Screening for HIV-Associated Dementia in South Africa: Potentials and Pitfalls of Task-Shifting

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Abstract

There is an urgent need for valid, reliable, and simple-to-use screening tools for HIV-associated dementia (HAD) in South Africa, as little is known about its impact on South Africa's 5.5 million people living with HIV (PLWH). Screening for HAD in South Africa involves several challenges, including few culturally appropriate and validated screening tools, and a shortage of trained personnel to conduct screening. This study examined rates of positive HAD screens as determined by the cutoff score on the International HIV Dementia Scale (IHDS) administered by nonspecialist community health workers (CHWs) in South Africa and examined associations between positive HAD screens and common risk factors for HAD. Sixty-five Xhosa-speaking HIV-positive individuals on antiretroviral therapy (ART) with low CD4 counts and documented ART adherence problems were administered a battery of demographic, psychiatric and neurocognitive screening measures. Positive HAD screens were present in 80% of the sample. Presence of a current alcohol dependence disorder and CD4 counts of 200 or lower were significantly associated with positive HAD screens. HIV-positive South Africans on ART with low CD4 counts and ART adherence problems may be at a very high risk for HAD, highlighting the need for more routine screening and monitoring of neurocognitive functions among South Africa's millions of PLWH on ART. Future research is needed to: (1) validate IHDS performance against a gold standard neurocognitive battery for the detection of HAD among larger samples of Xhosa-speaking South Africans with ART adherence difficulties and (2) compare performance of CHW to expert health care personnel in administering the IHDS.

Introduction

HIV-ASSOCIATED DEMENTIA (HAD) is the most severe form of HIV-associated neurocognitive disorder (HAND), one of the most common sequela of untreated HIV infection.¹ Considered one of the most common causes of dementia among adults 40 and younger,² HAD poses one of the greatest risks for mortality among people living with HIV (PLWH).³ The neuropsychological (NP) impairment associated with HAD affects the domains of motor functioning, attention/concentration, processing speed, executive functioning, and memory, and is thought to reflect a subcortical-type dementia with disruption in the frontostriatal and mesial temporal pathways.^{1,4} This pattern of NP-impairment has been associated with poor functional outcomes, such as suboptimal ART adherence,⁵ difficulties returning to work,^{6,7} driving problems,⁸ disruptions in interpersonal relationships,⁷ impaired activities of daily living and vocational abilities.^{7,9} Known risk

factors for HAD in high- and low-to-middle income countries include, lower CD4 count,^{10–12} older age,^{11–13} lower levels of education,^{12,14} depression,¹⁵ and alcohol and substance use.^{12,16}

Prevalence of HAD in high-income countries is estimated to be as high as 10% among people living with HIV (PLWH) regardless of whether they are on antiretroviral therapy (ART).^{17–19} Much less is known about rates of HAD in South Africa, where the majority of PLWH in the world reside.²⁰ Only one study to date has provided an estimate of HAD in South Africa. Among adults under 40 years of age initiating ART, 25.4% met the criteria for HAD,²¹ a much higher rate compared to industrialized countries, although lower compared to the 31% reported in Uganda.¹¹ If this is reflective of the larger population of PLWH in South Africa, then well over a million PLWH may be at risk for HAD.

Routine screening for HAD is not a common practice in the overburdened and underresourced health care clinics in

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South Africa. Yet, screening for and detecting HAD has the potential to track its incidence and prevalence and to provide benefit through behavioral interventions to improve daily functioning for those with HAD (e.g., such as medication management and memory enhancement techniques). Furthermore, diagnosing HAD may also have implications for knowing when to start ART and when and how to intervene to optimize adherence to ART. However, screening for HAD in South Africa is faced with numerous challenges.

First, diagnosing HAD requires a multi-hour confirmatory NP evaluation and neurologic examination.²² Second, South Africa does not have many NP screening tests for HAD that are translated, normed, and culturally validated for its multicultural population with 11 national languages, high rates of illiteracy, and low levels of educational attainment—all variables known to negatively bias NP test performance.^{23–25} Third, South Africa has a shortage of expert trained health care personnel,²⁶ such as physicians and nurses, let alone neurologists and neuropsychologists, to evaluate and administer NP tests and neurological evaluations to screen for and diagnose HAD among South Africa's 5.5 million PLWH.

