



Integrating HIV-associated neurocognitive impairment screening and health services within primary healthcare facilities in South Africa

Adele Delysia Munsami

BSocSc (Psychology), BA Hons (Research Psychology), MSocSc (Research Psychology)

Thesis presented for the Degree
DOCTOR OF PHILOSOPHY – PhD (Neuropsychiatry)

Department of Psychiatry and Mental Health
Faculty of Health Sciences
University of Cape Town
November 2022

Supervisors

Professor John Anton Joska
Associate Professor Hetta Gouse
Associate Professor Sam Nightingale

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

*“And whatever you do, whether in word or deed, do it all in the name of the Lord Jesus,
giving thanks to God the Father through Him.”*

Colossians 3:15-17

To my parents Joel and Mavis Munsami, for you, I give thanks.

A dedication to my younger self

This is for you little Adele, a girl facing giants in the darkest places. I know that you grow tired and giving up seems like the only reprieve. Dry your eyes, for you do not yet know just how far you will rise. Chin up, your story has only just begun.

Psalms 46:5

Table of Contents

Declaration.....	8
Acknowledgements.....	11
Funding	12
Abbreviations and acronyms.....	13
Abstract.....	14
Integrating HIV-associated neurocognitive impairment screening and health services within primary healthcare facilities in South Africa	14
Chapter 1	17
Introduction.....	17
1.1 Context	18
1.2 Research rational and aims.....	24
1.3 Research context	25
1.4 Coherence of the thesis	27
1.5 Overview of the thesis.....	27
Chapter 2	37
Mental and Cognitive Healthcare Training Targeting Primary Healthcare Workers Providing HIV Services in Africa: A Scoping Review	37
Abstract.....	38
2.1 Introduction	39
2.2 Methodology	40
2.2.1 Search strategy	40
2.2.2 Study selection.....	41
2.2.3 Data extraction and quality assessment	44
2.3 Results.....	45
2.3.1 Study characteristics	45
2.3.2 Evaluation methodology	49
2.4 Discussion	51
2.5 Limitations	53
2.6 Recommendations	54
Chapter 3.....	69
HIV-associated neurocognitive impairment knowledge and current practices: a survey of frontline healthcare workers in South Africa.....	69
Abstract.....	70
3.1 Introduction	71

3.2	Materials and methods	72
3.2.1	Survey development.....	72
3.2.2	Study process	73
3.2.3	Statistical analysis.....	73
3.3	Results	74
3.3.1	Demographics	74
3.3.2	HIV-associated neurocognitive impairment knowledge.....	76
3.3.3	Healthcare Workers' awareness of the Presence of HIV-associated neurocognitive impairment.....	78
3.3.4	Current HIV-associated neurocognitive impairment practices.....	81
3.3.5	Healthcare Workers' Views on Training for HIV-associated neurocognitive impairment Identification	81
3.4	Discussion	82
3.5	Limitations	84
3.6	Recommendations	84
3.7	Conclusion.....	85
Chapter 4		91
Exploring HIV-associated neurocognitive impairment in the era of effective antiretroviral therapy: A primary healthcare perspective		91
Abstract		92
4.1	Introduction	93
4.2	Methods.....	95
4.3	Study design	95
4.3.1	Participant selection	95
4.3.2	Procedure	96
4.4	Data analysis	98
4.5	Results	99
4.5.1	Participant characteristics	99
4.5.2	Healthcare workers' knowledge and understanding of HIV-associated neurocognitive impairment.....	100
4.5.3	Healthcare workers' views on the acceptability and feasibility of HIV-associated neurocognitive impairment screening	102
4.6	Discussion	106
4.7	Limitations	110
4.8	Recommendations	110
4.9	Conclusion.....	111

Supplementary material	126
Chapter 5	127
Developing an HIV-associated neurocognitive impairment training programme targeting primary healthcare workers in low- and middle-income countries	127
5.1 Introduction	128
5.2 Methods.....	130
5.2.1 Design	130
5.2.2 Developing the training curriculum	135
5.3 Lessons learned	144
5.4 Conclusion.....	146
Chapter 6.....	157
Integrating HIV-associated neurocognitive impairment screening within primary healthcare facilities: A pilot training intervention.....	157
Abstract	158
6.1 Introduction	158
6.2 Methods.....	161
6.2.1 Study design.....	161
6.2.1 Ethical considerations	162
6.2.2 Population and sample	162
6.2.3 Curriculum development	162
6.2.4 Data collection	164
6.3 Analysis.....	168
6.4 Results.....	168
6.4.1 Participants.....	168
6.4.2 HIV-associated neurocognitive impairment knowledge pre- and post-training 169	
6.4.3 Administering an HIV-associated neurocognitive impairment screening tool	172
6.4.4 Healthcare workers' confidence using a screening tool	181
6.5 Discussion	182
6.6 Limitations	185
6.7 Conclusion.....	185
Chapter 7.....	193
General discussion	193
7.1 Summary of findings.....	193
7.2 Summary of individual manuscript and findings	194
7.3 Key findings and final recommendations.....	196

7.3.1	Key finding 1 and recommendations	197
7.3.2	Key finding 2 and recommendations	198
7.3.3	Key finding 3 and recommendations	199
7.4	Limitation of the study	200
7.5	Conclusion.....	202

Declaration

I, Adele Delysia Munsami, present this thesis in fulfilment of the requirements for the degree of Doctor of Philosophy in the Department of Psychiatry and Mental Health, Faculty of Health Sciences, University of Cape Town. I confirm that this thesis is my original work and that no part of this thesis has been submitted in the past, is being, or is to be submitted for a degree in this or any other university. This thesis has been submitted to the Turnitin module and I confirm that my supervisor has seen the report and there were no plagiarism concerns. I hereby grant the University of Cape Town free license to reproduce this thesis in whole or in part for the purpose of research or teaching.

The study protocol was approved by University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee (HREC 624/2018) and all participants provided written informed consent (see Appendix A).

I do hereby declare that this thesis is based on five journal manuscripts: Four of which have been published in international journals (Chapters 2, 3, 4 and 6) and one which is under review in an international medical education journal (Chapter 5). I confirm that I have been granted permission by the University of Cape Town's Doctoral Degrees Board to include the five publications listed below, in my thesis. Where co-authorships are involved, my co-authors have agreed that I may include the publication(s).

Chapter 2.

Munsami, A., Dreyer, A. J., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022).

Mental and cognitive healthcare training targeting primary healthcare workers providing HIV services in Africa: a scoping review. *AIDS care*, 1-9.

<https://doi.org/10.1080/09540121.2022.2099512>

Chapter 3

Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *J Community Health* 46, 538–544 (2020). <https://doi.org/10.1007/s10900-020-00895-9>

Chapter 4

Munsami, A., Nightingale, S., Sorsdahl, K., & Joska, J. A. (2022). Exploring HIV-associated neurocognitive impairment in the era of effective antiretroviral therapy: A primary healthcare perspective. *Qualitative Health Research*. <https://doi.org/10.1177/10497323221110801>

Chapter 5

Munsami, A., Gouse, H., Sibeko, G., Nightingale, S., & Joska, J. A. Developing an HIV-associated neurocognitive impairment training programme targeting primary healthcare workers in low- and middle-income countries. Under review - *The International Journal of Medical Education*

Chapter 6

Munsami, A., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022). Integrating HIV-Associated Neurocognitive Impairment Screening within Primary Healthcare Facilities: A Pilot Training Intervention. *Nursing research and practice*, 2022. <https://doi.org/10.1155/2022/4495586>

The layout and subheadings of the publications were modified slightly for the purpose of this thesis to ensure consistent format throughout. The content of each manuscript remains unchanged from that which has been either published or submitted for publication. However, a statement has been added to the introduction and conclusion of each to underscore the coherence of the entire thesis i.e., how each chapter links to the next and the others. This thesis is presented for examination in fulfillment of the requirements for the degree of Doctor in Philosophy.

Name: Adele Delysia Munsami

Student number: MNSADE002

Signature:

A handwritten signature in black ink, appearing to be 'Adele', written over a horizontal line.

Acknowledgements

This thesis would not have come to fruition without the grace and mercy of my Lord Jesus Christ. All glory and honor be to the one who is my strength and my portion.

I would like to express my deep and sincere gratitude to my supervisor, Professor John Joska, for taking a chance on an unknown student and for giving me this life-changing opportunity. Your unwavering guidance, mentorship and timely advice have been invaluable. Thank you for your kindness, gentleness and sincerity throughout my journey. It has been a privilege to conduct this research under your wing. I would also like to thank Associate Professors Hetta Gouse and Sam Nightingale for their ongoing support and persistent help throughout this process.

In addition, I thank Professor Katherine Sorsdahl and Dr Goodman Sibeko for your time and assistance.

To my parents, you will always be my greatest blessings. I cannot express my gratitude to you both, especially for your sacrifice, love and support. I also wish to acknowledge my grandparents who are no longer with me, with special recognition of my grandmother who emphasized the value of education.

I would not have made it this far in my journey without the joy, laughter and endless questions I received from Liam and Mia Munsami. I love you without end.

My utmost thanks to Dr Chris Desmond for getting me across the finish line. Thank you for all the coffee, weekly chats, guidance and support during the final and most important leg of the race.

To my best friend, Yashika Govind. Thank you for believing in me long before I believed in myself.

To a host of family and friends too numerous to name, I thank you.

Funding

Adele Munsami was supported by The David and Elaine Potter Fellowship and the University of Cape Town Department of Psychiatry. The financial assistance of the National Institute for the Humanities and Social Sciences, in collaboration with the South African Humanities Deans Association (SAHUDA) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at are those of the author and are not necessarily to be attributed to the NIHSS and SAHUDA.

Abbreviations and acronyms

Acquired immunodeficiency syndrome (AIDS)

AIDS dementia complex (ADC)

Analysis of variance (ANOVA)

Antiretroviral therapy (ART)

Asymptomatic neurocognitive impairment (ANI)

Central nervous system (CNS)

Department of health (DoH)

Focus group discussions (FGDs)

Healthcare worker (HCW)

Human immunodeficiency virus (HIV)

HIV and sexually transmitted infections (HAST)

HIV-associated neurocognitive impairment (H-NCI)

HIV-associated dementia (HAD)

HIV-associated dementia (HIV-D)

Mild neurocognitive disorder (MND)

Neurocognitive impairment (NCI)

People living with HIV (PLWH)

World health organization (WHO)

Abstract

Integrating HIV-associated neurocognitive impairment screening and health services within primary healthcare facilities in South Africa

Introduction

Despite widespread availability of effective antiretroviral therapy (ART), people living with HIV (PWH) remain at risk of developing comorbidities including HIV-associated neurocognitive impairment (H-NCI). These individuals may then be at an increased risk for treatment non-adherence, which leads to poor quality of life and early mortality. Despite this risk, there is a paucity in trained professionals in low- and middle-income countries with appropriate knowledge and skills to identify H-NCI and make appropriate referrals for additional confirmatory testing or intervention, depending on the severity and context of the screening. General medical doctors, nurses and adherence counsellors provide most HIV related healthcare services at a primary healthcare level in South Africa. However, awareness of the clinical presentation of H-NCI, and their current screening practices among these cadres, is unclear. To address these knowledge gaps this thesis set out to explore the following aims (1) examine existing H-NCI knowledge and practices among healthcare workers delivering HIV services in South Africa, (2) develop an appropriate H-NCI training programme for primary healthcare workers, and (3) lastly, pilot the H-NCI training to determine whether H-NCI screening would be feasible at a primary healthcare level in South Africa.

Methods

To achieve these objectives, the study was divided into two phases. In phase one, a scoping review identified and summarised published studies addressing brain and/or behaviour training approaches, including H-NCI, targeting frontline HIV healthcare workers in Africa. An online survey was developed and administered to examine existing H-NCI

knowledge and current practices among healthcare workers providing HIV services in South Africa. Focus group discussions and in-depth interviews were then conducted to explore knowledge gaps, previous H-NCI training and healthcare workers' perspectives of screening at a primary healthcare level. In phase two, an H-NCI training curriculum was developed and a work-integrated H-NCI training programme targeting primary healthcare workers was piloted. The pilot training assessed knowledge of H-NCI signs and symptoms, healthcare workers' attitude toward and comfort with H-NCI screening tools and healthcare workers ability to accurately administer an H-NCI screening tool. The assessments were repeated two months post-training to evaluate retention of knowledge and skills.

Results

The scoping review of the existing literature suggested that there were few brain and/or behaviour training programs targeting healthcare workers providing HIV services in Africa. Of the ten studies identified in the scoping review, one study included H-NCI in the training curriculum. The online survey found that H-NCI knowledge was limited and screening practices virtually non-existent among healthcare workers providing HIV care in South Africa. Qualitative data gathered during the focus group discussions and the in-depth interviews provided greater insight on the existing knowledge and practices gaps as well as highlighting that healthcare workers had not received training on H-NCI. The results from the qualitative investigations showed that primary healthcare workers were in favour of receiving such training. Overall, knowledge of H-NCI improved among primary healthcare workers following the work-integrated H-NCI training programme. The training demonstrated that primary healthcare workers providing clinical services, such as medical doctors or professional nurses were able to administer an H-NCI screening tool. Although knowledge of the clinical presentation of H-NCI improved among adherence counsellors, these healthcare workers experienced challenges in administering the H-NCI screening tool.

Conclusion

As a body of work, the findings from this thesis suggest that healthcare professionals providing HIV services in South Africa have limited knowledge to identify H-NCI, and screening practices are uncommon. Although training revealed differences between cadres in administering screening tools, healthcare workers providing clinical care, including general medical doctors and professional nurses, may be able to provide H-NCI screening at routine annual visits. Although adherence counsellors are ideally situated in the clinic flow to provide targeted screening by flagging clinical presentation of H-NCI among PWH accessing care, this cadre will require additional training, mentorship and support to successfully administer H-NCI screening tools. However, the feasibility of H-NCI screening at a primary healthcare, timing and nature of any screening remains to be explored. This body of work is a step toward increasing the availability of skilled healthcare workers with appropriate knowledge and skills to screen and identify H-NCI in low- and middle-income countries. The work presented in this thesis provides a foundation for further development of the H-NCI training module and future investigations examining targeted screening strategies at a primary healthcare level, feasibility and access to existing interventions post-screening.

Chapter 1

Introduction

HIV-associated neurocognitive impairment knowledge and practices in the context of South Africa

1.1 Context

HIV has evolved into a serious but manageable chronic illness. This, following the development of effective antiretroviral therapy (ART, Fernandez-Cruz & Fellows, 2017). Sub-Saharan Africa is home to two thirds (67%) of people living with HIV (PWH), and remains the region hardest hit by the epidemic (UNAIDS, 2021). In this region, South Africa is the country most severely affected, accounting for approximately 8.2 million PWH (UNAIDS, 2021). South Africa is also home to the largest ART roll-out program worldwide, with 72 % of PWH currently accessing treatment (StatsSA, 2021; UNAIDS, 2020). Despite several advances in healthcare services and widespread availability of ART, PWH remain at risk of developing comorbidities, including HIV-associated neurocognitive impairment (H-NCI).

The relationship between HIV and neurocognitive and/or functional impairment is described as complex and bi-directional (Breuer et al., 2011). HIV has the ability to invade the central nervous system (CNS) during acute infection (Carter et al., 2003; Letendre, 2011). HIV is also able to persist in the neural tissue and cause disease of the CNS (Singer et al., 2010). If persistent, inflammation stimulated by the presence of HIV may lead to blood-brain barrier breakdown, neuronal and axonal injury, neurotoxicity (Singer et al., 2010). Since the CNS is incompletely permeable to ART, this creates a protected environment where HIV can replicate, mutate, and re-infect the circulation, in turn undermining treatment and management of the virus (Singer et al., 2010). This may then result in a range of challenges that are direct neurologic and brain deficits, or indirect effects through secondary infections, ART side-effects, persistent low levels of HIV due to subtherapeutic levels of ART, on-going immune-inflammatory responses, legacy effect of CNS impairment prior to ART initiation or the psycho-social stress of living with HIV (Breuer et al., 2011).

Individuals with H-NCI may then experience difficulties with learning, attention, problem-solving, decision making, as well as functional challenges with tasks required for daily living (Clifford & Ances, 2013; de Jager et al., 2015; Heaton et al., 2011). Of particular concern are the effects on treatment adherence. Individuals with functional impairment may be at an increased risk for chronic treatment non-adherence, which leads to a myriad of adverse outcomes, including increased risk of HIV transmission, opportunistic infections, poor quality of life and early mortality (Kamal et al., 2017; Thaler et al., 2015). Suppression of HIV requires full control of the virus, including in the CNS (Wang et al., 2020). PWH presenting with neurocognitive challenges and symptoms should be screened for H-NCI to confirm the presence of H-NCI, establish the extent of functional impairment, be assessed for co-morbidities and confounding factors such as alcohol abuse as well as other biological factors depending on the context (Joska et al., 2016). Screening for H-NCI may fast-track linkage to appropriate interventions for individuals with severe cognitive and/or functional, especially PWH requiring interventions aimed at improving ART adherence, such as the electronic pill box or cellphone alarm reminders (Bionghi et al., 2018).

Prior to widespread availability of ART, neurocognitive impairment (NCI) affected up to 50% of PWH across several different countries, globally (Wang et al., 2020). In this meta-analysis the overall prevalence of H-NCI was reported to be 43%, with higher rates found in sub-Saharan Africa (Wang et al., 2020). Although recent reports suggest that the incidence of the most severe form of H-NCI, HIV-associated dementia (HIV-D), has fallen dramatically, the risk of developing milder H-NCI remains a concern (Deeks et al., 2013; Heaton et al., 2010). The less severe forms of H-NCI, including mild neurocognitive disorder (MND) and asymptomatic neurocognitive impairment (ANI) occur in an estimated 12% and 33% of PWH on ART in South Africa, however, reports on prevalence vary in low-and middle-income countries (Joska et al., 2016). There is now considerable debate in the literature as to the scope of HIV-NCI in its broadest definitions (Nightingale et al 2022).

Perhaps the greatest value of increasing awareness and skills will be to address the burden of disease of PWH who either directly struggle with adherence of other activities of daily living due to cognitive impairment; or to PWH who do not directly report these symptoms but present to services with viral load breakthrough as the result of erratic adherence. The true impact of HIV -NCI on objective functional performance in real-world settings, is not well understood, and should be a key focus going forwards.

The gold standard treatment for H-NCI is to ensure peripheral viral load suppression (Cooley et al., 2021). Then to consider whether investigation into the possibility of underlying mechanisms that may influence persistent H-NCI, including limited penetration of ART into the blood-brain-barrier, persistent low levels of HIV, ongoing immune-inflammatory responses, interactions between chronic illnesses associated with aging, such as Alzheimer's Disease, neurotoxicity of ART or legacy effect of CNS impairment prior to ART initiation and CNS escape (Wang et al., 2020). This is determined on clinical grounds, as generally these patients have typical features of sub-cortical HIV encephalopathy. The assessment and management of other confounding factors including alcohol or substance abuse, common mental disorders or biological factors, such as Hepatitis C, is key (Joska et al., 2016). Finally, ensuring that ART toxicity, for example Efavirenz, is ruled out, and regular monitoring of neurocognitive change is important.

Detection of H-NCI involves an assessment of mental state and neuropsychological function, and usually involves a referral to an HIV neuropsychologist for a comprehensive neuropsychological battery (Bloch et al., 2016). These tests require specific skills to administer and knowledge to interpret results (Mogamberg et al., 2017). Ideally, the neuropsychological test battery taps into cognitive domains impacted by HIV which inform the diagnosis of H-NCI (Joska et al., 2016). Screening for H-NCI using neuropsychological tests in low-and middle-income countries is challenging as there are few neuropsychologists

in this setting who seldom provide services at a primary healthcare facility. Second, these resources are costly, and the test batteries are not widely available (Bloch et al., 2016). Thirdly, there are several considerations involved in screening and diagnosing H-NCI which is a diagnosis of exclusion (Milanini & Valcour, 2017). The HIV neuropsychologist would then need to determine whether poor performance on the neuropsychological assessment reflects H-NCI, or the effects of non-HIV contributing factors (Letendre, 2011; Milanini & Valcour, 2017; Nightingale et al., 2014). These include neurodegenerative conditions, uncontrolled epilepsy, alcoholism, or severe head injury (Nightingale et al., 2021). Currently, there are few HIV neuropsychologists in South Africa, based at tertiary institutions, who provide H-NCI screening and diagnosis among PWH who are referred for further investigations. These referrals seldomly occur and are usually cases of severe H-NCI.

Considerable debate surrounds the diagnosis of mild forms of H-NCI, including the criteria and classification of H-NCI, and have given rise to several terminologies used to refer to the clinical burden of disease (Meyer et al., 2013; Nightingale et al., 2014). The Frascati criteria developed by the National Institute of Mental Health and National Institute of Neurological Diseases and Stroke in 2007, were intended for use in research, however, the criteria and terminology have been widely used to describe neurocognitive and/or functional impairment among PWH (Antinori et al., 2007; Nightingale et al., 2021). These terms include acquired immunodeficiency syndrome (AIDS) dementia complex (ADC), HIV-associated neurocognitive disorder (HAND), HIV-associated dementia (HAD), MND and ANI (Antinori et al., 2007). However, several other terms and classification criteria have arisen in the modern era including HIV-D, H-NCI, NCI or cognitive impairment (CI) among PWH (Nightingale et al., 2021). There are several guidelines for identification of and testing for H-NCI, however, definitions for appropriate test methods, the timing of test administration, exclusion of confounders and requirements for further investigation are debated (Alford et al., 2019; Morley et al., 2013; Nightingale et al., 2021; Parry et al., 2017). In addition to this,

most HIV treatment guidelines do not make any specific recommendations for treatment and management of H-NCI (Underwood & Winston, 2016). A systematic review exploring guidelines concerning the management of H-NCI conducted by Underwood and Winston (2016) found that several guidelines recommended the use of ART among PWH with symptomatic H-NCI. The European AIDS Clinical Society guidelines published in 2015 make recommendation for screening of symptomatic HIV-positive individuals ‘without highly confounding conditions’ at diagnosis only and before ART initiation. Thereafter these guidelines suggest screening should be then done as indicated based on symptoms following ART initiation (Underwood & Winston, 2016). Against this background, it is unclear which practices have been adopted by healthcare workers providing HIV services in South Africa.

The existing health systems capacity to screen, diagnose and manage HIV-NCI represents a key opportunity and a challenge. Truly progressive HIV-NCI is fortunately rare, but important to detect and treat. Chronic impairment due to legacy effects may present more commonly. Although these patients will not benefit directly from biological treatments, adherence and psycho-social support may provide more benefit.

A program-wide screening program is unlikely to be feasible in South Africa. The development of targeted screening protocols for at-risk individuals would be an important next step. The use of neurocognitive screening tools in the hands of primary care providers will enhance their diagnostic abilities, even in the absence or paucity of detailed neuropsychological testing. As awareness and capacity grows, the program might better be able to detect and manage the progressive H-NCI cases as above; as well as assess and support those with chronic impairment manifesting with adherence concerns. However, an appropriate screening strategy remains unclear (Bloch et al., 2016; Kwasa et al., 2012; Meyer et al., 2013; Nightingale et al., 2021; Nightingale et al., 2014).

In this regard, tools used to screen for H-NCI that are appropriate for non-specialists may be useful to guide the assessment and then become the de facto diagnostic instrument. Healthcare worker who then administer and interpret the screening tool are required to follow the standardized procedure of the tool (Schaefer et al., 2018). H-NCI screening tools are often interactive, requiring the individual administering the tool to demonstrate tasks, observe the individual performing the task, note errors, count correct sequences, as well as keep track of the time taken to perform the desired task. Healthcare workers must then also be able to correctly score and interpret test scores to make informed decisions about future treatment and/or management. Therefore, adequate training is vital, especially in low- and-middle-income countries (Cettomai et al., 2011; Morley et al., 2013).

In South Africa, primary healthcare, including HIV services, are mainly provided by medical doctors, professional nurses, staff nurses, pharmacists, and lay healthcare workers such as adherence counsellors (Joska & Sorsdahl, 2012; Kwasu et al., 2012; Sibeko et al., 2018; Tshililo et al., 2019). The National Department of Health provides a basic HIV training course to equip healthcare professionals with the knowledge necessary to initiate and manage patients on ART. However, primary healthcare workers are required to provide holistic care to high volumes of PWH patient with limited resources and staff shortages (Joska & Sorsdahl, 2012). To address the shortage in trained personnel in this context, the World Health Organization (WHO) has recommended “task-sharing” of certain healthcare services, for instance mental healthcare, to non-specialist physicians, nurses, or other community healthcare workers, including adherence counsellors (Jacobs et al., 2021; Mendenhall et al., 2014). Previous studies in Ethiopia, Kenya, Rwanda, South Africa and Zimbabwe have shown that training interventions targeting primary healthcare workers promote integration of mental health screening through task-sharing (Berheto et al., 2018; Cettomai et al., 2011; Dos Santos & Wolvaardt, 2016; Duffy et al., 2017; Jenkins et al., 2010; Smith et al., 2017). H-NCI screening by doctors and nurses in practice has been explored in countries like Ireland,

Canada and Kenya (Cettomai et al., 2011; Liboro et al., 2018; Morley et al., 2013). While task-sharing of H-NCI screening may be a solution to personnel shortages in South Africa, there remains uncertainty about the appropriateness of H-NCI screening at a primary healthcare level. It is likely that in the absence of task-sharing of H-NCI screening in low-and middle-income countries, PWH with symptoms of H-NCI will go untreated. In low-and middle-income countries Although adherence counsellors currently provide the majority of psycho-social counselling and preliminary management of mild common mental disorders in low-and middle-income countries, a study conducted in Cape Town, South Africa, found that adherence counsellors over-detected cases of NCI compared to nurses (Breuer et al., 2012). It is unclear whether targeted training of primary healthcare workers, including medical doctors, nurses, and adherence counsellors will improve the screening skills among non-specialist healthcare workers (Cettomai et al., 2011; Morley et al., 2013).

To date, there have been no published studies on H-NCI training targeting primary healthcare workers in South Africa. These are some of the gaps that I sought to fill with this thesis. In addition to the appropriateness, other questions remain: do frontline HIV healthcare workers in South Africa see patients with H-NCI? What are current practices for H-NCI screening, existing referral pathways and/or available interventions? Which cadre would be suitable to identify symptoms and/or administer a H-NCI screening tool at a primary healthcare level? Would it be feasible to screen for H-NCI in a busy primary healthcare facility? What type of training would be feasible, acceptable, and appropriate for primary healthcare workers in this setting? This thesis is an attempt to address such questions.

1.2 Research rational and aims

Given the large population of PWH in South Africa, it is concerning that PWH remain at risk of developing H-NCI, even with effective ART. Due to severe resource limitations in this region, it is important to consider potential resolutions within existing healthcare

structures. Against the backdrop of the literature reviewed above, the overall aim of this thesis was to examine the appropriateness and feasibility of integrating H-NCI screening into primary healthcare facilities in South Africa. To address the knowledge gaps intimated in the review above, the objectives of this thesis were to (a) explore existing knowledge of H-NCI, current skills and practices among healthcare workers providing HIV care in South Africa, (b) investigate H-NCI training targeting primary healthcare workers and (c) design and pilot an H-NCI training to equip primary healthcare workers with skills to identify and screen for H-NCI in a real-world, clinic setting. Considerations arising from this thesis serve to expand our understanding of task-sharing of H-NCI screening in low- and middle-income countries.

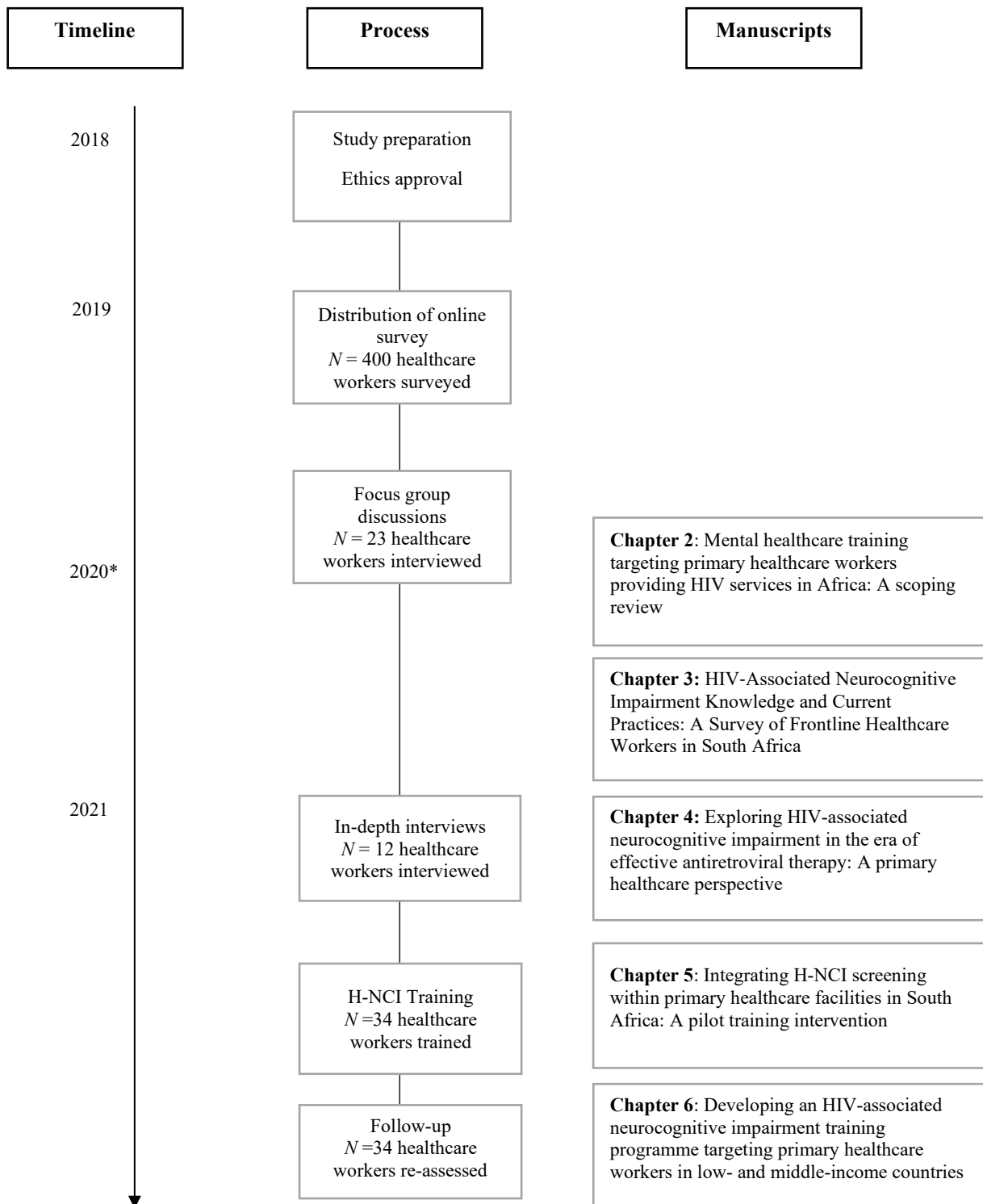
1.3 Research context

The research described in this doctoral thesis involved primary healthcare workers providing HIV services in South Africa. These healthcare workers represent the cadres which provide the majority of HIV healthcare to PWH in South Africa, including general medical doctors, staff and professional nurses, as well as adherence counsellors. Research sites included community clinics in two provinces in South Africa. In the Western Cape two community clinics in Khayelitsha formed part of this research. Khayelitsha is a peri-urban community clinic in Cape Town, accounting for the highest burden of HIV in the province. KwaZulu-Natal is the province with the highest burden of disease in South Africa and the Western Cape represents one of the lowest provinces with PWH in South Africa. Healthcare workers from several facilities in KwaZulu-Natal participated in the research presented in this thesis. Healthcare workers from primary healthcare facilities in the Ugu district participated in the H-NCI training.

Figure 1 outlines the timeline of the study.

Figure 1

Outline of the chronological order of the study and the manuscript preparation and publication



*Note: Several delays due to COVID-19 related nation-wide lock down and research restrictions

1.4 Coherence of the thesis

The coherence of the thesis is informed by my role as the investigator, which included initiating and leading the project from inception to completion. Secondly, each chapter of this thesis describes a manuscript arising from the data that I collected. Collectively, the manuscripts form a part of a single project. Thirdly, this thesis has a common underlying theme, which includes the investigation of H-NCI knowledge, skills and practices at a primary healthcare level in South Africa.

1.5 Overview of the thesis

The thesis reports findings from five separate journal manuscripts. To date, four manuscripts have been published and one manuscript is currently under review.

Each manuscript provides a background which contextualises the specific study in the current literature, outlines the aims and objectives of the study as well as the methodology used to conduct the research. The main findings are then discussed, in addition to limitations and recommendations for potential areas for future research are made. The manuscripts have been formatted to maintain consistency, connectedness and clarity throughout this body of work.

This thesis, therefore, comprises of seven chapters, with the five manuscripts as self-standing chapters (Chapters 2, 3, 4, 5, and 6). A general introduction precedes these five chapters (Chapter 1). A discussion chapter ties the various findings together (Chapter 7). I also indicate my contribution and role in the study and the study abstract before each of the chapters (Chapters 2–6).

In the first chapter of the thesis, Chapter 1, I have briefly introduced the main themes of the thesis which provides the guiding framework for the research rationale and aims.

In Chapters 2, I present investigations into existing training interventions that aimed to increase H-NCI knowledge and practices among frontline healthcare workers in Africa. Chapter 2 presents a scoping review of previously published literature and maps the breath of H-NCI training targeting HIV healthcare workers in Africa. This chapter summarised the literature on this topic and findings that have been rigorously evaluated in countries with similar resource constraints. This review summarised the findings of training interventions targeting primary healthcare workers in Africa including the curriculum, training methods and evaluation strategies. Several of these strategies are examined in Chapter 6. This scoping review highlighted that there are a limited number of published studies describing H-NCI training of these cadres in low- and middle-income countries. The scoping review then informed, in part, the development of the H-NCI training.

Chapter 3 presents an original empirical investigation into existing H-NCI knowledge and practices among frontline health care providers in South Africa. In this chapter I provide an overall picture of H-NCI knowledge, skills, and existing practices among healthcare workers in South Africa. Using a survey, we provide a broad description of existing knowledge, skills and the practices among healthcare workers primarily providing HIV services in South Africa.

Chapter 4 presents an original empirical investigation into knowledge of frontline HIV health care workers in South Africa regarding the need for H-NCI training and skills development, as well as their views on uptake, pragmatics, and feasibility of implementation in a real-world, ART clinic setting. The findings from the survey were used to inform knowledge and skill gaps among frontline HIV service providers. We used qualitative research strategies to explore these knowledge and skill gaps, in-depth, with focus group discussions and individual interviews among primary health care providers, including

medical doctors, nurses, and adherence counsellors. There were several emerging themes that are described in this manuscript.

Chapter 5 presents a summary of the literature that informed the development of the H-NCI training module. The manuscript which is under review in an international medical education journal describes methods utilised in the design and development of an H-NCI training programme for primary healthcare workers in South Africa. This review informed the H-NCI training in Chapter 6. This manuscript provided a theoretical framework for the training approaches selected, including the curriculum, training methods and evaluation strategies. This review provides a summary of the lessons learned following the implementation of the pilot training intervention.

Using the findings from the focus group discussions, in-depth interviews and the two reviews, I developed a pilot H-NCI training. Chapter 6 presents an original empirical investigation into training aimed to assess the utility of training primary healthcare workers to identify H-NCI and administer an H-NCI screening tool using a work-integrated training approach, in real world clinic settings. This training targeted general medical doctors, nurses and adherence counsellors providing HIV care at a primary healthcare facility in South Africa. The second objective was to determine the effectiveness of the training by evaluating knowledge, and H-NCI skills two months post-training. This study provides insight into frontline HIV healthcare providers' H-NCI knowledge, current skills, training, and capacitation needs for future continued education interventions.

In Chapter 7, I present an integrated discussion, by reviewing the main findings of the thesis, exploring implications for future work, and I describe the overall strengths and limitations of the research presented in this thesis.

References

- Alford, K., Banerjee, S., Nixon, E., O'Brien, C., Pounds, O., Butler, A., Elphick, C., Henshaw, P., Anderson, S., & Vera, J. H. (2019). Assessment and Management of HIV-Associated Cognitive Impairment: Experience from a Multidisciplinary Memory Service for People Living with HIV. *Brain Sci*, 9(2).
<https://doi.org/10.3390/brainsci9020037>
- Antinori, A., Arendt, G., Becker, J. T., Brew, B. J., Byrd, D. A., Cherner, M., Clifford, D. B., Cinque, P., Epstein, L. G., Goodkin, K., Gisslen, M., Grant, I., Heaton, R. K., Joseph, J., Marder, K., Marra, C. M., McArthur, J. C., Nunn, M., Price, R. W., . . . Wojna, V. E. (2007). Updated research nosology for HIV-associated neurocognitive disorders. *Neurology*, 69(18), 1789-1799.
<https://doi.org/10.1212/01.WNL.0000287431.88658.8b>
- Berheto, T. M., Hinderaker, S. G., Senkoro, M., Tweya, H., Deressa, T., Getaneh, Y., & Gezahegn, G. (2018). Body and mind: retention in antiretroviral treatment care is improved by mental health training of care providers in Ethiopia. *BMC Public Health*, 18(1), 896. <https://doi.org/10.1186/s12889-018-5821-y>
- Bionghi, N., Daftary, A., Maharaj, B., Msibi, Z., Amico, K. R., Friedland, G., Orrell, C., Padayatchi, N., & O'Donnell, M. R. (2018). Pilot evaluation of a second-generation electronic pill box for adherence to Bedaquiline and antiretroviral therapy in drug-resistant TB/HIV co-infected patients in KwaZulu-Natal, South Africa. *BMC Infect Dis*, 18(1), 171. <https://doi.org/10.1186/s12879-018-3080-2>
- Bloch, M., Kamminga, J., Jayewardene, A., Bailey, M., Carberry, A., Vincent, T., Quan, D., Maruff, P., Brew, B., & Cysique, L. A. (2016). A Screening Strategy for HIV-Associated Neurocognitive Disorders That Accurately Identifies Patients Requiring Neurological Review. *Clin Infect Dis*, 63(5), 687-693.
<https://doi.org/10.1093/cid/ciw399>

- Breuer, E., Myer, L., Struthers, H., & Joska, J. A. (2011). HIV/AIDS and mental health research in sub-Saharan Africa: a systematic review. *African Journal of AIDS Research*, 10(2), 101-122. <https://doi.org/10.2989/16085906.2011.593373>
- Carter, S. L., Rourke, S. B., Murji, S., Shore, D., & Rourke, B. P. (2003). Cognitive complaints, depression, medical symptoms, and their association with neuropsychological functioning in HIV infection: a structural equation model analysis. *Neuropsychology*, 17(3), 410. <https://doi.org/10.1037/0894-4105.17.3.410>
- Cettomai, D., Kwasa, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *J Neurol Sci*, 307(1-2), 92-96. <https://doi.org/10.1016/j.jns.2011.05.005>
- Clifford, D. B., & Ances, B. M. (2013). HIV-associated neurocognitive disorder. *Lancet Infect Dis*, 13(11), 976-986. [https://doi.org/10.1016/S1473-3099\(13\)70269-X](https://doi.org/10.1016/S1473-3099(13)70269-X)
- Cooley, S. A., Navid, J., Wisch, J. K., Boerwinkle, A., Doyle, J., Paul, R. H., & Ances, B. M. (2021). Relationships Between Viral Load, Neuroimaging, and NP in Persons Living With HIV. *J Acquir Immune Defic Syndr*, 87(3), 985-992. <https://doi.org/10.1097/qai.0000000000002677>
- de Jager, C. A., Joska, J. A., Hoffman, M., Borochowitz, K. E., & Combrinck, M. I. (2015). Dementia in rural South Africa: A pressing need for epidemiological studies. *S Afr Med J*, 105(3), 189-190. <https://doi.org/10.7196/samj.8904>
- Deeks, S. G., Lewin, S. R., & Havlir, D. V. (2013). The end of AIDS: HIV infection as a chronic disease. *Lancet*, 382(9903), 1525-1533. [https://doi.org/10.1016/S0140-6736\(13\)61809-7](https://doi.org/10.1016/S0140-6736(13)61809-7)
- Dos Santos, M., & Wolvaardt, G. (2016). Integrated intervention for mental health co-morbidity in HIV-positive individuals: A public health assessment. *African Journal of AIDS Research*, 15(4), 325-331. <https://doi.org/10.2989/16085906.2016.1229683>

Duffy, M., Sharer, M., Cornman, H., Pearson, J., Pitorak, H., & Fullem, A. (2017).

Integrating mental health and HIV services in Zimbabwean communities: a nurse and community-led approach to reach the most vulnerable. *Journal of the Association of Nurses in AIDS Care*, 28(2), 186-198. <https://doi.org/10.1016/j.jana.2015.09.003>

Fernandez-Cruz, A. L., & Fellows, L. K. (2017). The electrophysiology of neuroHIV: A systematic review of EEG and MEG studies in people with HIV infection since the advent of highly-active antiretroviral therapy. *Clinical Neurophysiology*, 128(6), 965-976.

Ghosh, A. K., Sarkar, A., & Mitsuya, H. (2017). HIV-Associated Neurocognitive Disorder (HAND) and the Prospect of Brain-Penetrating Protease Inhibitors for Antiretroviral Treatment. *Med Res Arch*, 5(4). PMC6034681

Heaton, R. K., Clifford, D. B., Franklin, D. R., Jr., Woods, S. P., Ake, C., Vaida, F., Ellis, R. J., Letendre, S. L., Marcotte, T. D., Atkinson, J. H., Rivera-Mindt, M., Vigil, O. R., Taylor, M. J., Collier, A. C., Marra, C. M., Gelman, B. B., McArthur, J. C., Morgello, S., Simpson, D. M., . . . Group, C. (2010). HIV-associated neurocognitive disorders persist in the era of potent antiretroviral therapy: CHARTER Study. *Neurology*, 75(23), 2087-2096. <https://doi.org/10.1212/WNL.0b013e318200d727>

Heaton, R. K., Franklin, D. R., Ellis, R. J., McCutchan, J. A., Letendre, S. L., Leblanc, S., Corkran, S. H., Duarte, N. A., Clifford, D. B., Woods, S. P., Collier, A. C., Marra, C. M., Morgello, S., Mindt, M. R., Taylor, M. J., Marcotte, T. D., Atkinson, J. H., Wolfson, T., Gelman, B. B., . . . Group, H. (2011). HIV-associated neurocognitive disorders before and during the era of combination antiretroviral therapy: differences in rates, nature, and predictors. *J Neurovirol*, 17(1), 3-16.
<https://doi.org/10.1007/s13365-010-0006-1>

Jacobs, Y., Myers, B., van der Westhuizen, C., Brooke-Sumner, C., & Sorsdahl, K. (2021). Task Sharing or Task Dumping: Counsellors Experiences of Delivering a

- Psychosocial Intervention for Mental Health Problems in South Africa. *Community Ment Health J*, 57(6), 1082-1093. <https://doi.org/10.1007/s10597-020-00734-0>
- Jenkins, R., Kiima, D., Njenga, F., Okonji, M., Kingora, J., Kathuku, D., & Lock, S. (2010). Integration of mental health into primary care in Kenya. *World Psychiatry*, 9(2), 118. <https://doi.org/10.1002/j.2051-5545.2010.tb00289.x>
- Joska, & Sorsdahl, K. (2012). Integrating mental health into general health care: lessons from HIV. *African journal of psychiatry*, 15(6), 420-423. <http://dx.doi.org/10.4314/ajpsy.v15i6.52>
- Joska, J. A., Witten, J., Thomas, K. G., Robertson, C., Casson-Crook, M., Roosa, H., Creighton, J., Lyons, J., McArthur, J., & Sacktor, N. C. (2016). A Comparison of Five Brief Screening Tools for HIV-Associated Neurocognitive Disorders in the USA and South Africa. *AIDS Behav*, 20(8), 1621-1631. <https://doi.org/10.1007/s10461-016-1316-y>
- Kamal, S., Locatelli, I., Wandeler, G., Sehhat, A., Bugnon, O., Metral, M., Du Pasquier, R., Gutbrod, K., Cavassini, M., Schneider, M. P., & and the Swiss, H. I. V. C. S. (2017). The Presence of Human Immunodeficiency Virus-Associated Neurocognitive Disorders Is Associated With a Lower Adherence to Combined Antiretroviral Treatment. *Open Forum Infect Dis*, 4(2), ofx070. <https://doi.org/10.1093/ofid/ofx070>
- Kwasa, J., Cettomai, D., Lwanya, E., Osiemo, D., Oyaro, P., Birbeck, G. L., Price, R. W., Bukusi, E. A., Cohen, C. R., & Meyer, A. C. (2012). Lessons learned developing a diagnostic tool for HIV-associated dementia feasible to implement in resource-limited settings: pilot testing in Kenya. *PLoS One*, 7(3), e32898. <https://doi.org/10.1371/journal.pone.0032898>
- Letendre, S. (2011). Central nervous system complications in HIV disease: HIV-associated neurocognitive disorder. *Topics in antiviral medicine*, 19(4), 137.

