Concurrent validity of four screening tests for HIV-associated Neurocognitive Disorders (HAND): Sensitivity, specificity, and classification accuracy

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Background

1. HIV-associated neurocognitive disorders (HAND) persist in the post-HAART era.13
2. Pattern of HAND has also has changed in the post-HAART era - incidence of dementia has declined, but asymptomatic neurocognitive impairment (ANI) and mild neurocognitive disorders (MND) remain prevalent.13
3. There is a need for brief, practical, and reliable screening tools that can be used in clinical settings for identification and management of HAND.2

Results

1. Of the 220 people in the study, 129 (59%) were diagnosed with HAND using the Gold Standard (clinical diagnosis).

2. Prevalence of HAND based on screening tests were:

<table>
<thead>
<tr>
<th>Screening test</th>
<th>Gold standard</th>
<th>AUC</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoCA</td>
<td>HAND</td>
<td>0.66</td>
<td>0.73</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CogState</td>
<td>HAND</td>
<td>0.56</td>
<td>0.73</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAMCI</td>
<td>HAND</td>
<td>0.56</td>
<td>0.63</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDS</td>
<td>HAND</td>
<td>0.60</td>
<td>0.77</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MoCA/CAMCI</td>
<td>HAND</td>
<td>0.69</td>
<td>0.76</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MoCA/HDS</td>
<td>HAND</td>
<td>0.64</td>
<td>0.77</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CogState/CAMCI</td>
<td>HAND</td>
<td>0.61</td>
<td>0.75</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Concurrent validity of screening tests: Area under the curve (AUC), sensitivity, and specificity estimates

Methods

Study sample: 220 HIV-infected adults who were referred for neuropsychological evaluation and received HIV care in Toronto, Canada (see Table 1).

Sample generally included middle-aged Caucasian men with successful HIV viral suppression.

Neuropsychological (NP) battery: Participants completed a comprehensive neuropsychological battery assessing psychomotor, working memory and attention, executive functioning, learning and memory, and motor speed abilities domains and included the following tests:

- WAIS-R Digit Symbol
- Symbol Digit Modalities (SDM) Subtest
- Trail Making test A & B
- Grooved Pegboard
- WAIS-R Digit Span
- Stroop test
- Story recall & memory

HAND diagnosis was made by a clinical neuropsychologist (independent of screening) and using the following parameters were estimated:

- Figure learning & memory
- The NP battery included the following tests
- Wisconsin Card Sorting Test
- F.A.S verbal fluency
- WMS-III Letter-Number
- WMS-III Digit Span

Classification accuracy for milder forms of HAND.

Conclusions

- MoCA and CogState screening tests have only modest classification accuracy for assessing mild HAND in people living with HIV.
- Combination of two screening tests resulted in modest classification accuracy improvements.
- Classification accuracy of screening tests improved slightly with severity of HAND (Table 3).

Table 1. Sample characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>NP-Normal</th>
<th>HAND</th>
<th>Whole sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years (mean, SD)</td>
<td>51.0±12</td>
<td>52.8±11</td>
<td>51.0±12</td>
</tr>
<tr>
<td>Years of Education (mean, SD)</td>
<td>13 (9)</td>
<td>14 (9)</td>
<td>13.0 (9.0)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Female</td>
<td>Male/Female</td>
</tr>
<tr>
<td>Caucasian</td>
<td>79 (82%)</td>
<td>47 (36%)</td>
<td>79 (82)</td>
</tr>
<tr>
<td>African/Caribbean/Black</td>
<td>9 (10%)</td>
<td>22 (17%)</td>
<td>18 (19)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (8%)</td>
<td>29 (22%)</td>
<td>36 (36)</td>
</tr>
<tr>
<td>Current CD4 (&lt;50 cells/mm3)</td>
<td>44 (59%)</td>
<td>67 (58%)</td>
<td>111 (56)</td>
</tr>
<tr>
<td>Nadir CD4 (&lt;200 cells/mm3)</td>
<td>39 (49%)</td>
<td>61 (58%)</td>
<td>100 (54)</td>
</tr>
<tr>
<td>Viral load (&lt;50 copies/mL)</td>
<td>70 (86%)</td>
<td>80 (78%)</td>
<td>150 (80)</td>
</tr>
</tbody>
</table>

References

6. Heaton R, Clifford D, Franklin Jr D, et al. (2010). Pattern of HAND has also has changed in the post-HAART era - incidence of dementia has declined, but asymptomatic neurocognitive impairment (ANI) and mild neurocognitive disorders (MND) remain prevalent.
7. Of the 220 people in the study, 129 (59%) were diagnosed with HAND using the Gold Standard (clinical diagnosis).
8. The MoCA score is the sum of the raw scores on the MoCA subtests.
9. The CogState score is the sum of the raw scores on the CogState subtests.
10. The CAMCI score is the sum of the raw scores on the CAMCI subtests.
11. The HDS score is the sum of the raw scores on the HDS subtests.

Objective

To assess the relative and concurrent validity of four screening tests for HAND diagnosis (with focus on milder forms) against the gold standard of clinical diagnosis.