A possible solution to these problems is to use valid, easy-to-administer screening tools administrable by nonspecialist community health workers (CHWs) to identify individuals at most risk for HAD. This type of task shifting has been a successful strategy for low-to-middle income countries to increase their health care resources through training and employing lay health care personnel, or CHWs.²⁷ In South Africa, CHWs have provided essential HIV related services, such as HIV counseling and testing, mother-to-child transmission prevention services, and ART adherence counseling.²⁸ Integrating CHWs into the health care system may free up valuable time for clinicians to focus on other urgent needs that require more specialized skills and so increase the capacity of the health care system. Using CHWs to screen for HAD could increase the capacity of the South African Health Care System to screen regularly for this serious problem.

The International HIV Dementia Scale (IHDS) is one such HAD screening tool that meets the constraints of the South African context.²⁹ The IHDS was designed to be administered across different cultures, in international, resource-limited settings, and by non-neurologists.²⁸ It is relatively brief to administer (approximately 2–3 min), does not require English language proficiency, and only requires the additional use of a timing device. Since the IHDS is heavily motor-focused, it is thought to be less prone to cultural biases compared to verbally laden tests and more sensitive to detecting subcortical-type dementias.²⁹

The IHDS has been used throughout in numerous resource-limited settings including India, Argentina, Uganda, and Ethiopia with success.^{30–33} Most studies indicated that the IHDS has good sensitivity and specificity in detecting HAD (when compared to a full NP battery and neurologic examination, as well as HIV-negative controls), although in India, less than a high school education was significantly related to worse performance on the IHDS.³⁴ Two recent studies established validity for use of the IHDS among HIV-positive populations in South Africa.^{21,35} Both studies suggested the IHDS is a useful tool to screen for HAD, though they recommend more research on the instrument to establish the most useful cut-off score. Use of the IHDS by CHWs is less clear, as most studies have used trained psy-

chologists,³⁵ medical officers trained in HIV neuropsychiatry,²¹ and physicians^{31,32} to administer it. Studies in Uganda and in India used “non-neurologist” staff to administer the IHDS, but did not define whom and at what level the staff was.^{30,33}

The purpose of this study was to (1) determine rates of positive HAD screens among ART-experienced HIV-positive Xhosa-speaking, Black South Africans when the IHDS is administered by CHWs and (2) examine associations between positive HAD screens and common risk factors for HAD, including current CD4 count, age, depression, and substance use problems. This is the first study to our knowledge to examine screening for HAD by CHWs in South Africa.

Methods

Data for this study were obtained from the baseline interview of a feasibility trial of an ART adherence intervention in a general medical clinic in the Western Cape Region of South Africa. In order to be eligible for the study, participants had to have had ART prescribed for at least 6 months and have exhibited less than 90% adherence to ART in one of the past 3 months prior to study enrollment, based on pharmacy refill records. Eligibility criteria included speaking English and/or Xhosa and healthy enough to attend all intervention sessions. Participants were excluded if they had a current psychotic disorder and/or a severe enough cognitive impairment such that they did not have capacity to consent.

All participants who met study eligibility and agreed to participate in the study were informed of their rights as participants and provided written informed consent. The Human Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town, the Institutional Review Board of the New York State Psychiatric Institute, and the health authorities of the City of Cape Town's Department of Health provided approval for the conduct of this study.

Two nonspecialist CHWs, fluent in Xhosa and English, were hired and trained to assist in the administration of the study assessment battery, which included the IHDS. Prior to joining our study, the CHWs had prior adherence counselor training through the Western Cape AIDS Training and Information Counseling Centre. Our CHWs also met all the requirements for CHWs as set forth by the Department of Health in the Western Cape Province (i.e., having at least a grade 10 education, three years of experience as a voluntary counseling and testing or prevention of mother-to-child transmission counselor, emotional stability, and good interpersonal communication skills).³⁶ The CHWs were trained by the study clinical psychologists and neuropsychologist on the administration and scoring of all study instruments, as well as delivery of the adherence intervention. The CHWs received regular onsite supervision by the project manager, a clinical psychologist, and weekly supervision from the project director, also a clinical psychologist. Both the project manager and director had extensive experience administering and scoring these types of instruments, including the neurocognitive screening tools.

Participants

Sixty-five HIV-positive eligible participants were recruited. All participants' HIV status was confirmed through medical record review and all were currently on ART for HIV. At

baseline, all participants underwent neuropsychiatric screening. All participants were between the ages of 18 and 68. Data were collected from March 2009 to August 2010.