- Liboro, R. M., Ibañez-Carrasco, F., Rourke, S. B., Eaton, A., Medina, C., Pugh, D., Rae, A., Ross, L. E., & Shuper, P. A. (2018). Barriers to addressing HIV-Associated neurocognitive disorder (HAND): Community-based service provider perspectives. *Journal of HIV/AIDS & Social Services*, 17(3), 209-223.
<https://doi.org/10.1080/15381501.2018.1431168>
- Mendenhall, E., De Silva, M. J., Hanlon, C., Petersen, I., Shidhaye, R., Jordans, M., Luitel, N., Ssebunnya, J., Fekadu, A., Patel, V., Tomlinson, M., & Lund, C. (2014). Acceptability and feasibility of using non-specialist health workers to deliver mental health care: stakeholder perceptions from the PRIME district sites in Ethiopia, India, Nepal, South Africa, and Uganda. *Soc Sci Med*, 118, 33-42.
<https://doi.org/10.1016/j.socscimed.2014.07.057>
- Meyer, A.-C. L., Boscardin, W. J., Kwasa, J. K., & Price, R. W. (2013). Is it time to rethink how neuropsychological tests are used to diagnose mild forms of HIV-associated neurocognitive disorders? Impact of false-positive rates on prevalence and power. *Neuroepidemiology*, 41(3-4), 208-216.
<https://doi.org/https://doi.org/10.1159/000354629>
- Milanini, B., & Valcour, V. (2017). Differentiating HIV-Associated Neurocognitive Disorders From Alzheimer's Disease: an Emerging Issue in Geriatric NeuroHIV. *Curr HIV/AIDS Rep*, 14(4), 123-132. <https://doi.org/10.1007/s11904-017-0361-0>
- Mogamberg, J. C., Dawood, H., Wilson, D., & Moodley, A. (2017). HIV-associated neurocognitive disorder in a KwaZulu-Natal HIV clinic: A prospective study. 2017, 18(1). <https://doi.org/10.4102/sajhivmed.v18i1.732>
- Morley, D., McNamara, P., Kennelly, S., McMahon, G., & Bergin, C. (2013). Limitations to the identification of HIV-associated neurocognitive disorders in clinical practice. *HIV medicine*, 14(8), 497-502. <http://doi.org/10.1111/hiv.12036>

- Nightingale, S., Dreyer, A. J., Saylor, D., Gisslén, M., Winston, A., & Joska, J. A. (2021).
Moving on From HAND: Why We Need New Criteria for Cognitive Impairment in
Persons Living With Human Immunodeficiency Virus and a Proposed Way Forward.
Clinical Infectious Diseases, 73(6), 1113-1118. <https://doi.org/10.1093/cid/ciab366>
- Nightingale, S., Winston, A., Letendre, S., Michael, B. D., McArthur, J. C., Khoo, S., &
Solomon, T. (2014). Controversies in HIV-associated neurocognitive disorders.
Lancet Neurol, 13(11), 1139-1151. [https://doi.org/10.1016/S1474-4422\(14\)70137-1](https://doi.org/10.1016/S1474-4422(14)70137-1)
- Parry, S., Zetler, S., Kentridge, A., Petrak, J., & Barber, T. (2017). Simple screening for
neurocognitive impairment in routine HIV outpatient care: is it deliverable? *AIDS
care*, 29(10), 1275-1279. <http://doi.org/10.1080/09540121.2017.1300632>
- Schaefer, L. A., Thakur, T., & Meager, M. R. (2018). Neuropsychological Assessment.
- Sibeko, G., Milligan, P. D., Roelofse, M., Molefe, L., Jonker, D., Ipser, J., Lund, C., & Stein,
D. J. (2018). Piloting a mental health training programme for community health
workers in South Africa: an exploration of changes in knowledge, confidence and
attitudes. *BMC Psychiatry*, 18(1), 191. <https://doi.org/10.1186/s12888-018-1772-1>
- Singer, E. J., Valdes-Sueiras, M., Commins, D., & Levine, A. (2010). Neurologic
presentations of AIDS. *Neurol Clin*, 28(1), 253-275.
<https://doi.org/10.1016/j.ncl.2009.09.018>
- Smith, S. L., Kayiteshonga, Y., Misago, C. N., Iyamuremye, J. D., Dusabeyezu, J. d. A.,
Mohand, A. A., Osrow, R. A., Anatole, M., Daimyo, S., & Uwimana, E. (2017).
Integrating mental health care into primary care: the case of one rural district in
Rwanda. *Intervention*, 15(2), 136-150.
- StatsSA. (2021). *Mid-year population estimates*
- Thaler, N. S., Sayegh, P., Arentoft, A., Thames, A. D., Castellon, S. A., & Hinkin, C. H.
(2015). Increased neurocognitive intra-individual variability is associated with

- declines in medication adherence in HIV-infected adults. *Neuropsychology*, 29(6), 919. <https://doi.org/10.1037/neu0000191>
- Tshililo, A. R., Mangena-Netshikweta, L., Nemathaga, L. H., & Maluleke, M. (2019). Challenges of primary healthcare nurses regarding the integration of HIV and AIDS services into primary healthcare in Vhembe district of Limpopo province, South Africa. *Curationis*, 42(1), e1-e6. <https://doi.org/10.4102/curationis.v42i1.1849>
- UNAIDS. (2021). *Fact Sheet World AIDS Day 2021* (UNAIDS_FactSheet_en. pdf (accessed on 7 April 2022), Issue. Available online: https://www.unaids.org/sites/default/files/media_asset
- Underwood, J., & Winston, A. (2016). Guidelines for Evaluation and Management of Cognitive Disorders in HIV-Positive Individuals. *Current HIV/AIDS Reports*, 13(5), 235-240. <https://doi.org/10.1007/s11904-016-0324-x>
- Wang, Y., Liu, M., Lu, Q., Farrell, M., Lappin, J. M., Shi, J., Lu, L., & Bao, Y. (2020). Global prevalence and burden of HIV-associated neurocognitive disorder: A meta-analysis. *Neurology*, 95(19), e2610-e2621. <https://doi.org/10.1212/WNL.00000000000010752>

Chapter 2

Mental and Cognitive Healthcare Training Targeting Primary Healthcare Workers

Providing HIV Services in Africa: A Scoping Review

Adele Munsami, Anna Jane Dreyer, Hetta Gouse, Goodman Sibeko, Sam Nightingale & John

Anton Joska

Description of the contribution of candidate and co-authors

This scoping review provides an overview of existing mental health training, including neurocognitive impairment training, targeting healthcare workers caring for people living with HIV in Africa. This review identified a paucity in neurocognitive impairment training targeting healthcare workers providing HIV services in Africa. For this manuscript Adele Munsami developed the concept, together with Professor John Anton Joska. Adele Munsami identified key terminology and developed the search methodology with input from Professor John Anton Joska, Associate Professor Hetta Gouse and Associate Professor Sam Nightingale. Adele Munsami conducted the database search, with guidance from a researcher with experience in systematic and scoping reviews. Adele Munsami reviewed the articles with this researcher to assess the potential of each article for inclusion in the manuscript and we established our level of agreement. Adele Munsami then analysed and summarised all data and generated the first full draft of the manuscript. The co-authors reviewed the drafts, made conceptual and intellectual contributions, and approved the final draft. I managed all revisions of the manuscript.

Current status: Published in *AIDS Care*

Munsami, A., Dreyer, A. J., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022).

Mental and cognitive healthcare training targeting primary healthcare workers providing HIV services in Africa: a scoping review. *AIDS care*, 1-9.

<https://doi.org/10.1080/09540121.2022.2099512>

Abstract

Mental health and neurocognitive functioning remain a concern among people living with HIV. Symptomatic neurocognitive impairment (NCI) and mental illness can cause difficulties in daily functioning, including problems adhering to treatment, but many healthcare workers in low- and middle-income countries have limited knowledge about the relationship between HIV and NCI. A synthesis of available literature on mental health and NCI training provided to healthcare workers delivering HIV services in Africa, is lacking. We conducted a scoping review of published literature to identify training interventions which targeted healthcare workers who engaged in providing services to people with HIV in Africa. Ten studies met the inclusion criteria. One study focused on NCI, two studies mentioned HIV-associated dementia and seven studies were centred on common mental health disorders. Most studies used a multi-method training approach, with pre-and-post testing as the main evaluation technique. This review highlights the gap in training interventions on NCI for healthcare workers in Africa. Although there is some commitment to building capacity for mental health and NCI assessment among healthcare workers in this setting, this review suggests that there is a need for research to develop and evaluate training interventions for healthcare workers delivering HIV services in Africa.

2.1 Introduction

Mental, neurological and substance use disorders contribute to a substantial proportion of the global burden of diseases (Breuer et al., 2011). This is concerning in low- and middle-income countries which are disproportionately affected by co-morbidities, such as the human immunodeficiency virus (HIV). Research suggests a complicated, bi-directional relationship, specifically between mental illness and HIV, due to possible direct brain effects and indirect secondary effects of HIV (Breuer et al., 2011). Neurocognitive impairment (NCI) then, may be the result of one or more of these pathways, thus requiring healthcare workers to have a more detailed knowledge of HIV and mental and neurocognitive disorders. This is especially important for healthcare workers providing HIV care in Africa which has the largest of population of people living with HIV (PWH) (Fairall et al., 2018).

Individuals with symptomatic NCI experience difficulties with neurocognitive and functional abilities, including memory, learning, attention, problem-solving and decision making, which impact daily activities (Heaton et al., 2004; Vance et al., 2014). Although NCI among PWH is concerning, two studies of frontline HIV healthcare workers in South Africa found limited knowledge of NCI (Gouse et al., 2021; Munsami et al., 2020). Reasons for the scarcity in knowledge of mental and neurocognitive problems associated with HIV in this context remain unclear.

Mapping what is known on mental health training, which may include NCI or similar concepts, is a useful base to examine brain and/or behaviour training approaches targeting frontline HIV healthcare workers. A review conducted by Liu et al. (2016) describe thirty-one mental health training for healthcare workers in Africa. Ninety percent of the training programs targeted non-specialist healthcare workers and focused on psychiatric conditions, whereas specific training included child psychiatry or a particular common mental disorder such as depression (Liu et al., 2016).

Scoping reviews have been commonly used as a preliminary assessment of the breadth or extent of available literature, to map existing data, summarise the evidence and inform future research (Peters et al., 2015). To the best of our knowledge, a synthesis or summary of the evidence exploring the extent of the literature on mental and neurocognitive training targeting frontline HIV healthcare workers in Africa has not been previously conducted. This scoping review differs to the review conducted by Liu et al. (2016), as our focus was solely on healthcare workers providing HIV services in Africa.

We explored the broad nature of the available literature focusing on mental and neurocognitive health training programmes targeting frontline HIV healthcare workers in Africa, while providing insight into potential future comprehensive reviews. The main objective of this scoping review was to examine the available literature on mental health and NCI training provided to healthcare workers primarily providing HIV services in Africa, the cadres of healthcare workers who received the training, the scope of the training curriculum, duration, training delivery methods and outcome evaluation strategies used in this context. This, with a view toward understanding current H-NCI knowledge gaps, H-NCI training needs in Africa and existing H-NCI training approaches which would inform future H-NCI training interventions.

2.2 Methodology

This review was completed and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, where applicable for a scoping review (Moher et al., 2010).

2.2.1 Search strategy

The first author (AM) and a librarian from the University of Cape Town developed the search terms by isolating key terms from the key phrase “mental and neurocognitive healthcare training programmes for primary healthcare workers delivering HIV-related

services in Africa”. Keywords were MeSH and non-MeSH search terms covering “healthcare workers”, “mental health”, “cognitive dysfunction”, “training and education”, “HIV”, and “Africa”.

In the first stage, online electronic databases (PubMed, EBSCOHost, and Scopus) were searched for articles in the English language, using the key terms and proxies, between March 2019 and August 2019. These terms were combined into six groups and a second search was conducted. Table S1 (Supplementary Material) details the PubMed search strategy, which was modified as needed for other electronic databases. We repeated the search in November 2020 to include recently published data.

2.2.2 Study selection

The final search yielded 1689 results which were exported to Rayyan, a systematic review web-based application, for further screening (Ouzzani et al., 2016). 93 duplicates were removed. 819 articles were screened, and 777 articles were excluded because they did not meet the criteria. 42 full-text articles were retrieved for in-depth eligibility assessment and full-text analysis, where 32 articles were excluded. The remaining 10 articles that were included in the review, are summarised in Table 1. The PRISMA flowchart, describes the process used to determine the final sample of studies (Figure 1).

Table 1*Inclusion and Exclusion Criteria*

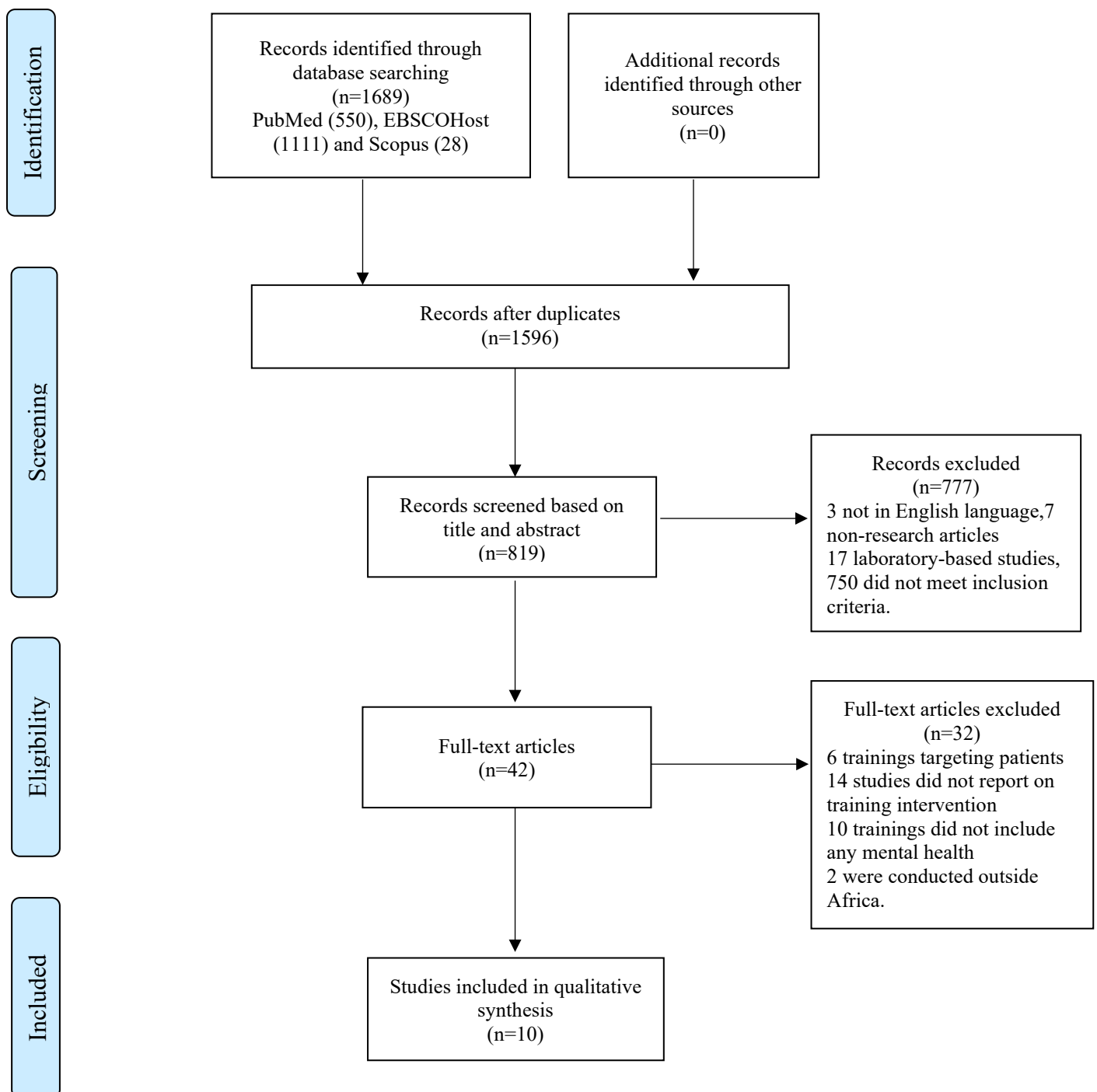
	Inclusion Criteria	Exclusion Criteria
Population	Healthcare workers providing HIV services in Africa	Mental health training implemented for patients and not among healthcare workers, for example cognitive behavioural therapy techniques taught to patients with neurocognitive problems. Conducted outside of Africa Mental healthcare workers who did not work in HIV receiving ad-hoc HIV training. Studies that used healthcare worker participants, which included facilities staff such as ward cleaners and administration workers, were excluded because they may not directly interact with the patients in a clinical context.
Intervention	Mental healthcare, including neurocognitive impairment training	
Comparison	None	
Outcomes	Evaluation of training aims ¹	
	Knowledge	
	Skills	
	Attitude	

Note. ¹We adapted outcome measures appropriate for this scoping review using Kirkpatrick and Craig (1967) suggested measurements as a guide.

² Grey literature such as reports, policy literature, conference proceedings, newsletters, newspaper articles, grant applications, government documents, conference abstracts, dissertations and theses were included in the initial search.

Figure 1

PRISMA flow diagram of studies included in review.

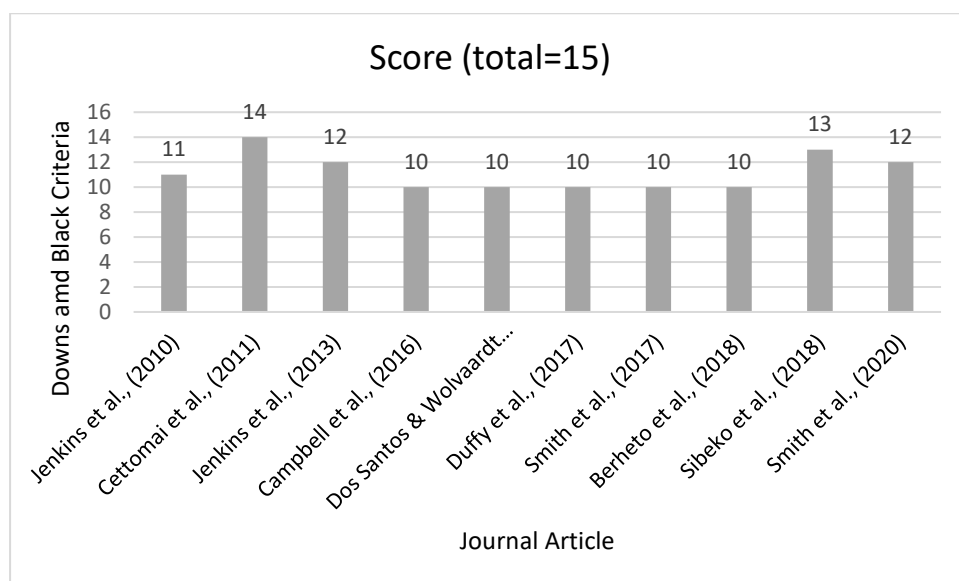


2.2.3 Data extraction and quality assessment

Data extraction was performed using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for observational studies (Von Elm et al., 2007). All relevant content were extracted and tabulated into a data collection form on Excel (Wagman et al., 2015). The classification of training interventions was adapted from Liu et al. (2016). A modified version of the Downs and Black checklist was used to confirm eligibility, by ensuring that all studies met the cut-off score of 10 (Table S2) (Downs & Black, 1998). Because we excluded clinical trials, only 15 items from this checklist were included, with a cut-off score of 10 (Muthuri et al., 2014). Figure 2 illustrates the Downs and Black checklist scores for each article included in the scoping review. Each article was scored using the recommended scoring system. In cases where the criteria were met completely a score of one or two was assigned. When the criteria were partially a score of one was assigned. When the criteria were not reported on, or it was unclear a score of zero was assigned. Disagreements were resolved by discussion and consensus.

Figure S1

Total score on the Downs and Black checklist for articles included in the scoping review



2.3 Results

2.3.1 Study characteristics

A total of 10 articles were included in the scoping review (Table 2).

Table 2*Overview of Studies Implementing Amental Health Training Intervention for Primary Healthcare Workers in Africa*

	Author	Setting	Study Design	Participants	n	Variables (Outcomes)	Measurements	Training Content	Duration	Training Strategy	Trainers
1.	Jenkins et al., (2010)	Kenya	Longitudinal cohort study	Primary healthcare workers	1673	Knowledge, attitude, and skills	Pre- and post-test	General mental health	40 hours	Multi-method training (didactic lectures, group discussions, role play and videos)	Train-the-trainer
2.	Cettomai et al., (2011)	Kenya	Cross-sectional study	Medical doctors and nurses	71	Knowledge and Attitude	Pre- and post-test	HIV-associated neurocognitive impairment	1 day	Multi-method training (didactic lectures, group activities and case studies)	Researcher
3.	Jenkins et al., (2013)	Kenya	Cluster randomised control trial	Clinical officers and nurses	119	Knowledge and Skills	Post-test	General mental health	40 hours	Multi-method training (didactic lectures, group discussions, role play)	Researcher
4.	Campbell et al., (2016)	South Africa	Cross-sectional study	Community healthcare workers	29	Knowledge and attitude	Post-test	General mental health	Half-day	Multi-method training (didactic lectures, facilitated group discussions and role play)	Researcher
5.	Dos Santos & Wolvaardt (2016)	South Africa	Longitudinal cohort study	Primary healthcare workers	100	Knowledge and skills	Pre- and post-test	HIV-associated neurocognitive impairment	2 years	Multi-method training (lectures, supervision, monitoring and evaluation)	Training institute
6.	Duffy et al., (2017)	Zimbabwe	Longitudinal cohort study	Nurses and traditional medicine practitioner	16	Knowledge and Attitude	Post-test (Focus group discussions)	General mental health	2 days	Multi-method training (didactic lectures, group discussions and role plays)	Training of Trainers
7.	Smith et al., (2017)	Rwanda	Longitudinal cohort study	Primary healthcare nurses	Not reported	Knowledge	Pre- and post-test	General mental health	5 days/ 40 hours	Multi-method training (didactic presentations, case studies, small group discussions, role plays)	Nurse mentors
8.	Berheto et al., (2018)	Ethiopia	Cohort study	ART nurses, healthcare officers, medical doctors, and psychologist	Not reported	No assessment of training	No assessment of training	General mental health	7 days	Didactic lectures	Not reported
9.	Sibeko et al., (2018)	South Africa	Quasi-experimental Cohort Intervention study	Community health workers	58	Knowledge, confidence, and attitudes	Pre- and post-test	General mental health	8 x 3 hours	Multi-method training (didactic lectures, case vignettes, interactive discussions)	Social worker
10.	Smith et al., (2020)	Rwanda	Quasi-experimental cohort study	Primary healthcare nurses and community healthcare workers	788	No assessment of training	No assessment of training	General mental health	40 hours	Multi-method training (lectures, role play)	Government psychiatric nurses

Three studies were also included in the review of Liu et al. (2016). The training programmes were implemented in five African countries: Ethiopia (Berheto et al., 2018), Zimbabwe (Duffy et al., 2017), Rwanda (Smith et al., 2020; Smith et al., 2017), Kenya (Cettomai et al., 2011; Jenkins et al., 2010; Jenkins et al., 2013) and South Africa (Campbell & Baernholdt, 2016; Dos Santos & Wolvaardt, 2016; Sibeko et al., 2018).

As Table 2 shows, the study designs included one retrospective cohort study conducted in Ethiopia which evaluated patient records following provider training (Berheto et al., 2018), one cluster randomised control trial in Kenya (Jenkins et al., 2013), two quasi-experimental cohort intervention studies conducted in Rwanda (Smith et al., 2020) and South Africa (Sibeko et al., 2018), two cross sectional studies conducted in Kenya (Cettomai et al., 2011), and South Africa (Campbell & Baernholdt, 2016), as well as four cohort studies in Kenya (Jenkins et al., 2010), South Africa (Dos Santos & Wolvaardt, 2016), Rwanda (Smith et al., 2017) and Zimbabwe (Duffy et al., 2017).

Training interventions were delivered by researchers in South Africa (Campbell & Baernholdt, 2016) and Kenya (Cettomai et al., 2011; Jenkins et al., 2010), by government nurses with psychiatric training, in Rwanda (Smith et al., 2020; Smith et al., 2017), a social worker in South Africa (Sibeko et al., 2018), trainee trainers in Kenya (Jenkins et al., 2010) and Zimbabwe (Duffy et al., 2017), as well as a training organisation in South Africa (Dos Santos & Wolvaardt, 2016). One study did not report the characteristics of the trainer (Berheto et al., 2018).

Eight of the ten interventions implemented in Kenya (Cettomai et al., 2011; Jenkins et al., 2010; Jenkins et al., 2013), South Africa (Dos Santos & Wolvaardt, 2016), Rwanda (Smith et al., 2020; Smith et al., 2017) and Zimbabwe (Duffy et al., 2017) used a multi-method training approach. The training approaches did not differ among healthcare worker

cadres who participated in the interventions. One study from South Africa provided direct mentorship and clinical experience at a facility over a two-year period (Dos Santos & Wolvaardt, 2016). One training used a didactic teaching approach only, at selected facilities in Ethiopia (Berheto et al., 2018).

The mean duration of the training was three days. Three trainings in South Africa (Campbell & Baernholdt, 2016), Kenya (Cettomai et al., 2011), and Zimbabwe (Duffy et al., 2017), were less than two days. Two Kenyan studies and two in Rwanda, lasted 40 hours (five days) (Jenkins et al., 2010; Jenkins et al., 2013; Smith et al., 2020; Smith et al., 2017). The intervention in Ethiopia lasted seven days (Berheto et al., 2018) and another in South Africa was spread over eight weekly, three-hour sessions (Sibeko et al., 2018). The intervention by Dos Santos and Wolvaardt (2016), in South Africa was spread over a two-year period.

The curriculum of the training interventions varied across all studies. The study conducted by (Cettomai et al., 2011) in Kenya was the only training intervention that focused on broad characteristics of NCI, but only described HIV-associated dementia on the spectrum of NCI. Two general mental health trainings conducted in Kenya (Jenkins et al., 2010) and South Africa (Dos Santos & Wolvaardt, 2016) included HIV-D among PWH. Finally, the Ethiopian study mentioned that memory loss or dementia could be treated with ART (Berheto et al., 2018).

Seven studies covered various topics relating to common mental disorders among PWH, including co-morbidities, major mental, behavioural, and neurological disorders mental health and HIV services and culture and mental health (Berheto et al., 2018; Campbell & Baernholdt, 2016; Dos Santos & Wolvaardt, 2016; Duffy et al., 2017; Jenkins et al., 2013; Sibeko et al., 2018; Smith et al., 2020).

Eight interventions also included skills to deliver services to PWH as part of the training. The Kenyan study trained healthcare workers to use the International HIV Dementia Scale to identify HIV-D (Cettomai et al., 2011). Three studies focused on skills to screen for, diagnose and treat common mental illnesses. The first study conducted in South Africa, equipped healthcare workers with screening skills to identify common mental disorders, as well as basic counselling (Dos Santos & Wolvaardt, 2016). The second study focused on diagnosis and treatment of mental health problems in Ethiopia (Berheto et al., 2018). The study in Rwanda focused on the diagnosis and treatment of selected major mental disorders as well as communication skills (Smith et al., 2020). The Kenyan study conducted by (Jenkins et al., 2013), trained healthcare workers to screen for mental health problems. However, these studies did not describe the diagnostic approach or screening tools that were used to identify common mental disorders (Berheto et al., 2018; Dos Santos & Wolvaardt, 2016; Jenkins et al., 2013; Smith et al., 2020). Data collection as well as referral and admission pathways for common mental illnesses were included in the training intervention in Zimbabwe (Duffy et al., 2017). Skills to provide support to patients and families were included in the South African study conducted by (Campbell & Baernholdt, 2016).

2.3.2 Evaluation methodology

Of the eight studies which measured outcomes, five studies employed a pre and post-test design (Cettomai et al., 2011; Dos Santos & Wolvaardt, 2016; Jenkins et al., 2010; Sibeko et al., 2018; Smith et al., 2017) and three employed a post-test only design by administering focus group discussions (Campbell & Baernholdt, 2016; Duffy et al., 2017; Jenkins et al., 2013). Berheto et al. (2018) and Smith et al. (2020) did not evaluate training outcomes.

2.3.2.1 *Assessment of knowledge*

Knowledge evaluations varied across the studies that conducted pre and post-test assessments (Campbell & Baernholdt, 2016; Cettomai et al., 2011; Dos Santos & Wolvaardt, 2016; Jenkins et al., 2010; Sibeko et al., 2018; Smith et al., 2017). Knowledge questionnaires were developed in these studies to compare participants' knowledge before and after the training intervention. Dos Santos and Wolvaardt (2016), conducted interviews at pilot sites before the training intervention. The post assessment included field-based assignments, follow-up surveys, field-visits from mentors and knowledge retention six months after the training intervention (Dos Santos & Wolvaardt, 2016). Sibeko et al. (2018) used the Mental Health Knowledge Schedule to assess knowledge and case vignettes to assess diagnostic topics.

2.3.2.2 *Assessment of attitudes*

Three studies assessed the influence of training on healthcare worker attitudes and behaviours in a variety of ways. Sibeko et al. (2018) used the Mental Health Nursing Clinical Confidence Scale to assess healthcare worker confidence. Healthcare workers' attitudes toward mental illness was assessed using the Community Attitudes Towards Mental Illness Scale (Sibeko et al., 2018). Cettomai et al. (2011), assessed healthcare workers' attitude toward treating mental illnesses and their clinical experiences, using a self-report comfort score. Studies that utilised focus group discussions explored attitudes and experiences in applying the skills learned during the training in Zimbabwe (Duffy et al., 2017), as well as healthcare worker attitudes toward learning more about mental illnesses and the content of the training intervention, in South Africa (Campbell & Baernholdt, 2016).

2.3.2.3 *Assessment of skills*

The two Kenyan studies conducted were the only studies to report on skills assessments post-training (Jenkins et al., 2010; Jenkins et al., 2013). In one study a senior

psychiatric nurse audited the trainees through observation (Jenkins et al., 2010). The second study evaluated the detection of mental disorders by the health workers by healthcare workers who had received training compared to those who did not.

2.4 Discussion

Our scoping review identified ten studies that described training interventions targeting healthcare workers providing HIV services in African countries. The review shows that training relied on a multi-method training approach, used an external trainer to conduct the trainings and pre and post testing was the common method of assessment. However, this review highlights few training inventions for HIV healthcare workers focusing on NCI among PWH.

Within low- and middle-income countries, healthcare workers providing HIV services at primary healthcare facilities are required to provide holistic healthcare, but their knowledge and skills to do so, remains limited (Joska & Sorsdahl, 2012). The findings from this scoping review shows that most training focused on mental health generally, and common mental disorders among PWH, without mentioning NCI. Among the few studies that included NCI, these studies focused severe NCI only (Cettomai et al., 2011; Dos Santos & Wolvaardt, 2016; Jenkins et al., 2010). Although severe NCI has declined over the years, milder forms of NCI may persist among PWH (Heaton et al., 2010). Thus, training curricula focusing on mental health and NCI among PWH should include the presentation of varying severities and not just the most severe form of NCI, as well as the practical skills to do so at a primary healthcare level.

Several of the training interventions reported improved knowledge and skills transfer among healthcare workers (Campbell & Baernholdt, 2016; Cettomai et al., 2011; Dos Santos & Wolvaardt, 2016; Duffy et al., 2017; Jenkins et al., 2010; Sibeko et al., 2018). Following training, healthcare workers reported greater confidence in identifying signs of mental

illnesses, as well as significant improvements in their knowledge and skills transfer which was retained over time (Cettomai et al., 2011; Dos Santos & Wolvaardt, 2016; Jenkins et al., 2010; Sibeko et al., 2018). Training conducted in South Africa by Campbell and Baernholdt (2016) and Dos Santos and Wolvaardt (2016) highlight the success of focus group discussions followed by role playing among community healthcare workers and ongoing mentorship sessions which improved practical screening skills among participants.

Screening for NCI among PWH in this context is generally done by specialised clinical professionals such as neurologists, psychiatrists or neuropsychologists (Cettomai et al., 2011). Since these professionals are scarce in low- and middle-income countries, especially at a primary healthcare level, it is important to consider that screening, and identification of NCI among PWH could be done by non-specialist healthcare workers, including medical doctors and certain non-clinical cadres of healthcare workers. However, there is still uncertainty regarding which group of primary healthcare workers would be able to administer NCI screening tools. Breuer et al. (2012) highlight that counsellors over-detected cases compared to nurses, when administering the International HIV-Dementia Scale. Counsellors may be better positioned to identify NCI symptoms that PWH may be experiencing and use this information to flag individuals requiring NCI screening. In the absence of medical doctors, trained nurses may be able to correctly administer an NCI screening tool, however nurse administered NCI screening requires further exploration.

When designing an effective training program, there are several things to consider. Most studies in this review adopted a multi-method training approach. This included a combination of didactic lectures, case studies and interactive activities. Didactic lectures allow trainees to receive relevant information on the topic, while interactive group discussions assist in engaging with the content and practical activities, such as role-playing help trainees to learn through practice and observations. This approach may require more

time and resources to be efficiently implemented but is likely to be more effective as this approach allows trainees to engage with the content in several modes. However, the studies included in this review did not examine or compare training approaches, to determine which methods would be most effective for frontline HIV healthcare workers.

The duration of the training in the studies included in this review varied across all studies. The average duration of the training included in this review was three days. There were no clear differences between the two training approaches and the chosen duration or structure of the training. When considering the duration of the training, it is important to weigh the impact on service delivery for longer training, especially at facilities with smaller staff compliments. Brief sessions, usually during a designated meeting time at the facility, spread across multiple days or weeks may be beneficial in these situations, to reduce the negative impact on patient care.

Various outcomes were measured. The most common assessment format was pre-and-post-evaluation during the training intervention. These assessments add value to the development of training strategies as they provide an indication of existing knowledge of the curriculum before the training intervention, or gaps in this knowledge, as well as areas that were improved upon or still require reinforcement. There are significant challenges in implementing training interventions in this context, especially due to resource constraints. For training programmes to be effective in this setting, they must be meticulously developed.

2.5 Limitations

This scoping review is not without limitations. First, we searched only published, peer-reviewed, research articles in the English language, to ensure that the studies that were included utilised robust research methods and had undergone external scrutiny prior to publication. We also did not include grey literature or non-empiric reports. Thus, there may

other training interventions conducted in Africa that may have not been published or available in search databases. Secondly, of the 55 countries in Africa, only five appeared in our search and as a result, the findings from this review may not be generalisable to all African countries. However, the studies provide relevant lessons and topics to inform future pilot training interventions in African countries.

2.6 Recommendations

This scoping review shows that very few African countries have explored NCI training interventions for healthcare workers. We can draw some guidance from this review to inform a pilot NCI training intervention. The findings from this review suggest that a multi-method approach implemented through brief interactive sessions, using a combination of didactic lectures, interactive discussions, practical activities and assessments, may be an effective strategy to increase knowledge, skills transfer, confidence in screening and knowledge of available referral pathways for further investigation and/or treatment. Future research should explore suitable training durations in this context, the reliability of NCI screening among the various primary healthcare worker cadres, uptake of the training intervention and linkage to care such as reinforced adherence counselling, in low-and middle-income countries.

The majority of training in this review focused on mental health generally, and/ or common mental disorders among PWH, and not H-NCI. These training targeted healthcare workers providing frontline HIV services in Africa, supporting the premise that task-sharing of brain and/ or behaviour healthcare services from specialists to non-specialist healthcare workers has the potential to increase access to care, including H-NCI healthcare services. I have highlighted a paucity in available literature describing H-NCI training targeting healthcare workers who primarily provide HIV services in low- and middle-income countries.

Therefore, in the next chapter (Chapters 3) I explored existing H-NCI knowledge, practices and previous H-NCI training among healthcare workers providing HIV services in South Africa, the country with the highest rate of PWH, globally. I expect that training to identify H-NCI among PWH will be limited among healthcare workers in South Africa. Further, I anticipate that healthcare workers will have limited knowledge of the signs and symptoms of H-NCI, as well as experience in administering H-NCI screening tools in practice.

References

- Berheto, T. M., Hinderaker, S. G., Senkoro, M., Tweya, H., Deressa, T., Getaneh, Y., & Gezahegn, G. (2018). Body and mind: retention in antiretroviral treatment care is improved by mental health training of care providers in Ethiopia. *BMC Public Health*, 18(1), 896. <https://doi.org/10.1186/s12889-018-5821-y>
- Breuer, E., Myer, L., Struthers, H., & Joska, J. A. (2011). HIV/AIDS and mental health research in sub-Saharan Africa: a systematic review. *African Journal of AIDS Research*, 10(2), 101-122. <https://doi.org/10.2989/16085906.2011.593373>
- Campbell, C., & Baernholdt, M. (2016). Community health workers' palliative care learning needs and training: results from a partnership between a US university and a rural community organization in Mpumalanga Province, South Africa. *Journal of Health Care for the Poor and Underserved*, 27(2), 440-449. <https://doi.org/10.1353/hpu.2016.0078>
- Cettomai, D., Kwasa, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *J Neurol Sci*, 307(1-2), 92-96. <https://doi.org/10.1016/j.jns.2011.05.005>
- Dos Santos, M., & Wolvaardt, G. (2016). Integrated intervention for mental health co-morbidity in HIV-positive individuals: A public health assessment. *African Journal of AIDS Research*, 15(4), 325-331. <https://doi.org/10.2989/16085906.2016.1229683>
- Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology & Community Health*, 52(6), 377-384. <https://doi.org/10.1136/jech.52.6.377>
- Duffy, M., Sharer, M., Cornman, H., Pearson, J., Pitorak, H., & Fullem, A. (2017). Integrating mental health and HIV services in Zimbabwean communities: a nurse and

community-led approach to reach the most vulnerable. *Journal of the Association of Nurses in AIDS Care*, 28(2), 186-198. <https://doi.org/10.1016/j.jana.2015.09.003>

Fairall, L., Petersen, I., Zani, B., Folb, N., Georgeu-Pepper, D., Selohilwe, O., Petrus, R., Mntambo, N., Bhana, A., Lombard, C., Bachmann, M., Lund, C., Hanass-Hancock, J., Chisholm, D., McCrone, P., Carmona, S., Gaziano, T., Levitt, N., Kathree, T., & Thornicroft, G. (2018). Collaborative care for the detection and management of depression among adults receiving antiretroviral therapy in South Africa: study protocol for the CobALT randomised controlled trial. *Trials*, 19(1), 193. <https://doi.org/10.1186/s13063-018-2517-7>

Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2021). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS care*, 33(4), 468-472. <https://doi.org/10.1080/09540121.2020.1736256>

Heaton, R. K., Clifford, D. B., Franklin, D. R., Jr., Woods, S. P., Ake, C., Vaida, F., Ellis, R. J., Letendre, S. L., Marcotte, T. D., Atkinson, J. H., Rivera-Mindt, M., Vigil, O. R., Taylor, M. J., Collier, A. C., Marra, C. M., Gelman, B. B., McArthur, J. C., Morgello, S., Simpson, D. M., . . . Group, C. (2010). HIV-associated neurocognitive disorders persist in the era of potent antiretroviral therapy: CHARTER Study. *Neurology*, 75(23), 2087-2096. <https://doi.org/10.1212/WNL.0b013e318200d727>

Heaton, R. K., Marcotte, T. D., Mindt, M. R., Sadek, J., Moore, D. J., Bentley, H., McCutchan, J. A., Reicks, C., Grant, I., & Group, H. (2004). The impact of HIV-associated neuropsychological impairment on everyday functioning. *J Int Neuropsychol Soc*, 10(3), 317-331. <https://doi.org/10.1017/S1355617704102130>

Jenkins, R., Kiima, D., Njenga, F., Okonji, M., Kingora, J., Kathuku, D., & Lock, S. (2010). Integration of mental health into primary care in Kenya. *World Psychiatry*, 9(2), 118. <https://doi.org/10.1002/j.2051-5545.2010.tb00289.x>

Jenkins, R., Othieno, C., Okeyo, S., Kaseje, D., Aruwa, J., Oyugi, H., Bassett, P., & Kauye, F. (2013). Short structured general mental health in service training programme in Kenya improves patient health and social outcomes but not detection of mental health problems—a pragmatic cluster randomised controlled trial. *International Journal of Mental Health Systems*, 7(1), 25. <http://www.ijmhs.com/content/7/1/25>.

Joska, & Sorsdahl, K. (2012). Integrating mental health into general health care: lessons from HIV. *African journal of psychiatry*, 15(6), 420-423.
<http://dx.doi.org/10.4314/ajpsy.v15i6.52>

Liu, G., Jack, H., Piette, A., Mangezi, W., Machando, D., Rwafa, C., Goldenberg, M., & Abas, M. (2016). Mental health training for health workers in Africa: a systematic review. *Lancet Psychiatry*, 3(1), 65-76. [https://doi.org/10.1016/S2215-0366\(15\)00379-X](https://doi.org/10.1016/S2215-0366(15)00379-X)

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Int J Surg*, 8(5), 336-341. DOI 10.1016/j.ijsu.2010.02.007.

Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. (2020). HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *Journal of Community Health*, 1-7. DOI 10.1007/s10900-020-00895-9.

Muthuri, S., Wachira, L.-J., Leblanc, A., Francis, C., Sampson, M., Onywera, V., & Tremblay, M. (2014). Temporal Trends and Correlates of Physical Activity, Sedentary Behaviour, and Physical Fitness among School-Aged Children in Sub-Saharan Africa: A Systematic Review. *Int J Environ Res Public Health*, 11, 3327-3359.
<https://doi.org/10.3390/ijerph110303327>

Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews*, 5 (210). In.

