: 0.711

Validation group ROC area: 0.707

Nomogram

Screenshot from the nomogram, with:
• 5-year risk
• Conditional yearly risk

With corresponding 95% Confidence Intervals

For more information check: www.utwente.nl/influence

CONCLUSIONS
This validated and time-dependent nomogram for the prediction of annual LRR risks is simple to use and shows good predictive ability in the Dutch population. It can be used as an instrument to identify patients with a low or high risk of LRR who might benefit from a less or more intensive follow-up after breast cancer and to aid clinical decision-making for personalized follow-up.

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BIOMEDICAL TECHNOLOGY AND TECHNICAL MEDICINE

More information:
Annemieke Witteveen, MSc PhD candidate
www.utwente.nl/influence
A.Witteveen@utwente.nl