Measures

Participants were administered a battery of medical, demographic, psychiatric, and neurocognitive measures during the baseline interview. All measures and instruments were available in Xhosa and English, the two most commonly spoken languages in the vicinity of the clinic. All Xhosa translations were forward and back-translated to ensure fidelity. Participants were able to choose which language they wanted the battery to be administered in. All items were read to participants due to concerns over low literacy levels.

Demographic and medical. All participants completed questionnaires that assessed demographic characteristics (i.e., age, gender, education) and a medical screen that asked participants about previous head injuries with unconsciousness of 30 min or longer, time since HIV diagnosis, and time on ART. Most recent CD4 count was obtained from medical charts.

Psychiatric. The Mini Neuropsychiatric Inventory (MINI)³⁷ was designed as a brief structured interview which assesses individuals across the major Axis I disorders in the DSM-IV.⁴⁰ The MINI has been used as a gold standard in cross-cultural studies around the world, including HIV-positive patients in South Africa.^{38,39} The MINI assessed participants according to DSM-IV⁴⁰ Axis I disorders. Participants were screened for major depression, post-traumatic stress disorder, panic disorder with and without agoraphobia, generalized anxiety disorder, manic and hypomanic episodes, and alcohol and substance use disorders.

International HIV Dementia Scale. The IHDS²⁹ was designed to be an easy to administer, brief, cross-cultural screening tool to identify those most likely to have HAD. It has been translated into several languages and used in numerous countries, including South Africa.^{30–33,35} The test consists of a four-word memory task (immediate recall and recall 3 min later), a Luria-type fist-edge-palm motor programming task, and a finger-to-finger tapping test. Each domain specific subtest is scored from 0 to 4 with total scores ranging from 0 to 12. The Xhosa-language version of the IHDS used for this study has been validated previously²¹ and does not use word substitutions for the four-item memory task, as the corresponding Xhosa words were deemed to be of similar frequency and difficulty as the English words. The original IHDS publication²⁹ reported that using a cutoff score of 10 or less had a sensitivity of 80% and specificity of 55% and that individuals who score 10 or less should be referred for a thorough evaluation for the presence of HAD.

Two recent studies in South Africa have established validity for its use among HIV-positive populations there. One study³⁵ found that among ART-naïve, Zulu-speaking, Black South Africans, with CD4 counts 200 or less, the IHDS had a sensitivity of 88% and specificity of 50% using the published cutoff score. In another study²¹ among young adult, ART-naïve, Xhosa-speaking HIV-positive South Africans, sensitivity was 44.83% and specificity was 78.57% using a cut-off of

10 or less, and 72.41% and 46.43%, respectively, using the cutoff score of 11 or less.

Statistical analysis

Descriptive statistics for continuous variables are presented with their means and standard deviations, and frequencies and percentages are presented for categorical variables. Because the IHDS was not designed to assess a range of abilities (where the lowest scores indicate the most severe impairment), but rather as a screening instrument with a specific cutoff point that indicates someone is most likely to have HAD,²⁸ we conducted all analyses using the IHDS as a discrete variable—likely to have HAD (a positive screen) or not. Bivariate relationships between dichotomous variables, such as positive HAD screen and CD4 count, head injury with unconsciousness of 30 min or longer, psychiatric disorder, and substance use disorder, were tested using 2×2 χ^2 analysis. Bivariate relationships between continuous variables and dichotomous variables, such as positive HAD screen and age, were tested via independent samples *t*-test. All analyses were conducted using PASW Statistics 18, Release Version 18.0 (2009; SPSS, Inc., Chicago, IL).

Results

Participants

Table 1 describes participants' demographic and medical characteristics. The sample was almost 40 years of age on average (mean age in years 38.50 ± 9.26), predominantly female (65%), mostly non-high school graduated (95%), diagnosed with HIV for just over 5 years (mean time since first positive HIV test 5.27 ± 3.25 years), on ART for more than 3 years (mean years prescribed ART 3.46 ± 1.93 years), and had relatively low CD4 counts (mean CD4 count 296.11 ± 162.83). Just about half (48%) of the sample reported going without food at least once in the past month. Five participants reported an episode of unconsciousness 30 min or more, of which head injury due to vehicular accident was the most common reason.

