Introduction to Systematic Review of Diagnostic Test Accuracy

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Outline

- Introduction
- How to conduct the diagnostic review
- How to define title and objective(s) of the review
- How to search the diagnostic studies
- How to select the included studies and extract data
- How to assess the study quality
- How to analyze data
- How to do the diagnostic review in RevMan5
Introduction

- **What is a diagnostic systematic review?**
  - It is a systematic summary of information or evidence about the accuracy of an index test or about a certain diagnostic test.

- **Why is it important?**
  - A need for systematic reviews of diagnostic and screening tests has grown markedly in recent years [Gatsonis and Paliwal, 2006].
Who need it?

- The information from such reviews is needed by clinicians, health policy makers, researchers in diagnostic medicine, developers of diagnostic techniques, and the general public [Gatsonis and Paliwal, 2006].
How to conduct the diagnostic review

- The major steps
  - Definition of title and objective(s) of the review
  - Searching the diagnostic studies
  - Selection the included studies and extraction of the data
  - Assessment of study quality
  - Statistical analysis
  - Interpretation of results and development of recommendations

Modified from [Gatsonis and Paliwal, 2006]
How to define title and objective(s) of the review

- To define a title in a RevMan5 [CRDTA, 2005]
  - Index test(s) versus comparator(s) for target condition(s) in patient description
  - Index test(s) versus comparator(s) for target condition(s)
  - Index test(s) for target condition(s) in patient description
  - Index test(s) for patient description

- Example:
  - Positron emission tomographic versus computed tomographic imaging for detecting mediastinal lymph node metastases in nonsmall cell lung cancer [Birim et al., 2005].
To define objective(s) of the review

- The key components of objective(s) of the review
  - The patients description, the presentation (a clinical problem)
  - Prior test
  - Index test
  - Comparator test (other tests)
  - Outcome (the target condition or a disease)

Example:
- To determine the diagnostic accuracy of Index test for diagnosing target disorder in patient description.
How to search the diagnostic studies
How to select the studies

same as intervention review

Included studies
How to extract data

- Important sections in the extraction data form
  - General Details
  - Participants
  - Target condition, reference standard, index test(s) and comparator test(s)
  - Results for diagnostic accuracy studies (2×2 table)
# How to assess the study quality

<table>
<thead>
<tr>
<th>QUADAS Items</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>1. Was the spectrum of patients’ representative of the patients who will receive the test in practice? (patients’ spectrum)</td>
<td></td>
</tr>
<tr>
<td>2. Is the reference standard likely to correctly classify the target condition? (reference standard)</td>
<td></td>
</tr>
<tr>
<td>3. Is the time period between reference standard and index test short enough to be reasonably sure that the target condition did not change between the two tests? (disease progression)</td>
<td></td>
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<tr>
<td>4. Did the whole sample or a random selection of the sample, receive verification using a reference standard of diagnosis? (partial verification)</td>
<td></td>
</tr>
<tr>
<td>5. Did patients receive the same reference standard regardless of the index test result? (differential verification)</td>
<td></td>
</tr>
<tr>
<td>6. Was the reference standard independent of the index test (i.e. the index test did not form part of the reference standard)? (incorporation)</td>
<td></td>
</tr>
<tr>
<td>7. Were the index test results interpreted without knowledge of the results of the reference standard? (test review)</td>
<td></td>
</tr>
<tr>
<td>8. Were the reference standard results interpreted without knowledge of the results of the index test? (diagnostic review)</td>
<td></td>
</tr>
<tr>
<td>9. Were the same clinical data available when test results were interpreted as would be available when the test is used in practice? (clinical review)</td>
<td></td>
</tr>
<tr>
<td>10. Were uninterpretable/intermediate test results reported? (uninterpretable results)</td>
<td></td>
</tr>
<tr>
<td>11. Were withdrawals from the study explained? (withdrawals)</td>
<td></td>
</tr>
</tbody>
</table>
How to analyze data

- Methods of meta-analysis of diagnostic test accuracy
  - Forest plot
  - Summary receiver operating characteristic curves (SROC)
  - Bivariate regression model
  - HSROC model
How to do the diagnostic review in RevMan5

Type of Review:
- Intervention review
- Diagnostic test accuracy review
- Methodology review
- Overview of reviews

New Review Wizard
Which type of review do you want to create?

New Review Wizard
What is the title of the review?