Peters, M., Godfrey, C., McInerney, P., Soares, C., Khalil, H., & Parker, D. (2015). The Joanna Briggs Institute reviewers' manual 2015: methodology for JBI scoping reviews.

Sibeko, G., Milligan, P. D., Roelofse, M., Molefe, L., Jonker, D., Ipser, J., Lund, C., & Stein, D. J. (2018). Piloting a mental health training programme for community health workers in South Africa: an exploration of changes in knowledge, confidence and attitudes. *BMC Psychiatry*, 18(1), 191. <https://doi.org/10.1186/s12888-018-1772-1>

Smith, S. L., Franke, M. F., Rusangwa, C., Mukasakindi, H., Nyirandagijimana, B., Bienvenu, R., Uwimana, E., Uwamaliya, C., Ndikubwimana, J. S., & Dorcas, S. (2020). Outcomes of a primary care mental health implementation program in rural Rwanda: A quasi-experimental implementation-effectiveness study. *PLoS One*, 15(2), e0228854. DOI 10.1371/journal.pone.0228854. DOI 10.1371/journal.pone.0228854

Smith, S. L., Kayiteshonga, Y., Misago, C. N., Iyamuremye, J. D., Dusabeyezu, J. d. A., Mohand, A. A., Osrow, R. A., Anatole, M., Daimyo, S., & Uwimana, E. (2017). Integrating mental health care into primary care: the case of one rural district in Rwanda. *Intervention*, 15(2), 136-150.

Vance, D. E., Fazeli, P. L., Ball, D. A., Slater, L. Z., & Ross, L. A. (2014). Cognitive functioning and driving simulator performance in middle-aged and older adults with HIV. *J Assoc Nurses AIDS Care*, 25(2), e11-26. <https://doi.org/10.1016/j.jana.2013.12.001>

Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Annals of internal medicine*, 147(8), 573-577. <https://doi.org/10.7326/0003-4819-147-8-200710160-00010>

Wagman, P., Håkansson, C., & Jonsson, H. (2015). Occupational balance: A scoping review of current research and identified knowledge gaps. *Journal of Occupational Science*, 22(2), 160-169. <https://doi.org/10.1080/14427591.2014.986512>

Supplementary table

Table S1

Scoping review search strategy

Healthcare worker terms		
#1	Mesh terms	Health personnel
#2		Physicians
#3	Free text:	Health care worker
#4		Health care workers
#5		Healthcare worker
#6		Healthcare workers
#7		Health provider
#8		Health care providers
#9		Healthcare provider
#10		Healthcare providers
#11		Health care personnel
#12		Healthcare personnel
#13		Health worker
#14		Health workers
#15		Physician
#16		Physicians
#17		Doctor
#18		Doctors
#19		Clinician
#20		Clinicians
#21		Nurse
#22		Nurses
#23		Counsellor
#24		Counsellors
#25	#1 OR #2	
#26	#3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24	
#27	#25 AND #26	
Training and education terms		
#28	Mesh terms	Health knowledge
#29		Attitudes
#30		Practice
#31	Free text:	Knowledge
#32		Information
#33		Curriculum
#34		Education
#35		Practice

#36	Practices
#37	Opinion
#38	Opinions
#39	Attitude
#40	Attitudes
#41	View
#42	Views
#43	Training
#44	Literacy
#45	Perspectives
#46	Workshop
#47	#28 OR #29 OR #30
#48	#31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46
#49	#47 AND #48

HIV terms

#50	Mesh terms	HIV
#51		HIV infections
#52	Free text:	HIV
#53		AIDS
#54		Human immunodeficiency virus
#55		HIV seropositivity
#56		Virus
#57		Aids viruses
#58		Acquired immune deficiency syndrome
#59		Acquired immunodeficiency syndrome virus
#60		#50 OR #51
#61		#52 OR #53 OR #54 OR #55 OR #56 OR #57 OR #58 OR #59
#62		#60 AND #61

Cognitive terms

#63	Mesh terms	Cognitive dysfunction
#64		AIDS dementia complex
#65	Free text:	Cognitive impairment
#66		Cognitive dysfunction

#67		Neurocognitive impairment
#68		Neurocognitive dysfunction
#69		Neurocognitive disorder
#70		Neurocognitive disorders
#71		Mental deterioration
#72		Cognitive decline
#73		Cognitive declines
#74		Cognitive deficit
#75		Cognitive deficits
#76		HIV dementia
#77		Dementia
#78		HIV dementias
#79		HIV encephalopathy
#80		HIV encephalopathies
#81		Dementia complex
#82	#63 OR #64	
#83	#65 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71 OR #72 OR #73 OR #74 OR #75 OR #76 OR #77 OR #78 OR #79 OR #80 OR #81	
#84	#82 AND #83	

Mental health terms

#85	Mesh terms	Mental health
#86		Mental health service
#87		Mental health services
#88		Community mental health services
#89	Free text:	Mental health services, community
#90		Substance use disorder
#91		Substance use disorders
#92		Disorder, substance use
#93		Anxiety
#94		Anxiety disorder
#95		Anxiety disorders
#96		Disorder, anxiety
#97		Depression
#98		Mood disorder

#99	Mood disorders
#100	Psychotic mood disorder
#101	Psychotic mood disorders
#102	Disorder, psychotic mood
#103	Seasonal mood disorder
#104	Seasonal mood disorders
#105	Disorder, seasonal mood
#106	#85 OR #86 OR #87 OR #88
#107	#89 OR #90 OR #91 OR #92 OR #93 OR #94 OR #95 OR #96 OR #97 OR #98 OR #99 OR #100 OR #101 OR #102 OR #103 OR #104 OR #105
#108	#106 AND #107

Country terms

#109	Mesh terms	Africa
#110	Free text	Africa
#112		Algeria
#113		Angola
#114		Benin
#115		Botswana
#116		Motswana
#117		Basotho
#118		Batswana
#119		Burkina Faso
#120		Burkinabé
#121		Burundi
#122		Cameroon
#123		Canary Islands
#124		Cape verd
#125		Central African Republic
#126		Chad
#127		Comoros
#128		Comorian
#129		Congo
#130		Democratic Republic of Congo
#131		Djibouti

#132	Egypt
#133	Equatorial Guinea
#134	Eritrea
#135	Ethiopia
#136	Gabon
#137	Gambia
#138	Ghana
#139	Guinea
#140	Guinea Bissau
#141	Ivory coast
#142	Cote D'Ivoire
#143	Ivorian
#144	Jamahiriya
#145	Kenya
#146	Lesotho
#147	Mosotho
#148	Liberia
#149	Libya
#150	Libia
#151	Madagascar
#152	Malawi
#153	Mali
#154	Mauritania
#155	Mauritius
#156	Morocco
#157	Mozambique
#158	Mocambique
#159	Mozambican
#160	Namibia
#161	Niger
#162	Nigeria
#163	Principe
#164	Reunion

#165		Rwanda
#166		Sao tome
#167		Senegal
#168		Seychelle
#169		Sierra Leone
#170		Somali
#171		South Africa
#172		St Helena
#173		Sudan
#174		Swazi
#175		Swaziland
#176		Tanzania
#177		Togo
#178		Tunisia
#179		Uganda
#180		Western Sahara
#181		Zaire
#182		Zambia
#183		Zimbabwe
#184	Not	Guinea pig
#185		Guinea pigs
#186		Aspergillus niger
#187	#110 OR #111 OR #112 OR #113 OR #114 OR #115 OR #116 OR #117 OR #118 OR #119 OR #120 OR #121 OR #122 OR #123 OR #124 OR #125 OR #126 OR #127 OR #128 OR #129 OR #130 OR #131 OR #132 OR #133 OR #134 OR #135 OR #136 OR #137 OR #138 OR #139 OR #140 OR #141 OR #142 OR #143 OR #144 OR #145 OR #146 OR #147 OR #148 OR #149 OR #150 OR #151 OR #152 OR #153 OR #154 OR #155 OR #156 OR #157 OR #158 OR #159 OR #160 OR #161 OR #161 OR #162 OR #163 OR #164 OR #165 OR #166 OR #167 OR #168 OR #169 OR #170 OR #171 OR #172 OR #173 OR #174 OR #175 OR #176 OR #177 OR #178 OR #179 OR #180 OR #181 OR #182 OR #183	
#188	#184 OR #184 OR #186	
#189	#109 AND #187 NOT #188	

Table S2**Modified Downs and Black checklist for clinical trial quality assessment**

Reporting	Yes/no/partially	
1. Is the objective of the study clear?	Yes = 1, No = 0	Included
2. Are the main outcomes clearly described in the Introduction or Methods?	Yes = 1, No = 0	Included
3. Are characteristics of the patients included in the study clearly described?	Yes = 1, No = 0	Included
4. Are the interventions clearly described?	Yes = 1, No = 0	Included
5. Are the distributions of principal confounders in each group of subjects clearly described?	Yes = 2, Partially = 1, No = 0	Included
6. Are the main findings of the study clearly described?	Yes = 1, No = 0	Included
7. Does the study estimate random variability in data for main outcomes?	Yes = 1, No = 0	Included
8. Have all the important adverse events consequential to the intervention been reported?	Yes = 1, No = 0	Included
9. Have characteristics of patients lost to follow-up been described?	Yes = 1, No = 0	Included
10. Have actual probability values been reported for the main outcomes except probability < 0.001?	Yes = 1, No = 0	Included
11. Is the source of funding clearly stated?	Yes = 1, No = 0	Included
External validity	Yes/no/unclear	
12. Were subjects who were asked to participate in the study representative of the entire population recruited?	Yes = 1, No = 0, Unclear = 0	Included
13. Were those subjects who were prepared to participate representative of the recruited population?	Yes = 1, No = 0, Unclear = 0	Included
14. Were staff, places, and facilities where patients were treated representative of treatment most received?	Yes = 1, No = 0, Unclear = 0	Excluded
Internal validity	Yes/no/unclear	
15. Was an attempt made to blind study subjects to the intervention?	Yes = 1, No = 0, Unclear = 0	Excluded
16. Was an attempt made to blind those measuring the main outcomes?	Yes = 1, No = 0, Unclear = 0	Excluded

	Unclear = 0	
17. If any of the results of the study were based on data dredging was this made clear?	Yes = 1, No = 0, Unclear = 0	Excluded
18. Was the time period between intervention and outcome the same for intervention and control groups or adjusted for?	Yes = 1, No = 0, Unclear = 0	Excluded
19. Were the statistical tests used to assess main outcomes appropriate?	Yes = 1, No = 0, Unclear = 0	Included
20. Was compliance with the interventions reliable?	Yes = 1, No = 0, Unclear = 0	Excluded
21. Were main outcome measures used accurate? (Valid and reliable)	Yes = 1, No = 0, Unclear = 0	Included
Internal validity-confounding (selection bias)	Yes/No/Unclear	
22. Were patients in different intervention groups recruited from the same population?	Yes = 1, No = 0, Unclear = 0	Excluded
23. Were study subjects in different intervention groups recruited over the same period of time?	Yes = 1, No = 0, Unclear = 0	Excluded
24. Were study subjects randomized to intervention groups?	Yes = 1, No = 0, Unclear = 0	Excluded
25. Was the randomized intervention assignment concealed from patients and staff until recruitment was complete?	Yes = 1, No = 0, Unclear = 0	Excluded
26. Was there adequate adjustment for confounding in the analyses from which main findings were drawn?	Yes = 1, No = 0, Unclear = 0	Excluded
27. Were losses of patients to follow-up taken into account?	Yes = 1, No = 0, Unclear = 0	Excluded
Power	Size of smallest intervention group Score of 0 to 5	
28. Was the study sufficiently powered to detect clinically important effects where probability value for a difference due to chance is < 5%?		Excluded

Chapter 3

HIV-associated neurocognitive impairment knowledge and current practices: a survey of frontline healthcare workers in South Africa

Adele Munsami, Hetta Gouse, Sam Nightingale, & John Anton Joska

Description of the contribution of candidate and co-authors

This is the first manuscript (chapter) of the thesis which presents empirical data. This manuscript provides an overview of existing knowledge of HIV-Associated neurocognitive impairment and healthcare worker screening practices in South Africa. This online survey was administered to healthcare workers providing HIV services in South Africa. Adele Munsami developed the questions for the online survey with input from the supervisory team. Adele Munsami programmed the questionnaire on the online software and managed the online database. Adele Munsami conducted all statistical analyses of the data, drafted the first full draft of the manuscript and managed all revisions. The co-authors provided conceptual and intellectual guidance to the final drafts. Adele Munsami managed all the revisions.

Current status: Published in *Journal of Community Health* 2020 (46), 538-544

Munsami, A., Gouse, H., Nightingale, S. et al. HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *J Community Health* 46, 538–544 (2021). <https://doi.org/10.1007/s10900-020-00895-9>.

Abstract

Neurocognitive impairment (NCI) associated with the human immunodeficiency virus (HIV) remains prevalent amongst people living with HIV. Testing for HIV-associated NCI in routine clinical care is limited in South Africa and reasons for this are unclear. We conducted an online survey amongst healthcare workers (HCW) to assess HIV-associated NCI knowledge and current practices. The final sample included four hundred surveys (n=400). Chi-square analyses were used to explore HCW knowledge of HIV-associated NCI and screening tools. One-way ANOVA was used to compare mean responses between HCW categories. We observed low awareness of HIV-associated NCI terminology and screening tools. HCW seldom suspected NCI among patients and screening practices were uncommon. Referrals for further NCI investigations were never requested. HCW expressed a desire to receive further training to identify HIV associated NCI. The current study highlights the context of HIV-associated NCI knowledge and practices among front-line HIV HCW in resource-limited settings.

3.1 Introduction

Sub-Saharan Africa accounts for more than 70% of the global burden of HIV infections, with the largest concentration of people living with HIV (PLWH) found in Southern Africa (Ghosh et al., 2017). South Africa is home to an estimated 7.9 million PLWH (AVERT.org, 2018; StatsSA, 2021); and 20% of all people currently receiving antiretroviral therapy (ART) (Ghosh et al., 2017).

Although HIV is predominantly known for its effects on the immune system, the virus also impacts the central nervous system leading to impaired neurocognitive functioning (Heaton et al., 2004; Joska et al., 2019; Morley et al., 2013). HIV-associated neurocognitive impairment (NCI) was defined in 2007 by the updated American Academy of Neurology criteria as HIV-associated neurocognitive disorders (HAND) (Antinori et al., 2007; Sacktor, 2018). HAND are subdivided into three categories according to the severity of the functional and neurocognitive impairment, that is, HIV-associated Dementia (HAD), mild neurocognitive disorder (MND) and asymptomatic neurocognitive impairment (ANI) (Antinori et al., 2007; Sacktor, 2018). Those with symptomatic HIV-associated NCI may experience difficulties with memory, learning, attention, problem-solving and decision making, as well as functional difficulties with tasks required for daily living such as treatment adherence (de Jager et al., 2015; Meade et al., 2011). This suggests that PLWH with HIV-associated NCI may be at an increased risk for chronic treatment non-adherence, highlighting a need for clinical services to be aware of the presence and potential impact of symptomatic HIV-associated NCI (Alford et al., 2019; Meade et al., 2011).

The identification of HIV-associated NCI typically requires knowledge of diagnostic criteria and the appropriate skill set to administer neuropsychological tests (Joska et al., 2016). There are varying guidelines for testing and identification of HIV-associated

NCI (Antinori et al., 2012; Antinori et al., 2007; Liboro et al., 2018; Williams et al., 2014), however, these lack consensus in their definitions for appropriate test methods, the timing of test administration, exclusion of confounders and requirements for further investigation (Alford et al., 2019; Parry et al., 2017). In South Africa, where the majority of healthcare services are provided at primary healthcare facilities, testing for HIV-associated NCI may be especially challenging, as healthcare services are often provided by non-physician healthcare workers (HCW), such as nurses or counsellors (Joska & Sorsdahl, 2012; Kwasa et al., 2012; Sibeko et al., 2018; Tshililo et al., 2019).

With limited research on HCW knowledge of HIV- associated NCI and testing methods in South Africa, it remains unclear whether knowledge and skills to identify HIV-associated NCI are present and desired by front-line HCW, which HCW category should conduct these tests and whether testing for HIV-associated NCI will be feasible at a primary healthcare level (Morley et al., 2013).

In a high HIV prevalence, resource-limited setting, where co-morbidities are common and ART adherence remains a challenge, an understanding of the current knowledge and practices for HIV-associated NCI testing in routine clinical care is necessary (Gouse et al., 2021). In this survey, we sought to explore existing knowledge of HIV-associated NCI among a range of HCW, current practices utilised in healthcare facilities in South Africa, as well as HCW desire to receive training to investigate HIV-associated NCI.

3.2 Materials and methods

3.2.1 Survey development

We developed the Integrating Neurocognitive Impairment Screening and Health Services Within Primary Healthcare Facilities in South Africa (INCREASE) cross-sectional survey (Appendix B). In total, 60 ordinal questions were developed using a 5-point Likert-

type scale. Forward and backward coding were interspersed within the survey to increase the validity and to decrease acquiescent response bias (Kumar, 2019).

Senior researchers from the HIV Mental Health Research Unit, University of Cape Town reviewed the items and eliminated questions that were ambiguous, irrelevant, double barrelled or double negative. The online survey was purpose- developed using REDCap (Research Electronic Data Capture), an electronic web-based platform (Harris et al., 2009). The survey consisted of four sections including HCW demographics, HCW knowledge, current HIV-associated NCI practices and HCW views on further training. A sample size calculation, with a 5% for the margin of error (95% confidence interval) was utilised to determine the minimum number of HCW. We determined that 370 HCW out of a total of 10,000 HCW, would be required to complete the survey.

3.2.2 Study process

A link to the INCREASE survey was distributed through the Southern African HIV Clinicians Society online database of approximately 10,000 HCW from multiple professional fields including medical physicians, nurses, counsellors and other fields described below. The link was also distributed through the South African Department of Health and the HIV/AIDS, sexually transmitted infections and TB committee. Survey responses were captured directly onto REDCap. This study was approved by the University of Cape Town Human Sciences Research Ethics Committee (HREC 624/2018).

3.2.3 Statistical analysis

Data were analysed using International Business Machines Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM-Corp., 2017). The data were disaggregated into the three most frequently reported HCW categories. These categories were (1) physicians, (2) nurses and counsellors, and (3) other health professionals. Demographic data were analysed

using frequency analyses. Chi-square analyses were used to assess HCW knowledge of HIV-associated NCI terms and screening tools.

Ordinal Likert-type scale data were analysed using a one-way analysis of variance (ANOVA) to compare the responses between the groups. The 5-point Likert-type scales ranged from strongly agree (1), agree (2), neutral (3), disagree (4), strongly disagree (5), and never or (1), rarely (2), sometimes (3), often (4) or all of the time (5). The ANOVA test was used to compare similarities or differences in responses between physicians, nurses, counsellors and other HCW. HCW who did not provide clinical services to PLWH only completed "demographic" and "future training" sections of the survey.

3.3 Results

3.3.1 Demographics

A total of 417 HCW responded to the online INCREASE survey and 400 surveys were included in the final analyses. Partially completed surveys were excluded (n = 13, 3.3%). An additional, four (1%) surveys were excluded due to multiple missing fields. The demographic data and the current healthcare services provided by respondents are summarised in Table 1. The mean age of respondents was 43 years (range = 20–85), and 71.2% of the HCW were female. In total, 53.8% of respondents were medical physicians. This group comprised of interns, junior physicians, physicians, district surgeons, consultants, registrars, specialists and general practitioners. The remaining 27% of respondents were nurses (staff nurse, enrolled nurse and/or midwives) and/or HIV counsellors and 19.3% were other medical professionals, such as medical technologists, pharmacists, speech therapists, audiologists and a dentist, as well as respondents primarily involved in research, senior management and public health.

Table 1

Summary of healthcare worker characteristics and current healthcare services disaggregated by healthcare worker category

Frequency n (%)	All (n=400)	Medical doctor/ physician (n=215)	Nurse and Counsellor (n=108)	All Other HCW (n=77)
Healthcare worker category		53.8 (215)	27 (108)	19.3 (77)
Age $\bar{x}$ (Standard Deviation)	43.3 (12.2)	43.2 (12.4)	45.5 (11.1)	40.0 (12.5)
Gender (Female)	71.2 (285)	65.6 (141)	84.2 (91)	68.8 (53)
Facility level at which healthcare workers currently provide services				
Primary Health Care	160 (40.0)	83 (20.8)	64 (16)	13 (3.3)
Specialist hospital	74 (18.5)	56 (14.0)	13 (3.2)	5 (1.2)
Private practice	55 (13.7)	10.5 (42)	2.5 (10)	0.8 (3)
No direct contact with patients*	51 (12.7)	9 (2.2)	5 (1.2)	37 (9.2)
Other type of facility [‡]	60 (15.0)	25 (6.2)	16 (4.0)	19 (4.8)
Frequency of healthcare services currently provided				
Everyday	225 (56.2)	134 (33.5)	80 (20.0)	11 (2.7)
2-3 days a week	58 (14.5)	38 (9.5)	12 (3.0)	8 (2.0)
Once a week	68 (17.0)	33 (8.2)	13 (3.2)	22 (5.5)
Never	49 (12.2)	10 (2.5)	3 (0.8)	36 (9.0)
Healthcare workers provide primary services at HIV outpatient facility				
Yes	221 (55.2)	119 (29.7)	83 (20.7)	19 (4.7)
No	132 (33.0)	90 (22.5)	15 (3.7)	27 (6.7)
Do not work in a facility*	38 (9.5)	6 (1.5)	10 (2.5)	22 (5.5)

[‡] Other facilities include non-government organisations, research facilities.

*This variable was adjusted for in the frequency analysis, cross tabulation and ANOVA, to exclude these responses where necessary. Healthcare workers who did not provide healthcare services to patients only complete section 1 and 4 of the survey. Respondents with healthcare experience who no longer working at a facility were included.

Among our respondents, 40% provided services at a primary healthcare clinic, 18.5% at a specialist hospital, 13.7% in private practice and 12.7% of the respondents had no direct contact with patients but had previous experience with PLWH or worked in other organisations such as nongovernment organisations that focus on PLWH (15%).

Overall, 55.2% of respondents were frontline HIV service providers, 33% provided general clinical services, not specifically to PLWH. The remaining 9.5% were not currently working in an HIV clinic or at a healthcare facility but had previous experience in HIV care. Of those HCW who did provide healthcare services to PLWH, 56% reported seeing HIV-positive patients daily, 14.5% of respondents had contact with patients two to three days per week, 17% less than weekly and 12.5% of HCW, such as facility managers and district managers, did not provide direct HIV healthcare services although they work in the field of HIV care.

3.3.2 HIV-associated neurocognitive impairment knowledge

HCW knowledge of HIV-associated NCI terminology and commonly used screening tools are shown in Table 2. Overall, physicians were more aware of broad HIV-associated NCI terminology compared to nurses, counsellors and other healthcare providers. Less than a quarter of HCW had previous experience in administering HIV-associated NCI tools.

Table 2*Health care workers' current knowledge of HIV-associated neurocognitive impairment terminology and screening tools*

	Frequency n (%)				Cross-Tabulation		
	All HCW (n=400)	Medical doctor/ physicians (n=215)	Nurses/ Lay Counsellors (n=108)	Other Categories (n=77)	Chi Square statistic	Degrees of freedom	p-value
Knowledge of HIV-associated neurocognitive impairment terms							
HIV-associated Dementia (HAD)	223 (55.8)	142 (35.5)	47 (11.8)	34 (8.5)	19.98	2	0.0001
HIV-associated neurocognitive Disorder (HAND)	172 (43.0)	118 (29.5)	30 (7.5)	24 (6.0)	29.99	2	0.0001
Neurocognitive impairment/ cognitive impairment (NCI/CI)	155 (39.0)	109 (27.3)	22 (5.5)	25 (6.3)	29.50	2	0.0001
Mild Neurocognitive Disorder (MND)	87 (16.8)	44 (11.0)	14 (3.5)	9 (2.3)	3.36	2	0.98
Asymptomatic neurocognitive impairment (ANI)	32 (8.0)	22 (5.5)	5 (1.3)	5 (1.3)	4.65	2	0.1860
Knowledge of screening tools							
Mini-Mental State Exam	245 (61.3)	178 (44.5)	37 (9.3)	30 (7.5)	91.29	2	0.0001
International HIV Dementia Scale	101 (25.3)	76 (19.0)	10 (2.5)	15 (3.8)	27.61	2	0.0001
Montreal Cognitive Assessment	76 (19.0)	58 (14.5)	5 (1.3)	13 (3.3)	23.61	2	0.0001
CAT-Rapid	26 (6.5)	12 (3.0)	8 (2.0)	6 (1.5)	0.66	2	0.72
Never heard of tests	58 (14.5)	12 (3.0)	33 (8.3)	13 (3.3)	36.60	2	0.0001
Previous use of screening tools							
Mini-Mental State Exam	91 (22.8)	66 (16.5)	16 (4.0)	9.0 (2.3)	16.96	2	0.0001
International HIV Dementia Scale	28 (7.0)	25 (6.3)	1 (0.3)	5 (0.5)	15.49	2	0.0001
Montreal Cognitive Assessment	15 (3.8)	13 (3.3)	2 (0.5)	0 (0)	7.22	2	0.03
CAT-Rapid	1 (0.3)	1 (0.3)	0 (0)	0 (0)	0.86	2	0.65

 $\alpha = p < 0.05$

Specifically, awareness was higher among physicians, compared to nurses, counsellors and other healthcare providers for: HAD (35.5% vs. 11.8% vs 8.5%), HAND (29.5% vs. 7.5% vs. 6.0%), NCI (27.3% vs. 5.5% vs. 6.3%), the Mini-Mental State Exam (MMSE) (44.5% vs. 9.3% vs 7.5%), International HIV Dementia Scale (IHDS) (19.0% vs. 2.5% vs 3.8%) and the Montreal Cognitive Assessment (MoCA) (14.5% vs. 1.3% vs 3.3%) ($p = 0.0001$). In total, 14.5% of front-line HCW had never heard of any of the aforementioned tests. A low number of nurses, counsellors and other healthcare providers than physicians had previously administered the MMSE (16.5% vs. 4.0% vs. 2.3%) ($p = 0.0001$).

3.3.3 Healthcare Workers' awareness of the Presence of HIV-associated neurocognitive impairment

One-way ANOVA was used to compare the differences between Likert-type scale responses between the three HCW categories (Table 3).

Table 3*Health care workers' current HIV-associated neurocognitive impairment practices*

One-way analysis of variance (ANOVA) Descriptive Analyses				
	n (%)	Mean (SD)	F	Sig.
HCW were aware that HIV-associated neurocognitive impairment (NCI) is common among people living with HIV (PLWH) [‡]				
Physician	195 (59.4)	1.65 (0.86)	7.223	.001
Nurse and Counsellors	83 (25.3)	2.06 (0.98)		
All Other HCW	50 (15.2)	2.02 (1.13)		
Total responses	328	1.81 (0.95)		
HCW were aware that HIV-associated NCI is common among patients who were non-adherent to antiretroviral therapy [‡]				
Physician	195 (59.6)	1.85 (0.95)	3.248	.040
Nurse and Counsellors	82 (25.1)	2.15 (1.22)		
All Other HCW	50 (15.3)	2.16 (1.22)		
Total responses	327	1.97 (1.07)		
HCW suspected HIV-associated NCI among their patients [•]				
Physician	118 (60.5)	1.89 (0.86)	8.065	.000
Nurse and Counsellors	50 (25.6)	2.00 (0.86)		
All Other HCW	27 (13.8)	1.19 (1.15)		
Total responses	195	1.82 (0.93)		
Patient or family reported symptoms of HIV-associated NCI or cognitive problems [•]				
Physician	118 (60.8)	1.81 (0.88)	5.758	.004
Nurse and Counsellors	49 (25.2)	1.78 (1.02)		
All Other HCW	27 (13.9)	1.15 (0.99)		
Total responses	194	1.71 (0.95)		
HCW were aware that NCI is common among PLWH [•]				
Physician	118 (60.8)	1.80 (1.03)	10.874	.000
Nurse and Counsellors	49 (25.2)	2.39 (1.24)		
All Others	27 (13.9)	1.15 (1.32)		
Total responses	194	1.86 (1.19)		
HCW were aware that NCI is common among non-adherent patients [•]				
Physician	118 (60.8)	2.06 (1.17)	7.721	.001
Nurse and Counsellors	49 (25.2)	2.33 (1.36)		
All Other HCW	27 (13.9)	1.19 (1.27)		
Total responses	194	2.01 (1.28)		

HCW administered a HIV-associated NCI screening tool•				
Physician	118 (60.8)	1.11 (1.08)		
Nurse and Counsellors	49 (25.2)	1.35 (1.45)	1.187	.307
All Other HCW	27 (13.9)	.93 (1.21)		
Total responses	194	1.14 (1.20)		
HCW made a referral for further HIV-associated NCI testing				
	0	0	0	0
HCW would like to access to a brief neurocognitive test for use among PLWH‡				
Physician	195	1.40 (0.65)		
Nurse and Counsellors	83	1.60 (0.69)	1.035	.356
All Other HCW	50	1.38 (0.56)		
Total responses	328	1.45 (0.70)		
It would be feasible to administer a brief neurocognitive test among PLWH‡				
Physician	195	3.227 (1.44)		
Nurse and Counsellors	83	3.01 (1.51)	2.151	.118
All Other HCW	50	3.00 (1.43)		
Total responses	328	3.13 (1.47)		
HCW would like to receive HIV-associated NCI training*				
Physician	191	0.93 (0.26)		
Nurse and Counsellors	78	0.96 (0.19)	.640	.528
All Other HCW	50	0.92 (0.27)		
Total responses	319	0.93 (0.25)		
Likert-type Scales				
‡ 0, I do not know; 1, Strongly agree; 2, Agree; 3, Neutral; 4, Disagree; 5, Strongly disagree				
• 0, Never; 1, Rarely; 2, Sometimes; 3, Often; 4, All of the time				
* 0, No; 1, Yes				
$\alpha = p < 0.05$				

More physicians than nurses, counsellors and other medical professionals strongly agreed or agreed that they were aware that HIV-associated NCI was common among PWH (59.4% vs. 25.3% vs. 15.2%) ($p = 0.001$); especially among non-adherent individuals (59.6% vs. 25.1% vs. 15.3%) ($p = 0.04$).

3.3.4 Current HIV-associated neurocognitive impairment practices

HIV-associated NCI practices were infrequent among HCW in this study (Table 3). HCW reported that they rarely or sometimes suspected HIV-associated NCI among their patients. In total, 60.5% of physicians occasionally suspected NCI related to HIV and asked PLWH or non-adherent individuals about NCI difficulties; compared to nurses, counsellors (25.6%) and other healthcare providers (13.8%) ($p = 0.0001$).

Furthermore, 60.8% of physicians, 25.2% nurses or counsellors and 13.9% of other healthcare providers occasionally received cognitive complaints from patients and/or family members ($p = 0.004$). None of the HCW had ever referred a patient for further HIV-associated NCI investigations.

3.3.5 Healthcare Workers' Views on Training for HIV-associated neurocognitive impairment Identification

The vast majority (94%) of physicians, nurses, counsellors and other healthcare providers indicated that they would like to receive training to learn more about HIV-associated NCI (Table 3). All three categories of HCW also expressed a desire to be trained to use and have access to an HIV-associated NCI tool at their local facility. However, physicians, nurses, counsellors and other healthcare providers were unsure if it would be feasible to administer an HIV-associated NCI screening tool at a primary healthcare level.

3.4 Discussion

The presence of symptomatic HIV-associated NCI, especially among PLWH who are non-adherent to ART, may potentially impact the progress of the 90–90–90 treatment goals in South Africa. There is a paucity in published research on HCW knowledge of HIV-associated NCI and current practices in resource-limited settings. To our knowledge, this is the first study to describe HIV-associated NCI knowledge, current identification practices and views by a range of front-line HCW in South Africa.

Reports of HCW awareness of HIV-associated NCI were generally poor among HCW providing daily HIV-related services at primary healthcare facilities in South Africa. Knowledge of HIV-associated NCI terminology was especially low among nurses, counsellors and other healthcare providers. This is of concern in settings where primary healthcare facilities experience high patient volumes and staff shortages; as a result HIV-related services are shared from physicians to non-physician HCW like nurses or counsellors (Kwasa et al., 2012; Sibeko et al., 2018). Non-adherent patients who are usually referred to a counsellor for further counselling but seldom is a behavioural cause for poor adherence sought. Non-physician HCW receive basic, if any, mental healthcare training (Kwasa et al., 2012; Sibeko et al., 2018). A study conducted in Kenya found this basic training to be insufficient for HCW to successfully screen and identify HIV-associated NCI (Cettomai et al., 2011; Kwasa et al., 2012).

It is interesting to note that HCW reported some awareness of HIV-associated NCI among PLWH, particularly among those who were non-adherent to ART, but rarely considered investigating. Furthermore, none of the HCW in this sample had ever referred a patient for further HIV-associated NCI investigations. There is a need to highlight that HIV-associated NCI may not present overtly, but rather with downstream behavioural issues like poor adherence (Kamal et al., 2017). Without sufficient knowledge among frontline HCW,

symptomatic HIV-associated NCI may be overshadowed by more active comorbidities such as Tuberculosis, during clinical examinations. As a result, HCW knowledge and skills may be focused on diseases overtly seen among PLWH in South Africa.

Compared to HCW in Ireland (Morley et al., 2013), awareness of HIV-associated NCI screening tools was poor and practical experience in using these tools was uncommon, even among physicians in this context. While HIV-associated NCI screening may be a useful compromise, it may not be possible within a busy outpatient facility in resource-limited settings as it can be time-consuming (Parry et al., 2017). There also remains a lack of consensus on testing methods, appropriateness of tests, the timing of tests and which HCW category is best suited to administer these tests in this setting (Alford et al., 2019; Parry et al., 2017). Nevertheless, HCW with knowledge of the impact of symptomatic HIV-associated NCI should still be able to support and monitor these at-risk patients to reduce the risk of poor treatment outcomes. This study highlights that HCW in settings with limited mental health skills, require substantial training to be able to reliably administer even a brief tool to identify HIV-associated NCI (Kwasa et al., 2012).

This study highlights a need for training for all cadres of frontline HCW, although there remains uncertainty on the cadre of HCW that is best suited to receive this training. Further work to delineate how such a training and implementation strategy would be applied is needed. This is similar to the findings from Canada highlighting a need for continued access to HIV-related information and training for HCW providing front-line HIV services, especially for HIV-associated NCI (Liboro et al., 2018). In our study, 94% of HCW expressed a desire to be trained to identify HIV-associated NCI among PLWH using appropriate screening tools. However, there remain questions about the feasibility of HIV-associated NCI testing in primary healthcare clinics. Practical barriers that make it difficult to implement HIV-associated NCI testing, especially in busy outpatient facilities, include the

availability of appropriate tests in resource-limited settings, culturally validated tools for PLWH in South Africa, extended clinic time and privacy to limit distractions or interruptions (Morley et al., 2013).

3.5 Limitations

The reach of our survey was confined to HCW who had access to email and internet services, which may not be the case for many HCW at the primary healthcare level in South Africa. The sample constituted a small percentage of the members of the Southern African HIV Clinicians Society which suggests that there was a self-selection bias in this study. As a result, the findings from this study are not representative of the target population and cannot be generalised. Finally, the survey had to be concise to increase response rates, as a result, in-depth and open-ended questions could not be included.

3.6 Recommendations

HCW awareness of HIV-associated NCI and its impact on PWH may be a key component to clinical care in a context of high HIV-prevalence, co-morbidities and poor treatment adherence, however, knowledge and practices are limited in South Africa. It may be necessary for physicians and non-physician HCW to receive training to identify symptomatic HIV-associated NCI as many facilities are serviced by non-physician HCW. Early identification will allow for ongoing monitoring of cognitive difficulties which has the potential to reduce poor treatment outcomes like ART non-adherence. However, the utility and feasibility of HIV-associated NCI screening tools in routine clinical care at a primary healthcare level remains uncertain and requires further research to establish guidelines for low- and middle-income countries.

3.7 Conclusion

Among HCW currently providing HIV-related services to PWH in South Africa, awareness of HIV-associated NCI was lacking and practical experience in administering appropriate tools were infrequent. Knowledge was higher among physicians, yet screening practices remain low among all groups of HCW. The question of which cadre should be trained and what level of skills each cadre should be offered remains open. This survey is a step toward understanding the current context of HIV-associated NCI knowledge, practices and views of HCW in South Africa, to appropriately train and upskill frontline HIV healthcare providers.

In the next chapter (Chapter 4), I aim to describe primary healthcare workers' perceptions of the prevalence of H-NCI among PWH, healthcare workers' views on the appropriateness of H-NCI identification and screening at this level of care, as well as healthcare workers' views on H-NCI training targeting primary healthcare workers. I also provide more detail on healthcare workers' understanding of H-NCI among PWH. The findings in the next chapter may assist in narrowing H-NCI knowledge gaps to be addressed in future training among these cadres, inform suitable cadres for H-NCI training, and provide insight into existing bottlenecks for H-NCI screening practices at primary healthcare facilities in South Africa.

References

- Alford, K., Banerjee, S., Nixon, E., O'Brien, C., Pounds, O., Butler, A., Elphick, C., Henshaw, P., Anderson, S., & Vera, J. H. (2019). Assessment and Management of HIV-Associated Cognitive Impairment: Experience from a Multidisciplinary Memory Service for People Living with HIV. *Brain Sci*, 9(2).
<https://doi.org/10.3390/brainsci9020037>
- Antinori, Arendt, G., Grant, I., Letendre, S., Muñoz-Moreno, J. A., Eggers, C., Brew, B., Brouillette, M.-J., & Bernal-Cano, F. (2012). Assessment, diagnosis, and treatment of HIV-associated neurocognitive disorder: a consensus report of the mind exchange program. *Clinical Infectious Diseases*, 56(7), 1004-1017.
<https://doi.org/https://doi.org/10.1093/cid/cis975>
- Antinori, A., Arendt, G., Becker, J. T., Brew, B. J., Byrd, D. A., Cherner, M., Clifford, D. B., Cinque, P., Epstein, L. G., Goodkin, K., Gisslen, M., Grant, I., Heaton, R. K., Joseph, J., Marder, K., Marra, C. M., McArthur, J. C., Nunn, M., Price, R. W., . . . Wojna, V. E. (2007). Updated research nosology for HIV-associated neurocognitive disorders. *Neurology*, 69(18), 1789-1799.
<https://doi.org/10.1212/01.WNL.0000287431.88658.8b>
- AVERT.org. (2018). *HIV and AIDS in South Africa*. Retrieved 06 September from
<https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/south-africa>
- Cettomai, D., Kwasia, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *J Neurol Sci*, 307(1-2), 92-96.
<https://doi.org/10.1016/j.jns.2011.05.005>

- de Jager, C. A., Joska, J. A., Hoffman, M., Borochoowitz, K. E., & Combrinck, M. I. (2015). Dementia in rural South Africa: A pressing need for epidemiological studies. *S Afr Med J*, 105(3), 189-190. <https://doi.org/10.7196/samj.8904>
- Ghosh, A. K., Sarkar, A., & Mitsuya, H. (2017). HIV-Associated Neurocognitive Disorder (HAND) and the Prospect of Brain-Penetrating Protease Inhibitors for Antiretroviral Treatment. *Med Res Arch*, 5(4). <https://www.ncbi.nlm.nih.gov/pubmed/29984302>
- Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2021). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS care*, 33(4), 468-472. <https://doi.org/10.1080/09540121.2020.1736256>
- Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of biomedical informatics*, 42(2), 377-381. <https://doi.org/https://doi.org/10.1016/j.jbi.2008.08.010>
- Heaton, R. K., Marcotte, T. D., Mindt, M. R., Sadek, J., Moore, D. J., Bentley, H., McCutchan, J. A., Reicks, C., Grant, I., & Group, H. (2004). The impact of HIV-associated neuropsychological impairment on everyday functioning. *J Int Neuropsychol Soc*, 10(3), 317-331. <https://doi.org/10.1017/S1355617704102130>
- IBM-Corp. (2017). IBM SPSS Statistics for Windows, Version 25.0. In. Armonk, NY: IBM Corp.
- Joska, J. A., Dreyer, A. J., Nightingale, S., Combrinck, M. I., & De Jager, C. A. (2019). Prevalence of HIV-1 Infection in an elderly rural population and associations with neurocognitive impairment. *Aids*, 33(11), 1765-1771. <https://doi.org/10.1097/QAD.0000000000002257>

- Joska, J. A., & Sorsdahl, K. (2012). Integrating mental health into general health care: lessons from HIV. *African journal of psychiatry*, 15(6), 420-423.
<https://doi.org/http://dx.doi.org/10.4314/ajpsy.v15i6.52>
- Joska, J. A., Witten, J., Thomas, K. G., Robertson, C., Casson-Crook, M., Roosa, H., Creighton, J., Lyons, J., McArthur, J., & Sacktor, N. C. (2016). A Comparison of Five Brief Screening Tools for HIV-Associated Neurocognitive Disorders in the USA and South Africa. *AIDS Behav*, 20(8), 1621-1631. <https://doi.org/10.1007/s10461-016-1316-y>
- Kamal, S., Locatelli, I., Wandeler, G., Sehhat, A., Bugnon, O., Metral, M., Du Pasquier, R., Gutbrod, K., Cavassini, M., Schneider, M. P., & and the Swiss, H. I. V. C. S. (2017). The Presence of Human Immunodeficiency Virus-Associated Neurocognitive Disorders Is Associated With a Lower Adherence to Combined Antiretroviral Treatment. *Open Forum Infect Dis*, 4(2), ofx070. <https://doi.org/10.1093/ofid/ofx070>
- Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners*. Sage Publications Limited.
- Kwasa, J., Cettomai, D., Lwanya, E., Osiemo, D., Oyaro, P., Birbeck, G. L., Price, R. W., Bukusi, E. A., Cohen, C. R., & Meyer, A. C. (2012). Lessons learned developing a diagnostic tool for HIV-associated dementia feasible to implement in resource-limited settings: pilot testing in Kenya. *PLoS One*, 7(3), e32898.
<https://doi.org/10.1371/journal.pone.0032898>
- Liboro, R. M., Ibañez-Carrasco, F., Rourke, S. B., Eaton, A., Medina, C., Pugh, D., Rae, A., Ross, L. E., & Shuper, P. A. (2018). Barriers to addressing HIV-Associated neurocognitive disorder (HAND): Community-based service provider perspectives. *Journal of HIV/AIDS & Social Services*, 17(3), 209-223.
<https://doi.org/10.1080/15381501.2018.1431168>

- Meade, C. S., Conn, N. A., Skalski, L. M., & Safren, S. A. (2011). Neurocognitive impairment and medication adherence in HIV patients with and without cocaine dependence. *Journal of behavioral medicine*, 34(2), 128-138.
<https://doi.org/https://dx.doi.org/10.1007%2Fs10865-010-9293-5>
- Morley, D., McNamara, P., Kennelly, S., McMahon, G., & Bergin, C. (2013). Limitations to the identification of HIV-associated neurocognitive disorders in clinical practice. *HIV Med*, 14(8), 497-502. <https://doi.org/10.1111/hiv.12036>
- Parry, S., Zetler, S., Kentridge, A., Petrak, J., & Barber, T. (2017). Simple screening for neurocognitive impairment in routine HIV outpatient care: is it deliverable? *AIDS care*, 29(10), 1275-1279. <https://doi.org/10.1080/09540121.2017.1300632>
- Sacktor, N. (2018). Changing clinical phenotypes of HIV-associated neurocognitive disorders. *J Neurovirol*, 24(2), 141-145. <https://doi.org/10.1007/s13365-017-0556-6>
- Sibeko, G., Milligan, P. D., Roelofse, M., Molefe, L., Jonker, D., Ipser, J., Lund, C., & Stein, D. J. (2018). Piloting a mental health training programme for community health workers in South Africa: an exploration of changes in knowledge, confidence and attitudes. *BMC Psychiatry*, 18(1), 191. <https://doi.org/10.1186/s12888-018-1772-1>
- StatsSA. (2021). *Mid-year population estimates*
- Tshililo, A. R., Mangena-Netshikweta, L., Nemathaga, L. H., & Maluleke, M. (2019). Challenges of primary healthcare nurses regarding the integration of HIV and AIDS services into primary healthcare in Vhembe district of Limpopo province, South Africa. *Curationis*, 42(1), e1-e6. <https://doi.org/10.4102/curationis.v42i1.1849>
- Williams, I., Churchill, D., Anderson, J., Boffito, M., Bower, M., Cairns, G., Cwynarski, K., Edwards, S., & Fidler, S. (2014). British HIV Association guidelines for the treatment of HIV-1-positive adults with antiretroviral therapy 2012 (Updated November 2013).