TABLE 1. PARTICIPANT CHARACTERISTICS

	HIV-positive (N = 65)
Age range	19–68
Age, mean (SD)	38.50 (9.26)
Female, <i>n</i> (%)	42 (65)
Years since testing HIV-positive, mean (SD)	5.27 (3.25)
Years prescribed ART, mean (SD)	3.46 (1.93)
Most recent CD4 count, mean (SD)	296.11 (162.83)
Unconscious ≥ 30 min, <i>n</i> (%)	5 (8)
Education, <i>n</i> (%)	
Grade 8 or less	23 (36)
Some high school	37 (59)
Completed high school	2 (3)
Some college or college degree	1 (2)
Currently employed/full or sometimes, <i>n</i> (%)	6 (17)
One or more times without food in past month, <i>n</i> (%)	31 (48)

SD, standard deviation; ART, antiretroviral therapy.

TABLE 2. INTERNATIONAL HIV DEMENTIA SCALE TEST RESULTS

	<i>HIV-positive</i> (N=65)
Total score, mean (SD)	8.58 (1.98)
Motor speed score	2.92 (0.77)
Psychomotor speed score	2.48 (1.26)
Delayed memory score	3.27 (0.78)
Cut-off score generated positive screens	
Cut-off ≤ 8 , <i>n</i> (%)	27 (42)
Cut-off ≤ 9 , <i>n</i> (%)	43 (66)
Cut-off ≤ 10 , <i>n</i> (%)	52 (80)
Cut-off ≤ 11 , <i>n</i> (%)	61 (94)

SD, standard deviation.

International HIV Dementia Scale

Table 2 displays means and standard deviations for the IHDS total and subtest scores. Of the 65 IHDS administrations, 79% (*n*=51) were administered in Xhosa, and 21% (*n*=14) were administered in English. No significant differences on mean total and subtest scores were found between the Xhosa and English versions. Using the recommended cut-off score of 10 or less suggested that 80% (*n*=52) were at risk for having HAD. Table 2 also presents rates of positive HAD screens using the cutoff scores of 11 or less, as suggested by a recent validation study of the IHDS in South Africa,²¹ 9 or less and 8 or less. Increasing the cutoff to 11 or less increased the rate of positive screens, whereas lowering the cut-off decreased the rates of positive screens.

Psychiatric

Results from the MINI indicated that 18.5% (*n*=12) of the sample met criteria for one current psychiatric diagnosis and 3.1% (*n*=2) met criteria for two comorbid psychiatric diagnoses. Two participants met criteria for current panic disorder, two for agoraphobia, seven for generalized anxiety disorder, four for posttraumatic stress disorder, and one for a bipolar disorder. Just over 32% (*n*=21) met criteria for a current alcohol dependence disorder. No one met criteria for a current substance use disorder.

To examine if known risk factors for HAD increased the likelihood of screening positive on the IHDS, we tested the bivariate relationship between IHDS scores and current CD4 count, age, education, unconsciousness of 30 min or more due to head injury, presence of a psychiatric disorder, and presence of a current alcohol disorder. Table 3 reports all bivariate relationships.

Significant relationships were only found between CD4 count and presence of an alcohol disorder and IHDS positive screens. Participants with IHDS scores of 10 or less were more likely to have CD4 counts of less than 200 (χ^2 [*N*=63, *df*=1] = 4.37, *p*=0.036). Participants with a current alcohol dependence disorder were more likely to also have a positive HAD screen, (*N*=65, *df*=1) = 6.50, *p*>0.012).

Discussion

In this sample of nonadherent, ART-experienced PLWH, we found 80% screened positive for HAD using the IHDS, a much higher rate than expected and previously found. HAD

TABLE 3. BIVARIATE ANALYSES BETWEEN HAD RISK FACTORS AND IHDS POSITIVE SCREENS

	χ^2 or <i>t</i>	<i>p</i>
Age ^a	-0.06	0.95
Education ^b	0.38	0.83
CD4 count ^c	4.37	0.04
Unconscious ≥ 30 -min ^c	0.25	0.88
Presence of a current psychiatric disorder ^c	0.82	0.37
Presence of a current alcohol disorder ^c	6.50	0.01

^aIndependent samples *t* test. ^b3×2 χ^2 comparison between 3 age groups (grade 8 or less, some high school, and completed high school and above). ^c2×2 χ^2 comparison.

may be more prevalent than thought in this population of PLWH. This is the first study in South Africa to present findings on rates of positive HAD screens among ART-experienced PLWH.

