Quality of healthcare is associated with antiretroviral neuropenetrance and neuropsychological outcomes in HIV+ adults

Maral Aghvinian, BA1, Alexis Villegas1, Chen Gonen1, Karen Alvarez1, Marissa Garcia1, April D. Thames, PhD2, Alyssa Arentoft, PhD1,2
1Department of Psychology, California State University, Northridge; 2Department of Psychiatry & Biobehavioral Sciences, UCLA

BACKGROUND

HIV is an infectious disease that affects the immune and central nervous system (CNS). Advances in antiretroviral therapy have improved clinical and virological outcomes for HIV+ individuals. Currently, CART (combined antiretroviral therapy) is the standard of care, resulting in higher quality of life and transforming HIV into a chronic disease. However, it is important to note that not all patients receive high-quality care, and there are significant health disparities in HIV care. Additionally, HIV+ individuals continue to exhibit neuropsychological impairments, and rates of HIV-Associated Neurocognitive Disorders (HAND) remain high. Many newer CART regimens have higher neuopenetration, or greater ability to cross the blood-brain barrier (BBB) and control the virus in the CNS. Studies have shown that higher neuopenetration (measured by CNS Penetration Effectiveness [CPE] scores) is associated with better cognition. This study explores how quality of healthcare influences the types of antiretroviral medications that patients are prescribed, particularly in terms of neuopenetration. It also examines how quality of healthcare is linked to neuropsychological (NP) outcomes.

AIM & HYPOTHESES

Specific Aim 1: To explore how healthcare quality influences the types of HIV antiretroviral regimens prescribed and neuropsychological outcomes.

Hypothesis 1.1: Lower quality of healthcare (i.e., QUOTE HIV scores) will be significantly associated with lower CPE scores.

Hypothesis 1.2: Lower quality of healthcare (i.e., QUOTE HIV scores) will be significantly associated with higher neuropsychological (NP) deficit scores.

METHOD

Participants: Table 1 provides an overview of the 21 HIV+ participants enrolled in an NIH-funded pilot study in Los Angeles (subaward of R25 MH80863; PI: A. Arentoft). Procedures: Participants completed comprehensive neuropsychological (NP) battery, psychiatric screening, and neuromedical evaluation.

1. Medication History. Information about past and current HIV medications were obtained. CPE scores were computed for the current HIV regimen, and participants were grouped into low or high CPE groups based on an established cut-off.

Table 1. Demographic characteristics by CPE group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low CPE (≤8)</th>
<th>High CPE (≥8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>49.55 ± 9.58</td>
<td>58.50 ± 5.46</td>
</tr>
<tr>
<td>Education</td>
<td>13.36 ± 1.96</td>
<td>14.80 ± 2.25</td>
</tr>
<tr>
<td>Gender (%)</td>
<td>91%</td>
<td>91%</td>
</tr>
<tr>
<td>Race/ethnicity (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American</td>
<td>64%</td>
<td>50%</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>587 (551)</td>
<td>576 (229)</td>
</tr>
<tr>
<td>CD4 count</td>
<td>287 (568)</td>
<td>87 (187)</td>
</tr>
<tr>
<td>Viral Load</td>
<td>1.28 (0.09)</td>
<td>1.84 (1.32)</td>
</tr>
</tbody>
</table>

2. NP Evaluation: The following domains of interest were considered. Demographically-corrected NP T-scores were converted into deficit scores (DS):

ATTENTION/ WORKING MEMORY
WAS-III Letter-Number Sequencing (LNS)
PASAT-50
LEARNING AND MEMORY
Hopkins Verbal Learning Test- Revised (HVLT-R)
Brief Visual Memory Test-Revised (BVMT-R)
VERBAL FLUENCY
Controlled Oral Word Association Test (COWAT)
WORDS/4 min
EXECUTIVE FUNCTION
Stroop Color Word Test
Trail Making Test-Part A (TMT-A)
PROCESSING SPEED
WASI-IV Digit Symbol Coding (DS)
WASI-IV Symbol Search (SS)
MOTOR FUNCTIONING
Grooved Pegboard Test

3. Quality of Healthcare: Participants completed the Quality of Care Through the Patient’s Eyes questionnaire- HIV version (QUOTE HIV), which has good validity and reliability (α > 0.80). It covers 27 aspects of healthcare, with 13 general items and 14 HIV-specific items. Total scores and 3 quality dimensions are computed: professional performance, attitude of the professional, and organization of care. Both “importance” and “performance” statements can be used to compute favorability ratios; only performance statements were considered in this study.

RESULTS

• Most participants switched medications several times in the past, commonly due to side effects (see Table 2).

<table>
<thead>
<tr>
<th>Reason for changing medication</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to current side effects</td>
<td>57.1</td>
</tr>
<tr>
<td>Doctor recommended a better medication</td>
<td>9.5</td>
</tr>
<tr>
<td>Switched to regimen with fewer pills</td>
<td>14.3</td>
</tr>
<tr>
<td>Due to low CD4/high viral load</td>
<td>33.3</td>
</tr>
<tr>
<td>Experienced medication resistance</td>
<td>28.6</td>
</tr>
</tbody>
</table>

Among the 3 QUOTE-HIV dimension scores, lower professional performance of the HIV healthcare provider was significantly associated with worse NP deficit scores (DS) in Attention and Memory, but not with any other NP DS. The remaining dimensions, attitude of the professional and organization of care, were not significantly associated with NP deficit scores (see Table 5).

Figure 3. QUOTE-HIV Performance Scores by CPE group

Figure 4. QUOTE-HIV Dimension Scores by CPE group

DISCUSSION

Conclusions:

- Results indicate that HIV+ individuals receiving lower quality healthcare were prescribed less neuopenenetrant ARV medications.
- Performance of the healthcare provider, specifically, was associated with worse NP functioning.
- While further research is being conducted to clarify the nature of these relationships, these results suggest that healthcare disparities affect the types of HIV medications that patients receive, including the level of neuopenetration, which may lead to suboptimal HIV treatment and affect neurological outcomes.

Limitations:

- The perceptions that patients have about their healthcare were self-reported, and therefore not an objective measure of healthcare quality.
- The sample size is currently small. This limited our power as well as the ability to investigate potential covariates or more complex models. However, data is still being collected.
- Currently, the sample is relatively healthy. These relationships may be stronger in samples with greater HIV disease progression or more significant NP deficits.