All changed text is cast in yellow highlight.). *HIV medicine*, 15, 1-6.

<https://doi.org/10.1111/hiv.12119>

Chapter 4

Exploring HIV-associated neurocognitive impairment in the era of effective antiretroviral therapy: A primary healthcare perspective

Adele Munsami, Sam Nightingale, Katherine Sorsdahl & John Anton Joska

Description of the contribution of candidate and co-authors

This manuscript served as the second chapter presenting empirical data and was a follow-up to chapter 3. A qualitative approach was utilised to explore knowledge and practice gaps identified in the survey presented in Chapter 3. This manuscript also described healthcare workers' perceptions of the prevalence of HIV-associated neurocognitive impairment among patients accessing HIV care at a primary healthcare level. In this manuscript healthcare workers' views on receiving HIV-associated neurocognitive impairment training are examined. I developed the interview schedule for the focus group discussions and the case vignettes with input from Professor John Joska and Associate Professor Sam Nightingale. I then developed an in-depth interview with input from Professor John Joska and Professor Katherine Sorsdahl. I conducted focus group discussions and in-depth interviews with primary healthcare workers providing HIV services. I transcribed the focus group discussions and in-depth interviews and then analysed the data with input from Professor Katherine Sorsdahl. I also wrote the first full draft of the manuscript. All co-authors provided conceptual and intellectual guidance, edited and approved the final drafts. I managed all revisions.

Current status: Published in *Qualitative Health Research* 2022, Vol. 0(0) 1–11.

Munsami, A., Nightingale, S., Sorsdahl, K., & Joska, J. A. (2022). Exploring HIV-associated neurocognitive impairment in the era of effective antiretroviral therapy: A primary healthcare perspective. *Qualitative Health Research*. <https://doi.org/10.1177/10497323221110801>

Abstract

The prevalence of HIV-associated neurocognitive impairment (H-NCI) is concerning. Individuals on effective antiretroviral therapy (ART) may still be at risk for H-NCI as they experience longer life expectancies. There are, however, few professionals with knowledge and skills to identify H-NCI, in low- and middle-income countries. We explored qualitatively, primary healthcare workers' knowledge and views of H-NCI, in the era of effective ART, particularly their views toward task-sharing of H-NCI screening from specialists to mid-level or lay healthcare providers. The first phase of data collection involved two focus group discussions (FGDs) 23 primary healthcare workers from two facilities in the Western Cape participated in the FGDs. In the second phase of data collection 12 individual, in-depth interviews were conducted in KwaZulu-Natal. Using thematic analysis, several key themes emerged. Although healthcare providers were unable to specifically identify H-NCI, they described several HIV diseases and treatment related or mental health comorbidities that could be responsible for the symptoms. Despite healthcare workers reporting low frequencies of H-NCI, they favoured receiving training to screen for H-NCI with a view toward providing holistic care.

4.1 Introduction

In the past decade, HIV has evolved into a manageable, multi-system, chronic illness, following the development of effective antiretroviral therapy (ART) (Milanini & Valcour, 2017; Sanford et al., 2019). However, HIV-associated neurocognitive impairment (H-NCI) remains a concern even among people with HIV (PWH) on ART (Underwood et al., 2019). Although the prevalence of H-NCI vary significantly across countries, a meta-analysis exploring the global prevalence and burden of H-NCI found that sub-Saharan Africa, which is home to the largest population of PWH, may also have the largest number of adults living with H-NCI (Wang et al., 2020).

HIV has the ability to invade the central nervous system during acute infection causing inflammation which may result in a range of cognitive, motor, and/or mood problems among people with HIV (Carter et al., 2003). H-NCI varies in clinical course as well as in signs and symptoms, which range from subtle cognitive and motor impairments to mood disorders including depression, or presents more severely as dementia (Mohamed et al., 2020; Watkins & Treisman, 2015). Typically, individuals with H-NCI may experience functional impairment (Sacktor, 2018) which includes difficulties with learning, attention, problem-solving, and decision making, as well as functional challenges with tasks required for daily living (de Jager et al., 2015; Heaton et al., 2011). Individuals with H-NCI may be at an increased risk for chronic treatment non-adherence, leading to a myriad of adverse outcomes, including opportunistic infections, poor quality of life and early mortality (Kamal et al., 2017; Meade et al., 2011). Despite significant declines in the incidence of severe H-NCI, the prevalence of milder forms may persist, as PWH now experience longer life expectancies (Simioni et al., 2010; Terpstra et al., 2018).

The diagnosis of H-NCI is a diagnosis of exclusion, requiring healthcare workers to be aware of confounding or contributing factors (Milanini & Valcour, 2017). An H-NCI

screening tool is administered once these factors have been ruled out. However, few trained professionals possess the necessary knowledge and skills to screen, diagnose and manage symptomatic H-NCI in low-and-middle-income countries (Cettomai et al., 2011).

Furthermore, specialists with skills to screen and for H-NCI, provide management recommendations for PWH with symptomatic H-NCI, such as reinforced adherence counselling or behavioural interventions including electronic pillboxes, seldom provide healthcare services at a primary healthcare level, where the majority of PWH access care (Cettomai et al., 2011; Dube & Uys, 2016; Mall et al., 2013).

Healthcare services are mainly provided by nurses, adherence counsellors, pharmacists, and a small number of medical doctors, at a primary healthcare level (Joska & Sorsdahl, 2012). These facilities often experience high patient volumes, as well as staff shortages (Sibeko et al., 2018). In lieu of these challenges, South Africa adopted the World Health Organization's (WHO) recommendation of "task sharing" of mental health services (Department of Health, 2013). These services are shared from specialised doctors to non-specialist physicians, followed by nurses, nursing assistants, as well as other community healthcare workers, such as adherence counsellors (Department of Health, 2013; Remien et al., 2019). Although task-sharing has been beneficial in improving general mental health services, it is unclear whether task-sharing of H-NCI screening at primary healthcare facilities will be equally beneficial (Cettomai et al., 2011; Remien et al., 2019). The paucity in literature describing H-NCI training interventions targeting primary healthcare workers is described in Chapter 2 of this thesis. This, despite previous cross-sectional surveys (Chapter 3) highlighting H-NCI knowledge gaps and uncommon screening practices in South Africa (Gouse et al., 2020; Munsami et al., 2021).

To our knowledge, there have been no in-depth reports on H-NCI knowledge and skill gaps among nurses, adherence counsellors, and medical doctors. This article expands on

previous research by qualitatively exploring primary healthcare workers knowledge, understanding, perceptions of H-NCI in the era of effective ART (Munsami et al., 2021). We further explore their views toward acceptability and feasibility of integrating H-NCI screening into primary healthcare services, suggestions for tool administration and perceived needs for capacitation.

4.2 Methods

This manuscript was guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007) (Appendix C).

4.3 Study design

In this qualitative study, we conducted focus group discussions (FGDs) and in-depth, individual interviews with medical doctors, nurses, and adherence counsellors providing HIV services at primary healthcare facilities (Hunter et al., 2019). The facilities were in the Western Cape and KwaZulu-Natal provinces, South Africa. The University of Cape Town, Faculty of Health Sciences, Human Sciences Research Ethics Committee (HSREC 624/2018), the Western Cape Department of Health, and the KwaZulu-Natal Department of Health, approved this study. All participants signed informed consent before continuing with the interviews.

4.3.1 Participant selection

Operational managers were approached and once they were agreeable healthcare workers were invited to voluntarily participate. The healthcare workers were informed that the FGDs would explore healthcare services provided to PWH accessing care at the facility. All who were approached for the FGDs agreed to participate, while three healthcare workers declined to participate in the in-depth interviews due to time constraints. Two participants who initially agreed to participate deceased prior to the interview taking place.

4.3.2 Procedure

Between July 2019 and August 2019, two FGDs were conducted by the first author with the participants in the Western Cape Province. The first author is a female researcher and has postgraduate qualifications, and previous training.

The FGDs were conducted first, to allow the opportunity for the individual interviews to further explore key themes that emerged. After obtaining informed consent, the in-depth, individual interviews were conducted in English with healthcare workers from two hospitals and three primary healthcare clinics, between December 2020 and January 2021. The in-depth interviews were conducted by the first author. We aimed to ensure that our sample was representative of the staffing profile of primary healthcare facilities in South Africa, to be able to explore any variations between cadres that emerged from the data.

The FGDs and in-depth interviews were conducted at the facility during the scheduled weekly staff meetings, to avoid removing healthcare workers from the facility, limiting disruptions to patient services. Only healthcare workers who agreed to participate were present during the FGDs. The FGDs followed an interview schedule that included questions pertaining to non-adherence among PWH, H-NCI symptoms, H-NCI screening at a primary healthcare level and future training. The complete interview schedule is provided in Appendix D. The FGDs lasted between 60 to 80 minutes and were recorded using a voice recorder and field notes which were made by the first author.

Following the initial analysis of the FGDs, 12 individual, in-depth interviews were conducted, to further explore and describe healthcare workers' understanding of H-NCI among PWH. Only healthcare workers' who provided informed consent were interviewed. Each in-depth interview lasted approximately 45 to 60 minutes and were conducted during

times where there were few patients at the healthcare facility. The in-depth interviews were conducted until saturation was reached.

To facilitate this discussion, the semi-structured guide was supplemented with a vignette. A vignette is a short, hypothetical story, commonly used in qualitative and quantitative research to explore real-world, patient-based scenarios (Aujla, 2020; Gourlay et al., 2014; Sampson & Johannessen, 2020). Given that milder forms of H-NCI may be complex to identify, we presented a vignette that describes severe H-NCI.

Vignette

A 35-year-old man who works at the local grocery store has come to the clinic following difficulties at work. His supervisor suggested that he see a doctor after noticing that he has been losing track of time and as a result he does not complete his daily tasks. He has also been finding it more difficult to concentrate and has greater difficulty in remembering the instructions that have been given to him by his supervisor. For example, which shelves need to be re-stocked. He informed the counsellor that he missed his last clinic visit because he has trouble remembering things, such as appointments, unless he is reminded by his wife. He tested positive for HIV recently and was initiated onto ART. His CD4 count at the time of testing was 25 cells/mm³ and his viral load was 260,862 copies/ml. He missed his last scheduled clinic appointment and has been without his ARVs for more than a month. His viral load (190,052 copies/ml) has not improved since being initiated onto treatment.

Reflexivity refers to the researcher's role and possible influence on the research process and the recognition and examination (Blanche et al., 2006). Steps taken to achieve reflexivity in this study include the careful use of fieldnotes to reflect on her behaviour during the data collection and a research journal detailing the interviewers' thoughts and views

during the interview and coding process. To ensure trustworthiness, AM acknowledge her feelings, thoughts and judgments throughout this process which assisted the researcher to be neutral so that her reactions towards the participants during data collection did not affect the findings of the study. To mitigate the potential role of the interviewer in influencing participation, a colleague from the facility approached healthcare workers to participate in the FGDs and in-depth interviews. The interviews were conducted, recorded and analysed using anonymised participant identifiers and the identity of healthcare workers who declined to participate were withheld from AM. Finally, AM engaged in regular consultations with the supervisory team to engage in discussions on difficult questions about assumptions and decisions which promoted quality, authenticity and truthfulness of the findings.

4.4 Data analysis

This study was informed by phenomenological methodology which is commonly used to understand healthcare workers sense of an existing practice (Creswell & Poth, 2016; Lopez & Willis, 2004). Inductive thematic analysis, an approach which focuses on identifying, analysing, organizing, describing, and interpreting patterns of meaning within qualitative data, was used to analyse the data (Braun & Clarke, 2012; Nowell et al., 2017). The analysis was facilitated using NVivo 12, a qualitative data analysis software. The data was recorded and transcribed by the first author who conducted the initial review or familiarisation, and identification of major themes with a second researcher. A detailed description of the coding tree can be found in the supplementary material (Supplementary material Table S1). The first author and a second researcher coded two FGDs and four in-depth interviews independently, before meeting to review the codes. The intercoder reliability coefficient was 0.83. All discrepancies were discussed until consensus regarding the coding was achieved. The remaining interviews were then coded using the agreed upon codes. The researchers resolved all differences through discussion.

4.5 Results

After describing participant characteristics, we present synthesised findings that emerged from the FGDs and in-depth interviews. H-NCI knowledge and screening practices among primary healthcare workers in South Africa were influenced by (1) existing knowledge and understanding of H-NCI, (2) views on the perceived acceptability and feasibility of screening at primary healthcare level, and (3) opinions on the appropriateness of training healthcare workers at primary healthcare facilities to identify H-NCI.

4.5.1 Participant characteristics

Twenty-three primary healthcare workers participated in the FGDs, the first phase of data collection, including four medical doctors, 13 nurses and 6 adherence counsellors. In the second phase of data collection, we conducted in-depth interviews with 12 additional primary healthcare workers (3 medical doctors, 7 nurses and 2 adherence counsellors). The final sample included 35 primary healthcare workers (7 medical doctors, 20 nurses and 8 adherence counsellors). 86% of the participants were female (4 medical doctors, 18 nurses and 7 adherence counsellors), the mean age of the sample was 38 years and the median number of years in HIV healthcare service delivery was 11 years (Table 1). There were no overlaps in participants in the FGDs and the in-depth interviews.

Table 1

Participant demographics

	Western Cape (n=23)	KwaZulu-Natal (n=12)	Total (n=35)
Gender (F)	57 (n=20)	31 (n=11)	86 (n=31)
Age ($\bar{x}$)	37	39	38 years

Cadre (%)			
General			
medical doctor	11 (n=4)	9 (n=3)	20 (n=7)
Nurse	37 (n=13)	20 (n=7)	57 (n=20)
Adherence counsellor	17 (n=6)	6 (n=2)	23 (n=8)
Years in HIV care (M)	11	11	11 years

4.5.2 Healthcare workers' knowledge and understanding of HIV-associated neurocognitive impairment

When asked to provide a broad description of the effects that HIV may have on the brain, several nurses and doctors specifically mentioned co-morbidities, opportunistic infections or described common mental disorders, particularly depression. Although a few doctors and nurses specifically mentioned dementia due to HIV impacting the brain, the term HIV-associated dementia (HIV-D) was not mentioned specifically. When describing the symptoms of dementia caused by HIV, the providers tended to describe quite severe clinical symptoms. This is illustrated by several participants who said:

[Patients with dementia] can get this apathy, insomnia, hallucinations, sleep disturbances, depression. (Medical doctor, participant 25)

In the older patients where they are restless, and they often forget things. It is like when they have dementia. (Nurse, participant number 31)

When prompted specifically about whether they had heard of H-NCI, only one doctor responded with “now that you mention it, I remember hearing something”, while all the providers “were only hearing about it now”. Upon further probing with the use of the vignette describing a typical patient living with H-NCI, only one healthcare provider mentioned that the person in the vignette could be living with “HIV encephalopathy or AIDS dementia complex”.

The healthcare providers did not specifically diagnose the individual described in the vignette with H-NCI. However, they did describe several factors that could be responsible for the symptoms. These were primarily HIV disease and treatment related causes or a result of a mental health problem. First, HIV specific causes including, non-adherence, side-effects of ART low CD4 cell count and late-stage disease, were mentioned by a few doctors and nurses in the sample.

You get mental manifestations due to advanced stage of disease. People have confusion, and this is most times in the low CD4 or late stages [of HIV]. (Medical doctor, participant 24)

All providers described how poor adherence to medication could explain the symptoms.

We have seen people with confusion then they are not taking their treatment [causing] general neuropsychiatric manifestations of HIV. (Medical doctor, participant 25)

Several healthcare professionals among all cadres, described side-effects frequently experienced by PWH who are on Efavirenz, a drug that forms part of older ART regimens that could be contributing to the symptoms described in the vignette.

Patients on first line, Efavirenz, they are going to have confusion, lucid dreams and neuropsychosis. It is a side effect of that drug. (Medical doctor, participant 13)

Efavirenz usually acts on the central nervous system which usually affects our patients causing acute confusion. (Nurse, participant 29)

In addition to HIV disease and treatment related causes, mental health problems were described by several healthcare providers as not only contributing to patient non-adherence to ART but could be a direct cause of the symptoms described in the vignette.

Depression has those same physical symptoms. So maybe it is also related to depression. (Nurse, participant 33)

[Confirm] if its only memory problems or a concentration problem maybe anxiety related issues because with HIV you are already thinking about death. (Medical doctor, participant 25)

When asked about the frequency of HIV patients presenting with symptoms described in the vignette, the doctors and nurses highlighted that they were common prior to the roll-out of ART, but they “do not really see these symptoms” in the era of effective ART. Medical doctors and nurses regarded H-NCI as a historic problem, which declined following widespread use of ART. This is illustrated by several healthcare providers who said:

It is not often. It is not so prevalent mainly because we started initiating [early]. Remember in the years before we used to start people at a certain level of low immunity. So those manifestations were prevalent when they [patients] used to have low CD4 count. (Medical doctor, participant 24)

We saw a lot of that in the beginning in the eighties and the latter part and the nineties. It is not as bad as before. Now you find it rarely. (Nurse, participant 29)

4.5.3 Healthcare workers’ views on the acceptability and feasibility of HIV-associated neurocognitive impairment screening

4.5.3.1 Screening at primary healthcare facilities

Given that healthcare workers in this study reported that they did not screen for H-NCI, we explored current care practices for patients who report problems with memory loss or confusion. Adherence counsellors suggested that patients with these problems would “need to be referred to the nurse”. Some nurses suggested that they would “refer to the doctors and

maybe the doctors would refer to the psychologist “, while several doctors stated they would “refer the patient to a psychologist”.

Among the doctors and nurses who reported that they would investigate the symptoms further, these individuals stated that they would administer “the mental health screen which was started in primary healthcare clinics” by the Department of Health in South Africa. The tool was described a brief set of “questions about mood disorders and fears or phobias”.

Nurses indicated that forgetfulness or difficulties with memory were investigated to determine treatment adherence. Adherence counsellors referred patients to a nurse if they reported challenges with their attention or memory.

We ask about the medication, using protection and being safe. I never really thought to ask about the other things [like H-NCI]. (Nurse, participant 27)

4.5.3.2 The acceptability and feasibility of screening for H-NCI at a PHC

Despite having reported low frequencies of H-NCI, all cadres still felt it was within their role to identify H-NCI among PWH accessing care at their facilities and responded positively to having access to an H-NCI screening tool. They also considered it feasible to administer an H-NCI screening tool at a primary healthcare level. Adherence counsellors agreed that screening for H-NCI “would be very good”.

Having this tool would allow us to recognise them at an early stage. Not when they are at a stage of possible irreversibility or requiring admission or something. (Medical doctor, participant 24)

I think it will benefit patients a lot. Because the more we identify early the better. It will be better to identify early and prevent it if it is happening. (Nurse, participant 30)

Healthcare workers expressed alternate views when asked which cadre of healthcare worker should be equipped to screen for H-NCI. Medical doctors and nurses agreed that patients provided more detailed, and honest information to the adherence counsellors or nurses during counselling, compared to information provided to medical doctors during a physical examination.

The counsellors might know more because patients tell us different things, and then something else to the nurses. The counsellors also see the patients more frequently than us [doctors]. (Medical doctor, participant 2)

The nurses would be central because they see more patients than a doctor.

Counsellors are the entry point they help a lot and can be helpful. (Medical doctor, participant 24)

Several nurses reported that medical doctors would be more suitable to administer screening tools, as further treatment and management decisions lie with the medical doctors.

It will be better because then the medical doctor will know how to manage the patient better than we will have to wait to know from the medical doctor, and this can create delays. (Nurse, participant 30)

The majority of healthcare workers felt that all cadres should be equipped to screen for H-NCI, as each cadre has a different role to fulfil in terms of patient care.

I think that everyone needs to be trained, because if a medical doctor or nurse screens a patient, the reinforced counselling provided by counsellors will also become important. (Medical doctor, participant 1)

It is all of us. We all have a part to play. (Nurse, participant 29)

When asked to suggest suitable times at which H-NCI screening could be conducted, the following points in the clinic flow were suggested: adherence clubs, during waiting time at the facility and annual check-ups, for ongoing monitoring of H-NCI as highlighted by the following statements:

We can talk about neurocognitive impairment during the adherence clubs.

(Adherence counsellor, participant 5)

It will be feasible at this facility because we have much standing time sometimes while patients are waiting to be seen. The other thing is at their first test, maybe it is possible and annually after that when they come for CD4. (Medical doctor, participant 2)

4.5.3.3 Perception of training in H-NCI screening and diagnosis

All cadres reported that they had attended training to provide HIV services. However, the medical doctors indicated that they had “not been for any training” focusing on HIV and cognition or H-NCI. In most cases healthcare workers had attended courses many years ago and did not receive refresher training thereafter. As a result, they were unsure if they had received information on H-NCI in previous training.

Remember we did nursing school very long ago. We maybe cannot remember things that were mentioned. We know the focus. Check viral load check CD4 count check these things. (Nurse, participant 27)

It has been like 13 years since I completed my medicine. I do not remember other [disorders] to be honest it has been a very long time. (Medical doctor, participant 26)

All three cadres of healthcare workers were open to receive training on H-NCI and the use of screening tools. However, there were mixed views on the best method of delivery for

the training programme. Several healthcare workers preferred traditional methods of training such as didactic, face-to-face lectures.

We have tried the online training here at this facility. It has had a lot of issues and people do not really pay attention, they are in and out because no one can see you. So maybe face-to-face. (Medical doctor, participant 25)

Others preferred a combination of shorter brief workshops over multiple sessions or ongoing, online training which could be accessible after clinic duties, but were concerned about network or connectivity issues as illustrated below:

Personally, I think online you can log in at any time. As you came today its quiet so I would login and learn instead of having to go and sit for hours to do this. (Nurse, participant 30)

I like to face-to-face because you have a question you can ask. Sometimes online it will be connecting, and they cannot hear you. (Adherence counsellor, participant 35)

4.6 Discussion

To our knowledge, this is the first paper to use qualitative methodology to report on primary healthcare workers' knowledge and understanding of H-NCI and, perceptions, toward H-NCI screening at this level of care and attitudes toward received H-NCI training. Between the three cadres, we found that healthcare workers did not identify H-NCI specifically but attributed symptoms to HIV treatment related causes or a result of an underlying mental health condition. Medical doctors and nurses viewed H-NCI as a historic problem, suggesting that H-NCI was uncommon among PWH accessing care at primary healthcare facilities, while many others expressed not knowing enough about this disorder. All cadres had no prior experience in screening for H-NCI. Despite primary healthcare

workers suggesting a low prevalence of H-NCI among their patients as result of effective ART, they were in favour of receiving training to screen for H-NCI. This, with a view toward providing holistic care for PWH accessing care at this level. There were differing views on the method of training best suited for primary healthcare workers. Certain individuals favoured traditional, didactic, face-to-face training, whilst others favoured flexible, online training sessions. There were no differences in knowledge and views between the two provinces.

Although our findings illustrate that healthcare workers were not able to identify H-NCI and were unaware of the spectrum of impairment caused by HIV, a few were aware of dementia due to late-stage disease among PWH. Several healthcare workers attributed symptoms of H-NCI to treatment related factors such as poor treatment adherence, low CD4 count or resulting from common mental disorders, such as depression. Similar to findings from previous studies in South Africa, the majority of healthcare workers had never heard about H-NCI, especially adherence counsellors (Gouse et al., 2021; Munsami et al., 2021). Many believed that H-NCI had declined since the advent of ART and only existed in rare cases. This may be true for the incidence of severe H-NCI such as HIV-D, that has declined over the years, however, the prevalence of milder H-NCI may still increase as PWH accessing ART experience longer life expectancies (Simioni et al., 2010). Reports on the prevalence of H-NCI vary and remain a debatable topic (Valcour et al., 2011). It is thus, unclear whether H-NCI is indeed uncommon in the current context, or whether primary healthcare workers' lack the appropriate knowledge to identify milder forms of H-NCI among individuals accessing care.

The attribution of neurocognitive and functional impairment in PWH to co-morbid factors, for example, the side effects of the drug Efavirenz, or low CD4 cell count, is still positive. This, as the first stage of H-NCI diagnosis is the exclusion or optimal management

of other contributing factors (Milanini & Valcour, 2017). Therefore, our findings show that if milder forms of H-NCI are prevalent, primary healthcare workers may be able to identify these symptoms among PWH, if future training differentiate between H-NCI and other commonly occurring co-morbidities, such as depression.

The paucity of primary healthcare workers administering H-NCI screening tools is consistent with reports on mental health screening among HIV service providers in this context (Mall et al., 2012). Medical doctors were the only cadre that were aware of common H-NCI screening tools such as the International HIV Dementia scale, though they had never used a screening tool outside of their undergraduate training. All cadres were in favour of learning to administer a H-NCI screening tool, to improve patient outcomes at their facilities and agreed that it would be feasible to administer a tool at this level of care.

There is still controversy about the clinical utility of screening for H-NCI, especially in low-and-middle-income countries, as well as potential false positive diagnoses could cause increased anxiety among PWH (Nightingale et al., 2014; Winston & Spudich, 2020). There are also questions around which healthcare worker cadre should screen, who should be screened and when screening should occur, in lieu of the high patient volumes, staff and resource shortages. Our findings show that should screening at a primary healthcare level be deemed appropriate, healthcare workers considered a combined effort from all cadres to be the best approach toward integration of H-NCI screening. Mall et al. (2013) highlight that the burden of care often falls to non-clinical healthcare workers due to time constraints and linguistic similarities. Similarly, medical doctors in this study suggested that counsellors and nurses may be in a better position to ascertain important and accurate behavioural information during adherence counselling sessions or while patients wait to see a medical doctor, which could trigger the use of an H-NCI screening tool. In contrast, nurses in this study viewed medical doctors to be better suited to administer screening tools as patient

management is determined by clinical healthcare workers. Our findings highlight that adherence counsellors often referred patients when there were problems with memory or attention, suggesting that this cadre may be able to flag patients for screening and diagnostic confirmation by a medical doctor. Primary healthcare workers also suggested that on-going monitoring for neurocognitive decline among PWH with functional impairment could take place during routine, annual visits.

Although medical doctors, nurses and adherence counsellors predominantly provide healthcare to PWH, none had ever received training on H-NCI. There were mixed views on appropriate training methods among the different cadres. Previous H-NCI training targeting healthcare workers in South Africa are limited. In a Kenyan study, Cettomai et al. (2011) developed a one-day H-NCI training module for healthcare workers who were not medical doctors. This training utilised didactic lectures conducted by a trainer, group discussions and case studies (Cettomai et al., 2011). Several nurses and counsellors preferred traditional face-to-face workshops similar to the training conducted by Cettomai et al. (2011), while some medical doctors and nurses favoured online learning. There were a range of factors that influenced these preferences, including time, resources, and workload. On-line training requires access to a computer, access to the Internet as well as strong Internet connectivity, which can be costly and not always readily available or accessible in low-and-middle-income countries. Online training would, however, allow healthcare workers to access training at a convenient time without impacting on patient services. Face-to-face, didactic training have been widely recognised as a traditional approach to continued education present challenges as these sessions are hosted away from the facility for several hours at a time. As a result, healthcare workers would have difficulties attending due to patient volumes and staff shortages. Considering these challenges healthcare workers favoured brief training sessions

spread over several days or weeks. Determining the best method for training among primary healthcare workers in low-and-middle-income countries require further investigation.

4.7 Limitations

There were several methodological considerations in this study. Firstly, our data were collected at the healthcare facility, resulting in distractions or disruptions during the discussion. The initial FGDs could not exceed the scheduled weekly staff meeting time, which was 90 minutes, to allow staff to continue providing services to patients accessing care at the facility. In-depth interviews were conducted to supplement the brief FGDs. Finally, our findings rely on healthcare worker self-reports only, as we did not observe the practices of healthcare workers.

4.8 Recommendations

There is a need to disseminate information regarding the varying degrees of severity of H-NCI and the potential adverse outcomes experienced by PWH with functional impairment. Training targeting medical doctors, nurses and adherence counsellors focusing on H-NCI and skills to successfully use a readily available H-NCI tool, could have potential benefits in this setting. Our findings show all cadres desired training to implement H-NCI screening services to improve care. It is, however, unclear how screening for H-NCI should be implemented and distributed amongst the different primary healthcare cadres, thus requiring pilot research to explore the appropriateness of each of the three groups in administering an H-NCI screening tool. Assessments of feasibility and acceptability, reflective of current practices in a primary healthcare facility, may then be conducted to inform decision making for future programmes and potential integration into primary healthcare services.

4.9 Conclusion

There is limited knowledge of H-NCI screening tools among primary healthcare workers, and screening practices were uncommon. There is also a paucity in previous training provided to cadres providing frontline HIV healthcare services in South Africa. Our findings show that H-NCI training is desired, however there are few programmes available in this setting, especially for primary healthcare workers who do not receive specialist training. In-field training targeting healthcare workers in this setting would be useful in this setting to equip healthcare workers with knowledge to recognise the signs and symptoms H-NCI as well as the skills to administer screening tools at this level of care. Training healthcare workers providing services at a primary healthcare level, where most people living with HIV access care, would be useful to understand the feasibility of H-NCI screening at this level of care. This should be followed by research examining the appropriateness and acceptability of H-NCI screening among the various cadres providing services at these facilities to determine which cadres are best suited to administer an H-NCI screening tool.

Here I show that primary healthcare workers require knowledge to differentiate between common mental disorders and H-NCI. Similar to findings from Chapter 3, I highlight here that primary healthcare workers have had no previous experience in administering H-NCI screening tools to PWH. Several studies show that task-sharing of medical care is an appropriate approach to addressing personnel shortages in low- and middle-income countries. However, this has not been explored empirically to establish appropriateness of H-NCI screening and identification at this level of care. Further, suitable cadres have not been identified for task-sharing of H-NCI care in low- and middle-income countries.

References

- Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(1), 4-23. <https://doi.org/10.1007/s10488-010-0327-7>
- Alford, K., Banerjee, S., Nixon, E., O'Brien, C., Pounds, O., Butler, A., Elphick, C., Henshaw, P., Anderson, S., & Vera, J. H. (2019). Assessment and Management of HIV-Associated Cognitive Impairment: Experience from a Multidisciplinary Memory Service for People Living with HIV. *Brain Sci*, 9(2). <https://doi.org/10.3390/brainsci9020037>
- Anand, T. N., Joseph, L. M., Geetha, A. V., Prabhakaran, D., & Jeemon, P. (2019). Task sharing with non-physician health-care workers for management of blood pressure in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Glob Health*, 7(6), e761-e771. [https://doi.org/10.1016/S2214-109X\(19\)30077-4](https://doi.org/10.1016/S2214-109X(19)30077-4)
- Antinori, Arendt, G., Grant, I., Letendre, S., Muñoz-Moreno, J. A., Eggers, C., Brew, B., Brouillette, M.-J., & Bernal-Cano, F. (2012). Assessment, diagnosis, and treatment of HIV-associated neurocognitive disorder: a consensus report of the mind exchange program. *Clinical Infectious Diseases*, 56(7), 1004-1017. <https://doi.org/https://doi.org/10.1093/cid/cis975>
- Antinori, A., Arendt, G., Becker, J. T., Brew, B. J., Byrd, D. A., Cherner, M., Clifford, D. B., Cinque, P., Epstein, L. G., Goodkin, K., Gisslen, M., Grant, I., Heaton, R. K., Joseph, J., Marder, K., Marra, C. M., McArthur, J. C., Nunn, M., Price, R. W., . . . Wojna, V. E. (2007). Updated research nosology for HIV-associated neurocognitive disorders. *Neurology*, 69(18), 1789-1799. <https://doi.org/10.1212/01.WNL.0000287431.88658.8b>
- Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to research in education*. Cengage Learning.
- Aujla, W. (2020). Using a Vignette in Qualitative Research to Explore Police Perspectives of a Sensitive Topic: "Honor"-Based Crimes and Forced Marriages. *International Journal of Qualitative Methods*, 19, 1609406919898352. <https://doi.org/10.1177/1609406919898352>
- AVERT.org. (2018). *HIV and AIDS in South Africa*. Retrieved 06 September from <https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/south-africa>
- Becan, J. E., Bartkowski, J. P., Knight, D. K., Wiley, T. R. A., DiClemente, R., Ducharme, L., Welsh, W. N., Bowser, D., McCollister, K., Hiller, M., Spaulding, A. C., Flynn, P. M., Swartzendruber, A., Dickson, M. F., Fisher, J. H., & Aarons, G. A. (2018). A model for rigorously applying the Exploration, Preparation, Implementation, Sustainment (EPIS) framework in the design and measurement of a large scale collaborative multi-site study. *Health & Justice*, 6(1), 9. <https://doi.org/10.1186/s40352-018-0068-3>
- Berheto, T. M., Hinderaker, S. G., Senkoro, M., Tweya, H., Deressa, T., Getaneh, Y., & Gezahegn, G. (2018). Body and mind: retention in antiretroviral treatment care is improved by mental health training of care providers in Ethiopia. *BMC Public Health*, 18(1), 896. <https://doi.org/10.1186/s12889-018-5821-y>
- Bionghi, N., Daftary, A., Maharaj, B., Msibi, Z., Amico, K. R., Friedland, G., Orrell, C., Padayatchi, N., & O'Donnell, M. R. (2018). Pilot evaluation of a second-generation electronic pill box for adherence to Bedaquiline and antiretroviral therapy in drug-resistant TB/HIV co-infected patients in KwaZulu-Natal, South Africa. *BMC Infect Dis*, 18(1), 171. <https://doi.org/10.1186/s12879-018-3080-2>
- Blazar, E., Krishnan, V., & Mody, S. (2020). Education Theory Made Practical–Volume 4, Part 5: Miller's Pyramid. <https://icenetblog.royalcollege.ca/2020/03/03/education-theory-made-practical-volume-4-part-5/>
- Bloch, M., Kamminga, J., Jayewardene, A., Bailey, M., Carberry, A., Vincent, T., Quan, D., Maruff, P., Brew, B., & Cysique, L. A. (2016). A Screening Strategy for HIV-Associated Neurocognitive

- Disorders That Accurately Identifies Patients Requiring Neurological Review. *Clin Infect Dis*, 63(5), 687-693. <https://doi.org/10.1093/cid/ciw399>
- Braun, V., & Clarke, V. (2012). Thematic analysis. In Cooper (Ed.), *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. (Vol. 2 Research Designs, pp. 57-71). American Psychological Association. <https://doi.org/10.1037/13620-004>
- Breuer, E., Myer, L., Struthers, H., & Joska, J. A. (2011). HIV/AIDS and mental health research in sub-Saharan Africa: a systematic review. *African Journal of AIDS Research*, 10(2), 101-122. <https://doi.org/10.2989/16085906.2011.593373>
- Breuer, E., Stoloff, K., Myer, L., Seedat, S., Stein, D. J., & Joska, J. (2012). Reliability of the lay adherence counsellor administered substance abuse and mental illness symptoms screener (SAMISS) and the International HIV Dementia Scale (IHDS) in a primary care HIV clinic in Cape Town, South Africa. *AIDS and Behavior* 16(6), 1464-1471. <https://doi.org/10.1007/s10461-011-0067-z>
- Campbell, C., & Baernholdt, M. (2016). Community health workers' palliative care learning needs and training: results from a partnership between a US university and a rural community organization in Mpumalanga Province, South Africa. *Journal of Health Care for the Poor and Underserved*, 27(2), 440-449. <https://doi.org/10.1353/hpu.2016.0078>
- Carter, S. L., Rourke, S. B., Murji, S., Shore, D., & Rourke, B. P. (2003). Cognitive complaints, depression, medical symptoms, and their association with neuropsychological functioning in HIV infection: a structural equation model analysis. *Neuropsychology*, 17(3), 410. <https://doi.org/https://doi.org/10.1037/0894-4105.17.3.410>
- Cettomai, D., Kwasa, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *J Neurol Sci*, 307(1-2), 92-96. <https://doi.org/10.1016/j.jns.2011.05.005>
- Clifford, D. B., & Ances, B. M. (2013). HIV-associated neurocognitive disorder. *Lancet Infect Dis*, 13(11), 976-986. [https://doi.org/10.1016/S1473-3099\(13\)70269-X](https://doi.org/10.1016/S1473-3099(13)70269-X)
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- de Jager, C. A., Joska, J. A., Hoffman, M., Borochowitz, K. E., & Combrinck, M. I. (2015). Dementia in rural South Africa: A pressing need for epidemiological studies. *S Afr Med J*, 105(3), 189-190. <https://doi.org/10.7196/samj.8904>
- Deeks, S. G., Lewin, S. R., & Havlir, D. V. (2013). The end of AIDS: HIV infection as a chronic disease. *Lancet*, 382(9903), 1525-1533. [https://doi.org/10.1016/S0140-6736\(13\)61809-7](https://doi.org/10.1016/S0140-6736(13)61809-7)
- Department of Health. (2013). *National mental health policy framework and strategic plan 2013–2020*. Government Printers Pretoria
- Desveaux, L., Saragosa, M., Rogers, J., Bevan, L., Loshak, H., Moser, A., Feldman, S., Regier, L., Jeffs, L., & Ivers, N. (2017). Improving the appropriateness of antipsychotic prescribing in nursing homes: a mixed-methods process evaluation of an academic detailing intervention. *Implementation Science*, 12(1), 1-14. <https://doi.org/10.1186/s13012-017-0602-z>
- Dos Santos, M., & Wolvaardt, G. (2016). Integrated intervention for mental health co-morbidity in HIV-positive individuals: A public health assessment. *African Journal of AIDS Research*, 15(4), 325-331. <https://doi.org/10.2989/16085906.2016.1229683>
- Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology & Community Health*, 52(6), 377-384. <https://doi.org/10.1136/jech.52.6.377>
- Dube, F. N., & Uys, L. R. (2016). Integrating mental health care services in primary health care clinics: a survey of primary health care nurses' knowledge, attitudes and beliefs. *South African Family Practice*, 58(3), 119-125. <https://doi.org/10.1080/20786190.2016.1191747>

- Duffy, M., Sharer, M., Cornman, H., Pearson, J., Pitorak, H., & Fullem, A. (2017). Integrating mental health and HIV services in Zimbabwean communities: a nurse and community-led approach to reach the most vulnerable. *Journal of the Association of Nurses in AIDS Care*, 28(2), 186-198. <https://doi.org/10.1016/j.jana.2015.09.003>
- Fairall, L., Petersen, I., Zani, B., Folb, N., Georgeu-Pepper, D., Selohilwe, O., Petrus, R., Mntambo, N., Bhana, A., Lombard, C., Bachmann, M., Lund, C., Hanass-Hancock, J., Chisholm, D., McCrone, P., Carmona, S., Gaziano, T., Levitt, N., Kathree, T., & Thornicroft, G. (2018). Collaborative care for the detection and management of depression among adults receiving antiretroviral therapy in South Africa: study protocol for the CobALT randomised controlled trial. *Trials*, 19(1), 193. <https://doi.org/10.1186/s13063-018-2517-7>
- Friedrich-Nel, H., De Jager, L., & Nel, M. (2005). An assessment model in outcomes-based education and training (OBET) for health sciences and technology in South Africa. *South African Journal of Higher Education*, 19(5), 880-899.
- Garland, A. F., Kruse, M., & Aarons, G. A. (2003). Clinicians and outcome measurement: what's the use? *The journal of behavioral health services & research*, 30(4), 393-405. <https://doi.org/10.1007/BF02287427>.
- Ghosh, A. K., Sarkar, A., & Mitsuya, H. (2017). HIV-Associated Neurocognitive Disorder (HAND) and the Prospect of Brain-Penetrating Protease Inhibitors for Antiretroviral Treatment. *Med Res Arch*, 5(4). <https://www.ncbi.nlm.nih.gov/pubmed/29984302>
- Giguère, K., Eaton, J. W., Marsh, K., Johnson, L. F., Johnson, C. C., Ehui, E., Jahn, A., Wanyeki, I., Mbofana, F., & Bakiono, F. (2021). Trends in knowledge of HIV status and efficiency of HIV testing services in sub-Saharan Africa, 2000–20: a modelling study using survey and HIV testing programme data. *The Lancet HIV*, 8(5), e284-e293. [https://doi.org/https://doi.org/10.1016/S2352-3018\(20\)30315-5](https://doi.org/https://doi.org/10.1016/S2352-3018(20)30315-5)
- Gourlay, A., Mshana, G., Birdthistle, I., Bulugu, G., Zaba, B., & Urassa, M. (2014). Using vignettes in qualitative research to explore barriers and facilitating factors to the uptake of prevention of mother-to-child transmission services in rural Tanzania: a critical analysis. *BMC Med Res Methodol*, 14(1), 21. <https://doi.org/10.1186/1471-2288-14-21>
- Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2020). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS Care*, 1-5. <https://doi.org/10.1080/09540121.2020.1736256>
- Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2021). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS care*, 33(4), 468-472. <https://doi.org/10.1080/09540121.2020.1736256>
- Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of biomedical informatics*, 42(2), 377-381. <https://doi.org/https://doi.org/10.1016/j.jbi.2008.08.010>
- Heaton, R. K., Clifford, D. B., Franklin, D. R., Jr., Woods, S. P., Ake, C., Vaida, F., Ellis, R. J., Letendre, S. L., Marcotte, T. D., Atkinson, J. H., Rivera-Mindt, M., Vigil, O. R., Taylor, M. J., Collier, A. C., Marra, C. M., Gelman, B. B., McArthur, J. C., Morgello, S., Simpson, D. M., . . . Group, C. (2010). HIV-associated neurocognitive disorders persist in the era of potent antiretroviral therapy: CHARTER Study. *Neurology*, 75(23), 2087-2096. <https://doi.org/10.1212/WNL.0b013e318200d727>
- Heaton, R. K., Franklin, D. R., Ellis, R. J., McCutchan, J. A., Letendre, S. L., Leblanc, S., Corkran, S. H., Duarte, N. A., Clifford, D. B., Woods, S. P., Collier, A. C., Marra, C. M., Morgello, S., Mindt, M. R., Taylor, M. J., Marcotte, T. D., Atkinson, J. H., Wolfson, T., Gelman, B. B., . . . Group, H. (2011). HIV-associated neurocognitive disorders before and during the era of combination