We found a significant association between IHDS scores of 10 or lower and CD4 counts of 200 or less, suggesting that poor immune functioning is related to increased neurocognitive impairment, a finding consistent with the literature.¹⁰ We also found a significant association between presence of an alcohol dependence disorder and positive HAD screens, suggesting that alcohol dependence is related to worse neurocognitive functioning in HIV, which is also consistent with the literature.¹⁶ We did not find relationships between a positive HAD screen and age, education, or presence of a current psychiatric disorder. Overall IHDS test performance indicated that it was the motor and psychomotor programming subtests that individuals performed worst on, with psychomotor programming having the lowest mean score.

There are several reasons that may help explain why we found such high rates of positive HAD screens. First, our sample consisted of a select group of PLWH, namely those with documented adherence problems and overall very low CD4 counts. Consistent with the literature, this group is at higher risk for neurocognitive problems, such as HAD, as research has documented a strong relationship between poor ART adherence and more neurocognitive impairment,⁴¹ as well as poor immunologic function (e.g., low CD4 count) and increased neurocognitive impairment.^{10–12} In fact, we observed a significant association between CD4 ≤ 200 and IHDS scores 10 or less. Furthermore, it may be that poor adherence contributed to the overall low CD4 counts. Third, other non-HIV-related problems could also result in a positive screen, such as severe brain injuries and alcohol use problems. Not only do alcohol use problems increase the risk for HAD,^{12,16} they are also known to have independent negative effects on neurocognitive functioning in the absence of HIV or other neurotoxic diseases.^{42,43} In the current study, we found a large portion met criteria for a current alcohol dependence disorder, which was significantly related to IHDS performance. We did not, however, find an association between positive HAD screens and brain injuries with 30 minutes or more of unconsciousness. Fourth, the overall low education of the sample (most had not completed high school) could have contributed to lower scores on the IHDS,³⁴ although we did not find such an association.

It is also possible that CHW use of the IHDS resulted in over estimates of HAD. We raise this issue in light of recent

reports calling into question the quality and consistency of CHW provided HIV service in resource limited settings.⁴⁴ With such a dearth of health care providers in South Africa and the enormous number of HIV patients, shifting HIV services to CHWs can help increase the capacity of the health care system. However, CHWs often have much less training and supervision compared to health professionals. Thus, considerable variation exists in CHW capacity and ability to deliver a wide variety of services. Further, no research that we are aware of has compared the ability of CHW administration of screening tools to detect neurocognitive impairment to that of health care professional administration of the same tools. There may be elements of some screening tools that make accurate interpretation of performance more difficult for CHW as compared to health professionals with many years training and clinical experience. In fact, one of the more challenging aspects of training our CHWs to administer the IHDS was their apparent wish to offer subtle encouragement with hints during the item recall subtest (e.g., head nods and facial expressions) and their apparent difficulty in discerning what constitutes a mistake on the motor programming task. Thus, while our CHWs had multiple training sessions on use and scoring of the IHDS, had directly observed supervision, and time allocated specifically to conduct these assessments, it is possible that aspects of the IHDS' administration were challenging for them, and they overestimated impairment. Without further research and data on CHW ability to use the IHDS to screen for HAD compared to health professionals' ability to do so, it is important to consider such potential difficulties as a possible source of our observed high rates of positive HAD screens.

It is important to note that this study had several limitations. First, we had a small sample size with only a few participants with negative HAD screens ($n = 13$), which may have limited our ability to detect additional differences, such as the effects of psychiatric disorders or education on IHDS performance. Second, without a comparison of the IHDS to a gold standard battery, we cannot evaluate its sensitivity and specificity in this population, nor can we confirm the actual presence of HAD in this sample. It may very well be that the IHDS is more sensitive than specific, and in the two validity studies using it in South Africa findings suggested just that.^{21,35} Thus, while we found that 80% of our sample may be at risk for HAD, a high percentage may be inaccurately classified as possibly having HAD. However, without a confirmatory diagnosis of it, it is not clear to what extent this population actually has HAD and it is possible that some of the positive screens we detected may not be HIV-related, but reflective of other disease processes, such as alcohol use problems or other neurodegenerative processes. Furthermore, we did not directly compare screening outcomes between well-trained medical specialists and non-specialist CHWs ability in using the IHDS.

