Development and validation of an electronic version of the Health Assessment Questionnaire Disability Index (HAQ-DI)

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Why use ePRO?

- Only valid, in-range entries can be made
- Time management of entries
- Missing data can be reduced or eliminated
- Data available for prompt review.
- Reminders and feedback enhance compliance
- ePRO easy to use and generally preferred to paper
  - Including the elderly, and those without computer experience or skills
Migration to Electronic Format

• Where instrument is validated in paper format, electronic version should be equivalent to paper
• Changes in layout of questionnaire may be needed
• Could the changes made affect responses?
## Changes in Migration

<table>
<thead>
<tr>
<th>Level</th>
<th>Type of change</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>No change in context or meaning</td>
<td>Cognitive debriefing</td>
</tr>
<tr>
<td></td>
<td>Justified by existing literature</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Changes in layout or wording that could affect interpretation</td>
<td>Equivalence testing</td>
</tr>
<tr>
<td>Substantial</td>
<td>Changes that clearly affect context or meaning</td>
<td>Psychometric Validation</td>
</tr>
</tbody>
</table>

Based on Shields et al. (2006) and Coons et al. (2008)
Examples of Minor Changes

• Tap on a screen
• Press a button
  
  Rather than tick or circle a response on paper

• Change in length of visual analogue scale
HAQ-DI Domains

**Page 1**

**Dressing and Grooming**
- Rising
- Eating
- Walking

**Aids and Devices**
- Help from another person

**Page 2**

**Hygiene**
- Reach
- Grip

**Activities**
- Help from another person
Please tick the response which best describes your usual abilities OVER THE PAST WEEK:

<table>
<thead>
<tr>
<th></th>
<th>Without ANY Difficulty</th>
<th>With SOME Difficulty</th>
<th>With MUCH Difficulty</th>
<th>UNABLE To Do</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GRIP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you able to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Open car doors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Open jars which have been previously opened?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Turn taps on and off?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Scoring**

0 1 2 3
HAQ-DI Question Layout

Please tick any of the following AIDS OR EQUIPMENT that you usually use for any of the activities mentioned above:

- Raised toilet seat
- Bath seat
- Jar opener (for jars previously opened)
- Bath rail
- Long-lived appliances for reaching things
- Long-handled appliances in bathroom (e.g.: a long handled brush)
- Other (Please specify: ______________________)

Please tick any of the following categories for which you usually need HELP FROM ANOTHER PERSON:

- Hygiene
- Reaching
- Gripping and opening things
- Shopping and housework
HAQ-DI Scoring

• Each domain is scored with a combination of DIFFICULTY and whether AIDS or HELP are used for activities in that domain

• Information about specific devices used (including free text in “other”) are used only to allocate score to domain

• Final score is mean of eight domain scores from 0 (no disability) to 3
HAQ-DI: Electronic

- Each domain is self contained
- No free-text entry
- Scoring algorithm is unchanged from original
Equivalence Study Design

N = 43

interval
Quantifying Equivalence

• Correlational approach
  – Intraclass correlation coefficient (ICC) is preferred to Spearman's r.
  – Value from 0 (no agreement) to 1 (perfect agreement)

• Numerical agreement approach
  – Based on precision of measurement
  – Agreement indicated by size and variance of Electronic-Paper differences in scale measure.
Intraclass Correlation

**ICC = 0.96:**

**Excellent agreement**

Case (2,1) from Shrout and Fleiss (1979) is used. This is also referred to as the absolute agreement form of the ICC (Friedman 2005)
ICC and Range

• Correlation-based measures such as ICC are very dependent on range of values in sample
• ICC will increase if variability is high
  – Wide range of severity in sample
• ICC will be lower if variability is restricted
  – Normal population vs clinical group
  – Inclusion criteria specifying minimum severity

Other measures should be used as well as ICC
Bland-Altman Plot

- Distribution as expected
- No serious outliers
- No tendency for bias
Bioequivalence Model

Target window ± 0.25 ES

- Mean E-P difference is small: ~ 1% of scale length
- Confidence intervals are well within target window
Patient Acceptability

![Chart 1: Comparison of Paper and Electronic Acceptability](chart1.png)

- **Very Easy**
  - Paper: 80%
  - Electronic: 90%

- **Very Difficult**
  - Paper: 5%
  - Electronic: 3%

![Chart 2: Acceptability by Age Group](chart2.png)

- **60 or over**
  - Paper: 20%
  - No Pref: 40%
  - Electronic: 60%

- **Under 60**
  - Paper: 25%
  - No Pref: 30%
  - Electronic: 45%
Conclusions

• HAQ-DI shows excellent agreement between paper and electronic versions, showing that migration has not affected scale scoring
• Electronic version very acceptable to patients