- antiretroviral therapy: differences in rates, nature, and predictors. *J Neurovirol*, 17(1), 3-16. <https://doi.org/10.1007/s13365-010-0006-1>
- Heaton, R. K., Marcotte, T. D., Mindt, M. R., Sadek, J., Moore, D. J., Bentley, H., McCutchan, J. A., Reicks, C., Grant, I., & Group, H. (2004). The impact of HIV-associated neuropsychological impairment on everyday functioning. *J Int Neuropsychol Soc*, 10(3), 317-331. <https://doi.org/10.1017/S1355617704102130>
- Heydari, M. R., Taghva, F., Amini, M., & Delavari, S. (2019). Using Kirkpatrick's model to measure the effect of a new teaching and learning methods workshop for health care staff. *BMC Res Notes*, 12(1), 388. <https://doi.org/10.1186/s13104-019-4421-y>
- Hunter, D., McCallum, J., & Howes, D. (2019). Defining exploratory-descriptive qualitative (EDQ) research and considering its application to healthcare. *Journal of Nursing and Health Care*, 4(1). <http://dl6.globalstf.org/index.php/jnhc/article/view/1975>
- IBM-Corp. (2017). IBM SPSS Statistics for Windows, Version 25.0. In. Armonk, NY: IBM Corp.
- Jacobs, Y., Myers, B., van der Westhuizen, C., Brooke-Sumner, C., & Sorsdahl, K. (2021). Task Sharing or Task Dumping: Counsellors Experiences of Delivering a Psychosocial Intervention for Mental Health Problems in South Africa. *Community Ment Health J*, 57(6), 1082-1093. <https://doi.org/10.1007/s10597-020-00734-0>
- Jenkins, R., Kiima, D., Njenga, F., Okonji, M., Kingora, J., Kathuku, D., & Lock, S. (2010). Integration of mental health into primary care in Kenya. *World Psychiatry*, 9(2), 118. <https://doi.org/10.1002/j.2051-5545.2010.tb00289.x>
- Jenkins, R., Othieno, C., Okeyo, S., Kaseje, D., Aruwa, J., Oyugi, H., Bassett, P., & Kauye, F. (2013). Short structured general mental health in service training programme in Kenya improves patient health and social outcomes but not detection of mental health problems-a pragmatic cluster randomised controlled trial. *International Journal of Mental Health Systems*, 7(1), 25. <https://doi.org/http://www.ijmhs.com/content/7/1/25>
- Jessani, N. S., Rohwer, A., Schmidt, B. M., & Delobelle, P. (2021). Integrated knowledge translation to advance noncommunicable disease policy and practice in South Africa: application of the Exploration, Preparation, Implementation, and Sustainment (EPIS) framework. *Health Res Policy Syst*, 19(1), 82. <https://doi.org/10.1186/s12961-021-00733-x>
- John, M.-S., Sibuma, B., Wunnavu, S., Anggoro, F., & Dubosarsky, M. (2018). An Iterative Participatory Approach to Developing an Early Childhood Problem-Based STEM Curriculum. *Grantee Submission*, 3(3). <https://doi.org/https://doi.org/10.20897/ejsteme/3867>
- Johnston, J. M., Leung, G. M., Fielding, R., Tin, K. Y., & Ho, L. M. (2003). The development and validation of a knowledge, attitude and behaviour questionnaire to assess undergraduate evidence-based practice teaching and learning. *Med Educ*, 37(11), 992-1000. <https://doi.org/10.1046/j.1365-2923.2003.01678.x>
- Joska, & Sorsdahl, K. (2012). Integrating mental health into general health care: lessons from HIV. *African journal of psychiatry*, 15(6), 420-423. <http://dx.doi.org/10.4314/ajpsy.v15i6.52>
- Joska, J. A., Dreyer, A. J., Nightingale, S., Combrinck, M. I., & De Jager, C. A. (2019). Prevalence of HIV-1 Infection in an elderly rural population and associations with neurocognitive impairment. *Aids*, 33(11), 1765-1771. <https://doi.org/10.1097/QAD.0000000000002257>
- Joska, J. A., Witten, J., Thomas, K. G., Robertson, C., Casson-Crook, M., Roosa, H., Creighton, J., Lyons, J., McArthur, J., & Sacktor, N. C. (2016). A Comparison of Five Brief Screening Tools for HIV-Associated Neurocognitive Disorders in the USA and South Africa. *AIDS Behav*, 20(8), 1621-1631. <https://doi.org/10.1007/s10461-016-1316-y>
- Kamal, S., Locatelli, I., Wandeler, G., Sehhat, A., Bugnon, O., Metral, M., Du Pasquier, R., Gutbrod, K., Cavassini, M., Schneider, M. P., & and the Swiss, H. I. V. C. S. (2017). The Presence of Human Immunodeficiency Virus-Associated Neurocognitive Disorders Is Associated With a Lower Adherence to Combined Antiretroviral Treatment. *Open Forum Infect Dis*, 4(2), ofx070. <https://doi.org/10.1093/ofid/ofx070>

- Kirkpatrick, D. L., & Craig, R. (1967). Evaluation of training. *Evaluation of Short-Term training in Rehabilitation. Monograph*(3), 35-56.
- Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners*. Sage Publications Limited.
- Kwasa, J., Cettomai, D., Lwanya, E., Osiemo, D., Oyaro, P., Birbeck, G. L., Price, R. W., Bukusi, E. A., Cohen, C. R., & Meyer, A. C. (2012). Lessons learned developing a diagnostic tool for HIV-associated dementia feasible to implement in resource-limited settings: pilot testing in Kenya. *PLoS One*, 7(3), e32898. <https://doi.org/10.1371/journal.pone.0032898>
- Letendre, S. (2011). Central nervous system complications in HIV disease: HIV-associated neurocognitive disorder. *Topics in antiviral medicine*, 19(4), 137.
- Liboro, R. M., Ibañez-Carrasco, F., Rourke, S. B., Eaton, A., Medina, C., Pugh, D., Rae, A., Ross, L. E., & Shuper, P. A. (2018). Barriers to addressing HIV-Associated neurocognitive disorder (HAND): Community-based service provider perspectives. *Journal of HIV/AIDS & Social Services*, 17(3), 209-223. <https://doi.org/10.1080/15381501.2018.1431168>
- Liu, G., Jack, H., Piette, A., Mangezi, W., Machando, D., Rwafa, C., Goldenberg, M., & Abas, M. (2016). Mental health training for health workers in Africa: a systematic review. *Lancet Psychiatry*, 3(1), 65-76. [https://doi.org/10.1016/S2215-0366\(15\)00379-X](https://doi.org/10.1016/S2215-0366(15)00379-X)
- Long, L. C., Rosen, S. B., Brennan, A., Moyo, F., Sauls, C., Evans, D., Modi, S. L., Sanne, I., & Fox, M. P. (2016). Treatment outcomes and costs of providing antiretroviral therapy at a primary health clinic versus a hospital-based HIV clinic in South Africa. *PLoS One*, 11(12), e0168118. <https://doi.org/https://doi.org/10.1371/journal.pone.0168118>
- Lopez, K. A., & Willis, D. G. (2004). Descriptive Versus Interpretive Phenomenology: Their Contributions to Nursing Knowledge. *Qualitative health research*, 14(5), 726-735. <https://doi.org/10.1177/1049732304263638>
- Lund, C., Schneider, M., Davies, T., Nyatsanza, M., Honikman, S., Bhana, A., Bass, J., Bolton, P., Dewey, M., Joska, J., Kagee, A., Myer, L., Petersen, I., Prince, M., Stein, D. J., Thornicroft, G., Tomlinson, M., Alem, A., & Susser, E. (2014). Task sharing of a psychological intervention for maternal depression in Khayelitsha, South Africa: study protocol for a randomized controlled trial. *Trials*, 15(1), 457. <https://doi.org/10.1186/1745-6215-15-457>
- Lyon, A. R., Stirman, S. W., Kerns, S. E., & Bruns, E. J. (2011). Developing the mental health workforce: review and application of training approaches from multiple disciplines. *Adm Policy Ment Health*, 38(4), 238-253. <https://doi.org/10.1007/s10488-010-0331-y>
- Mall, S., Sorsdahl, K., Struthers, H., & Joska, J. A. (2013). Mental health in primary human immunodeficiency virus care in South Africa: a study of provider knowledge, attitudes, and practice. *J Nerv Ment Dis*, 201(3), 196-201. <https://doi.org/10.1097/NMD.0b013e3182845c24>
- Mall, S., Sorsdahl, K., Swartz, L., & Joska, J. (2012). "I understand just a little..." Perspectives of HIV/AIDS service providers in South Africa of providing mental health care for people living with HIV/AIDS. *AIDS care*, 24(3), 319-323. <https://doi.org/10.1080/09540121.2011.608790>
- Meade, C. S., Conn, N. A., Skalski, L. M., & Safren, S. A. (2011). Neurocognitive impairment and medication adherence in HIV patients with and without cocaine dependence. *Journal of behavioral medicine*, 34(2), 128-138. <https://doi.org/https://dx.doi.org/10.1007%2Fs10865-010-9293-5>
- Meyer, A.-C. L., Boscardin, W. J., Kwasa, J. K., & Price, R. W. (2013). Is it time to rethink how neuropsychological tests are used to diagnose mild forms of HIV-associated neurocognitive disorders? Impact of false-positive rates on prevalence and power. *Neuroepidemiology*, 41(3-4), 208-216. <https://doi.org/https://doi.org/10.1159/000354629>
- Milanini, B., & Valcour, V. (2017). Differentiating HIV-Associated Neurocognitive Disorders From Alzheimer's Disease: an Emerging Issue in Geriatric NeuroHIV. *Curr HIV/AIDS Rep*, 14(4), 123-132. <https://doi.org/10.1007/s11904-017-0361-0>

- Mogambery, J. C., Dawood, H., Wilson, D., & Moodley, A. (2017). HIV-associated neurocognitive disorder in a KwaZulu-Natal HIV clinic: A prospective study. *2017*, *18*(1).
<https://doi.org/10.4102/sajhivmed.v18i1.732>
- Mohamed, A. A., Oduor, C., & Kinyanjui, D. (2020). HIV-associated neurocognitive disorders at Moi teaching and referral hospital, Eldoret, Kenya. *BMC Neurology*, *20*(1), 280.
<https://doi.org/10.1186/s12883-020-01857-3>
- Mohamoud, G., Mash, B., Merali, M., Orwa, J., & Mahoney, M. (2018). Perceptions regarding the scope of practice of family doctors amongst patients in primary care settings in Nairobi. *Afr J Prim Health Care Fam Med*, *10*(1), e1-e7. <https://doi.org/10.4102/phcfm.v10i1.1818>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Group, P. (2010). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Int J Surg*, *8*(5), 336-341.
<https://doi.org/10.1016/j.ijsu.2010.02.007>
- Mohieldein, A. H. (2017). Outcome-based approach to medical education towards academic programmes accreditation: A review article. *J Pak Med Assoc*, *67*(3), 454-460.
- Morley, D., McNamara, P., Kennelly, S., McMahon, G., & Bergin, C. (2013). Limitations to the identification of HIV-associated neurocognitive disorders in clinical practice. *HIV Med*, *14*(8), 497-502. <https://doi.org/10.1111/hiv.12036>
- Moullin, J. C., Dickson, K. S., Stadnick, N. A., Rabin, B., & Aarons, G. A. (2019). Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework. *Implementation Science*, *14*(1), 1. <https://doi.org/10.1186/s13012-018-0842-6>
- Munsami, A., Dreyer, A. J., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022). Mental and cognitive healthcare training targeting primary healthcare workers providing HIV services in Africa: a scoping review. *AIDS care*, 1-9.
- Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. (2020). HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *Journal of Community Health*, 1-7.
- Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. (2021). HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *J Community Health*, *46*(3), 538-544. <https://doi.org/10.1007/s10900-020-00895-9>
- Munsami, A., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022). Integrating HIV-Associated Neurocognitive Impairment Screening within Primary Healthcare Facilities: A Pilot Training Intervention. *Nursing Research and Practice*, 2022.
- Muthuri, S., Wachira, L.-J., Leblanc, A., Francis, C., Sampson, M., Onywera, V., & Tremblay, M. (2014). Temporal Trends and Correlates of Physical Activity, Sedentary Behaviour, and Physical Fitness among School-Aged Children in Sub-Saharan Africa: A Systematic Review. *Int J Environ Res Public Health*, *11*, 3327-3359. <https://doi.org/10.3390/ijerph110303327>
- Nightingale, S., Dreyer, A. J., Saylor, D., Gisslén, M., Winston, A., & Joska, J. A. (2021). Moving on From HAND: Why We Need New Criteria for Cognitive Impairment in Persons Living With Human Immunodeficiency Virus and a Proposed Way Forward. *Clinical Infectious Diseases*, *73*(6), 1113-1118. <https://doi.org/10.1093/cid/ciab366>
- Nightingale, S., Winston, A., Letendre, S., Michael, B. D., McArthur, J. C., Khoo, S., & Solomon, T. (2014). Controversies in HIV-associated neurocognitive disorders. *Lancet Neurol*, *13*(11), 1139-1151. [https://doi.org/10.1016/S1474-4422\(14\)70137-1](https://doi.org/10.1016/S1474-4422(14)70137-1)
- Norcini, J. J. (2003). ABC of learning and teaching in medicine. *Work based assessment. BMJ*, *326*(7392), 753-755. <https://doi.org/10.1136/bmj.326.7392.753>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis. *International Journal of Qualitative Methods*, *16*(1), 1609406917733847.
<https://doi.org/10.1177/1609406917733847>
- Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). *Rayyan—a web and mobile app for systematic reviews. Systematic Reviews*, *5* (210).

- Parry, S., Zetler, S., Kentridge, A., Petrak, J., & Barber, T. (2017). Simple screening for neurocognitive impairment in routine HIV outpatient care: is it deliverable? *AIDS care*, 29(10), 1275-1279. <https://doi.org/10.1080/09540121.2017.1300632>
- Peters, M., Godfrey, C., McInerney, P., Soares, C., Khalil, H., & Parker, D. (2015). The Joanna Briggs Institute reviewers' manual 2015: methodology for JBI scoping reviews.
- Remien, R. H., Stirratt, M. J., Nguyen, N., Robbins, R. N., Pala, A. N., & Mellins, C. A. (2019). Mental health and HIV/AIDS: the need for an integrated response. *Aids*, 33(9), 1411-1420. <https://doi.org/10.1097/QAD.0000000000002227>
- Robbins, R. N., Remien, R. H., Mellins, C. A., Joska, J. A., & Stein, D. J. (2011). Screening for HIV-associated dementia in South Africa: potentials and pitfalls of task-shifting. *AIDS Patient Care STDS*, 25(10), 587-593. <https://doi.org/10.1089/apc.2011.0154>
- Robertson, A. C., Fowler, L. C., Niconchuk, J., Kreger, M., Rickerson, E., Sadovnikoff, N., Hepner, D. L., Bader, A. M., McEvoy, M. D., & Urman, R. D. (2019). Application of Kern's 6-Step Approach in the Development of a Novel Anesthesiology Curriculum for Perioperative Code Status and Goals of Care Discussions. *J Educ Perioper Med*, 21(1), E634. <https://doi.org/https://doi.org/10.3171/2020.4.JNS201056>
- Robertson, F. C., Lippa, L., & Broekman, M. L. (2020). Task shifting and task sharing for neurosurgeons amidst the COVID-19 pandemic. *Journal of neurosurgery*, 133(1), 5-7. <https://doi.org/https://doi.org/10.3171/2020.4.JNS201056>
- Sacktor, N. (2018). Changing clinical phenotypes of HIV-associated neurocognitive disorders. *J Neurovirol*, 24(2), 141-145. <https://doi.org/10.1007/s13365-017-0556-6>
- Sacktor, N. C., Wong, M., Nakasujja, N., Skolasky, R. L., Selnes, O. A., Musisi, S., Robertson, K., McArthur, J. C., Ronald, A., & Katabira, E. (2005). The International HIV Dementia Scale: a new rapid screening test for HIV dementia. *Aids*, 19(13), 1367-1374. <https://doi.org/10.1097/01.aids.0000180790.77379.3a>
- Sampson, H., & Johannessen, I. A. (2020). Turning on the tap: the benefits of using 'real-life' vignettes in qualitative research interviews. *Qualitative Research*, 20(1), 56-72. <https://doi.org/https://doi.org/10.1177%2F1468794118816618>
- Sanford, R., Strain, J., Dadar, M., Maranzano, J., Bonnet, A., Mayo, N. E., Scott, S. C., Fellows, L. K., Ances, B. M., & Collins, D. L. (2019). HIV infection and cerebral small vessel disease are independently associated with brain atrophy and cognitive impairment. *Aids*, 33(7), 1197-1205. <https://doi.org/10.1097/QAD.0000000000002193>
- Schaefer, L. A., Thakur, T., & Meager, M. R. (2018). Neuropsychological Assessment.
- Sibeko, G., Milligan, P. D., Roelofse, M., Molefe, L., Jonker, D., Ipser, J., Lund, C., & Stein, D. J. (2018). Piloting a mental health training programme for community health workers in South Africa: an exploration of changes in knowledge, confidence and attitudes. *BMC Psychiatry*, 18(1), 191. <https://doi.org/10.1186/s12888-018-1772-1>
- Sidebotham, M., Walters, C., Chipperfield, J., & Gamble, J. (2017). Midwifery participatory curriculum development: Transformation through active partnership. *Nurse education in practice*, 25, 5-13. <https://doi.org/https://doi.org/10.1016/j.nepr.2017.04.010>
- Simioni, S., Cavassini, M., Annoni, J. M., Rimbault Abraham, A., Bourquin, I., Schiffer, V., Calmy, A., Chave, J. P., Giacobini, E., Hirschel, B., & Du Pasquier, R. A. (2010). Cognitive dysfunction in HIV patients despite long-standing suppression of viremia. *Aids*, 24(9), 1243-1250. <https://doi.org/10.1097/QAD.0b013e3283354a7b>
- Singer, E. J., Valdes-Sueiras, M., Commins, D., & Levine, A. (2010). Neurologic presentations of AIDS. *Neurol Clin*, 28(1), 253-275. <https://doi.org/10.1016/j.ncl.2009.09.018>
- Smidt, A., Balandin, S., Sigafoos, J., & Reed, V. A. (2009). The Kirkpatrick model: A useful tool for evaluating training outcomes. *Journal of Intellectual and Developmental Disability*, 34(3), 266-274. <https://doi.org/https://doi.org/10.1080/13668250903093125>
- Smith, S. L., Franke, M. F., Rusangwa, C., Mukasakindi, H., Nyirandagijimana, B., Bienvenu, R., Uwimana, E., Uwamaliya, C., Ndikubwimana, J. S., Dorcas, S., Mpunga, T., Misago, C. N.,

- Iyamuremye, J. D., Dusabeyezu, J. D., Mohand, A. A., Atwood, S., Osrow, R. A., Aldis, R., Daimyo, S., . . . Raviola, G. J. (2020). Outcomes of a primary care mental health implementation program in rural Rwanda: A quasi-experimental implementation-effectiveness study. *PLoS One*, 15(2), e0228854.
<https://doi.org/10.1371/journal.pone.0228854>
- Smith, S. L., Kayiteshonga, Y., Misago, C. N., Iyamuremye, J. D., Dusabeyezu, J. d. A., Mohand, A. A., Osrow, R. A., Anatole, M., Daimyo, S., & Uwimana, E. (2017). Integrating mental health care into primary care: the case of one rural district in Rwanda. *Intervention*, 15(2), 136-150.
- StatsSA. (2021). *Mid-year population estimates*
- Sweet, L. R., & Palazzi, D. L. (2015). Application of Kern's Six-step approach to curriculum development by global health residents. *Educ Health (Abingdon)*, 28(2), 138-141.
<https://doi.org/10.4103/1357-6283.170124>
- Tan, K., Chong, M. C., Subramaniam, P., & Wong, L. P. (2018). The effectiveness of outcome based education on the competencies of nursing students: A systematic review. *Nurse education today*, 64, 180-189. <https://doi.org/https://doi.org/10.1016/j.nedt.2017.12.030>
- Tariq, M., Shamim, M. S., Subhan, A., Saeed, S., Rehman, Z., Virani, B., Ashraf, A., Qamar, I., Qamar, F., & Mohsin, R. (2017). Re-structuring a University Hospital's Internship Program Using Kern's Six-Step Model of Instructional Design. *MedEdPublish*, 6.
<https://doi.org/https://doi.org/10.15694/mep.2017.000038>
- Terpstra, A. R., Worthington, C., Ibáñez-Carrasco, F., O'Brien, K. K., Yamamoto, A., Chan Carusone, S., Baltzer Turje, R., McDougall, P., Granger, W., & Thompson, V. (2018). "I'm just forgetting and I don't know why": Exploring how people living with HIV-associated neurocognitive disorder view, manage, and obtain support for their cognitive difficulties. *Qualitative health research*, 28(6), 859-872.
- Thaler, N. S., Sayegh, P., Arentoft, A., Thames, A. D., Castellon, S. A., & Hinkin, C. H. (2015). Increased neurocognitive intra-individual variability is associated with declines in medication adherence in HIV-infected adults. *Neuropsychology*, 29(6), 919.
<https://doi.org/10.1037/neu0000191>
- Thomas, P. A., Kern, D. E., Hughes, M. T., & Chen, B. Y. (2016). *Curriculum development for medical education: a six-step approach* (D. E. K. Patricia A. Thomas, Mark T. Hughes, Belinda Y. Chen, Ed.). JHU Press.
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*, 19(6), 349-357. <https://doi.org/10.1093/intqhc/mzm042>
- Tshililo, A. R., Mangena-Netshikweta, L., Nemathaga, L. H., & Maluleke, M. (2019). Challenges of primary healthcare nurses regarding the integration of HIV and AIDS services into primary healthcare in Vhembe district of Limpopo province, South Africa. *Curationis*, 42(1), e1-e6.
<https://doi.org/10.4102/curationis.v42i1.1849>
- UNAIDS. (2020). *Country Factsheets : South Africa 2020*
<https://www.unaids.org/en/regionscountries/countries/southafrica>
- UNAIDS. (2021). *Fact Sheet World AIDS Day 2021* (UNAIDS_FactSheet_en. pdf (accessed on 7 April 2022), Issue. Available online: https://www.unaids.org/sites/default/files/media_asset
- Underwood, J., De Francesco, D., Cole, J. H., Caan, M. W. A., van Zoest, R. A., Schmand, B. A., Sharp, D. J., Sabin, C. A., Reiss, P., Winston, A., Collaboration, C. O. i. R. t. A., the, P., & clinical Observations in PePle over fift, Y. S. G. (2019). Validation of a Novel Multivariate Method of Defining HIV-Associated Cognitive Impairment. *Open Forum Infect Dis*, 6(6), ofz198.
<https://doi.org/10.1093/ofid/ofz198>
- Underwood, J., & Winston, A. (2016). Guidelines for Evaluation and Management of Cognitive Disorders in HIV-Positive Individuals. *Current HIV/AIDS Reports*, 13(5), 235-240.
<https://doi.org/10.1007/s11904-016-0324-x>

- Valcour, V., Sithinamsuwan, P., Letendre, S., & Ances, B. (2011). Pathogenesis of HIV in the central nervous system. *Curr HIV/AIDS Rep*, 8(1), 54-61. <https://doi.org/10.1007/s11904-010-0070-4>
- Vance, D. E., Fazeli, P. L., Ball, D. A., Slater, L. Z., & Ross, L. A. (2014). Cognitive functioning and driving simulator performance in middle-aged and older adults with HIV. *J Assoc Nurses AIDS Care*, 25(2), e11-26. <https://doi.org/10.1016/j.jana.2013.12.001>
- Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., & Vandenbroucke, J. P. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Annals of internal medicine*, 147(8), 573-577. <https://doi.org/10.7326/0003-4819-147-8-200710160-00010>
- Wagman, P., Håkansson, C., & Jonsson, H. (2015). Occupational balance: A scoping review of current research and identified knowledge gaps. *Journal of Occupational Science*, 22(2), 160-169. <https://doi.org/10.1080/14427591.2014.986512>
- Wang, Y., Liu, M., Lu, Q., Farrell, M., Lappin, J. M., Shi, J., Lu, L., & Bao, Y. (2020). Global prevalence and burden of HIV-associated neurocognitive disorder: A meta-analysis. *Neurology*, 95(19), e2610-e2621. <https://doi.org/10.1212/WNL.00000000000010752>
- Wass, V., Van der Vleuten, C., Shatzer, J., & Jones, R. (2001). Assessment of clinical competence. *Lancet*, 357(9260), 945-949. [https://doi.org/10.1016/S0140-6736\(00\)04221-5](https://doi.org/10.1016/S0140-6736(00)04221-5)
- Watkins, C. C., & Treisman, G. J. (2015). Cognitive impairment in patients with AIDS—prevalence and severity. *HIV/AIDS (Auckland, NZ)*, 7, 35. <https://doi.org/10.2147/HIV.S39665>
- Whitehead, A. L., Julious, S. A., Cooper, C. L., & Campbell, M. J. (2016). Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable. *Stat Methods Med Res*, 25(3), 1057-1073. <https://doi.org/10.1177/0962280215588241>
- Willcox, M. L., Peersman, W., Daou, P., Diakit , C., Bajunirwe, F., Mubangizi, V., Mahmoud, E. H., Moosa, S., Phaladze, N., & Nkomazana, O. (2015). Human resources for primary health care in sub-Saharan Africa: progress or stagnation? *Human Resources for Health*, 13(1), 1-11. <https://doi.org/10.1186/s12960-015-0073-8>
- Williams, I., Churchill, D., Anderson, J., Boffito, M., Bower, M., Cairns, G., Cwynarski, K., Edwards, S., & Fidler, S. (2014). British HIV Association guidelines for the treatment of HIV-1-positive adults with antiretroviral therapy 2012 (Updated November 2013. All changed text is cast in yellow highlight.). *HIV medicine*, 15, 1-6. <https://doi.org/10.1111/hiv.12119>
- Winston, A., & Spudich, S. (2020). Cognitive disorders in people living with HIV. *Lancet HIV*, 7(7), e504-e513. [https://doi.org/10.1016/S2352-3018\(20\)30107-7](https://doi.org/10.1016/S2352-3018(20)30107-7)
- Witten, J. A. (2015). *Validation of the CAT rapid: a smartphone screening tool for HIV-associated neurocognitive disorders in South Africa* [University of Cape Town].

Aujla, W. (2020). Using a vignette in qualitative research to explore police perspectives of a sensitive topic: “Honor”- based crimes and forced marriages. *International Journal of Qualitative Methods*, 19, 1–10. <https://doi.org/10.1177/1609406919898352>

Braun, V., & Clarke, V. (2012). Thematic analysis. In Cooper (Ed.), *APA handbook of research methods in psychology. Vol 2 Research designs: Quantitative, qualitative, neuropsychological, and biological. 2 Research Designs* (pp. 57–71). American Psychological Association.

Carter, S. L., Rourke, S. B., Murji, S., Shore, D., & Rourke, B. P. (2003). Cognitive complaints, depression, medical symptoms, and their association with neuropsychological functioning in HIV infection: A structural equation model analysis. *Neuropsychology*, 17(3), 410–419. <https://doi.org/10.1037/0894-4105.17.3.410>

Cettomai, D., Kwasa, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *Journal of the Neurological Sciences*, 307(1–2), 92–96. <https://doi.org/10.1016/j.jns.2011.05.005>

de Jager, C. A., Joska, J. A., Hoffman, M., Borochoowitz, K. E., & Combrinck, M. I. (2015). Dementia in rural South Africa: A pressing need for epidemiological studies. *South African Medical Journal*, 105(3), 189–190. <https://doi.org/10.7196/samj.8904>

Department of Health (2013). National mental health policy framework and strategic plan 2013–2020. Government Printers Pretoria.

Dube, F. N., & Uys, L. R. (2016). Integrating mental health care services in primary health care clinics: A survey of primary health care nurses' knowledge, attitudes and beliefs. *South African Family Practice*, 58(3), 119–125. <https://doi.org/10.1080/20786190.2016.1191747>

Gourlay, A., Mshana, G., Birdthistle, I., Bulugu, G., Zaba, B., & Urassa, M. (2014). Using vignettes in qualitative research to explore barriers and facilitating factors to the uptake of prevention of mother-to-child transmission services in rural Tanzania: A critical analysis. *BMC Medical Research Methodology*, 14(1), 21. <https://doi.org/10.1186/1471-2288-14-21>

Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., et al. (2020). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A Short Report. *AIDS Care* 33(4), 1–5. <https://doi.org/10.1080/09540121.2020.1736256>

Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2021). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS Care*, 33(4), 468–472. <https://doi.org/10.1080/09540121.2020.1736256>

Heaton, R. K., Franklin, D. R., Ellis, R. J., McCutchan, J. A., Letendre, S. L., Leblanc, S., Corkran, S. H., Duarte, N. A., Clifford, D. B., Woods, S. P., Collier, A. C., Marra, C. M., Morgello, S., Mindt, M. R., Taylor, M. J., Marcotte, T. D.,

Atkinson, J. H., Wolfson, T., Gelman, B. B., & Grant, I. (2011). HIV-Associated neurocognitive disorders before and during the era of combination antiretroviral therapy: Differences in rates, nature, and predictors. *Journal of Neurovirology*, 17(1), 3–16. <https://doi.org/10.1007/s13365-010-0006-1>

Hunter, D., McCallum, J., & Howes, D. (2019). Defining exploratory-descriptive qualitative (EDQ) research and considering its application to healthcare. *Journal of Nursing and Health Care*, 4(1).

Joska, S. K., & Sorsdahl, K. (2012). Integrating mental health into general health care: Lessons from HIV. *African Journal of Psychiatry*, 15(6), 420–423. <https://doi.org/10.4314/ajpsy.v15i6.52>

Kamal, S., Locatelli, I., Wandeler, G., Sehhat, A., Bugnon, O., Metral, M., Du Pasquier, R., Gutbrod, K., Cavassini, M., & Schneider, M. P., and the Swiss HIV Cohort Study (2017). The presence of human immunodeficiency virus-associated neurocognitive disorders is associated with a lower adherence to combined antiretroviral treatment. *Open Forum Infect Dis*, 4(2), ofx070. <https://doi.org/10.1093/ofid/ofx070>

Mall, S., Sorsdahl, K., Struthers, H., & Joska, J. A. (2013). Mental health in primary human immunodeficiency virus care in South Africa: A study of provider knowledge,

attitudes, and practice. *The Journal of Nervous and Mental Disease*, 201(3), 196–201.

<https://doi.org/10.1097/nmd.0b013e3182845c24>

Mall, S., Sorsdahl, K., Swartz, L., & Joska, J. (2012). I understand just a little. Perspectives of HIV/AIDS service providers in South Africa of providing mental health care for people living with HIV/AIDS. *AIDS Care*, 24(3), 319–323.

<https://doi.org/10.1080/09540121.2011.608790>

Meade, C. S., Conn, N. A., Skalski, L. M., & Safren, S. A. (2011). Neurocognitive impairment and medication adherence in HIV patients with and without cocaine dependence. *Journal of Behavioral Medicine*, 34(2), 128–138. <https://doi.org/10.1007/s10865-010-9293-5>

Milanini, B., & Valcour, V. (2017). Differentiating HIV-associated neurocognitive disorders from Alzheimer's disease: An emerging issue in geriatric neuroHIV. *Current HIV/AIDS Reports*, 14(4), 123–132. <https://doi.org/10.1007/s11904-017-0361-0>

Mohamed, A. A., Oduor, C., & Kinyanjui, D. (2020). HIV-associated neurocognitive disorders at Moi teaching and referral hospital, Eldoret, Kenya. *BMC Neurology*, 20(1), 280. <https://doi.org/10.1186/s12883-020-01857-3>

Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. (2021). HIV-associated neurocognitive impairment knowledge and current practices: A survey of frontline healthcare workers in South Africa. *Journal of Community Health*, 46(3), 538–544.

<https://doi.org/10.1007/s10900-020-00895-9>

Nightingale, S., Winston, A., Letendre, S., Michael, B. D., McArthur, J. C., Khoo, S., & Solomon, T. (2014). Controversies in HIV-associated neurocognitive disorders. *Lancet Neurology*, 13(11), 1139–1151. [https://doi.org/10.1016/s1474-4422\(14\)70137-1](https://doi.org/10.1016/s1474-4422(14)70137-1)

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis. *International Journal of Qualitative Methods*, 16(1), 1609406917733847.

<https://doi.org/10.1177/1609406917733847>

Remien, R. H., Stirratt, M. J., Nguyen, N., Robbins, R. N., Pala, A. N., & Mellins, C. A. (2019). Mental health and HIV/AIDS: The need for an integrated response. *AIDS* (London, England), 33(9), 1411–1420. <https://doi.org/10.1097/qad.0000000000002227>

Sacktor, N. (2018). Changing clinical phenotypes of HIV-associated neurocognitive disorders. *Journal of Neurovirology*, 24(2), 141–145. <https://doi.org/10.1007/s13365-017-0556-6>

Sampson, H., & Johannessen, I. A. (2020). Turning on the tap: The benefits of using ‘real-life’ vignettes in qualitative research interviews. *Qualitative Research*, 20(1), 56–72. <https://doi.org/10.1177/1468794118816618>

Sanford, R., Strain, J., Dadar, M., Maranzano, J., Bonnet, A., Mayo, N. E., Scott, S. C., Fellows, L. K., Ances, B. M., & Collins, D. L. (2019). HIV infection and cerebral small vessel disease are independently associated with brain atrophy and cognitive impairment. *AIDS* (London, England), 33(7), 1197–1205. <https://doi.org/10.1097/qad.0000000000002193>

Sibeko, G., Milligan, P. D., Roelofse, M., Molefe, L., Jonker, D., Ipser, J., Lund, C., & Stein, D. J. (2018). Piloting a mental health training programme for community health workers in South Africa: An exploration of changes in knowledge, confidence and attitudes. *BMC Psychiatry*, 18(1), 191. <https://doi.org/10.1186/s12888-018-1772-1>

Simioni, S., Cavassini, M., Annoni, J. M., Rimbault Abraham, A., Bourquin, I., Schiffer, V., Calmy, A., Chave, J. P., Giacobini, E., Hirschel, B., & Du Pasquier, R. A. (2010). Cognitive dysfunction in HIV patients despite long-standing suppression of viremia. *AIDS* (London, England), 24(9), 1243–1250. <https://doi.org/10.1097/qad.0b013e3283354a7b>

Terpstra, A. R., Worthington, C., Ibáñez-Carrasco, F., O’Brien, K. K., Yamamoto, A., Chan Carusone, S., Baltzer Turje, R., McDougall, P., Granger, W., Thompson, V., DeSousa, M., Creal, L., Rae, A., Medina, C., Morley, E., & Rourke, S. B. (2018). I’m just forgetting and I don’t know why”: Exploring how people living with HIV-associated

neurocognitive disorder view, manage, and obtain support for their cognitive difficulties.

Qualitative Health Research, 28(6), 859–872. <https://doi.org/10.1177/1049732318761364>

Underwood, J., De Francesco, D., Cole, J. H., Caan, M. W. A., van Zoest, R. A., Schmand, B. A., Sharp, D. J., Sabin, C. A., Reiss, P., & Winston, A., COmorBidity in Relation to AIDS COBRA Collaboration and the Pharmacokinetic and clinical Observations in PePle over fiftY POPPY Study Group(2019). Validation of a novel multivariate method of defining HIV-associated cognitive impairment. Open Forum Infect Dis, 6(6), ofz198. <https://doi.org/10.1093/ofid/ofz198>

Valcour, V., Sithinamsuwan, P., Letendre, S., & Ances, B. (2011). Pathogenesis of HIV in the central nervous system. Current HIV/AIDS Reports, 8(1), 54–61. <https://doi.org/10.1007/s11904-010-0070-4>

Wang, Y., Liu, M., Lu, Q., Farrell, M., Lappin, J. M., Shi, J., Lu, L., & Bao, Y. (2020). Global prevalence and burden of HIV-associated neurocognitive disorder: A meta-analysis. Neurology, 95(19), e2610–e2621. <https://doi.org/10.1212/wnl.00000000000010752>

Watkins, C. C., & Treisman, G. J. (2015). Cognitive impairment in patients with AIDS—prevalence and severity. HIV/AIDS (Auckland, NZ), 7, 35–47. <https://doi.org/10.2147/hiv.s39665>

Winston, A., & Spudich, S. (2020). Cognitive disorders in people living with HIV. Laboratory Hematology: Official Publication of the International Society for Laboratory Hematology, 7(7), e504–e513. [https://doi.org/10.1016/s2352-3018\(20\)30107-7](https://doi.org/10.1016/s2352-3018(20)30107-7)

Supplementary material

Table S1

Thematic analysis coding tree

	Major theme	Sub-theme	Cadres
	Healthcare workers perceptions of neurocognitive impairment among PWH		
1.	The impact of HIV on the brain		
1.1	PWH experience co-morbidities which may cause impact to brain	Cryptococcal meningitis	Doctors, nurses
		Depression	Doctors, nurses
		Dementia	Doctors, nurses
		Psychosis	Doctors, nurses
		Side-effects	Doctors, nurses
		Unaware	Counsellors
2.	The prevalence of HIV-associated neurocognitive impairment		
2.1	Limited knowledge of H-NCI among different cadres	Unaware	Doctors (3), Nurses (16) Counsellors (9)
2.2	H-NCI is a historic problem	Uncommon	Doctors, nurses
2.3	Occurring among PWH on first line ART	Side-effects	Doctors, nurses
2.4	Diagnosis of H-NCI symptoms (vignette)	Neuropsychiatric manifestations	Doctor
		Neuropsychosis	Doctor
		Dementia	Doctors, nurses
		HIV encephalopathy	Doctor
		AIDs dementia complex	Doctor
		Depression	Nurses
		Non-adherence	Counsellors
3.	Current H-NCI screening practices		
3.1	No experience with H-NCI screening tools	Unaware	Doctors Nurses, Counsellors
3.2	Mental state exam	Forgetting medication Adherence	Doctors Nurses, Doctors Nurses, Counsellors
4.	Healthcare workers' views on H-NCI screening at primary healthcare facilities		
4.1	Availability of screening tool at PHC	Positive view	Doctors Nurses, Counsellors
		Access	Doctors Nurses, Counsellors
		Cadre to administer Timepoint	
5.	Previous H-NCI training (for screening and identification)		
5.1	HIV training	Optimum treatment outcomes NIMART Basic counselling Adherence	Doctors Nurses, Nurses Counsellors Doctors Nurses, Counsellors
5.2	Exposure to H-NCI in previous HIV training	Unaware	Doctors Nurses, Counsellors
6.	Healthcare workers views and suggestions for a H-NCI training to screen and identify HIV-associated neurocognitive impairment		
6.1	Best method of delivery	Online Face-to-face	

Chapter 5

Developing an HIV-associated neurocognitive impairment training programme in low- and middle-income countries

Adele Munsami, Hetta Gouse, Goodman Sibeko, Sam Nightingale & John Anton Joska

Description of the contribution of candidate and co-authors

This manuscript reviewed and summarised the current literature for developing a training programme for primary healthcare workers in low- and middle-income countries. The training programme was based on my findings in Chapters 2,3, 4 and 6. This manuscript described the theoretical framework underpinning the design and development of the HIV-Associated neurocognitive impairment training curriculum, teaching methods, evaluation strategies, feedback approaches, and reflects on the lessons learned to inform future training programme design, for implementation in low-and middle-income countries. Together with Associate Professor Goodman Sibeko and Professor John Joska, I generated the concept for the manuscript. Adele Munsami conducted the literature mining and searches and wrote the first draft of the manuscript. All authors provided conceptual and intellectual contributions to the final drafts. I managed all revisions.

Current status: Under review

The International Journal of Medical Education

5.1 Introduction

There are approximately 8.2 million people living with HIV (PWH) in South Africa (StatsSA, 2021; UNAIDS, 2020). Seventy two percent of PWH in South Africa are currently receiving antiretroviral therapy (ART) (StatsSA, 2021; UNAIDS, 2020). Although HIV is recognised as a manageable, chronic illness following widespread availability of ART, there remain concerns for co-morbidities (Deeks et al., 2013). These include HIV-associated neurocognitive impairment (H-NCI), even with effective ART (Heaton et al., 2010).

HIV is able to invade the central nervous system causing inflammation which may then cause a range of neurocognitive and functional challenges among PWH (Carter et al., 2003). H-NCI varies in signs, symptoms, and clinical course, ranging from mild neurocognitive impairment to dementia, its most severe form (Mohamoud et al., 2018; Watkins & Treisman, 2015). PWH with H-NCI typically experience difficulties with attention, memory, learning, problem solving, decision making, as well as with activities required for everyday functioning, including ART adherence (Heaton et al., 2004). Although the incidence of HIV-dementia has fallen dramatically, the risk of developing milder H-NCI remains a concern (Heaton et al., 2011). As the population of PWH ages, the numbers of persons with cognitive impairment and dementia (major neurocognitive disorders) will increase significantly. Early detection and intervention therefore is of critical public health concern.

The diagnosis of H-NCI requires healthcare workers to have knowledge of the signs and symptoms, as well as the appropriate skills to identify H-NCI. Appropriately trained personnel are limited in low-and middle-income countries like South Africa, especially at a primary healthcare level, where HIV services are predominantly provided (Cettomai et al., 2011; Sibeko et al., 2018). These facilities experience high patient volumes and shortages in

healthcare workers (Willcox et al., 2015). Medical, surgical and neurosurgical specialties have adopted task-sharing to address these shortages in this setting (Anand et al., 2019). Task-sharing involves the reassigning of services performed by specialists to less specialised cadres, under supervision (Robertson et al., 2020). It is, however, unclear whether task-sharing of H-NCI services from specialists to primary healthcare workers, will be able to address H-NCI service gaps in South Africa.

Two cross-sectional surveys of healthcare workers in South Africa found that knowledge of H-NCI and H-NCI screening were scarce (Gouse et al., 2021; Munsami et al., 2021). The paucity in available literature describing H-NCI training highlights a potential skills development gap among healthcare workers in low- and middle-income countries. A scoping review focusing on training targeting healthcare workers providing HIV services in Africa found one, single-day training intervention targeting non-clinical healthcare workers in Kenya (Munsami, Dreyer, et al., 2022). This training focused on identifying aetiologies of peripheral neuropathy and diagnostic criteria for HIV-associated dementia (HIV-D), neurologic examination, localization, diagnosis and treatment of HIV-D (Cettomai et al., 2011). The training conducted in Kenya comprised of a knowledge transfer component only and did not explore the use of a screening tool among non-clinical healthcare workers.

To our knowledge, no H-NCI training programmes have been developed to equip primary healthcare workers with appropriate knowledge and skills to provide H-NCI screening in South Africa. The main aim was to design and develop an H-NCI training programme to be implemented at primary healthcare level. In this article we describe the design and development of the PriCog training: Introduction to H-NCI for Primary Healthcare Workers. This article also provides an overview of the theoretical framework underpinning the training.

5.2 Methods

5.2.1 Design

We developed a work-integrated training programme for healthcare workers providing HIV services at primary healthcare facilities in South Africa. Several models were assessed based on their field of origin (public/health services sector), construct flexibility, implementation focus, and application at different levels of healthcare, including the Consolidated Framework for Implementation Research, the Active Implementation Framework, the Promoting Action on Implementation Research in Health Services and the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance). The EPIS framework (Exploration, Preparation, Implementation, And Sustainability) was selected as this framework provided a multilevel, context-sensitive and broadly applicable implementation mechanisms for varying healthcare settings. The EPIS framework was developed by Aarons et al. (2011), for the integration of interventions in the public health service sector in the United States (Jessani et al., 2021). This framework has been demonstrated to aid the integration of implemented interventions in other countries and settings, including South Africa (Becan et al., 2018; Jessani et al., 2021; Moullin et al., 2019). The study conducted by Jessani et al. (2021), examined noncommunicable disease policy and practice in South Africa. This study document the phased process of developing, implementing, and monitoring a novel approach to facilitate effective translation of research into policy and practice (Jessani et al., 2021). The appropriateness of the EPIS framework was evaluated for use in South Africa and was found to be relevant and useful (Jessani et al., 2021).