The findings from our study must also be considered in light of the psychometric limitations of the IHDS and cultural context of South Africa. Most of our participants have never been administered NP tests before, nor have they undergone neurological examinations. It may well be the case that this unfamiliarity with the procedures and protocols for this screening test could make individuals appear impaired, as individuals may perform poorly due to lack of test exposure and unfamiliarity,⁴⁵⁻⁴⁷ rather than actual NP impairment. For

instance, correctly completing the fist-edge-palm procedure for the very first time can be anxiety provoking and difficult to master quickly, and poor performance on this test has been associated with low education.⁴⁸

Future research needs to further evaluate the psychometric properties of the IHDS among a variety of HIV-infected populations in South Africa on ART with varying degrees of adherence and at different HIV disease stages to determine the most clinically useful and accurate cutoff score by comparison to a gold standard evaluation for HIV-associated neurocognitive disorder. Future research will also need to disentangle the psychometric and cultural issues of the IHDS from the administration of it by CHWs. It is also important to note that in real world applications of HAD screening, CHWs may face very different circumstances than those in our study. For instance, inconsistent and offsite supervision, as well as time constraints that do not allow specifically for the administration of the IHDS could make use of the IHDS by CHWs challenging with increased opportunities to overestimate impairment. And while the IHDS is overall brief and straightforward, it still requires the use of a timing device and a well-trained eye to detect errors in the motor programming task. It is possible that overburdened and resource limited clinics may not have easy access to stopwatches, and thus health care personnel may rely on more imprecise use of a clock or watch with a second hand. Thus, future research needs to compare CHW versus specialist health personnel administration of the IHDS in research and real-world clinical settings.

In summary, this is the first study to examine rates and correlates of positive HAD screens using the IHDS among Xhosa-speaking, ART-experienced PLWH with low education and ART adherence problems in South Africa. We believe our findings, notwithstanding the limitations presented, are an important addition to the growing and much needed work on cross-cultural neurocognitive screening tools for resource limited settings.^{21,30,35,49-53} Furthermore, we think HAD may be very common in nonadherent PLWH in South Africa with low CD4 counts and alcohol use disorders. Thus, routine screening and testing for HAD is much needed. Using CHWs to conduct regular HAD screening may help make the process a viable possibility. The IHDS holds promise as an easy-to-use, culturally appropriate, and brief screening tool for resource-limited clinics in South Africa. However, more research needs to be undertaken to further validate the IHDS' ability to detect HAD across the HIV disease spectrum and via CHW administration. Given the actual contexts in which many CHWs in South Africa work, perhaps neurologists and neuropsychologists can develop even easier to administer screening tools that do not require use of stopwatches, is more automated, and can be administered with a high degree of fidelity with or without consistent supervision. Mobile technologies, such as smart phones with touch screens could possibly be used to develop such a tool. However, until such tools are developed and deployed, the overburdened and resource limited health clinics of South Africa will need to rely on tools like the IHDS.

