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A novel comorbidity index predicts cognitive change in people with chronic HIV

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CNS HIV Anti-Retroviral Therapy Effects Research
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Background & Significance

- People with chronic HIV (PWCH) have an excess burden of comorbidities with a substantial adverse impact on mortality and quality of life. The combined effects of these comorbidities on long-term neurocognitive (NC) outcomes are less well-studied

Objective

- To predict long-term neurocognitive decline based on a brief and simple assessment of comorbid conditions

Methods

- Inclusions: people with HIV for at least 2 years at baseline
- Exclusions: conditions sufficient to interfere with study evaluations
- Neurocognitive evaluation: comprehensive, standardized tests at baseline and follow-up
- Depressed mood assessed using the Beck Depression Inventory-II (BDI-II)
- Constructed a simple comorbidity index (SCI), based on univariable analyses predicting NC decline over 12 years.
- We compared the SCI to other well-established comorbidity indices: The Charlson Comorbidity Index (CCI), the Veterans Administration Comorbidity Score (VACS) and the Framingham cardiovascular risk
- Linear regression assessed the relationship between the SCI and a published, summary regression-based change score (sRBCS), adjusted for baseline, practice effect, and other factors, measuring change in overall NC performance
- We assessed daily performance using the Karnofsky Performance Index (KPI) and quality of life using the HIV Medical Outcomes Survey (HIV-MOS)

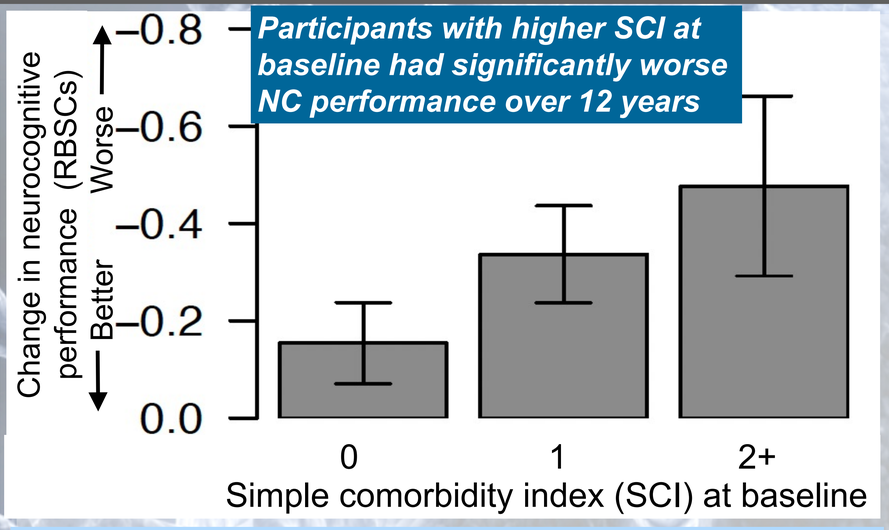

Figure. Bar plots of global summary change score at each level of the SCI. Error bars denote 95% confidence intervals

Results. Participant characteristics at baseline

IQR, interquartile range	SCI 0	SCI 1	SCI 2+	p
N	163	78	10	p
Age, years mean±SD	44.2±7.64	43.7±7.53	41.5±6.1	0.521
Female N, %	28, 17.2%	17, 21.8%	2, 20%	0.692
Non-white N, %	91, 55.8%	43, 55.1%	6, 60.0%	0.949
Education mean±SD	13.3±2.55	13.3±2.80	12.7±1.77	0.789
Duration of HIV years median, IQR	9.76±6.43	10.8±6.04	8.32±7.52	0.326
On ART N, %	124, 76.1%	58, 84.4%	8, 80%	0.962
Nadir CD4 median, IQR	172 (21, 296)	154 (52, 299)	268 (61, 434)	0.623
Current CD4 median, IQR	461 (277, 643)	489 (314, 681	707(372, 882)	0.143
Plasma HIV RNA <50 c/mL N, %	80, 50%	33, 42.3%	3, 30%	0.291

Results, continued

- The **Table** shows participant characteristics at baseline (2003-2009)
- The SCI comprised the presence or absence of hypertension, chronic obstructive pulmonary disease (COPD), and BDI-II>13, one point per comorbidity (range 0-3).
- The comorbidity with the largest effect at baseline was COPD (ES=-0.32 [-0.67,0.036]) vs hypertension (ES=-0.24 [-0.50,0.017]) and BDI-II (ES=-0.25 [-0.45,-0.047]
- **Figure. Participants with higher SCI at baseline had significantly worse NC performance over 12 years (p=0.003). Those with 2+ baseline comorbidities had worse decline over the subsequent 12 years than 0 (effect size [ES] 0.64).**
- Confounds (sex, age, substance use disorders, concomitant medications used to treat the component comorbidities) did not explain the relationship of SCI to neurocognitive decline. SCI was significantly associated with decline in the verbal domain, with trends for the processing speed and motor domains.
- In separate multivariable models using previously published indexes (Charlson, VACS and Framingham CVD risk), only the SCI was significantly associated with NC worsening rate
- Clinical significance: NC worsening correlated with worsening KPS (r=0.174, p=0.0063). There was a trend for those with improved quality of life to show less NC decline (r=0.125, p=0.0560). NC decline was worse in those who were unemployed at the follow-up visit (-0.295±0.610 versus 0.0119±0.486, p=0.000128).

Conclusions

- **Baseline comorbidities in PWCH predicted subsequent global cognitive decline over extended follow-up, suggesting that any treatments for these comorbidities during the follow-up period were only partly effective, and that more successful treatment of them might ameliorate NC decline**

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