EPIS, as utilised here, describes implementation as a process moving through four stages.

Table 1 provides a summary of the EPIS stages and processes followed in the design of the

PriCog training. Figure 1 provides a summary of the different theoretical frameworks underpinning the investigation at each stage.

Figure 2

Theoretical framework applied at each phase of the EPIS process when developing the introduction to HIV-associated neurocognitive impairment training

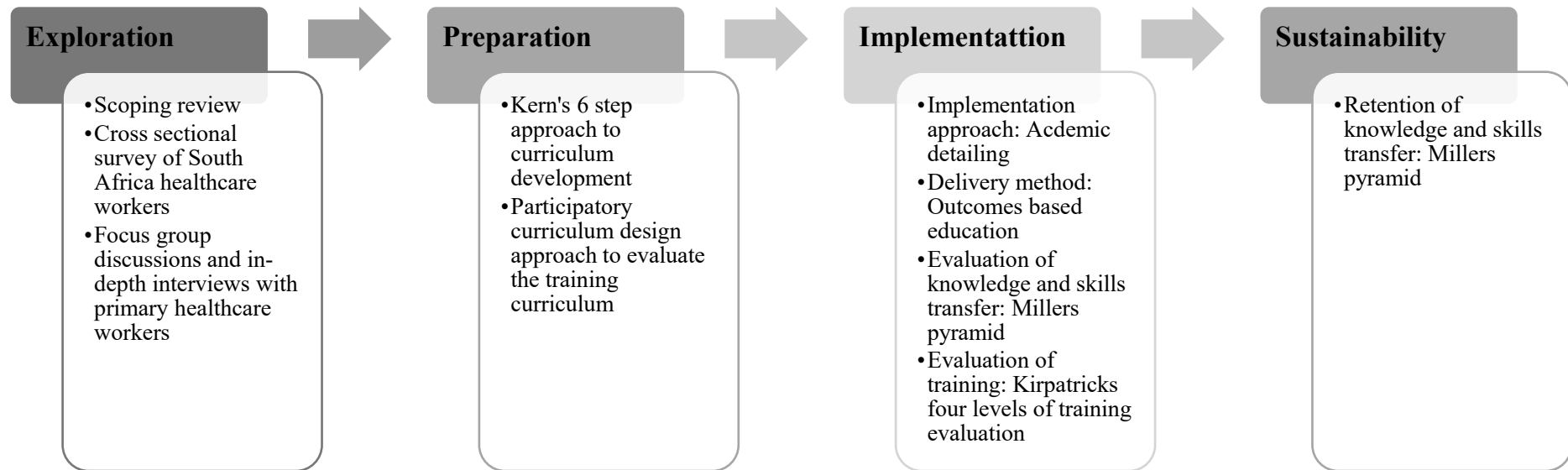


Table 1*Training development process guided by EPIS framework*

EPIS Stage		Intervention aim	Activity	Outcome
Exploration	Identify potential knowledge or gaps in existing health systems	Explore existing H-NCI knowledge, previous training and current practices among healthcare workers providing HIV services in South Africa.	Scoping review of H-NCI training literature	We identified a paucity in literature describing existing H-NCI training among healthcare workers providing HIV services in Africa.
			Cross-sectional survey of healthcare workers providing HIV services in South Africa	We found limited knowledge of H-NCI and screening practices were uncommon among primary healthcare workers. We identified gaps in H-NCI knowledge among healthcare workers.
			Focus-group discussions with primary healthcare workers	Healthcare workers desired training to identify H-NCI.
Preparation	Planning for integration of the selected evidence-based practice into the existing system, including the identifying potential challenges	Examine healthcare workers views on H-NCI prevalence and screening a primary healthcare level.	In-depth interviews with primary healthcare workers	
			Identify potential barriers to H-NCI screening at primary healthcare level and healthcare workers views on training.	
			Examine existing systems components that could be strengthened to improve integration of proposed intervention at primary healthcare level	We gained insight on the existing systems at a primary healthcare level for potential implementation of an evidence-based practice and training preferences.
		Design and develop H-NCI curriculum and training programme appropriate for providers at a primary healthcare level.	Consultation with key stakeholders, continued education managers and trainers from Department of Health in South Africa	Introduced to Kern's six step approach, outcomes-based education model and Kirkpatrick's training evaluation strategy.
			Consultation with University Higher Education Department.	

			Conducted extensive literature searches of training methods and evaluation strategies.	Identified academic detailing and Miller's pyramid for assessing clinical competence.
Implementation	Coaching, and active facilitation of evidence-based practices are implemented	Conduct training, demonstrations, and active facilitation of evidence-based practices in a real-world clinic setting	Didactic lectures, case studies and group discussions.	Trained primary healthcare workers to identify signs and symptoms of H-NCI and to administer an H-NCI screening tool. Evaluated impact of training on knowledge and skills. Determine whether H-NCI training methods were feasible and appropriate. Determine which cadres were suitable to administer an H-NCI screening tool.
		Examine feasibility, appropriateness and acceptability of H-NCI screening at a primary healthcare level	Pre- and post-questionnaires Simulation and direct observation of skills Provided feedback to participants	
Sustainability	Address the use of the newly installed practices over time	Evaluate the use of the newly installed practices over 8 weeks	Pre- and post-questionnaires Simulation and direct observation of skills Provided feedback to participants	Evaluated retention of knowledge and skills.

5.2.2 Developing the training curriculum

A scoping review of available published literature on H-NCI training in Africa was conducted in the initial exploration stage (Munsami, Dreyer, et al., 2022). Mapping of existing training was a useful base to examine brain and/or behaviour training approaches targeting frontline HIV healthcare workers. This ensured that our design was informed by appropriate training interventions for healthcare workers providing HIV services. A study identified in the scoping review focusing on mental health training for community health workers in South Africa, provided a useful methodological guide for training healthcare workers in South Africa (Sibeko et al., 2018).

Focus group discussions and in-depth interviews were conducted due to the paucity in available published studies detailing training of primary healthcare workers to administer cognitive impairment screening tools to PWH (Munsami, Nightingale, et al., 2022). These discussions and interviews explored H-NCI knowledge in more detail to identify specific knowledge gaps, healthcare workers previous training and their perceptions of the best training methods in this context. These interviews highlighted that frontline healthcare workers were aware of symptoms of H-NCI, but often associated these symptoms with treatment side effects or depression, showed a need to provide information which distinguished H-NCI from other illnesses or conditions. The interviews also highlighted primary healthcare workers preference for face-to-face training, as well as their willingness and desire to learn more about H-NCI through further training.

Preparation stage

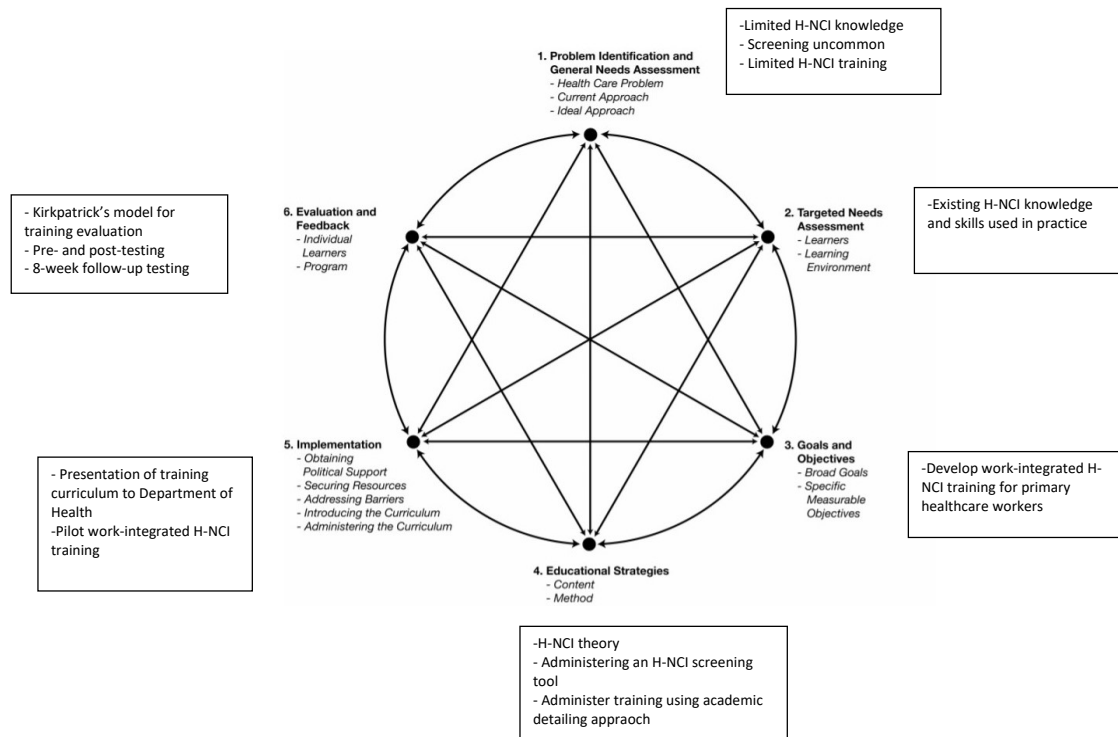
The PriCog training curriculum was guided by Kern's 6-step approach to curriculum development which have several overlapping principles of the EPIS framework, including an

exploration of educational needs, as well as the preparation, implementation and evaluation of curricula.

Kern's 6-step approach has been successfully applied within medical education across multiple specialties and training (Robertson et al., 2019; Sweet & Palazzi, 2015). The approach is described as a practical and theoretically sound approach to curriculum development, as call for consideration of several implementation and evaluation mechanisms (Robertson et al., 2019; Sweet & Palazzi, 2015). The curriculum was informed by the following six steps 1) problem identification and general needs assessment among healthcare workers, (2) targeted needs assessment of healthcare workers educational needs, (3) goals and objectives of the educational intervention, (4) appropriate educational strategies for work-integrated learning among primary healthcare workers, (5) implementation of training intervention and (5) feedback and evaluation of training intervention (Figure 2). Supplementary table S1 provides detail on the research activities at each stage.

Figure 2

Kern's 6 step approach to curriculum development



The first two steps of Kern's approach are described above and are addressed in the exploration stage of the EPIS framework. The third step of PriCog curriculum design was to address key learning areas, goals and objectives informed by the needs assessments. The overarching goal of the PriCog training was to investigate whether knowledge can be transferred and retained. The first objective of the intervention was to develop an appropriate training programme to equip primary healthcare workers with knowledge on H-NCI, to be able to identify signs and symptoms among patients accessing care. The second objective was to train primary healthcare workers to administer a H-NCI screening tool, and the final objective was to explore retention of the knowledge and skills over time among these cadres of healthcare workers. The third step was to establish appropriate educational strategies to implement the PriCog training curriculum.

The PriCog training curriculum consisted of the following educational components: 1) theoretical component which included didactic lectures, case studies and group discussions and 2) practical component which included video demonstrations and role-playing. Table S2 (Supplementary Material) provides an outline of the training curriculum.

We also developed a participant workbook and a trainer manual. The participant workbook contained the core objectives of the training, theoretical content, practical applications, and assessments (Annexure A). The study conducted in Kenya by Cettomai et al. (2011) did not describe the training manual utilised in the study. The PriCog trainer manual used a rubric lesson plan approach to guide the training facilitator (Annexure B). This was similar to the training manual developed by Sibeko et al. (2018). The PriCog trainer manual included step-by-step instructions, detailed descriptions of the goals for each session, duration, speech guides and multimedia aids requirements to ensure that the training would be reproducible.

Curriculum appraisal

We used a participatory curriculum design approach to evaluate the training curriculum (John et al., 2018). This approach relies on the involvement of stakeholders and end users in the design and evaluation process, as well as facilitating buy-in from key personnel to support the roll-out of the proposed intervention (John et al., 2018; Sidebotham et al., 2017). The PriCog training curriculum was evaluated by the HAST Ugu district manager in KwaZulu-Natal, who is involved in continued education. The Ugu district mental health manager and trainers from other districts in KwaZulu-Natal also evaluated the training curriculum. Feedback was provided using criterion for high quality interventions outlined by Ary et al. (2018). The table in the supplementary material (Supplementary table S3) describes the criteria used to evaluate the PriCog training curriculum. The evaluation responses from

the Ugu district mental health manager and trainers from other districts using these criteria are summarised in Supplementary table S4.

Implementation

The PriCog training adopted an academic detailing approach which has received considerable research attention and empirical support (Lyon et al., 2011). Academic detailing has been used in psychiatric healthcare interventions (Desveaux et al., 2017; Lyon et al., 2011). The approach involves in-person visits to the work setting of the target audience from a trained professional. During the visit, the trained professional demonstrates the new practices and discusses the intervention (Lyon et al., 2011). Garland et al. (2003) suggest that academic detailing could be used to increase the use of standardised assessment tools, which are often not routine in community practice, highlighting the appropriateness of this approach for the training intervention that we developed (Lyon et al., 2011).

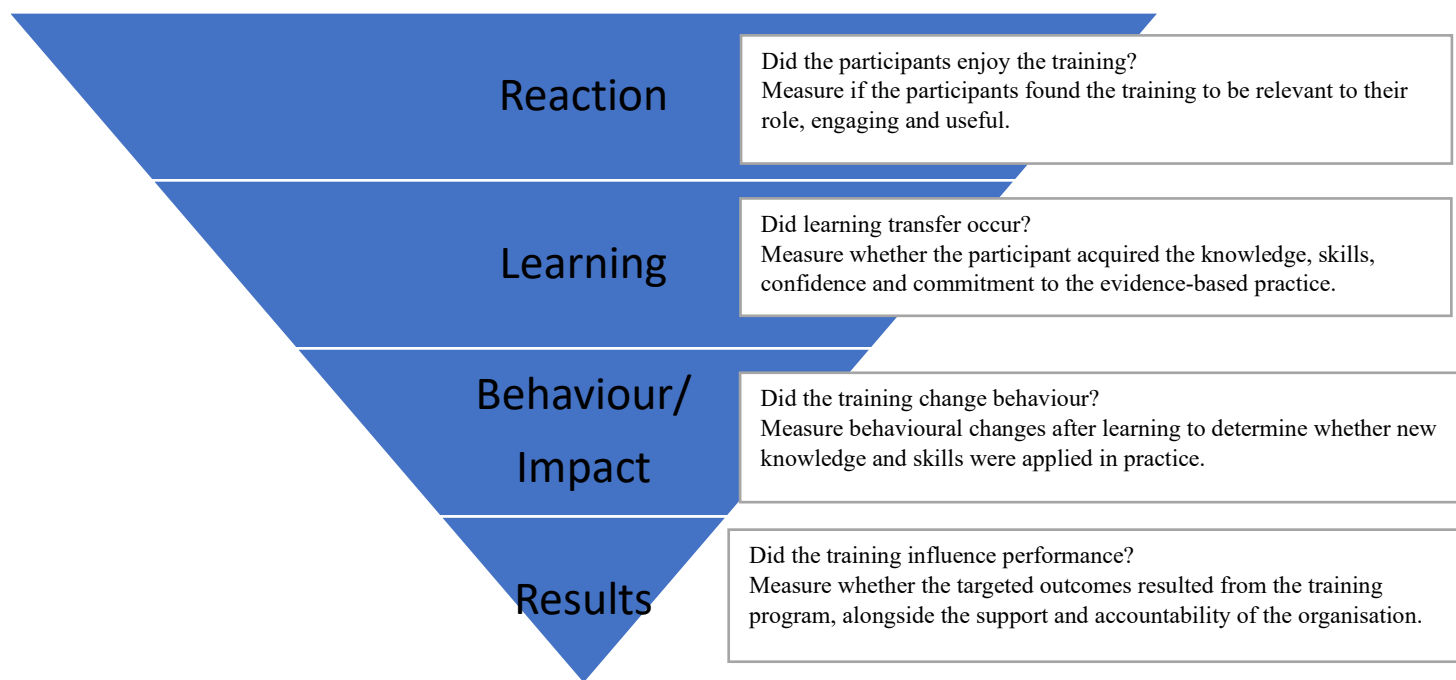
The delivery of the training was informed by the principles of outcomes-based education (OBE). OBE is a widespread teaching model which has been used in various educational programmes in South Africa, for over two decades including continued medical education programmes (Friedrich-Nel et al., 2005; Mohieldein, 2017; Tan et al., 2018). OBE uses a student-centred approach to curriculum design and teaching, and is principally concerned with what learners should know, understand, demonstrate and equipping them to practically adapt their knowledge and skills beyond the training environment (Tan et al., 2018).

The most common knowledge assessment techniques involved in academic detailing include targeted pre-training assessment and feedback about the knowledge and current practices of individuals and groups (Lyon et al., 2011). This is usually done through survey evaluations of providers' understanding of concepts or tracking specific practices, for

example screening practices or referrals (Lyon et al., 2011). The pre-assessments are followed by didactic information sessions informed by the training curriculum. This is followed by active and open-ended questioning sessions which allow participants to engage with the facilitator on the content, clarify concepts or request further information to aid learning (Lyon et al., 2011). Academic detailing involves the distribution of reference materials that contain the content of the training, for example, a participant workbook as well as a specific plan to promote the implementation of learned skills in practice following the training. Return visits from the trained professional or training facilitator to reinforce key messages and conduct post-training assessments, are typically between one to two visits (Lyon et al., 2011).

We targeted healthcare workers providing HIV services at primary healthcare facilities in KwaZulu-Natal for our pilot training intervention. We included medical doctors, nurses and adherence counsellors, due to the task-sharing from medical doctors to nurses and occasionally adherence counsellors which is a common practice in low-and middle-income countries. The PriCog training was conducted over two sessions which were designed to last two hours. The sessions were conducted at the local facility to reduce disruptions to healthcare worker duties, to be more appropriate for primary healthcare facilities which are often understaffed and experience high patient volumes. An additional session involved ten-minute simulations and direct observations of procedural skills, where participants were evaluated as they administered the H-NCI screening tool. The results from the PriCog training intervention are described in Munsami, Sibeko, et al. (2022).

The evaluation of the PriCog training was guided by Kirkpatrick's model of training evaluation (Kirkpatrick & Craig, 1967). This model consists of four levels of evaluation which include 1) reaction, 2) learning, 3) behaviour and 4) results (Figure 3) (Smidt et al.,



2009). Kirkpatrick's model has been used to evaluate of training interventions targeting healthcare workers in several countries (Heydari et al., 2019).

Figure 3

Kirkpatrick's four levels of training evaluation

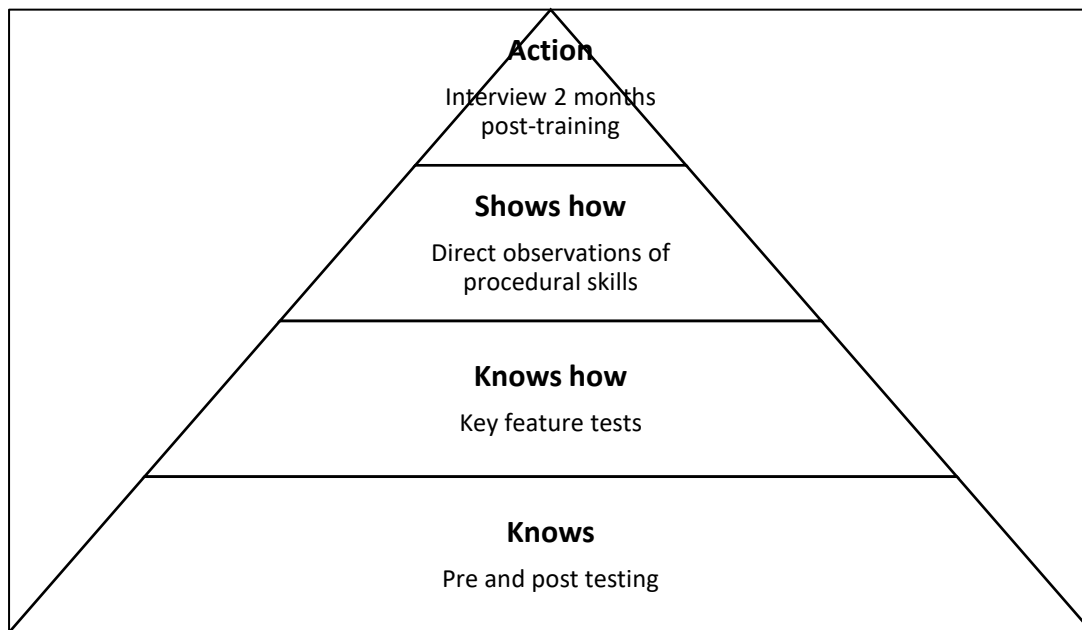
Adapted from Kirkpatrick and Craig (1967); Smidt et al. (2009)

The first level of the Kirkpatrick model evaluates trainees' reaction to the training. This involves the examination of the trainees' impressions and perceptions of the program following the intervention (Smidt et al., 2009). Healthcare workers participating in the PriCog training provided feedback by completing a survey at the end of the training (Appendix E). The survey assessed key components of the training intervention, including the perceived value of the training, satisfaction with the training curriculum and the H-NCI screening tool, as well as whether healthcare workers would recommend the training program to other primary healthcare workers. We also provided participants with the opportunity to make suggestions to improve future H-NCI training.

The second level of this model, learning, allows participants to demonstrate their understanding of specific skills and/or knowledge gained from the training (Smidt et al., 2009). The PriCog trainee assessments were designed using Miller's pyramid for assessing clinical competence as a framework (Appendix E). This framework has been used to assess clinical competence among students in healthcare fields, including those training as medical doctors and nurses. This model emphasizes the importance of acquiring knowledge to perform a task in practice and has been successfully used to assess diagnostic and management skills in medical education (Blazar et al., 2020; Norcini, 2003). Figure four illustrates the following four levels: knowledge (knows), competence (knows how), performance (shows how), and action (does) (Blazar et al., 2020; Norcini, 2003). Pre- and post-multiple-choice questionnaires were used to evaluate knowledge, as well participants attitude and comfort with H-NCI tools before and after the training. Our questions were adapted from a validated tool developed by Johnston et al. (2003) measuring knowledge, attitude and behaviour among students in healthcare fields.

Figure 4

Evaluation strategy adapted from Millers pyramid of clinical competency



The third level is behaviour or performance which involves the assessment of the trainees' ability to apply newly learned knowledge or skills in practice (Smidt et al., 2009). At the end of the PriCog training, key feature cases were used to assess whether participants knew how to identify symptoms of H-NCI. We also used direct observations of procedural skills to assess participants ability to administer screening tools to a standardized patient, as part of a simulation. The use of these assessment methods in healthcare education have been described by Wass et al. (2001).

The final level of the Kirkpatrick model measures the overall impact of the training, such as, increased knowledge H-NCI or identification of H-NCI symptoms at a primary healthcare level. We conducted follow-up assessments to determine whether participants knowledge and skills were retained two months post-training. This, with a view toward improving the curriculum, teaching methods, evaluation strategies and the overall methodology of the PriCog training for future interventions.

5.3 Lessons learned

The presence of symptomatic H-NCI remains a risk, especially among PWH who non-adherent to ART. Published literature describing H-NCI training interventions for healthcare workers in low-and middle-income countries, are limited. To our knowledge, this is the first article to describe the process of designing, developing and piloting an H-NCI training intervention targeting primary healthcare workers providing HIV services in South Africa. The process of developing this training has highlighted several important considerations for future H-NCI training.

One of the questions we sought to answer with this training was whether H-NCI knowledge can be transferred and retained. We were also interested in understanding whether H-NCI screening tool could be administered by healthcare workers at a primary healthcare level, and eventually incorporated into practice. The training intervention was developed for primary healthcare workers in South Africa, which included medical doctors, nursing staff, staff nurses and adherence counsellors. We found that medical doctors and professional nurses who provide clinical care to PWH accessing services at primary healthcare facilities were better suited to administer an H-NCI screening tool following two training sessions and practice over eight weeks (Munsami, Sibeko, et al., 2022). Adherence counsellors on the other hand struggled with several aspects of the H-NCI screening tool and required more mentorship to be able to successfully administer the screening tool (Munsami, Sibeko, et al., 2022). In the general clinic flow, this cadre may be better suited to identify signs or symptoms of H-NCI (Munsami, Sibeko, et al., 2022). According to Nightingale et al. (2022) the following key considerations should be investigated when making an H-NCI diagnosis including (1) symptoms, (2) poor test performance, and (3) the presence of HIV-brain disease. A pragmatic approach may use this conceptual model of H-NCI diagnosis to task-share investigations between lay staff who would be able to identify symptoms, nursing staff

who would administer screening tests and medical staff who would be able to investigate for HIV-brain disease. Thus, a tailored training curriculum targeting the appropriate cadre focusing on each of these considerations should be considered.

We also sought to understand whether a work-integrated learning design would benefit this group of healthcare workers in South Africa who provide HIV care to high patient volumes and often experience shortages in staff. The use of a work-integrated intervention has advantages and disadvantages. Many of the healthcare workers attended the training as it was on-site, however the training had to be brief to fit into existing, allocated meeting times. This approach ensured that healthcare workers were available to attend to emergency cases and did not disrupt service delivery by removing healthcare workers from the facility for several hours. However, there were also several disruptions to the training for those individuals required to attend to patients. These disruptions may have impacted the outcomes of the training intervention.

On-going mentorship over several follow-up visits will be beneficial due to the complexity in administering H-NCI screening tools which require healthcare workers to master several components, multi-task as well as assign correct scores. Follow-up visits will allow the trained professional to troubleshoot, rectify any persisting errors and/or demonstrate the correct method of administration. Although, this iterative process aligns with the academic detailing approach, it requires increased resources to be achieved. Despite resource challenges that may arise, the use of the weekly staff meeting time slot for training and mentorship is a viable option to promote on-going training and mentorship to ensure that skills are sustained. Future mental health training targeting healthcare workers, which are implemented more than H-NCI focused training, could incorporate H-NCI into the training curriculum to broaden the reach.

5.4 Conclusion

The shortage of trained healthcare workers in low-and-middle income countries, especially those equipped to identify H-NCI among PWH, required the exploration of task-sharing of H-NCI services from specialists to primary healthcare workers. This, with a view toward understanding whether primary healthcare workers would be able to use an H-NCI screening tool in a busy clinic setting in South Africa. The EPIS framework provided an appropriate guide to design and develop H-NCI training. The work-integrated learning design was suitable for healthcare workers delivering HIV services as there were minimal disruptions to patient care, in already burdened facilities. Although medical doctors and professional nurses were able to administer the H-NCI screening tool following the intervention, on-going mentorship from a trained professional is desirable for screening tools that are not commonly administered at this level of care. Adherence counsellors may be better suited to identify signs and symptoms of H-NCI and require a training programme that provides specific content relating to the identification of H-NCI. There are several factors that can be improved upon in the design utility of H-NCI training in low-and-middle income countries and the feasibility of this training needs to be explored.

References

- Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(1), 4-23. <https://doi.org/10.1007/s10488-010-0327-7>.
- Anand, T. N., Joseph, L. M., Geetha, A. V., Prabhakaran, D., & Jeemon, P. (2019). Task sharing with non-physician health-care workers for management of blood pressure in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Glob Health*, 7(6), e761-e771. [https://doi.org/10.1016/S2214-109X\(19\)30077-4](https://doi.org/10.1016/S2214-109X(19)30077-4).
- Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to research in education*. Cengage Learning.
- Becan, J. E., Bartkowski, J. P., Knight, D. K., Wiley, T. R. A., DiClemente, R., Ducharme, L., Welsh, W. N., Bowser, D., McCollister, K., Hiller, M., Spaulding, A. C., Flynn, P. M., Swartzendruber, A., Dickson, M. F., Fisher, J. H., & Aarons, G. A. (2018). A model for rigorously applying the Exploration, Preparation, Implementation, Sustainment (EPIS) framework in the design and measurement of a large scale collaborative multi-site study. *Health & Justice*, 6(1), 9. <https://doi.org/10.1186/s40352-018-0068-3>.
- Blazar, E., Krishnan, V., & Mody, S. (2020). *Education Theory Made Practical—Volume 4, Part 5: Miller’s Pyramid*. <https://icenetblog.royalcollege.ca/2020/03/03/education-theory-made-practical-volume-4-part-5/>
- Carter, S. L., Rourke, S. B., Murji, S., Shore, D., & Rourke, B. P. (2003). Cognitive complaints, depression, medical symptoms, and their association with neuropsychological functioning in HIV infection: a structural equation model analysis. *Neuropsychology*, 17(3), 410. <https://doi.org/10.1037/0894-4105.17.3.410>.

Cettomai, D., Kwasa, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *J Neurol Sci*, 307(1-2), 92-96.

<https://doi.org/10.1016/j.jns.2011.05.005>.

de Jager, C. A., Joska, J. A., Hoffman, M., Borochowitz, K. E., & Combrinck, M. I. (2015). Dementia in rural South Africa: A pressing need for epidemiological studies. *S Afr Med J*, 105(3), 189-190. <https://doi.org/10.7196/samj.8904>.

Deeks, S. G., Lewin, S. R., & Havlir, D. V. (2013). The end of AIDS: HIV infection as a chronic disease. *Lancet*, 382(9903), 1525-1533. [https://doi.org/10.1016/S0140-6736\(13\)61809-7](https://doi.org/10.1016/S0140-6736(13)61809-7).

Desveaux, L., Saragosa, M., Rogers, J., Bevan, L., Loshak, H., Moser, A., Feldman, S., Regier, L., Jeffs, L., & Ivers, N. (2017). Improving the appropriateness of antipsychotic prescribing in nursing homes: a mixed-methods process evaluation of an academic detailing intervention. *Implementation Science*, 12(1), 1-14. <https://doi.org/10.1186/s13012-017-0602-z>.

Friedrich-Nel, H., De Jager, L., & Nel, M. (2005). An assessment model in outcomes-based education and training (OBET) for health sciences and technology in South Africa. *South African Journal of Higher Education*, 19(5), 880-899.

Garland, A. F., Kruse, M., & Aarons, G. A. (2003). Clinicians and outcome measurement: what's the use? *The journal of behavioral health services & research*, 30(4), 393-405. DOI 10.1007/BF02287427.

Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2021). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS care*, 33(4), 468-472. <https://doi.org/10.1080/09540121.2020.1736256>

Heaton, R. K., Franklin, D. R., Ellis, R. J., McCutchan, J. A., Letendre, S. L., LeBlanc, S., Corkran, S. H., Duarte, N. A., Clifford, D. B., & Woods, S. P. (2011). HIV-associated neurocognitive disorders before and during the era of combination antiretroviral therapy: differences in rates, nature, and predictors. *Journal of neurovirology*, 17(1), 3-16. DOI 10.1007/s13365-010-0006-1

Heaton, R. K., Marcotte, T. D., Mindt, M. R., Sadek, J., Moore, D. J., Bentley, H., McCutchan, J. A., Reicks, C., Grant, I., & Group, H. (2004). The impact of HIV-associated neuropsychological impairment on everyday functioning. *J Int Neuropsychol Soc*, 10(3), 317-331. <https://doi.org/10.1017/S1355617704102130>

Heydari, M. R., Taghva, F., Amini, M., & Delavari, S. (2019). Using Kirkpatrick's model to measure the effect of a new teaching and learning methods workshop for health care staff. *BMC Res Notes*, 12(1), 388. <https://doi.org/10.1186/s13104-019-4421-y>

Jessani, N. S., Rohwer, A., Schmidt, B. M., & Delobelle, P. (2021). Integrated knowledge translation to advance noncommunicable disease policy and practice in South Africa: application of the Exploration, Preparation, Implementation, and Sustainment (EPIS) framework. *Health Res Policy Syst*, 19(1), 82. <https://doi.org/10.1186/s12961-021-00733-x>

John, M.-S., Sibuma, B., Wunnava, S., Anggoro, F., & Dubosarsky, M. (2018). An Iterative Participatory Approach to Developing an Early Childhood Problem-Based STEM Curriculum. *Grantee Submission*, 3(3). <https://doi.org/https://doi.org/10.20897/ejsteme/3867>

Johnston, J. M., Leung, G. M., Fielding, R., Tin, K. Y., & Ho, L. M. (2003). The development and validation of a knowledge, attitude and behaviour questionnaire to assess undergraduate evidence-based practice teaching and learning. *Med Educ*, 37(11), 992-1000. <https://doi.org/10.1046/j.1365-2923.2003.01678.x>

Joska, & Sorsdahl, K. (2012). Integrating mental health into general health care: lessons from HIV. *African journal of psychiatry*, 15(6), 420-423. <http://dx.doi.org/10.4314/ajpsy.v15i6.52>

Kamal, S., Locatelli, I., Wandeler, G., Sehhat, A., Bugnon, O., Metral, M., Du Pasquier, R., Gutbrod, K., Cavassini, M., Schneider, M. P., & and the Swiss, H. I. V. C. S. (2017). The Presence of Human Immunodeficiency Virus-Associated Neurocognitive Disorders Is Associated With a Lower Adherence to Combined Antiretroviral Treatment. *Open Forum Infect Dis*, 4(2), ofx070. <https://doi.org/10.1093/ofid/ofx070>

Kirkpatrick, D. L., & Craig, R. (1967). Evaluation of training. Evaluation of Short-Term training in Rehabilitation. *Monograph*(3), 35-56.

Liboro, R. M., Ibañez-Carrasco, F., Rourke, S. B., Eaton, A., Medina, C., Pugh, D., Rae, A., Ross, L. E., & Shuper, P. A. (2018). Barriers to addressing HIV-Associated neurocognitive disorder (HAND): Community-based service provider perspectives. *Journal of HIV/AIDS & Social Services*, 17(3), 209-223. <https://doi.org/10.1080/15381501.2018.1431168>

Lyon, A. R., Stirman, S. W., Kerns, S. E., & Bruns, E. J. (2011). Developing the mental health workforce: review and application of training approaches from multiple disciplines. *Adm Policy Ment Health*, 38(4), 238-253. <https://doi.org/10.1007/s10488-010-0331-y>

Mohamoud, G., Mash, B., Merali, M., Orwa, J., & Mahoney, M. (2018). Perceptions regarding the scope of practice of family doctors amongst patients in primary care settings in Nairobi. *Afr J Prim Health Care Fam Med*, 10(1), e1-e7. <https://doi.org/10.4102/phcfm.v10i1.1818>

Mohieldein, A. H. (2017). Outcome-based approach to medical education towards academic programmes accreditation: A review article. *J Pak Med Assoc*, 67(3), 454-460.

Moullin, J. C., Dickson, K. S., Stadnick, N. A., Rabin, B., & Aarons, G. A. (2019). Systematic review of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework. *Implementation Science*, 14(1), 1. <https://doi.org/10.1186/s13012-018-0842-6>

Munsami, A., Dreyer, A. J., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022). Mental and cognitive healthcare training targeting primary healthcare workers providing HIV services in Africa: a scoping review. *AIDS care*, 1-9.
<https://doi.org/10.1080/09540121.2022.2099512>

Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. (2021). HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *J Community Health*, 46(3), 538-544.
<https://doi.org/10.1007/s10900-020-00895-9>

Munsami, A., Nightingale, S., Sorsdahl, K., & Joska, J. A. (2022). Exploring HIV-Associated Neurocognitive Impairment in the Era of Effective Antiretroviral Therapy: A Primary Healthcare Perspective. *Qualitative health research*, DOI 10497323221110801.

Munsami, A., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022). Integrating HIV-Associated Neurocognitive Impairment Screening within Primary Healthcare Facilities: A Pilot Training Intervention. *Nursing Research and Practice*, 2022.
<https://doi.org/10.1155/2022/4495586>

Nightingale, S., Cinque, P., Joska, J. A., Price, R. W., Underwood, J., Ances, B., Dravid, A., Dreyer, A. J., Gisslén, M., & Kwasia, J. (2022). A new approach to cognitive impairment in people with HIV. *The Lancet HIV*, 9(12), e815-e817.
[https://doi.org/10.1016/S2352-3018\(22\)00267-3](https://doi.org/10.1016/S2352-3018(22)00267-3)

Norcini, J. J. (2003). ABC of learning and teaching in medicine. Work based assessment. *BMJ*, 326(7392), 753-755. <https://doi.org/10.1136/bmj.326.7392.753>

Robertson, A. C., Fowler, L. C., Niconchuk, J., Kreger, M., Rickerson, E., Sadovnikoff, N., Hepner, D. L., Bader, A. M., McEvoy, M. D., & Urman, R. D. (2019). Application of Kern's 6-Step Approach in the Development of a Novel Anesthesiology Curriculum for Perioperative Code Status and Goals of Care Discussions. *J Educ Perioper Med*, 21(1), E634. <https://doi.org/https://doi.org/10.3171/2020.4.JNS201056>

Robertson, F. C., Lippa, L., & Broekman, M. L. (2020). Task shifting and task sharing for neurosurgeons amidst the COVID-19 pandemic. *Journal of neurosurgery*, 133(1), 5-7. <https://doi.org/https://doi.org/10.3171/2020.4.JNS201056>

Sibeko, G., Milligan, P. D., Roelofse, M., Molefe, L., Jonker, D., Ipser, J., Lund, C., & Stein, D. J. (2018). Piloting a mental health training programme for community health workers in South Africa: an exploration of changes in knowledge, confidence and attitudes. *BMC Psychiatry*, 18(1), 191. <https://doi.org/10.1186/s12888-018-1772-1>

Sidebotham, M., Walters, C., Chipperfield, J., & Gamble, J. (2017). Midwifery participatory curriculum development: Transformation through active partnership. *Nurse education in practice*, 25, 5-13. <https://doi.org/https://doi.org/10.1016/j.nepr.2017.04.010>

Smidt, A., Balandin, S., Sigafoos, J., & Reed, V. A. (2009). The Kirkpatrick model: A useful tool for evaluating training outcomes. *Journal of Intellectual and Developmental Disability*, 34(3), 266-274. <https://doi.org/10.1080/13668250903093125>

StatsSA. (2021). Mid-year population estimates

Sweet, L. R., & Palazzi, D. L. (2015). Application of Kern's Six-step approach to curriculum development by global health residents. *Educ Health (Abingdon)*, 28(2), 138-141. <https://doi.org/10.4103/1357-6283.170124>

Tan, K., Chong, M. C., Subramaniam, P., & Wong, L. P. (2018). The effectiveness of outcome based education on the competencies of nursing students: A systematic review. *Nurse education today*, 64, 180-189. <https://doi.org/10.1016/j.nedt.2017.12.030>

UNAIDS. (2020). Country Factsheets : South Africa 2020
<https://www.unaids.org/en/regionscountries/countries/southafrica>

Wass, V., Van der Vleuten, C., Shatzer, J., & Jones, R. (2001). Assessment of clinical competence. *Lancet*, 357(9260), 945-949. [https://doi.org/10.1016/S0140-6736\(00\)04221-5](https://doi.org/10.1016/S0140-6736(00)04221-5)

Watkins, C. C., & Treisman, G. J. (2015). Cognitive impairment in patients with AIDS—prevalence and severity. *HIV/AIDS (Auckland, NZ)*, 7, 35. 10.2147/HIV.S39665

Willcox, M. L., Peersman, W., Daou, P., Diakité, C., Bajunirwe, F., Mubangizi, V., Mahmoud, E. H., Moosa, S., Phaladze, N., & Nkomazana, O. (2015). Human resources for primary health care in sub-Saharan Africa: progress or stagnation? *Human Resources for Health*, 13(1), 1-11. DOI 10.1186/s12960-015-0073-8

Supplementary Table S1

Kern's 6-step approach to curriculum development

Step	Description	Study activity
1.	Problem identification and general needs assessment	A survey of 400 frontline HIV healthcare workers providing HIV care at various facility levels in South Africa described existing HIV-associated CI knowledge and current practices. A scoping review of available published showed that there were limited data on HIV-associated CI training provided to primary healthcare workers in Africa.
2.	Targeted needs assessment	Focus group discussions and in-depth interviews were conducted due to the paucity in available published studies which trained primary healthcare workers to administer cognitive impairment screening tools to people living with HIV.
3.	Goals and objectives	Key learning areas and goals for the training were developed based on the survey, interviews, and the scoping review.
4.	Educational strategies	The pilot training curriculum was consisted of the following educational components: 1) theoretical component which included didactic lectures, case studies and group discussions, 2) practical component which included didactic lectures, video demonstrations and role-playing and 3) patient simulation exercise and direct observation of procedural skills.
5.	Implementation	A pilot training was implemented among 34 primary healthcare workers
6.	Feedback and evaluation	Primary healthcare workers evaluated the pilot training. Key personnel from the4 department of Health evaluated the curriculum and training programme.

Supplementary Table S2

Summary of core knowledge aptitudes and specific focus skills

Existing knowledge

The Human Immunodeficiency Virus (HIV)

HIV and the central nervous system

Core knowledge aptitudes

HIV-associated neurocognitive impairment (H-NCI)

A brief history of H-NCI

Risk factors to be considered when investigating H-NCI

Characteristics of H-NCI

Treatment non-adherence and H-NCI

Co-morbidities and H-NCI

Difficulties in using these criteria at the primary healthcare level

Managing patients with symptomatic H-NCI

Consequences of H-NCI

Specific Skills

Administering and interpreting the International HIV-Dementia Scale

Administering and interpreting the CAT-Rapid

Supplementary Table S3

Criteria for high quality interventions

Criterion	Description
Relevance (also referred to as content validity)	There is a need for the intervention and its design is based on state-of-the-art (scientific) knowledge.
Consistency (also referred to as construct validity)	The intervention is 'logically' designed.
Practicality	Expected The intervention is expected to be usable in the settings for which it has been designed and developed. Actual The intervention is usable in the settings for which it has been designed and developed.
Effectiveness	Expected Using the intervention is expected to result in desired outcomes. Actual Using the intervention results in desired outcomes.
Note: Adapted from Jacobs et al. (2021)	

Supplementary Table S4

High quality interventions criterion responses

Criterion	Mental Health Manager	HAST Manager	District Manager	Provincial Mental Health Manager	District Trainer	District Trainer
Relevance	5	5	4	5	5	5
Practicality (expected)	5	5	4	4	5	4
Effectiveness (expected)	5	5	4	4	5	5
Total (range : 0 – 15)	15	15	12	13	15	13
Note: Likert scale 1: Strongly disagree, 2: Disagree, 3 Somewhat agree, 4: Agree, 5: Strongly agree						

Chapter 6

Integrating HIV-associated neurocognitive impairment screening within primary healthcare facilities: A pilot training intervention

Adele Munsami, Hetta Gouse, Goodman Sibeko, Sam Nightingale & John Anton Joska

Description of the contribution of candidate and co-authors

The fifth manuscript describes the HIV-Associated neurocognitive impairment training programme. This manuscript provides empirical data from the training programme that I designed and developed for primary healthcare workers. Together with Associate Professor Goodman Sibeko and Professor John Joska, I developed the training material, including the training curriculum, trainee workbook, trainer manual, the training presentation and training assessments. The supervisory team reviewed the trainee workbook and the trainer manual. Adele Munsami worked with the Department of Health stakeholders to gain access to facilities where the training were held, recruited the study participants, conducted and facilitated the training sessions. Adele Munsami collected, entered, managed and analysed the data. I wrote the first draft of the manuscript. All authors provided conceptual and intellectual contributions to the final drafts. Adele Munsami managed all the revisions.