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Author Disclosure Statement

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References

- Heaton RK, Grant I, Butters N, White DA, et al. The HNRC 500: Neuropsychology of HIV infection at different disease stages. *J Int Neuropsychol Soc* 1995;1:231–251.
- Rowland LP, Pedley TA. *Merritt's Neurology*, 12th ed. Philadelphia, PA: Lippincott Williams & Wilkins, 2010.
- Ellis RJ, Deutsch R, Heaton RK, et al. Neurocognitive impairment is an independent risk factor for death in HIV infection. *Arch Neurol* 1997;54:416–424.
- Grant I. Neurocognitive disturbances in HIV. *Int Rev Psychiatry* 2008;20:33–47.
- Hinkin CH, Castellon SA, Durvasula RS, et al. Medication adherence among HIV+ adults: Effects of cognitive dysfunction and regimen complexity. *Neurology* 2002;59:1944–1950.
- van Gorp WG, Rabkin JG, Ferrando SJ, et al. Neuropsychiatric predictors of return to work in HIV/AIDS. *J Int Neuropsychol Soc* 2007;13:80–89.
- Gorman A, Foley J, Ettenhofer M, Hinkin C, van Gorp W. Functional consequences of HIV-associated neuropsychological impairment. *Neuropsychol Rev* 2009;19:186–203.
- Marcotte TD, Wolfson T, Rosenthal TJ, et al. A multimodal assessment of driving performance in HIV infection. *Neurology* 2004;63:1417–1422.
- Heaton RK, Marcotte TD, Mindt MR, et al. The impact of HIV-associated neuropsychological impairment on everyday functioning. *J Int Neuropsychol Soc* 2004;10:317–331.
- Childs EA, Lyles RH, Selnes OA, et al. Plasma viral load and CD4 lymphocytes predict HIV-associated dementia and sensory neuropathy. *Neurology* 1999;52:607–613.
- Wong MH, Robertson K, Nakasujja N, et al. Frequency of and risk factors for HIV dementia in an HIV clinic in sub-Saharan Africa. *Neurology* 2007;68:350–355.
- Joska J, Fincham D, Stein D, Paul R, Seedat S. Clinical correlates of HIV-associated neurocognitive disorders in South Africa. *AIDS Behav* 2010;14:371–378.
- Valcour V, Shikuma C, Shiramizu B, et al. Age, apolipoprotein E4, and the risk of HIV dementia: The Hawaii Aging with HIV Cohort. *J Neuroimmunol* 2004;157:197–202.
- Chiesi A, Vella S, Dally LG, et al. Epidemiology of AIDS Dementia Complex in Europe. *J Acquir Immune Defic Syndr* 1996;11:39–44.
- Starace F, Bartoli L, Aloisi MS, et al. Cognitive and affective disorders associated to HIV infection in the HAART era: Findings from the NeuroICONA study. *Acta Psychiatr Scand* 2002;106:20–26.
- De Ronchi D, Faranca I, Berardi D, et al. Risk factors for cognitive impairment in HIV-1-infected persons with different risk behaviors. *Arch Neurol* 2002;59:812–818.
- Simioni S, Cavassini M, Annoni J-M, et al. Cognitive dysfunction in HIV patients despite long-standing suppression of viremia. *AIDS* 2010;24:1243–1250.
- Dore GJ, McDonald A, Li Y, Kaldor JM, Brew BJ. Marked improvement in survival following AIDS dementia complex in the era of highly active antiretroviral therapy. *AIDS* 2003;17:1539–1545.
- Sacktor N, Lyles RH, Skolasky R, et al. HIV-associated neurologic disease incidence changes: Multicenter AIDS Cohort Study, 1990–1998. *Neurology* 2001;56:257–260.
- Abdool Karim SS, Abdool Karim Q, Gouws E, Baxter C. Global epidemiology of HIV/AIDS. *Infect Dis Clin North Am* 2007;21:1–17.
- Joska JA, Westgarth-Taylor J, Hoare J, et al. Validity of the International HIV Dementia Scale in South Africa. *AIDS Patient Care STDs* 2011;25:95–101.
- Antinori A, Arendt G, Becker JT, et al. Updated research nosology for HIV-associated neurocognitive disorders. *Neurology* 2007;69:1789–1799.
- Manly JJ, Espino DV. Cultural influences on dementia recognition and management. *Clin Geriatr Med* 2004;20:93–119.
- Manly JJ, Byrd DA, Touradji P, Stern Y. Acculturation, reading level, and neuropsychological test performance among African American elders. *Appl Neuropsychol* 2004;11:37–46.
- Manly JJ, Touradji P, Tang MX, Stern Y. Literacy and memory decline among ethnically diverse elders. *J Clin Exp Neuropsychol* 2003;25:680–690.
- World Health Organization. *World health statistics 2010*. Geneva, Switzerland: 2010.
- Chen L, Evans T, Anand S, et al. Human resources for health: Overcoming the crisis. *Lancet* 2004;364:1984–1990.
- Schneider H, Hlophe H, van Rensburg D. Community health workers and the response to HIV/AIDS in South Africa: Tensions and prospects. *Health Policy Plan* 2008;23:179–187.
- Sacktor NC, Wong M, Nakasujja N, et al. The International HIV Dementia Scale: A new rapid screening test for HIV dementia. *AIDS* 2005;19:1367–1374.
- Riedel D, Ghate M, Nene M, et al. Screening for human immunodeficiency virus (HIV) dementia in an HIV clade C-infected population in India. *J Neurovirol* 2006;12:34–38.
- Lopardo GD, Bissio E, Iannella MdC, Crespo AD, Garone DB, Cassetti LI. Good neurocognitive performance measured by the International HIV Dementia Scale in early HIV-1 infection. *J Acquir Immune Defic Syndr* 2009;52:488–492.
- Clifford DB, Mitike MT, Mekonnen Y, et al. Neurological evaluation of untreated human immunodeficiency virus infected adults in Ethiopia. *J Neurovirol* 2007;13:67–72.
- Sacktor N, Nakasujja N, Robertson K, et al. HIV-associated cognitive impairment in sub-Saharan Africa—The potential effect of clade diversity. *Nat Clin Pract Neurol* 2007;3:436–443.
- Waldrop-Valverde D, Nehra R, Sharma S, et al. Education effects on the International HIV Dementia Scale. *J Neurovirol* 2010;16:264–267.
- Singh D, Sunpath H, John S, Eastham L, Gouden R. The utility of a rapid screening tool for depression and HIV dementia amongst patients with low CD4 counts—A preliminary report. *Afr J Psychiatry* 2008;11:282–286.
- Department of Health. *Community Care Worker Management Policy Framework*. Tshwane, South Africa: The Republic of South Africa; 2009.
- Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J Clin Psychiatry* 1998;59(Suppl 20):22–33.
- Smit J, van der Berg CE, Bekker L-G, Seedat S, Stein DJ. Translation and cross-cultural adaptation of a mental health battery in an African setting. *Afr Health Sci* 2006;6:215–222.
- Myer L, Smit J, Roux LL, Parker S, Stein DJ, Seedat S. Common mental disorders among HIV-infected individuals

