Scleroderma Classification Criteria: Developing Methods for Multi-criteria decision analysis

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On behalf of the
ACR-EULAR SSc Classification Criteria Committee

ACR Meeting 2012

Disclosures

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Aim

• Define a system of criteria, which produces a measure of the relative probability that a particular case (combination of clinical features) has SSc

• Reduce and weight the candidate criteria

Objectives

• SSc specific instrument
  – Develop
  – Evaluate: Sensibility

• Multi-criteria decision analysis
  – Reduce
  – Weight

• Explore agreement among SSc experts

Item Generation (Delphi panel) N = 168
Item Reduction (Delphi panel followed by Nominal Group Technique) N = 23
Evaluate validity of items in SSc and SSc mimickers
Collect prospective data in SSc and SSc mimickers

Evaluate operating characteristics of SSc criteria and assess face validity by SSc experts

ACR Abstract, 2012 B13
Instrument

Design
- Format
- Visual presentation
- Response options

Sensibility
- Comprehensibility
- Clarity
- Face validity
- Content validity
- Feasibility

Dillman. Tailored Design Method. 2009
Feinstein. Clinimetrics. 1987

- Sensibility

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Endorsement</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity and navigation of the form</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Clarity of the instructions</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Clarity of the response option</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Median time to completion</td>
<td>10 minutes</td>
<td>(10 - 20 minutes)</td>
</tr>
</tbody>
</table>

SSc Experts

Ranking and Multi-criteria decision analysis

<table>
<thead>
<tr>
<th>Attribute</th>
<th>n = 8</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>63%</td>
<td></td>
</tr>
<tr>
<td>Median years in practice</td>
<td>30</td>
<td>(range 13 – 40 years)</td>
</tr>
<tr>
<td>Practice location</td>
<td>50%</td>
<td>Europe</td>
</tr>
<tr>
<td>Involvement in previous phases of criteria development</td>
<td>38%</td>
<td></td>
</tr>
</tbody>
</table>

1\textsuperscript{st} Ranking. Experts’ rankings of the relative probability that the case has systemic sclerosis. The cases ranked from highest (rank = 1) to lowest probability (rank = 20) on the Y-axis.

\begin{align*}
\text{ICC}_{1,1} &= 0.73 \ (95\% \ CI \ 0.58, 0.86) \\
\text{ICC}_{1} &= 0.68 \ (95\% \ CI \ 0.48, 0.84) \\
\text{ICC}_{2} &= 0.76 \ (95\% \ CI \ 0.60, 0.88)
\end{align*}

Systemic Sclerosis

Entry Criterion → Exclusion Criterion → Absolute Criteria → Multi-Criteria Decision Analysis → "YES" meets "Threshold" → "YES"

Not Systemic Sclerosis

Entry Criterion → Exclusion Criterion → Absolute Criteria → Multi-Criteria Decision Analysis → "NO"
PAPRIKA method

*Potentially All Pairwise Rankings of All hypothetically-possible patients*

Which patient (‘Left’ or ‘Right’) has the higher probability of being classified as systemic sclerosis?

(given they are identical in all other aspects)

<table>
<thead>
<tr>
<th>Raynaud’s phenomenon</th>
<th>Raynaud’s phenomenon</th>
</tr>
</thead>
<tbody>
<tr>
<td>GERD</td>
<td>SSIs specific antibodies</td>
</tr>
</tbody>
</table>

The overall ranking of all hypothetically-possible patients is arrived at by asking experts to make *tradeoffs between 2 criteria at a time*.

**Item Reduction**

- **Exclusion criterion**
  
  - *Skin thickening sparing the fingers*
  
  - If present, the use of the SSIs classification criteria should not proceed further.

- **Absolute criterion**
  
  - *Skin thickening proximal to the MCP joints*
  
  - If present, the patient could be classified as SSs.

**Item Reduction: Low weights**

- FVC
- DLCO
- Dysphagia for solid foods
- GERD
- Anti-PM-ScL antibody
- ANA

**Item reduction: Criterion revision**

- **Skin thickening of the fingers**
  
  - a) distal to MCP, or b) distal to PIP joint.

- **Finger tip lesions**
  
  - a) pitting scars, b) digital tip ulcers, or c) clinical evidence of acro-osteolysis.

- **Scleroderma specific antibodies**
  
  - anti-topoisomerase-1, anticentromere or anti-RNA polymerase III antibody.

**Experts’ rankings of the relative probability that the case has systemic sclerosis in second ranking exercise.**

The cases ranked from highest (rank = 1) to lowest probability (rank = 20) on the Y-axis.

\[ ICC_{Ma} = 0.80 \ (95\% \ CI 0.68, 0.90) \]
Summary

- Reduced the number of candidate criteria
- Indicated relative weights.
- Experts had substantial overall agreement in rank order of the relative probability that each case can be classified as having SSc
- Defined a system of criteria, which produces a measure of the relative probability that a particular case (combination of clinical features) has SSc

Strengths

- Methodologic rigor
  - Bias reduction strategies
- Diverse methodology
  - Consensus methods
  - Measurement science
  - Decision analysis

Next Phases

- Need for further item reduction
- Possible re-weighting and scaling
- Threshold to classify a patient as having SSc
- Validation of criteria

- Face validity
- External validation

Experts’ rankings of the relative probability that the case has systemic sclerosis in second ranking exercise. The cases ranked from highest (rank = 1) to lowest probability (rank = 20) on the Y-axis.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Subcriteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin thickening of the fingers</td>
<td>Base in early proximal interphalangeal joints to MCP</td>
<td>14</td>
</tr>
<tr>
<td>Fingers tip blisters</td>
<td>Digital tip blisters</td>
<td>10</td>
</tr>
<tr>
<td>Clinical evidence of acro-osteolysis</td>
<td>Erosions of proximal phalangeal bone</td>
<td>16</td>
</tr>
<tr>
<td>Telangiectasia</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Abnormal radial capillaries</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Puffy fingers</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Calcinosis</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Raynaud’s phenomena</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Tendon or joint fixation</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Intercostal lung diseases (ICL) or pulmonary fibrosis (PP)</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Pulmonary hypertension (with/without HP)</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Renal crises</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Sclero-aneurysmal renal arteries and/or anti-centromere antibody</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>anti-RNA polymerase (II)</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL SCORE:

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ACR Abstract, 2012 #L3