Current status: Published in *Nursing Research and Practice*, 2022

Munsami, A., Sibeko, G., Gouse, H., Nightingale, S., & Joska, J. A. (2022). Integrating HIV-Associated Neurocognitive Impairment Screening within Primary Healthcare Facilities: A Pilot Training Intervention. *Nursing research and practice*, 2022.

<https://doi.org/10.1155/2022/4495586>

Abstract

HIV-associated neurocognitive impairment (H-NCI) remains a common co-morbidity, which may affect several key health outcomes. However, there are shortages of appropriately skilled healthcare workers able to identify and manage H-NCI, in low- and middle-income countries. We conducted an exploratory, quasi-experimental, pre- and post-cohort training intervention in KwaZulu-Natal, South Africa. Thirty-four healthcare workers (2 general medical doctors, 22 nurses and 10 adherence counsellors) from six facilities and a mobile clinic unit attended two, two-hour face-to-face, training sessions comprising of didactic knowledge and skill transfer components. Pre- and post-knowledge questionnaires demonstrated an improvement among $n = 28$ (82%) attendees from all three cadres. Knowledge was retained by $n = 30$ (88%) attendees after eight weeks. H-NCI screening tools were administered with 78% accuracy. After eight weeks two general medical doctors and eight senior nurses were able to accurately administer the tool. The Primary Healthcare H-NCI training was successful in improving knowledge among primary healthcare workers, however several healthcare workers experienced challenges with administering such tools.

6.1 Introduction

HIV is now recognised as a manageable, multi-system, chronic illness, following widespread availability of virologically suppressive antiretroviral therapy (ART) (Deeks et al., 2013). More than two thirds of the global population of people with HIV (PWH) are found in sub-Saharan Africa (Giguère et al., 2021). South Africa is the country most severely affected by the epidemic, accounting for approximately 7.8 million PWH (UNAIDS, 2020). South Africa is also home to the largest ART program worldwide, with 72 % of PWH in the country currently accessing treatment (UNAIDS, 2020).

Over the past decade, there have been significant declines in several AIDS defining illnesses including severe HIV-associated neurocognitive impairment (H-NCI), such as HIV-associated dementia (HIV-D) (Deeks et al., 2013). However, while the incidence of HIV-D has fallen dramatically, the lifetime prevalence may remain stable or even increase, as PWH on effective ART now have longer life (Heaton et al., 2004).

PWH with symptoms of H-NCI, experience difficulties with attention, memory, learning, problem solving, decision making, and with activities required for everyday functioning, including ART adherence (Heaton et al., 2004). Healthcare providers in clinical settings have been noted to have limited knowledge of H-NCI, and screening practices remain uncommon in low- and middle-income countries (Gouse et al., 2021; Long et al., 2016; Munsami et al., 2021). In lieu of this, it is unclear whether the paucity in knowledge is due to lower H-NCI incidence and prevalence rates in a context of effective ART, or whether H-NCI is under-detected due to limited knowledge and appropriate screening skills among healthcare workers in this setting.

Low- and middle-income countries experience severe shortages in trained healthcare providers, especially mental and neurological healthcare workers (Cettomai et al., 2011). Medical, surgical, and neurosurgical specialties have adopted a task-sharing to address human resource shortages in this setting (Anand et al., 2019). This approach involves the redistribution of duties through the delegation of services (Robertson et al., 2020). Several healthcare workers from various tiers form a collaborative team of specialists and less-qualified cadres, relying on iterative communication and training to preserve high-quality outcomes (Robertson et al., 2020).

It is unclear whether targeted H-NCI screening for neurocognitive and functional symptoms, can be effectively integrated into a primary healthcare clinic through task-sharing from specialists to primary healthcare workers (Cettomai et al., 2011; Remien et al., 2019).

This approach has the potential to fast-track access to reinforced counselling among PWH who are non-adherent to ART, or referral to a neuropsychologist among those with behavioural and/or functional impairment. A systematic review conducted by Liu et al. (2016) reported several studies exploring task-sharing through the delegation of mental health services from specialists to general medical doctors, nurses, and community healthcare workers. However, few studies included H-NCI in the training interventions (Liu et al., 2016). Although one H-NCI training intervention found improved confidence in identifying H-NCI symptoms among clinical officers in Kenya, this training did not include general medical doctors, nurses, and adherence counsellors (Cettomai et al., 2011). Task-sharing which is commonly evaluated through training, practice, and maintenance, has not been explored among general medical doctor, nurse and/or adherence counsellors administering H-NCI screening in this setting (Robertson et al., 2020).

Our study aimed to provide preliminary evidence needed to inform the design of an H-NCI training intervention targeting primary healthcare workers in low- and middle-income countries with a view toward task-sharing of H-NCI screening from specialists to primary healthcare workers. Our primary objective was to explore the viability of H-NCI screening by primary healthcare workers. We examined the initial uptake of knowledge and skills among general medical doctors, nurses and adherence counselors following the training intervention. Our secondary objective was to examine the appropriateness of an in-field, H-NCI training intervention among primary healthcare workers, at this level of care. This was informed by the knowledge gaps identified in Chapters 2,3 and 4, as well as the review reported in Chapter 5.

6.2 Methods

6.2.1 Study design

An exploratory, quasi-experimental, pre- and post-cohort intervention study was conducted among primary healthcare workers as these healthcare workers provide majority of HIV services in KwaZulu-Natal, South Africa. We developed a four-hour Primary Healthcare H-NCI training programme that was spread over two weekly, two-hour sessions. This programme design comprised of didactic knowledge and H-NCI skill transfer components content and specific skills training delivered in a short period of time. This with a view to making it cost-effect and easily replicated by future interventions in low- and middle-income countries. The on-site design also ensured that the healthcare workers remained in the facility and were available to attend to emergencies, thus ensuring minimal impact on patient services in already burdened facilities. The development process of the pilot H-NCI training is described below.

The training sessions took place at primary healthcare facilities based on the principles of academic detailing. Academic detailing involves peer-to-peer outreach process involving visits to the work setting of a target audience from a trained professional and allows the trainer to demonstrate and discuss topics, including new skill sets, to improve patient services (Lyon et al., 2011). The main aim of academic detailing is to increase the uptake of a new intervention, such as the use of a standardized assessment tool in community practice, that are otherwise uncommon (Garland et al., 2003; Lyon et al., 2011). The iterative processes of academic detailing, involving peer-to-peer skills transfer, demonstration and feedback were appropriate for our pilot training.

6.2.1 Ethical considerations

The University of Cape Town Faculty of Health Sciences Human Research Ethics Committee, the City of Cape Town Department of Health, the KwaZulu-Natal Department of Health in, and the Ugu District provided approval for this study. The training was approved by the HAST district manager, district mental health manager and the operational manager and the chief executive officer, at each facility. All participants provided informed consent prior to participation.

6.2.2 Population and sample

We applied the general rule which suggests a minimum of 30 subjects or greater for pilot studies (Whitehead et al., 2016). This sample size was sufficient to test procedures and processes which will inform future training interventions. To recruit participants for the Primary Healthcare H-NCI training, we approached medical managers from the HIV and Sexually Transmitted Infections (HAST) units at primary healthcare facilities in the Ugu district of KwaZulu-Natal (KZN), under the KZN Department of Health. General medical doctors, nurses and adherence counsellors working in these units were invited to participate in the training. The healthcare workers were informed by the medical manager that participation was not mandatory. Between June and July 2021, 34 primary healthcare workers (2 doctors, 22 nurses and 10 adherence counsellors) from five primary healthcare facilities and a mobile clinic unit attended both sessions of the pilot training.

6.2.3 Curriculum development

The Primary Healthcare H-NCI training curriculum was developed by the first author (AM) and senior researchers from the University of Cape Town (JJ, HG, SN, GS), following Kern's 6-step approach to curriculum development (Robertson et al., 2019; Thomas et al.,

2016). Kern's framework, which is described as a practical and theoretically sound approach to developing, implementing, evaluating and continually improving health education has been successfully applied in medical education (Robertson et al., 2019; Sweet & Palazzi, 2015; Tariq et al., 2017). The model includes six steps: 1) problem identification and general needs assessment, 2) targeted needs assessment, 3) goals and objectives, 4) educational strategies, 5) implementation, and 6) feedback and evaluation (Thomas et al., 2016). Table S1 (Supplementary Material) details the activities undertaken at each step and provides an outline of the training curriculum.

The first author developed a workbook to facilitate learning during the training, in consultation with the other authors (GS, HG, SN and JJ). The workbook included the training content as well as additional reading material providing more information. It also allowed participants to have access to information that could not be covered, such as a detailed background of H-NCI. The content of the workbook was summarised in point form and was presented to the training recipients by the first author using a power point presentation. The presentation was guided by a trainer manual that was developed by the first author with input from the co-authors. The trainer manual included session directions, such as the duration of the session and instructions for the trainer (for example, the trainer should request participants to complete the pre-test before beginning the session). The trainer manual also included a speech guide for the trainer to follow and a list of required materials for each session, for example, a stopwatch or watch with a second hand. Visual aids in the form of video demonstrations of the screening tools were used to supplement the information provided in the workbook.

We used the International HIV dementia scale (IHDS) and the cognitive assessment tool-rapid version (CAT-rapid) for this training. These tools have previously been validated for use in South Africa (Joska et al., 2016; Robbins et al., 2011). The IHDS tests three

neurocognitive domains including motor speed (timed finger tapping), psychomotor speed and processing (timed alternating hand sequence test), as well as short-term memory recollection of four words in two minutes) (Sacktor et al., 2005). The CAT-rapid includes four symptom questions, short-term memory (registration of four words), executive functioning (a mini-trail-making test), psychomotor speed and processing (timed alternating hand sequence test), and verbal learning and memory (word recall) assessments (Joska et al., 2016). A detailed description of the administration of the IHDS and the CAT-rapid are described in Sacktor et al. (2005) and Witten (2015).

6.2.4 Data collection

6.2.4.1 Delivery of the training

The training was delivered by the first author (AM), who has experience in HIV/TB training facilitation among general medical doctors, nurses, and adherence counsellors, providing healthcare services at various levels in South Africa. The first author received training on neuropsychological screening tools whilst working on a research study conducted at the University of Cape Town, under HG - a registered neuropsychologist. The H-NCI training sessions comprised of didactic lectures, case vignettes, interactive discussions and role playing. The first session focused on the theoretical components of H-NCI. The second session involved practical training in administering H-NCI screening tools.

6.2.4.2 Participant evaluation and measures

The knowledge and skills assessments were designed using Miller's pyramid for assessing clinical competence as a framework (Blazar et al., 2020; Norcini, 2003). This framework has been used to assess clinical competence beyond test-taking or memorizing of information (Blazar et al., 2020). The model emphasizes the importance of acquiring

knowledge to perform a task in practice (Norcini, 2003). The lowest level in the model is knowledge (knows), followed by competence (knows how), performance (shows how), and action (does) (Blazar et al., 2020; Norcini, 2003). In the post training evaluation, we examined participants' attitudes and views of the H-NCI training.

6.2.4.3 Knowledge and attitudes

Pre- and post- multiple-choice questionnaires were used to evaluate knowledge as well participants' attitude and comfort with NCI screening tools before and after the training. This is the most common technique adopted in academic detailing (Lyon et al., 2011). The questions were adapted from a tool developed by Johnston et al. (2003). This tool consisted of 43 items, measuring non-skill attributes including knowledge, attitude and behaviour among undergraduate medical students. This tool was appropriate for our study as it sought to evaluate teaching and learning of medical curriculum.

6.2.4.4 Skills

Direct observation of procedural skills (DOPS) was used to assess healthcare workers ability to administer the H-NCI screening tool. DOPS has been described by Wass et al. (2001) as appropriate assessment of clinical competence. Each trainee was assigned a one-on-one time slot to demonstrate the H-NCI screening tool to a standardized patient as part of a simulation. The simulations were assessed using a checklist detailing the steps required to accurately administer the selected screening tools and to interpret the results. The participants' performances were scored by a counselling psychologist with previous experience in neuropsychological testing. Tasks that were accurately demonstrated were given a score of 2, tasks that were listed on the checklist but were performed inaccurately were given a score of 1, and tasks that were incorrect or excluded were given a score of 0.

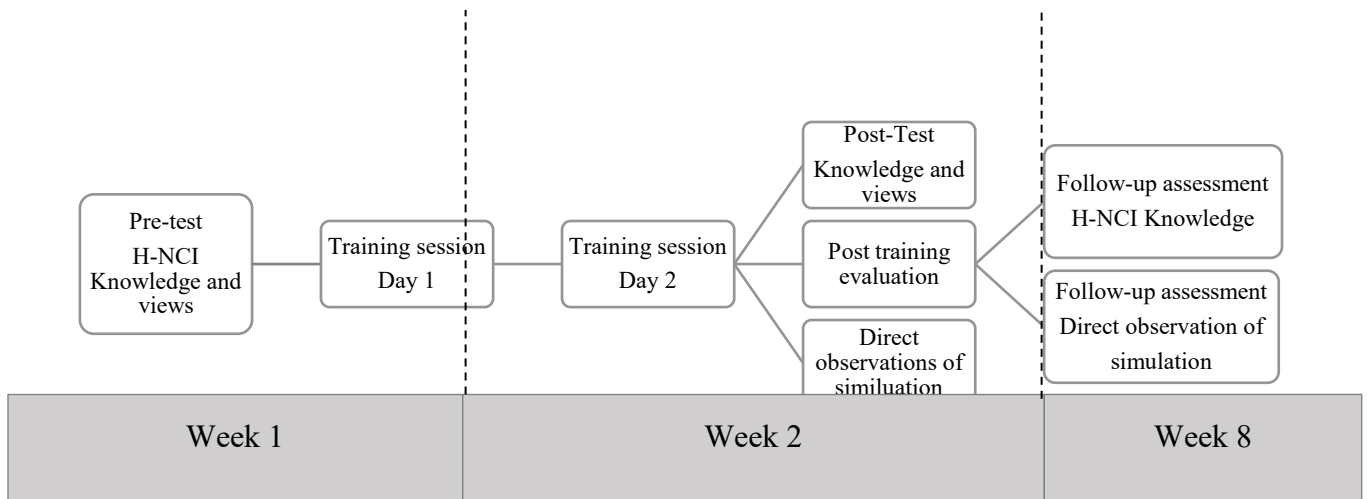
Healthcare workers who did not accurately demonstrate the use of the screening tool were given immediate feedback by the trainer once the simulation was completed.

6.2.4.5 Evaluation procedures

Data collected at baseline included participant demographics and pre-training data for knowledge of H-NCI and attitudes toward screening for H-NCI among PWH. Training evaluation data were collected at the end of the second session. Knowledge of H-NCI and screening skills were assessed immediately after the training and after eight weeks. This is illustrated in the flow diagram (Figure 1). All data were collected anonymously using a unique participant identifier. Documentation containing participant names and their unique identifiers were kept confidential by using a hardcopy linking log that was stored in a separate location to the data.

Figure 1

Flow diagram of H-NCI training and evaluations



6.3 Analysis

IBM Statistical Package for the Social Sciences (SPSS) 27, was used to analyse the data (IBM-Corp., 2017). We compared H-NCI knowledge among general medical doctors, nurses and adherence counsellors before the training, immediately after the training and eight weeks later. The data were analysed using frequency analysis and Fishers exact t-test and are reported as mean and standard deviation. We report healthcare workers 'ability to administer the H-NCI screening tools immediately after the training using chi-square analyses. We compared performance between the three cadres to establish which cadres would be appropriate to administer the H-NCI screening tools. We examined whether these skills were retained eight weeks after the training by comparing the three cadres.

6.4 Results

After describing participant characteristics, we present the results from the pre- and post-tests, DOPS and follow-up assessments.

6.4.1 Participants

Of the 42 healthcare workers who initially enrolled to participate in the training, thirty-four participated in two training sessions (21 healthcare workers from six small facilities combined at facility one, and 13 from facility two, a mobile unit). Eight healthcare workers were excluded from the final analysis, including six who were required to attend to patients during the second session and two who were unavailable as they were schedule to work the night shift on the day of the training.

Study participants consisted of two general medical doctors (6%), 22 nurses (65%) and ten adherence counsellors (29%). Most healthcare workers who participated in the training were female (71%, n = 24). The mean age of participants attending the training was

39 years ($SD = 9.5$, range : 26 - 62) and the median number of years in service was 12 years ($SD = 7.8$, range : 2 - 40).

6.4.2 HIV-associated neurocognitive impairment knowledge pre- and post-training

To determine whether the pilot training intervention led to improved H-NCI knowledge among primary healthcare workers, contingency tables were used to compare pre- and post-questionnaire scores for the total sample of 34 (Figure 2). Results show that there was a significant increase in H-NCI knowledge overall. Prior to the training the mean knowledge score was 61% ($SD = 1.48$). Healthcare workers demonstrated sufficient knowledge of H-NCI after the training ($M = 83\%$, $SD = 1.25$). There were significant improvements in knowledge among 82% ($n = 28$) all three cadres. Five (15%) healthcare workers (one nurse and four adherence counsellors) showed no change in knowledge while one adherence counsellor (3%) scored lower as they intermittently attended to patients during the training.

Figure 2

Healthcare worker H-NCI knowledge scores before and after training

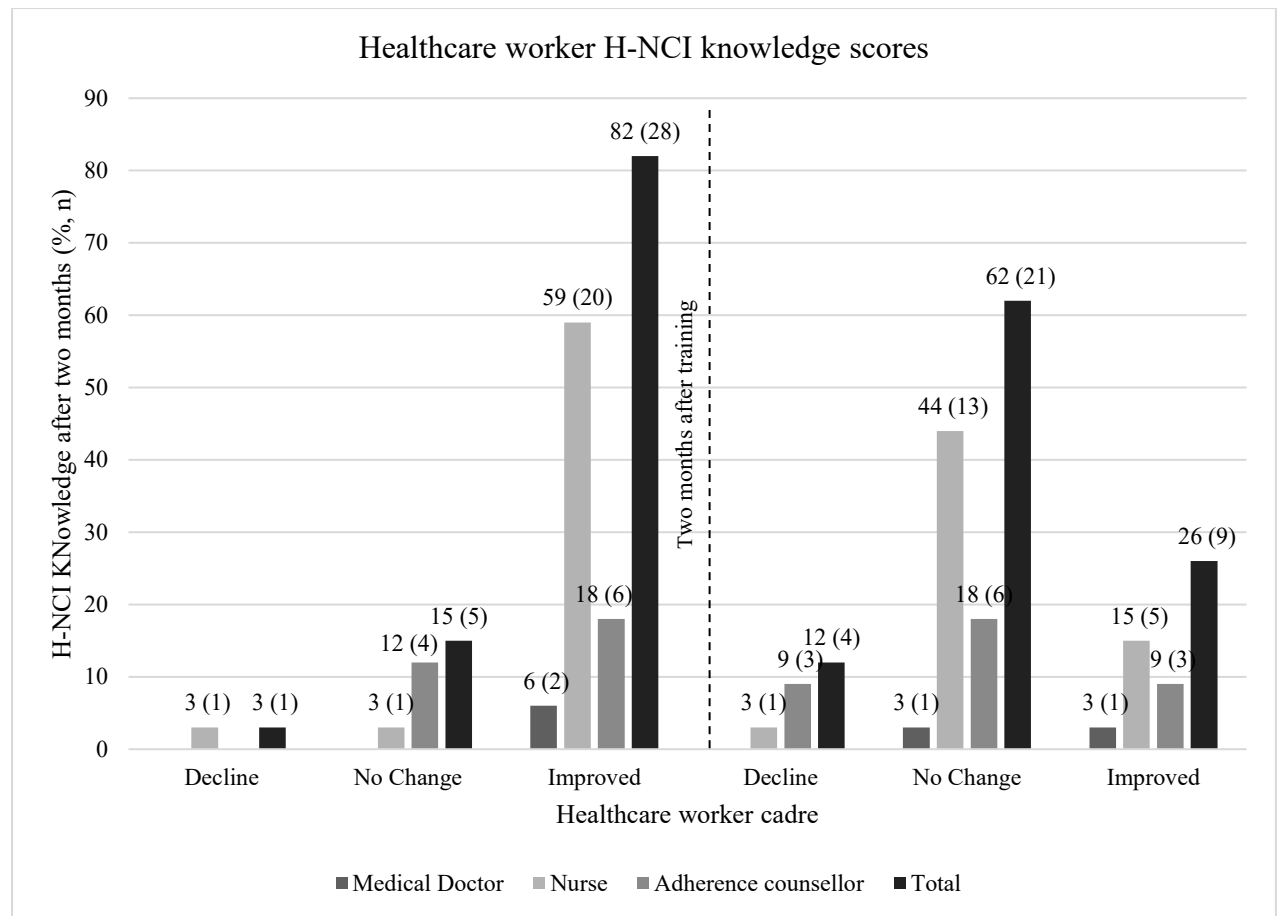
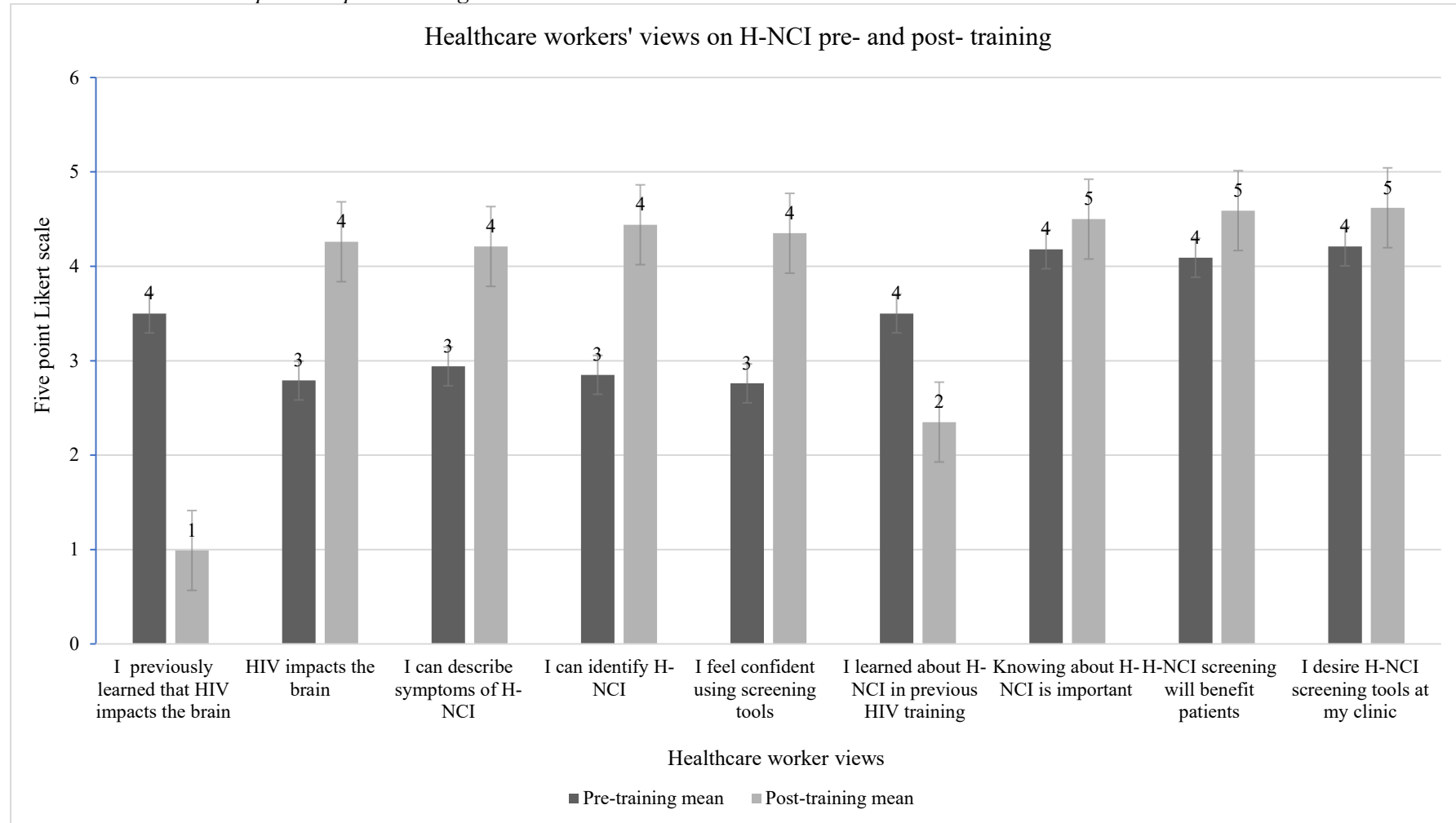


Figure 3 illustrates the change in knowledge scores between cadres eight weeks after the training intervention. Overall, knowledge was retained among 62% (n = 21) of healthcare workers (one general medical doctor, 13 nurses and six adherence counsellors) who showed no change in knowledge. Nine (26%) healthcare workers (one general medical doctor, five nurses and three adherence counsellors) demonstrated improved knowledge. There was a decline in knowledge among four (13 %) healthcare workers (one nurses and three adherence counsellors).

Figure 3

Healthcare worker views pre- and post-training



Note: 5-point Likert scale

0: Strongly disagree, 1: Disagree, 2: I do not know enough to answer, 3: Agree, 4: Strongly agree

One-tail paired-samples t-tests were used to compare healthcare workers views on their knowledge of H-NCI before and after the training. These results are illustrated in Figure 3. Those who had limited or no knowledge of the impact of HIV on the brain prior to training agreed that they a had significantly better understanding of the impact of HIV on the brain after the training. Prior to the training intervention, primary healthcare workers were unsure whether H-NCI was covered in their previous training. At the end of the H-NCI training this was clarified, and healthcare workers agreed that previous training did not address the impact of HIV on the brain or H-NCI.

6.4.3 Administering an HIV-associated neurocognitive impairment screening tool

6.4.3.1 Overall performance of screening tools immediately after the training

To understand whether primary healthcare workers would be able to accurately administer and interpret an H-NCI screening tool, we observed the demonstration of an H-NCI screening tool to a simulated patient which included the IHDS and the CAT-rapid. The mean performance scores of their administration skills and interpretation of the results are summarised in Table 1.

Table 1*Overall HIV-associated neurocognitive impairment screening tool demonstration scores*

Screening tool	Task % (score)	Doctor (n=2)	Nurse (n=22)	Adherence counsellor (n=10)	Total (n=34)	Std. Deviation	Minimum	Maximum	Chi-square	df	p-value
IHDS	Motor speed	88 (14)	83 (13)	64 (10)	77 (12)	4,2	3,0	16,0	35,4	22,0	0.07
	Psychomotor speed	89 (16)	77 (14)	66 (12)	75 (13)	4,6	4,0	18,0	20.65	20	0.41
	Memory recall	92 (11)	77 (9)	62 (7)	73 (9)	3,1	2,0	12,0	39.29	16	0.002
	IHDS Total	90 (43)	82 (39)	57 (28)	75 (13)	11,4	11,0	48,0	36.47	32	0.31
	Symptoms	100 (6)	94 (5)	100 (6)	96 (6)	0,6	3,0	6,0	3.97	4	0.33
CAT-R	Trail making	88 (7)	76 (6)	56 (5)	71 (6)	2,2	1,0	8,0	10.77	14	0.72
	Motor speed	91 (15)	79 (13)	67 (11)	76 (12)	4,6	2,0	16,0	24.93	22	0.34
	Psychomotor speed test	81 (15)	70 (13)	61 (11)	68 (12)	5,4	3,0	18,0	12.42	14	0.55
	Memory recall	95 (10)	87 (9)	64 (6)	81 (8)	2,4	1,0	10,0	41.79	36	0.28
	CAT-Rapid Total	90 (58)	84 (54)	66 (42)	79 (51)	13,7	18,0	64,0	34.62	40	0.76
Total combined score		91 (101)	85 (93)	64 (70)	78 (86)	24,0	29,0	110,0	38.02	42	0.73

Overall, primary healthcare workers demonstrated the combined screening tool with 78% ($n = 34$) accuracy, ($M = 78.1$, $SD = 24.0$). One general medical doctor and one nurse administered the combined screening tool with 100% accuracy (6%). Four (12%) healthcare workers (one general medical doctor and three nurses), demonstrated the screening tool with few errors, scoring between 96% - 99%. Overall, 41% ($n = 14$) of healthcare workers administered the screening tool reasonably accurately (range : 71% - 95%), 21% ($n = 7$) administered the screening tool somewhat accurately (range : 40% - 70%), and 6% ($n = 2$) administered the tool poorly (range : 0% - 39%). The accuracy of the demonstrations varied among the three cadres. General medical doctors (91 %, $n = 2$) and nurses (85%, $n = 22$) demonstrated the screening tools with greater accuracy compared to adherence counsellors (63%, $n = 10$).

6.4.3.2 Healthcare workers' performance on the CAT-rapid

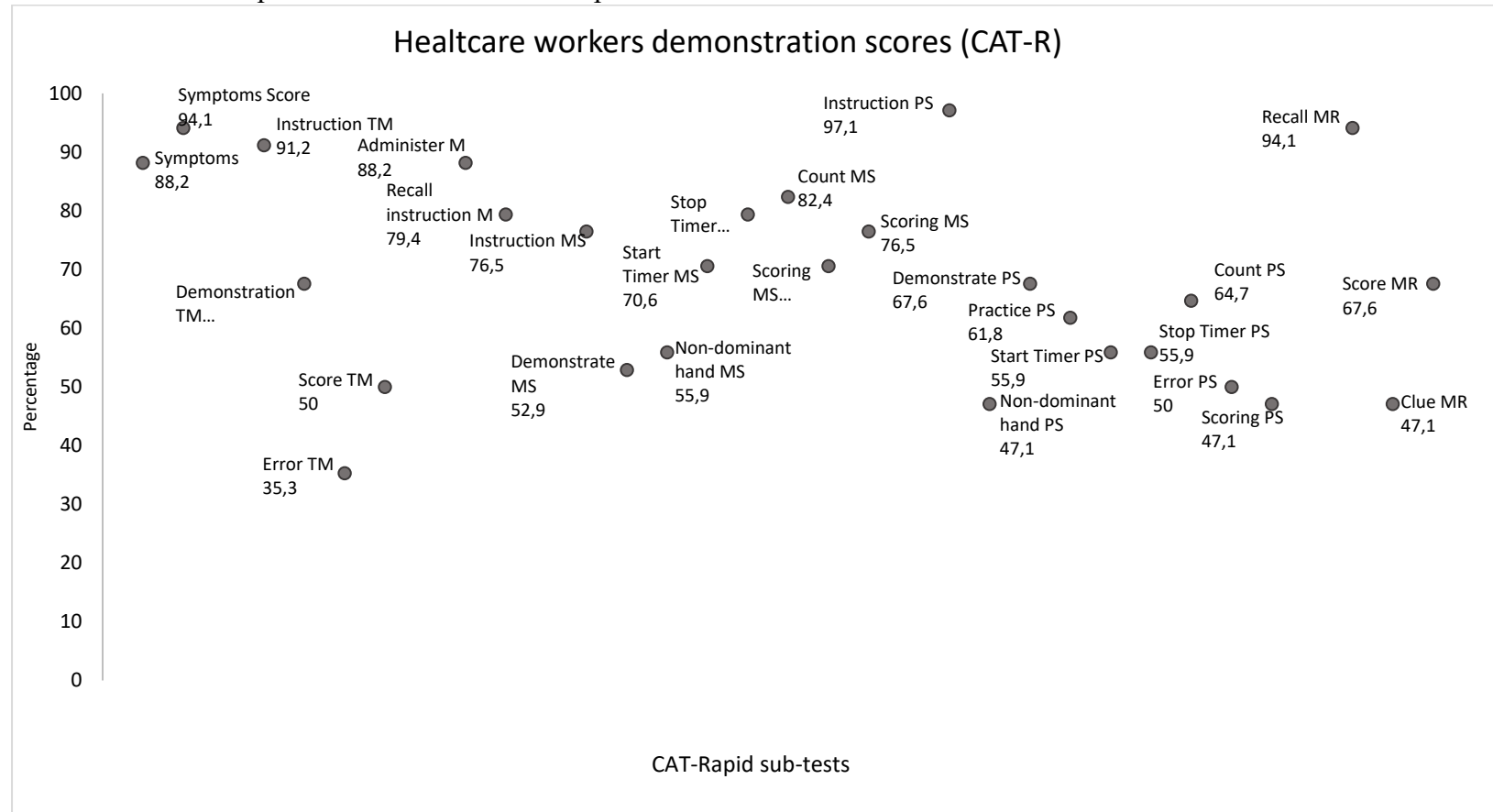
Healthcare workers performed marginally better on the CAT-rapid screening tool ($M = 79.0\%$, $SD = 13.7$) compared to the IHDS ($M = 75.0\%$, $SD = 11.4$; see Table 1).

The CAT-rapid was administered with 100% accuracy by 15% ($n = 5$, one doctor and four nurses) of healthcare workers. Five (15%) healthcare workers (one general medical doctor and four nurses) demonstrated the CAT-rapid with few errors, scoring between 96% - 99%. Overall, 50% ($n = 17$) administered the CAT-rapid reasonably accurately (range : 71% - 95%), 18% ($n = 6$) somewhat accurately (range: 40% - 70%) and 12 % ($n = 4$) administered the CAT-rapid poorly (range : 0% - 39%). Overall, general medical doctors performed the CAT-rapid with 90% accuracy ($n = 2$), followed by the nurses who demonstrated 84% accuracy ($n = 22$). The adherence counsellors ($n = 10$) demonstrated the CAT-rapid somewhat accurately (66%).

Our results show that primary healthcare workers were least successful with the following components of the CAT-rapid: demonstrating the timed finger tapping test and the alternating hand sequence test, scoring the alternating hand sequence test and the mini trail making test, administering the memory recall clues, ensuring that the non-dominant hand was used during the test, use of the timer for the alternating hand sequence test (see Figure 4).

Figure 4

Healthcare workers 'performance on the CAT-Rapid



Key

Symptoms: Administration of symptom questions, Symptoms score: Accurately scored symptom responses, Instruction TM: Accurately read trail making test instruction, Demonstration TM: Accurately demonstrated trail making test, Error TM: Detected error during trail making test, Score TM: Accurately scored trail making test, Administering M: Accurately read out word registration list, Recall Instruction M: Informed patient that the words will be asked for later, Instruction MS: Accurately read motor speed test instruction, Demonstrate MS: Accurately demonstrated motor speed test, Non-dominant hand MS: Instructed and ensured participant used their non-dominant hand, Start timer MS: Started the timer for motor speed test, Stop timer MS: Stopped the timer correctly for motor speed test, Count MS: Accurately counted the number of finger taps, Scoring MS: Accurately scored the completed taps on the motor speed test, Scoring MS: Wrote down correct score for the motor speed test, Instruction PS: Accurately read psychomotor speed test instruction, Demonstrate PS: Accurately demonstrated motor speed test, Non-dominant hand PS: Instructed and ensured participant used their non-dominant hand, Practice PS: Allowed participant to practice the sequence three times, Start timer PS: Started the timer for motor speed test, Stop timer PS: Stopped the timer correctly for motor speed test, Count MS: Accurately counted the number of finger taps, Scoring MS: Accurately scored the completed taps on the motor speed test, Error PS: Detected error in psychomotor speed test, Count PS: Accurately counted the number of sequences, Scoring PS: Wrote down correct score for the psychomotor speed test, Recall MR: Asked participant to recall word list, Clue MR: Accurately provided clue for memory recall test, Score MR: Accurately scored the correct words

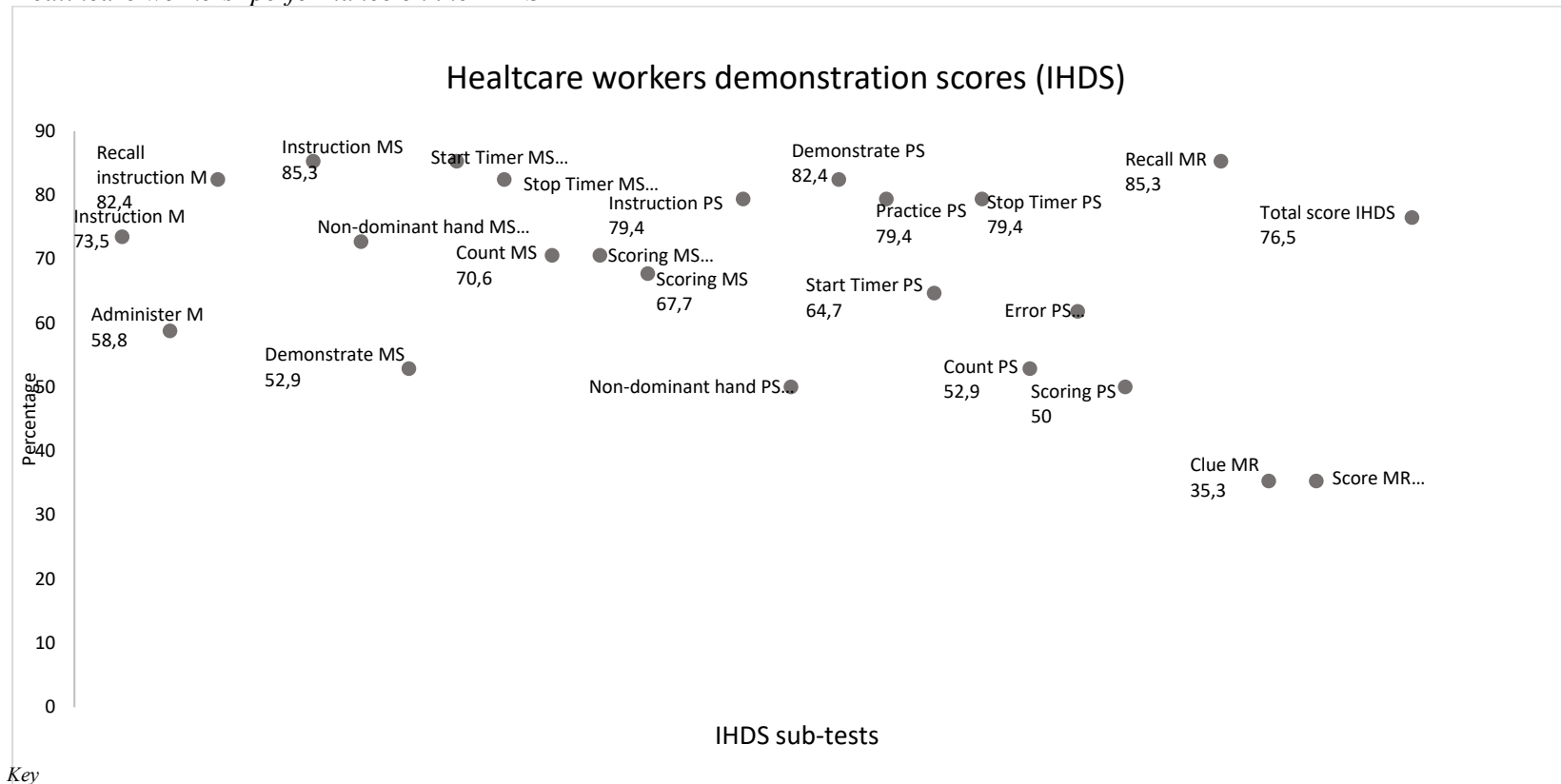
6.4.3.3 Healthcare workers' performance on the IHDS

The IHDS was administered with 100% accuracy by 21% (n = 7) of primary healthcare workers (one general medical doctor and six nurses). Four (12%) healthcare workers (one general medical doctor and three nurses) demonstrated the IHDS with few errors, scoring between 96% - 99%. Overall, 38% of healthcare workers (n =13) administered the IHDS with reasonable accuracy (range : 71% - 95%), 29% (n = 10) somewhat accurately (range : 40% - 70%), and 12% (n = 4) administered the IHDS poorly (range : 0% - 39%). Between the cadres, the IHDS was demonstrated with greater accuracy among general medical doctors (90%) and nurses (82%). Adherence counsellors demonstrated the IHDS somewhat accurately (57%).

Primary healthcare workers were least successful with the following components of the IHDS (Figure 5): the administration of the memory recall clue, scoring the memory recall task and the alternating hand sequence test, ensuring that the non-dominant hand was used during the test.

Figure 5

Healthcare workers 'performance on the IHDS



Key

Instruction M: Accurately read out word registration list, Recall Instruction M: Informed patient that the words will be asked for later, Instruction MS: Accurately read motor speed test instruction, Demonstrate MS: Accurately demonstrated motor speed test, Non-dominant hand MS: Instructed and ensured participant used their non-dominant hand, Start timer MS: Started the timer for motor speed test, Stop timer MS: Stopped the timer correctly for motor speed test, Count MS: Accurately counted the number of finger taps, Scoring MS: Accurately scored the completed taps on the motor speed test, Scoring MS: Wrote down correct score for the motor speed test, Instruction PS: Accurately read psychomotor speed test instruction, Demonstrate PS: Accurately demonstrated motor speed test, Non-dominant hand PS: Instructed and ensured participant used their non-dominant hand, Practice PS: Allowed participant to practice the sequence three times, Start timer PS: Started the timer for motor speed test, Stop timer PS: Stopped the timer correctly for motor speed test, Count PS: Accurately counted the number of finger taps, Scoring PS: Accurately scored the completed taps on the motor speed test, Error PS: Detected error in psychomotor speed test, Count PS: Accurately counted the number of sequences, Scoring PS: Wrote down correct score for the psychomotor speed test, Recall MR: Asked participant to recall word list, Clue MR: Accurately provided clue for memory recall test, Score MR: Accurately scored the correct words, Total score IHDS: Correctly scored the total tool

6.4.3.4 Two-months post-training

Primary healthcare workers were asked to demonstrate the screening tools eight weeks after the training. The results of the follow-up DOPS are summarised in Table 2.