- in South Africa: Prevalence, predictors, and validation of Brief Psychiatric Rating Scales. *AIDS Patient Care STDs* 2008;22:147–158.
40. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders: DSM-IV*, 4th ed. Washington, D.C.: American Psychiatric Association, 1994.
 41. Hinkin CH, Hardy DJ, Mason KI, et al. Medication adherence in HIV-infected adults: Effect of patient age, cognitive status, and substance abuse. *AIDS* 2004;18(Suppl 1):S19–S25.
 42. Errico AL, Parsons OA, King AC. Assessment of verbose-quantitative and visuospatial cognitive abilities in chronic alcoholics. *Psych Assess* 1991;3:693–696.
 43. Grant I. Alcohol and the brain: Neuropsychological correlates. *J Consult Clin Psychol* 1987;55:310–324.
 44. Rohleder P, Swartz L. 'What I've noticed what they need is the stats': Lay HIV counsellors' reports of working in a task-orientated health care system. *AIDS Care* 2005;17:397–406.
 45. Scruggs TE, Lifson SA. Current conceptions of test-wiseness: Myths and realities. *School Psychol Rev* 1985;14:339–350.
 46. Teng EL, Manly JJ. Neuropsychological testing: Helpful or harmful? *Alzheimer Dis Assoc Disord* 2005;19:267–271.
 47. Nell V. Translation and test administration techniques to meet the assessment needs of ethnic minorities, migrants, and refugees. In: Goldstein G, Beers SR, Hersen M, eds. *Comprehensive Handbook of Psychological Assessment*, Vol. 1: Intellectual and Neuropsychological Assessment. Hoboken, NJ: John Wiley & Sons Inc., 2004:333–338.
 48. Nitrini R, Caramelli P, Herrera EJ, Charchat-Fichman H, Porto CS. Performance in Luria's fist-edge-palm test according to educational level. *Cogn Behav Neurol* 2005;18:211–214.
 49. Robertson K, Liner J, Heaton R. Neuropsychological assessment of HIV-infected populations in international settings. *Neuropsychol Rev* 2009;19:232–249.
 50. Wojna V, Skolasky RL, McArthur JC, et al. Spanish validation of the HIV dementia scale in Women. *AIDS Patient Care STDs* 2007;21:930–941.
 51. Ganasen KA, Fincham D, Smit J, Seedat S, Stein D. Utility of the HIV Dementia Scale (HDS) in identifying HIV dementia in a South African sample. *J Neurol Sci* 2008;269:62–64.
 52. Maj M, Satz P, Janssen R, Zaudig M, et al. WHO Neuropsychiatric AIDS Study, Cross-Sectional Phase II: Neuropsychological and neurological findings. *Arch Gen Psychiatry* 1994;51:51–61.
 53. Njamnshi AK, Djientcheu VdP, Fonsah JY, Yepnjio FN, Njamnshi DM, Muna WF. The International HIV Dementia Scale is a useful screening tool for HIV-associated dementia/cognitive impairment in HIV-infected adults in Yaounde-Cameroon. *J Acquir Immune Defic Syndr* 2008;49:393–397.

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