Title:
- [Index test(s)] versus [comparator(s)] for [target condition(s)] in [participant description]
- [Index test(s)] versus [comparator(s)] for [target condition(s)]
- [Index test(s)] for [target condition(s)] in [participant description]
- [Index test(s)] for [target condition(s)]
Re-analysis of the data from Birim et al. (2005).
Re-analysis of the data from Birim et al (2005).

<table>
<thead>
<tr>
<th>Study</th>
<th>TP</th>
<th>FP</th>
<th>FN</th>
<th>TN</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bury 1997</td>
<td>11</td>
<td>8</td>
<td>3</td>
<td>44</td>
<td>0.79 [0.49, 0.95]</td>
<td>0.85 [0.72, 0.93]</td>
</tr>
<tr>
<td>Chin 1995</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>18</td>
<td>0.56 [0.21, 0.86]</td>
<td>0.86 [0.64, 0.97]</td>
</tr>
<tr>
<td>Guhlmann 1997</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>0.53 [0.27, 0.79]</td>
<td>0.82 [0.57, 0.96]</td>
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<tr>
<td>Gupta 2000</td>
<td>36</td>
<td>36</td>
<td>17</td>
<td>79</td>
<td>0.68 [0.54, 0.80]</td>
<td>0.69 [0.59, 0.77]</td>
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<tr>
<td>Hagberg 1997</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>9</td>
<td>0.56 [0.21, 0.86]</td>
<td>1.00 [0.66, 1.00]</td>
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<tr>
<td>Marom 1999</td>
<td>26</td>
<td>4</td>
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<td>30</td>
<td>0.59 [0.43, 0.74]</td>
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<tr>
<td>Pieterman 2000</td>
<td>24</td>
<td>4</td>
<td>18</td>
<td>30</td>
<td>0.75 [0.57, 0.89]</td>
<td>0.66 [0.53, 0.77]</td>
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<tr>
<td>Poncelet 2001</td>
<td>5</td>
<td>17</td>
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<td>36</td>
<td>0.56 [0.21, 0.86]</td>
<td>0.68 [0.54, 0.80]</td>
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<tr>
<td>Sasaki 1996</td>
<td>11</td>
<td>7</td>
<td>6</td>
<td>47</td>
<td>0.65 [0.38, 0.86]</td>
<td>0.87 [0.75, 0.95]</td>
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<tr>
<td>Saunders 1999</td>
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<td>7</td>
<td>12</td>
<td>62</td>
<td>0.20 [0.04, 0.48]</td>
<td>0.90 [0.80, 0.96]</td>
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<td>Sazon 1996</td>
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<td>9</td>
<td>0.81 [0.54, 0.96]</td>
<td>0.56 [0.30, 0.80]</td>
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<tr>
<td>Scott 1994</td>
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<td>30</td>
<td>0.33 [0.01, 0.91]</td>
<td>0.91 [0.71, 0.99]</td>
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<tr>
<td>Scott 1996</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>15</td>
<td>0.67 [0.30, 0.93]</td>
<td>0.83 [0.59, 0.96]</td>
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<tr>
<td>Steinert 1997</td>
<td>16</td>
<td>5</td>
<td>12</td>
<td>79</td>
<td>0.57 [0.37, 0.76]</td>
<td>0.94 [0.87, 0.98]</td>
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<tr>
<td>Valk 1995</td>
<td>15</td>
<td>14</td>
<td>9</td>
<td>38</td>
<td>0.63 [0.41, 0.81]</td>
<td>0.73 [0.59, 0.84]</td>
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<tr>
<td>Vansteenkiste 1997</td>
<td>10</td>
<td>13</td>
<td>5</td>
<td>22</td>
<td>0.67 [0.38, 0.88]</td>
<td>0.63 [0.45, 0.79]</td>
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<tr>
<td>Wahl 1994</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>7</td>
<td>0.64 [0.31, 0.89]</td>
<td>0.44 [0.20, 0.70]</td>
</tr>
</tbody>
</table>
Re-analysis of the data from Birim et al (2005).
Re-analysis of the data from Birim et al (2005).
Re-analysis of the data from Birim et al (2005).
Comparison between the performance of tests

Re-analysis of the data from Birim et al (2005).
Acknowledgments

- Thailand Research Fund and Thai Cochrane Network for all support.
- Dutch Cochrane Centre and Diagnostic Test Accuracy Working Group for providing knowledge.
References

Thank you for your attention