Table 2*Healthcare workers' performance on HIV-associated neurocognitive impairment screening tool demonstration two months post-training*

Cadre		Doctor (n=2)			Nurse (n=22)			Adherence counsellor (n=10)			Total (n=34)			Chi-square	df	p-value
Screening tool	Task	No change	Improved	Declined	No change	Improved	Declined	No change	Improved	Declined	No change	Improved	Declined			
IHDS	Motor speed	5.9 (2)	0 (0)	0 (0)	55.9 (19)	5.9 (2)	2.9 (1)	17.6 (6)	0 (0)	12 (4)	79.4 (27)	5.9 (2)	14.7.8 (5)	7.99	4	0.09
	Psychomotor speed	0 (0)	2.9 (1)	2.9 (1)	35.3 (12)	23.5 (8)	5.9 (2)	17.6 (6)	5.9 (2)	5.9 (2)	52.9 (18)	32.4 (11)	5.9 (5)	4.29	4	0.37
	Memory recall	5.9 (2)	0 (0)	0 (0)	35.3 (12)	23.5 (8)	5.9 (2)	14.7 (5)	5.9 (2)	8.8 (3)	55.9 (19)	29.4 (10)	8.8 (5)	4.37	4	0.36
	IHDS Total	0 (0)	2.9 (1)	2.9 (1)	29.4 (10)	26.5 (9)	8.8 (3)	8.8 (3)	8.8 (3)	11.8 (4)	38.2 (13)	38.2 (13)	23.5 (8)	4.20	4	0.38
CAT-Rapid	Symptoms	5.9 (2)	0 (0)	0 (0)	41.2 (14)	20.6 (7)	2.9 (1)	11.8 (4)	8.8 (3)	8.8 (3)	55.8 (20)	29.4 (10)	11.8 (4)	5.6	4	0.20
	Trail making	5.9 (2)	0 (0)	0 (0)	41.2 (14)	17.6 (6)	5.9 (2)	20.6 (7)	2.9 (1)	5.9 (2)	67.6 (23)	20.6 (7)	11.8 (4)	2.75	4	0.60
	Motor speed	2.9 (1)	0 (0)	2.9 (1)	26.5 (9)	32.4 (11)	5.9 (2)	17.6 (6)	5.9 (2)	5.9 (2)	47.1 (16)	38.2 (13)	14.7 (5)	5.32	4	0.26
	Psychomotor speed test	0 (0)	2.9 (1)	2.9 (1)	41.2 (14)	17.6 (6)	5.9 (2)	17.6 (6)	2.9 (1)	8.8 (3)	58.8 (20)	23.5 (8)	17.6 (6)	4.46	4	0.35
	Memory recall	0 (0)	2.9 (1)	2.9 (1)	41.2 (14)	17.6 (6)	5.9 (2)	17.6 (6)	2.9 (1)	5.9 (2)	58.5 (20)	23.5 (8)	17.6 (6)	4.20	4	0.38
Total combined score	CAT-Rapid Total	0 (0)	2.9 (1)	2.9 (1)	41.2 (14)	17.6 (6)	5.9 (2)	17.6 (6)	2.9 (1)	5.9 (2)	58.5 (20)	23.5 (8)	17.6 (6)	4.20	4	0.38
	Total	0 (0)	2.9 (1)	2.9 (1)	29.4 (10)	29.4 (10)	5.9 (2)	5.9 (2)	8.8 (3)	14.7 (5)	35.3 (12)	41.2 (14)	23.5 (8)	7.97	4	0.09

Ten (29%) healthcare workers (one doctor and nine nurses) demonstrated the combined tool with 100% accuracy after eight weeks of daily practice. Overall, 41% ($n = 14$) of health care workers (one general medical doctor, ten nurses and three adherence counsellors) improved on their demonstration of the screening tools with practice over the eight-week period. The results show no significant differences among the cadres who improved when administering the screening tools. Fourteen (41%) primary healthcare workers (one general medical doctor, ten nurses and three adherence counsellors) demonstrated no change. H-NCI screening skills declined among eight (24%) primary healthcare workers (one general medical doctor, two nurses and five adherence counsellors) when compared to immediately after the training.

The CAT-rapid, was demonstrated with no changes by 59% ($n = 20$) of health care workers (14 nurses and six adherence counsellors). Eight (24%) healthcare workers (one general medical doctor, six nurses and one adherence counsellors) showed improvements, while five (15%) healthcare workers (one general medical doctor, two nurses and two adherence counsellors) scored lower than they did immediately after the training. The IHDS was demonstrated with no changes by thirteen (38%) healthcare workers (ten nurses and three adherence counsellors). Thirteen (38%) healthcare workers (one general medical doctor, nine nurses and three adherence counsellors) also improved when demonstrating the IHDS. There were eight (24%) healthcare workers who scored lower than they did immediately after the training (one general medical doctor, three nurses and four adherence counsellors). There were no statistically significant differences between the three cadres.

6.4.4 Healthcare workers' confidence using a screening tool

Healthcare workers who had limited or no knowledge of H-NCI symptoms or screening tools prior to the training were able to describe the symptoms of H-NCI ($M = -1.27$, $SD = 1.14$), identify H-NCI symptoms ($M = -1.35$, $SD = 1.26$) and felt more confident using

an H-NCI screening tool after attending the H-NCI training ($M = -1.59$, $SD = 1.05$). This was measured after the second session of the training.

6.5 Discussion

To our knowledge this study is the first to assess the viability of H-NCI screening by general medical doctors, nurses, and adherence counsellors at a primary healthcare level in low- and middle-income countries. This study also focuses the acceptability of in-field H-NCI training in a clinic setting. There were significant improvements in H-NCI knowledge among all three cadres following the training intervention and this was sustained by most healthcare workers at eight weeks. Although only a few general medical doctors and nurses were able to administer the H-NCI screening tool with 100% accuracy immediately after training, several others made minor errors which improved over time. Junior nurses and adherence counsellors demonstrated greater difficulty with administering the screening tool accurately, especially at eight weeks. Primary healthcare workers were in favour of attending future training that are brief and in-field, similar to the design adopted by H-NCI training.

H-NCI knowledge improved among all three cadres of primary healthcare workers following the training intervention (Cettomai et al., 2011). These preliminary knowledge findings are important for two reasons. First, there are extreme shortages of trained professionals in low- and middle-income countries, and second, there is a paucity in literature describing the adoption of task-sharing for H-NCI screening with delegation from specialists to mid-level and lay healthcare workers in low- and middle-income countries (Jacobs et al., 2021; Lund et al., 2014). Our training intervention was helpful as it provided clarity on H-NCI, with several healthcare workers later reporting that H-NCI had not been addressed during their initial HIV training. This study highlights that once equipped with knowledge of H-NCI, general medical doctors, nurses and adherence counsellors could potentially fill in the

skills gap, by task-sharing the identification of cognitive or functional challenges among PWH from the tertiary level where there are a limited number of specialists, to a primary healthcare level. Each of these cadres would also be able to flag patients for further investigation at the facility, or for referral to the next level of care among those with severe H-NCI. We hypothesize that the inclusion of H-NCI in future training, particularly HIV training targeting primary healthcare workers may serve as a potential mechanism for bridging the neurocognitive skills gap in low- and middle-income countries.

Viability of H-NCI training by non-specialist healthcare workers at a primary healthcare level is still unclear. Our findings show that the administration of the H-NCI screening tools varied between general medical doctors, nurses and adherence counsellors, similar to other local research comparing adherence counsellors and nurses (Breuer et al., 2012). Few general medical doctors and senior or mid-level nurses were able to administer the screening tool correctly immediately after the training. Several others demonstrated the screening tool with minor errors. This was not unexpected given that H-NCI screening tools differ from general clinical procedures or checklist type examinations. H-NCI screening tools are interactive and require the use of healthcare workers hands as part of the demonstrations, as well as accurate timing of tasks performed by patients. We saw several improvements in the administration of H-NCI screening tools among this group over time, suggesting that with a longer or more intensive training followed by mentorship from skilled professionals and routine refresher training, non-specialist healthcare workers may be able to accurately administer H-NCI screening tools.

Several other junior nurses, including staff nurses or certified nursing assistants and adherence counsellors experienced more challenges with the H-NCI screening tools which did not improve over time. This group of healthcare workers were only able to administer sub-sections of the screening tools, despite multiple practice sessions. Although staff nurses,

certified nursing assistants and adherence counsellors may have more contact with patients, certain diagnostic and treatment activities are carried out by mid-level nurses such as registered nurses or general medical doctors. As a result, this group may not use diagnostic tools routinely, especially tools that follow stringent processes like H-NCI screening tools.

Among this group, nurses and adherence counsellors struggled with demonstrating motor-function activities, including the finger tapping test and the alternating hand sequence test. These activities require the healthcare workers to master finger and hand sequences themselves before demonstrating this to a patient. Primary healthcare workers also struggled with tasks that required simultaneous or multiple actions such as the use of the timer and counting correct sequences only. Inaccuracy in administering H-NCI screening tools may lead to high false positive and negative rates. This may in turn result in increased anxiety and poor quality of life among PWH. Since these tools are required to be precisely administered to be interpreted correctly, junior, or lay healthcare workers may not be appropriate to administer H-NCI screening tools at primary healthcare clinics. The challenges we found in this study suggest that junior nurses or adherence counsellors may be better suited to administer tools that do not rely heavily on motor-function demonstrations, such as the HIV Cognitive Symptom Questionnaire (HCSQ), which involves a series of questions (Gouse et al., 2017). Alternatively, these healthcare worker cadres could flag at-risk patients for further investigation by general medical doctors or senior nurses, using checklists or question-based screening tools.

The appropriateness of the H-NCI training targeting primary healthcare workers was mixed. The training received a positive response from primary healthcare workers and knowledge improved among all cadres. Healthcare workers found the training appropriate and acceptable for general medical doctors, nurses and adherence counsellors who provide HIV services in busy clinic settings. The on-site training design was also considered to be

feasible, especially in over-burdened clinics with limited staff, as they were close enough to attend to emergency queries. However, this is also a limitation to the design as the training may be disrupted to provide patient care. Due to the complexity of the H-NCI screening tools the skills component of the training may require more time and mentoring to ensure that the skill has been mastered. Although screening may be practical, questions regarding the clinical utility and the timing of such screening, will remain. Training methods for mid-level or lay healthcare workers in the administration of H-NCI screening tools, does, however, require further investigation.

6.6 Limitations

This study has several limitations. The pilot sample was confined to one region in a single district of KwaZulu-Natal and may not be generalised to other parts of the country or other countries with limited resources. Due to the small sample size our findings are not generalisable. Our statistical analyses were limited to descriptive statistics. Despite efforts to create a suitable in-facility learning environment, there were several challenges including postponements of the training due to healthcare workers being required to administer the COVID-19 vaccines, interruptions for urgent patient care, and logistical or infrastructural challenges which may have indirectly impacted learning. A final limitation of this pilot study was the eight-week follow-up period. Repeated follow-up assessments would provide a better indication of the uptake of knowledge and implementation of skills were sustained over time.

6.7 Conclusion

H-NCI knowledge was well received among these cadres and retained after eight weeks. Skills training, however, presented some differences and challenges. We propose that knowledge training, which might improve detection of self-reported symptoms and signs of more severe H-NCI could be delivered in-person or using hybrid or even on-line platforms to

all cadres of primary healthcare workers. Skills training, where direct observation, correction and supervision is required, will need further research. Future research could explore whether alternate screening tools may be more suitable for general medical doctors and senior nurses to administer in busy primary healthcare clinics. In the next chapter (Chapter 7), I review the current literature of appropriate training method and the guiding framework underpinning the design and development of an H-NCI training programme targeting primary healthcare workers.

References

- Anand, T. N., Joseph, L. M., Geetha, A. V., Prabhakaran, D., & Jeemon, P. (2019). Task sharing with non-physician health-care workers for management of blood pressure in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Glob Health*, 7(6), e761-e771. [https://doi.org/10.1016/S2214-109X\(19\)30077-4](https://doi.org/10.1016/S2214-109X(19)30077-4)
- Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to research in education*. Cengage Learning.
- Blazar, E., Krishnan, V., & Mody, S. (2020). Education Theory Made Practical—Volume 4, Part 5: Miller’s Pyramid. <https://icenetblog.royalcollege.ca/2020/03/03/education-theory-made-practical-volume-4-part-5/>
- Breuer, E., Stoloff, K., Myer, L., Seedat, S., Stein, D. J., & Joska, J. (2012). Reliability of the lay adherence counsellor administered substance abuse and mental illness symptoms screener (SAMISS) and the International HIV Dementia Scale (IHDS) in a primary care HIV clinic in Cape Town, South Africa. *AIDS and Behavior* 16(6), 1464-1471. <https://doi.org/10.1007/s10461-011-0067-z>
- Cettomai, D., Kwasa, J., Birbeck, G. L., Price, R. W., Bukusi, E. A., & Meyer, A. C. (2011). Training needs and evaluation of a neuro-HIV training module for non-physician healthcare workers in western Kenya. *J Neurol Sci*, 307(1-2), 92-96. <https://doi.org/10.1016/j.jns.2011.05.005>
- Deeks, S. G., Lewin, S. R., & Havlir, D. V. (2013). The end of AIDS: HIV infection as a chronic disease. *Lancet*, 382(9903), 1525-1533. [https://doi.org/10.1016/S0140-6736\(13\)61809-7](https://doi.org/10.1016/S0140-6736(13)61809-7)

- Garland, A. F., Kruse, M., & Aarons, G. A. (2003). Clinicians and outcome measurement: what's the use? *The journal of behavioral health services & research*, 30(4), 393-405. DOI 10.1007/BF02287427.
- Giguère, K., Eaton, J. W., Marsh, K., Johnson, L. F., Johnson, C. C., Ehui, E., Jahn, A., Wanyeki, I., Mbofana, F., & Bakiono, F. (2021). Trends in knowledge of HIV status and efficiency of HIV testing services in sub-Saharan Africa, 2000–20: a modelling study using survey and HIV testing programme data. *The Lancet HIV*, 8(5), e284-e293. [https://doi.org/https://doi.org/10.1016/S2352-3018\(20\)30315-5](https://doi.org/https://doi.org/10.1016/S2352-3018(20)30315-5)
- Gouse, H., Masson, C. J., Henry, M., Marcotte, T. D., London, L., Kew, G., Rourke, S., & Robbins, R. N. (2021). Assessing HIV provider knowledge, screening practices, and training needs for HIV-associated neurocognitive disorders. A short report. *AIDS care*, 33(4), 468-472. <https://doi.org/10.1080/09540121.2020.1736256>
- Heaton, R. K., Clifford, D. B., Franklin, D. R., Jr., Woods, S. P., Ake, C., Vaida, F., Ellis, R. J., Letendre, S. L., Marcotte, T. D., Atkinson, J. H., Rivera-Mindt, M., Vigil, O. R., Taylor, M. J., Collier, A. C., Marra, C. M., Gelman, B. B., McArthur, J. C., Morgello, S., Simpson, D. M., . . . Group, C. (2010). HIV-associated neurocognitive disorders persist in the era of potent antiretroviral therapy: CHARTER Study. *Neurology*, 75(23), 2087-2096. <https://doi.org/10.1212/WNL.0b013e318200d727>
- Heaton, R. K., Marcotte, T. D., Mindt, M. R., Sadek, J., Moore, D. J., Bentley, H., McCutchan, J. A., Reicks, C., Grant, I., & Group, H. (2004). The impact of HIV-associated neuropsychological impairment on everyday functioning. *J Int Neuropsychol Soc*, 10(3), 317-331. <https://doi.org/10.1017/S13555617704102130>
- IBM-Corp. (2017). IBM SPSS Statistics for Windows, Version 25.0. In. Armonk, NY: IBM Corp.

- Jacobs, Y., Myers, B., van der Westhuizen, C., Brooke-Sumner, C., & Sorsdahl, K. (2021). Task Sharing or Task Dumping: Counsellors Experiences of Delivering a Psychosocial Intervention for Mental Health Problems in South Africa. *Community Ment Health J*, 57(6), 1082-1093. <https://doi.org/10.1007/s10597-020-00734-0>
- John, M.-S., Sibuma, B., Wunnava, S., Anggoro, F., & Dubosarsky, M. (2018). An Iterative Participatory Approach to Developing an Early Childhood Problem-Based STEM Curriculum. *Grantee Submission*, 3(3). <https://doi.org/https://doi.org/10.20897/ejsteme/3867>
- Johnston, J. M., Leung, G. M., Fielding, R., Tin, K. Y., & Ho, L. M. (2003). The development and validation of a knowledge, attitude and behaviour questionnaire to assess undergraduate evidence-based practice teaching and learning. *Med Educ*, 37(11), 992-1000. <https://doi.org/10.1046/j.1365-2923.2003.01678.x>
- Joska, J. A., Witten, J., Thomas, K. G., Robertson, C., Casson-Crook, M., Roosa, H., Creighton, J., Lyons, J., McArthur, J., & Sacktor, N. C. (2016). A Comparison of Five Brief Screening Tools for HIV-Associated Neurocognitive Disorders in the USA and South Africa. *AIDS Behav*, 20(8), 1621-1631. <https://doi.org/10.1007/s10461-016-1316-y>
- Liu, G., Jack, H., Piette, A., Mangezi, W., Machando, D., Rwafa, C., Goldenberg, M., & Abas, M. (2016). Mental health training for health workers in Africa: a systematic review. *Lancet Psychiatry*, 3(1), 65-76. [https://doi.org/10.1016/S2215-0366\(15\)00379-X](https://doi.org/10.1016/S2215-0366(15)00379-X)
- Long, L. C., Rosen, S. B., Brennan, A., Moyo, F., Sauls, C., Evans, D., Modi, S. L., Sanne, I., & Fox, M. P. (2016). Treatment outcomes and costs of providing antiretroviral therapy at a primary health clinic versus a hospital-based HIV clinic in South Africa.

PLoS One, 11(12), e0168118.

<https://doi.org/https://doi.org/10.1371/journal.pone.0168118>

Lund, C., Schneider, M., Davies, T., Nyatsanza, M., Honikman, S., Bhana, A., Bass, J., Bolton, P., Dewey, M., Joska, J., Kagee, A., Myer, L., Petersen, I., Prince, M., Stein, D. J., Thornicroft, G., Tomlinson, M., Alem, A., & Susser, E. (2014). Task sharing of a psychological intervention for maternal depression in Khayelitsha, South Africa: study protocol for a randomized controlled trial. *Trials*, 15(1), 457.

<https://doi.org/10.1186/1745-6215-15-457>

Lyon, A. R., Stirman, S. W., Kerns, S. E., & Bruns, E. J. (2011). Developing the mental health workforce: review and application of training approaches from multiple disciplines. *Adm Policy Ment Health*, 38(4), 238-253. <https://doi.org/10.1007/s10488-010-0331-y>

Munsami, A., Gouse, H., Nightingale, S., & Joska, J. A. (2021). HIV-Associated Neurocognitive Impairment Knowledge and Current Practices: A Survey of Frontline Healthcare Workers in South Africa. *J Community Health*, 46(3), 538-544.

<https://doi.org/10.1007/s10900-020-00895-9>

Norcini, J. J. (2003). ABC of learning and teaching in medicine. *Work based assessment*.

BMJ, 326(7392), 753-755. <https://doi.org/10.1136/bmj.326.7392.753>

Remien, R. H., Stirratt, M. J., Nguyen, N., Robbins, R. N., Pala, A. N., & Mellins, C. A. (2019). Mental health and HIV/AIDS: the need for an integrated response. *Aids*, 33(9), 1411-1420. <https://doi.org/10.1097/QAD.0000000000002227>

Robbins, R. N., Remien, R. H., Mellins, C. A., Joska, J. A., & Stein, D. J. (2011). Screening for HIV-associated dementia in South Africa: potentials and pitfalls of task-shifting. *AIDS Patient Care STDS*, 25(10), 587-593. <https://doi.org/10.1089/apc.2011.0154>

- Robertson, A. C., Fowler, L. C., Niconchuk, J., Kreger, M., Rickerson, E., Sadovnikoff, N., Hepner, D. L., Bader, A. M., McEvoy, M. D., & Urman, R. D. (2019). Application of Kern's 6-Step Approach in the Development of a Novel Anesthesiology Curriculum for Perioperative Code Status and Goals of Care Discussions. *J Educ Perioper Med*, 21(1), E634. <https://doi.org/https://doi.org/10.3171/2020.4.JNS201056>
- Robertson, F. C., Lipka, L., & Broekman, M. L. (2020). Task shifting and task sharing for neurosurgeons amidst the COVID-19 pandemic. *Journal of neurosurgery*, 133(1), 5-7. <https://doi.org/https://doi.org/10.3171/2020.4.JNS201056>
- Sacktor, N. C., Wong, M., Nakasujja, N., Skolasky, R. L., Selnes, O. A., Musisi, S., Robertson, K., McArthur, J. C., Ronald, A., & Katabira, E. (2005). The International HIV Dementia Scale: a new rapid screening test for HIV dementia. *Aids*, 19(13), 1367-1374. <https://doi.org/10.1097/01.aids.0000180790.77379.3a>
- Sidebotham, M., Walters, C., Chipperfield, J., & Gamble, J. (2017). Midwifery participatory curriculum development: Transformation through active partnership. *Nurse education in practice*, 25, 5-13. <https://doi.org/https://doi.org/10.1016/j.nepr.2017.04.010>
- Sweet, L. R., & Palazzi, D. L. (2015). Application of Kern's Six-step approach to curriculum development by global health residents. *Educ Health (Abingdon)*, 28(2), 138-141. <https://doi.org/10.4103/1357-6283.170124>
- Tariq, M., Shamim, M. S., Subhan, A., Saeed, S., Rehman, Z., Virani, B., Ashraf, A., Qamar, I., Qamar, F., & Mohsin, R. (2017). Re-structuring a University Hospital's Internship Program Using Kern's Six-Step Model of Instructional Design. *MedEdPublish*, 6. <https://doi.org/https://doi.org/10.15694/mep.2017.000038>
- Thomas, P. A., Kern, D. E., Hughes, M. T., & Chen, B. Y. (2016). *Curriculum development for medical education: a six-step approach* (D. E. K. Patricia A. Thomas, Mark T. Hughes, Belinda Y. Chen, Ed.). JHU Press.

UNAIDS. (2020). *Country Factsheets : South Africa 2020*

<https://www.unaids.org/en/regionscountries/countries/southafrica>

Wass, V., Van der Vleuten, C., Shatzer, J., & Jones, R. (2001). Assessment of clinical competence. *Lancet*, 357(9260), 945-949. [https://doi.org/10.1016/S0140-6736\(00\)04221-5](https://doi.org/10.1016/S0140-6736(00)04221-5)

Whitehead, A. L., Julious, S. A., Cooper, C. L., & Campbell, M. J. (2016). Estimating the sample size for a pilot randomised trial to minimise the overall trial sample size for the external pilot and main trial for a continuous outcome variable. *Stat Methods Med Res*, 25(3), 1057-1073. <https://doi.org/10.1177/0962280215588241>

Witten, J. A. (2015). *Validation of the CAT rapid: a smartphone screening tool for HIV-associated neurocognitive disorders in South Africa* [University of Cape Town].

Chapter 7

General discussion

7.1 Summary of findings

In this chapter, I present a summary of the results from the four studies that form the core of this thesis. Thus, providing a stepwise synthesis and discussion of the main findings, including the implications of this body of work. At the end of the chapter, I discuss the overall limitations of the thesis and present the overall conclusion.

As summarised in the previous chapters, the need to understand task-sharing of H-NCI screening is underscored by five key problems in South Africa: (1) HIV remains a public health challenge, and PWH remain at risk of developing H-NCI, even with virologically suppressive ART. However, there are few healthcare providers with the necessary knowledge and skills to identify H-NCI in low- and middle-income countries, (2) although the majority of PWH access healthcare services at a primary healthcare level, it is unclear whether primary healthcare workers, such as general medical doctors, nurses and adherence counsellors, have the necessary knowledge and skills to identify the clinical presentation of H-NCI, (3) task-sharing has been successfully used to address personnel shortages in low- and middle-income countries, however there is limited evidence describing task-sharing of H-NCI screening from specialists to primary healthcare workers, and (4) there is a paucity in H-NCI training interventions targeting frontline HIV healthcare workers in South Africa.

The overarching aim of this thesis was to describe the feasibility of integrating H-NCI screening into primary healthcare in South Africa. To achieve this aim, I undertook four separate investigations: (1) a review of published literature describing training targeting frontline HIV healthcare workers in Africa, (2) an original empirical study exploring H-NCI knowledge and practice among frontline HIV healthcare workers in South Africa, (3) an

original empirical study exploring knowledge and practice gaps among primary healthcare workers, including healthcare workers' views on H-NCI training at this level of care, and (4) designing and piloting a work-integrated H-NCI training programme, targeting primary healthcare workers which included a review of existing training literature.

I conducted these studies within the unique context of H-NCI screening in South Africa, where the burden of disease overshadows the number frontline HIV healthcare workers. In this country, there are few healthcare professionals with knowledge and skills to identify, screen for, and manage H-NCI among PWH. Unlike developed countries, the high volumes of PWH accessing healthcare services in South Africa, do not have direct access to specialists. Thus, it was important to examine whether H-NCI screening could be shared from specialists to primary healthcare workers who provide the majority of HIV services in this setting. There were several questions about the practical implementation of H-NCI screening at this level of care, including whether these cadres desired to administer an H-NCI screening tool in the context of an already overburdened healthcare programme. Therefore, primary healthcare workers' views on H-NCI screening were key.

7.2 Summary of individual manuscript and findings

1) In the scoping review I highlighted a paucity in available literature describing training targeting healthcare workers providing HIV services in Africa, especially training on H-NCI. Several studies identified in the scoping review did however, report on common mental disorders. Of the 54 countries in Africa, training on common mental disorders was reported from five countries, with one including the most severe form of H-NCI, HIV-D, in the training curriculum. None of the studies reported training of healthcare workers to administer screening tools to identify H-NCI among PWH (Chapter 2 – manuscript 1).

2) The exploratory survey of healthcare workers providing HIV services in South Africa allowed me to demonstrate that awareness of H-NCI was lacking, and practical experience in administering appropriate tools were infrequent. Few healthcare workers suspected H-NCI among their patients, and none of the healthcare workers had ever referred a patient for further investigations. There were no differences in the knowledge of classification terminology, criteria and H-NCI guidelines among the cadres participating in the survey. Knowledge was higher among medical doctors, yet screening practices were scarce among all cadres (Chapter 3 – manuscript 2).

3) I explored qualitatively, primary healthcare workers' perceptions of the prevalence of H-NCI, in two provinces in South Africa. This investigation examined primary healthcare workers' views on cadres most appropriate to identify and/ or screen for H-NCI as well as their desire to receive training, in a subset of South African healthcare workers. This study also explored primary healthcare workers' understanding of H-NCI among PWH, building on the findings from the survey described in Chapter 2. Healthcare workers reported low frequencies of H-NCI in both provinces. The results from the case vignette showed that although healthcare providers were unable to specifically identify H-NCI, they attributed symptoms to several comorbidities relating to ART or mental health. Healthcare workers reported that they favoured receiving training to screen for H-NCI with a view toward providing holistic care (Chapter 4 – manuscript 3).

4) In a prospective review I provided an overview of the theoretical framework underpinning the methodology of the H-NCI training programme, the PriCog training, and described the lessons learned from the pilot training intervention. This review describes the curriculum, teaching methods, evaluation strategies and feedback approaches. To my knowledge, this is the first to describe the process of designing and

piloting a work-integrated H-NCI training intervention, targeting primary healthcare workers in South Africa (Chapter 5 – manuscript 4)

In this exploratory study I investigated the integration of H-NCI screening at a primary healthcare level through a work-integrated training programme. I was able to show that the training improved knowledge of H-NCI among primary healthcare workers, including general medical doctors, nurses and adherence counsellors. I was able to demonstrate that healthcare workers who routinely provide clinical care such as general medical doctors and professional nurses, benefited from the brief, work-integrated training. These cadres were successful in identifying the clinical presentation of H-NCI and in administering an H-NCI screening tool. Although knowledge of H-NCI improved among adherence counsellors and staff nurses, these cadres experienced more challenges in administering the H-NCI screening tool. Thus, suggesting that non-clinical healthcare workers require intensive training and ongoing mentorship to administer an H-NCI screening tool. This is the first study to my knowledge exploring H-NCI knowledge and skills transfer from specialists to general medical doctors, nurses and adherence counsellors in South Africa (Chapter 6 – manuscript 5). Ideally, targeted screening by adherence counsellors, followed by routine screening by clinical healthcare workers would assist in identifying PWH at risk of treatment non-adherence requiring support to help achieve viral suppression.

7.3 Key findings and final recommendations

Although South Africa is home to the largest ART roll-out programme, globally, most empiric research on H-NCI screening have been conducted in developed countries. Task-sharing of healthcare services is considered an effective strategy to bridge skills gaps in low-and-middle-income countries. To my knowledge, there have been no previous studies exploring H-NCI screening at a primary healthcare level following an H-NCI training intervention. The overall conclusion from my thesis supports the premise that task-sharing of

H-NCI healthcare services from specialists to clinical healthcare workers at a primary healthcare level, may serve as a potential solution to address the bottleneck in H-NCI services in low- and middle-income countries. The key findings my thesis can be divided into three major components.

7.3.1 Key finding 1 and recommendations

Firstly, I have demonstrated that published literature on H-NCI training in Africa was scarce. As a result, there are few existing training models that have been rigorously tested and peer-reviewed for task-sharing of H-NCI screening in this setting. This includes appropriate training approaches and methodologies proven to effectively equip non-specialist healthcare workers with knowledge and skills to detect H-NCI. Training targeting healthcare workers in South Africa should be considered against the backdrop of an ART roll-out programme situated within busy, short staffed and resource-limited facilities. Healthcare workers providing care at these facilities may be unable to attend traditional training which removes them for long periods due to high patient burdens and staff shortages. Despite perceptions of low prevalence of H-NCI, primary healthcare workers championed holistic care and desired training that will equip them with skills to provide such care.

There is a need to explore alternate training designs that will benefit such healthcare workers. This thesis shows that the use of a work-integrated training design may be a feasible option for primary healthcare workers in South Africa. However, future studies aimed at implementing training interventions should compare training approaches and suitable durations, for example, work-integrated, face-to-face workshops, online training or traineeships with ongoing mentorship, to determine which training approach would best suit primary healthcare workers in low- and middle-income countries. Future research could investigate the use of traditional paper-based screening tools and digital screening mobile applications to understand which method is more appropriate for primary healthcare workers.

The heterogeneity in the current literature describing training targeting healthcare workers providing HIV services to PWH, is evident. More homogeneous training interventions will allow for improved comparability of findings and inform future H-NCI training designs.

7.3.2 Key finding 2 and recommendations

Secondly, I have shown that H-NCI knowledge is limited among healthcare workers providing the majority of HIV services in South Africa and that investigations for H-NCI, especially those using an H-NCI screening tool, are practically non-existent beyond tertiary or a specialist level of care. Several knowledge gaps were identified among healthcare workers, including limited knowledge of the terminology used to describe the clinical presentation of H-NCI, terminology for the diagnosis, such as the varying forms of H-NCI, as well as knowledge of appropriate screening tools. These topics should be incorporated into future H-NCI training.

Healthcare workers had mixed views about the frequency of PWH presenting with H-NCI at a primary healthcare clinic. Some healthcare workers suggested that H-NCI was a historic problem following the availability of effective ART. This is indeed true for severe forms of H-NCI, which were often described by healthcare workers who held this view. It is important for future training to highlight the prevalence and risk of milder forms of H-NCI which will then underscore the importance of healthcare worker awareness of H-NCI. In addition, primary healthcare workers often attributed neurocognitive and functional challenges among PWH to common mental disorders without considering H-NCI as a potential differential diagnosis. This is not surprising since there were more published training focusing on common mental disorders. Given this, future H-NCI training could be incorporated into common mental disorder training. This will increase the reach among healthcare workers, reduce the quantity of required training which may negatively impact

service delivery due to attendance, as well as promote cost-effective continued medical education initiatives.

7.3.3 Key finding 3 and recommendations

Although the prevalence of severe H-NCI has decreased over the past decade, milder forms of H-NCI may persist, which poses a risk for chronic treatment non-adherence. Given this risk, it I have highlighted that it remains important to firstly establish the prevalence and severity of H-NCI seen at a primary healthcare level and secondly to equip healthcare workers providing primary healthcare to PWH with the necessary knowledge to identify H-NCI. While task-sharing of healthcare services is considered an effective strategy to bridge skills gaps in low-and-middle-income countries, to my knowledge, there is a paucity in literature describing H-NCI screening at a primary healthcare level. The third key finding in my thesis supports the premise that task-sharing of H-NCI healthcare services from specialists to clinical healthcare workers at a primary healthcare level, may serve as a potential solution to address the existing bottleneck in H-NCI services, in low- and middle-income countries.

Since H-NCI has the ability to negatively impact ART adherence, the inclusion of H-NCI in basic HIV training, for all healthcare workers providing HIV services, has the potential to impact the 90-90-90 treatment goals. Future studies informing guidelines for H-NCI screening implementation will be useful to impact policy and practice change in South Africa. There is a need for feasibility studies to examine H-NCI screening in a busy clinic setting, referral pathways to be followed once a diagnosis is made, as well as to investigate whether the referred specialist is easily accessible to PWH in this setting.

Medical doctors, professional nurses or other cadres providing clinical healthcare services at a primary healthcare level possess appropriate medical knowledge and skills to,

potentially, assimilate H-NCI screening into practice. These point of care healthcare workers may be appropriate to screen those with neurocognitive and/or functional challenges. Non-clinical healthcare workers such as adherence counsellors, may be best for targeted screening, as they spend more time with PWH during counselling sessions. Through self-reports or reports from family members, adherence counsellors will be able to flag at-risk patients for further investigations. Future research should investigate this screening strategy in a clinic setting. The reliability of H-NCI screening and referral comparing primary healthcare workers in other provinces and with larger samples will be useful and will provide more insight into the findings reported in this thesis. A future cost-effectiveness study should explore the feasibility of training healthcare workers to screen for H-NCI

Although of importance, the body of work that I have presented does not explore the prevalence of H-NCI among PWH accessing primary healthcare, particularly H-NCI with functional impairment, or deterioration. This thesis also did not investigate which patients should be targeted for screening and the timing of screening in low-and middle-income countries, which should be explored in future research. It would also be interesting to understand the risk-benefit ratio of screening and diagnosis of H-NCI. This with a view toward understanding the impact of H-NCI diagnosis and management on PWH. Particularly, whether being diagnosed with H-NCI increased anxiety and/ or depression associated with the diagnosis, as well as explore models that would increase the benefit of accessing this care for patients.

7.4 Limitation of the study

The work that I have presented is not without limitations. In Chapter 3 I described a survey of healthcare workers providing HIV services in South Africa.

Firstly, the survey was an online survey requiring access to a computer or smartphone, internet and sufficient internet connectivity to complete the survey. These resources are not always readily available in areas where primary healthcare facilities are located, suggesting that healthcare providers with limited resources may not have been able to complete the survey.

Secondly, the research (Chapters 3,4 and 6) was in English only, which is often not the first language spoken by primary healthcare workers in South Africa. This could have had potential restrictions on the content and communication, as isiZulu is one of the main languages spoken in South Africa.

Thirdly, a limitation in Chapters 2, 3 and 6 was the small sample sizes. Due to the paucity in published training literature, I was unable to conduct a systematic review and meta-analysis focusing on H-NCI training to provide more generalizable conclusions. Furthermore, the findings from the training intervention should be replicated in larger, prospective cohorts of healthcare workers to understand the feasibility and reliability of H-NCI screening at a primary healthcare level.

Fourthly, the investigations and interventions were brief, to reduce the impact on patient care. The survey had to be concise to increase response rates, as a result, in-depth and open-ended questions could not be included. The duration of the training intervention had to be incorporated into the weekly staff meeting time slot. Although this design did not present challenges for healthcare workers providing clinical care, future training intervention may need to be more extensive for adherence counsellors with on-going mentorship to administer an H-NCI screening tool. Finally, the COVID-19 pandemic and subsequent restrictions provided further logistical challenges with the duration of the training intervention during the height of the pandemic in South Africa.

7.5 Conclusion

The studies presented in this doctoral thesis generated results that might be condensed into three main findings. First, primary healthcare workers in South Africa had limited knowledge of H-NCI. This, despite providing the majority of HIV services to PWH accessing care in the country with the largest ART roll-out programme. Among those with some knowledge of H-NCI, this was greater among medical doctors compared to nurses and adherence counsellors. Investigations for H-NCI were uncommon and knowledge or prior experience in administering an H-NCI screening tool was absent. Secondly, there was a paucity in available published literature describing H-NCI training targeting primary healthcare workers. Thus, highlighting a gap in existing, rigorously tested training models aimed at upskilling primary healthcare workers in low- and middle-income countries, such as South Africa. A work-integrated training design may be key, in enhancing H-NCI knowledge and developing screening skills among this group of healthcare professionals. Thirdly, the findings from this thesis highlight that task-sharing of H-NCI screening from specialists to primary healthcare workers, may be a potential solution to the existing bottleneck. Non-clinical healthcare workers, such as adherence counsellors, will be able to provide targeted screening services by flagging at-risk patients during routine counselling sessions. These individuals may then be screened by a clinical healthcare professional, such as a medical doctor or a professional nurse.

As a body of work, the findings presented here further our understanding of H-NCI knowledge and screening at a primary healthcare level, where the majority of PWH access and receive care. Further, studies should explore flagging of at-risk patients through targeted screening, the reliability of the H-NCI screening administered and the accuracy of H-NCI diagnosis by primary healthcare workers in a busy clinic setting. Appropriate care pathways at this level care should also be investigated to inform screening strategies for H-NCI in low-

and middle-income countries. Further investigations into the appropriateness of brief work-integrated training of primary healthcare workers to administer H-NCI screening tools are necessary.

Introduction to Cognitive Impairment

Trainer Manual

Prepared by
Ms. Adele

An introductory training for primary healthcare workers providing HIV services in South Africa



Contents

Acronyms	3
Purpose of this training	4
Who can use this information?.....	4
Logistics.....	4
Training Programme	5
How to use the trainer manual	6
Section 1 Introduction	7
Section 2 overview of training	9
Section 3 Assessment 1	10
Section 4 HIV-associated cognitive impairment theory component	11
Section 5 Assessment 2	18
Section 6 Practical	19
Section 7 Assessment 3	Error! Bookmark not defined.

Acronyms

HIV	- Human Immunodeficiency Virus
AIDS	- Acquired Immunodeficiency Syndrome
PWH	- People living with HIV
CI	- Cognitive impairment
CNS	- Central nervous system
HAND	- HIV-associated neurocognitive disorders
HAD	- HIV-associated dementia
MND	- Mild neurocognitive disorder
ANI-	- Asymptomatic neurocognitive
BMI -	- Body mass index
IHDS	- International HIV Dementia Scale
CAT-Rapid	- Cognitive Assessment Tool-Rapid
MCQ	- Multiple choice question

Purpose of this training

The purpose of this training is to introduce cognitive impairment (CI), to healthcare workers who are providing HIV services in South Africa. This training will help medical doctors, nurses and counsellors to understand how HIV impacts the brain. The training will enable healthcare providers to recognise symptoms of CI and functional problems linked to CI, as well as to equip healthcare providers with the skills to use a brief CI assessment tool.

Who can use this information?

This training is designed for healthcare workers who provide HIV care at a primary healthcare level in South Africa.

Logistics

Ideally, a trainer with knowledge about HIV and mental health should conduct this training. The trainer should have excellent facilitation skills are essential to assist healthcare workers in navigating a new and potentially anxiety-provoking experience.

This training is presented with the aid of a PowerPoint presentation and video demonstrations. All sessions are interactive. While the trainer/ facilitator guides the discussion, input and ongoing feedback from the trainee is encouraged. The training sessions are 2 hours and are conducted at the primary healthcare facility. A training assistant will also be required to complete the simulation assessments.

Training Programme

Session 1 HIV-associated cognitive impairment theory	
Duration 2 hours	Section
10 minutes	Introduction
5 minutes	Overview of training
15 minutes	Assessment 1
45 minutes	HIV-associated cognitive impairment theory
Session 2 HIV-associated cognitive impairment screening	
Duration 2 hours	Section
10 minutes	Welcome
45 minutes	Introduction to cognitive impairment screening tools
40 minutes	Role playing
10 minutes	Training evaluation
15 minutes	Assessment 2
10 minutes	Assessment 3

How to use the trainer manual

Section	Description of this section	Colour code
Information	This information will be your guide at the beginning of each session. This section will explain what each session is about, the objectives, duration, and requirements for the session.	This information will appear in orange.
Directions	Under this heading you will find instructions for each section. This will correspond with the speech guide.	This information will appear in blue.
Speech guide	The speech guide in green will provide the narrative for each section. You may read directly or use it as a guide. You must cover all the information in the speech guide section.	This information will appear in green.
Required Materials	These are the materials you will need for each section. The multimedia aids for this training are PowerPoint presentations and videos. The trainee workbook and assessments also form part of the required materials.	This information will appear in pink.

Session 1 HIV-associated cognitive impairment theory

Section 1 Introduction

In this section you will introduce the participants to the HIV-associated CI training module.

Section objectives:

1. The objective of this section is to welcome participants to the training and to introduce them to the trainer.

Duration: 10 minutes

Section directions	Speech guide	Material
1. Begin with a greeting and a few friendly words	Good morning/afternoon it is a pleasure to welcome you to this training cognitive impairment among people living with HIV.	You will not require additional material for this section.
2. State a question that grabs their imagination	All of you here today work with people living with HIV. You may have seen how HIV damages the body. If HIV can do that to the body, have you ever thought about what HIV does to the brain?	
3. Give your name and brief credentials	My name is_____ and I am working at _____. I am a _____ I am conducting this training on behalf of _____ (state why you are doing the training).	
4. Follow with a promise of rewards for listening	This morning I would like to talk about HIV and the brain and how we can look for this among our HIV positive patients. I will take approximately 45 minutes to do this. I will then ask you to answer a few questions about what we have learned.	
5. Let people know that you will take questions and comments	I would like to go through the presentation first in full and then have a following Q&A time, so please note down any questions or comments as we go along.	

6. Describe benefit of audience concern	Seated in this room are the people who can make a difference in our community, especially among the patients that access care at your facility. To make an even bigger difference than we do now, I would like to ask for the next few minutes to talk to you about this important issue.	
7. Conclude with a positive, hopeful note of encouragement.	Life is short and precious. This is an opportunity for you to help us as we try to improve the lives of others.	

Section 2 Overview of training

In this section you will provide a brief overview of the HIV-associated CI training.

Section Objectives:

1. To explain the purpose of the training and how the training has been structured.
2. To explain the research component of the training.
3. Answer questions that participants may have about the training.

Duration: 5 minutes

Section directions	Speech Guide	Materials
Explain who this training is for	This training is designed for healthcare workers who provide HIV care at a primary healthcare level in South Africa.	Workbook and power point presentation
Explain the structure of the training	This training will be spread over 2 sessions. Each session will be 2 hours. The first section will cover the theory and the second section will cover the practical.	
Explain how this fit will into the research project	This training is in its developmental phase or pilot stage. In the pilot training we would like to explore whether the training content is suitable, and the training and evaluation methods are appropriate.	
Allow time for questions. For example: How many other facilities in this area who are participating? If someone raises their hand allow them to ask a question.	Before we begin, does anyone have any questions about the training.	
If no one raises their hand proceed to section 3	If there are no questions, we will proceed to section 3.	

Section 3 Assessment 1 (Knowledge pre-assessment)

In this section you will explain the pre-assessment to the participants.

Section objectives:

1. The objective is for participants to complete the pre-assessment (Assessment 1)

Duration: 15 minutes

Section directions	Speech Guide	Materials
Refer the participants to their workbook for the pre-assessment.	We are going to begin this section with a short questionnaire which can be found at the back of your workbook. Please turn to the back of your workbook and complete the questions for Assessment 1.	Workbook, pen, pre-assessment questionnaire
Introduce the pre-assessments to the trainees	These questionnaires will help us get an idea of everyone's understanding of cognitive impairment which we now refer to using the abbreviation CI, your current practices and attitude toward screening for CI among people with HIV (PWH). This is important for us to know so that we will be able to see if this training helped you to gain more knowledge by the end of the section.	
Provide instructions for the assessment.	Please turn to the assessment which has been provided. Complete the assessment under the heading Assessment 3 in the workbook provided. Try to answer all the questions to the best of your ability.	
	If anyone needs any help completing this form, please let me know and I will assist you.	
	Now that we have all completed the assessment, we can begin with the theory section of our training.	
	First let us take a 5-minute break	

Section 4 HIV-associated cognitive impairment

In this section, you will explain introduce the participants to CI and look at signs and symptoms of CI among people living with HIV. This section will be delivered as a didactic lecture.

Section objectives:

1. To explain how HIV impacts the brain
2. To describe how CI among PWH
3. To describe signs and symptoms among PWH so that participants will be able to identify them

Duration: 45 minutes

Section directions	Speech Guide	Materials
Introduce the section on HIV and the brain. Refer the participants to page 10 of the workbook.	Please turn to page 10 of your workbook. We will now look at the impact that HIV has on the brain	Workbook, pen
Introduce HIV and explain how HIV impacts the brain.	Let us begin with a brief introduction to HIV. The human immunodeficiency virus which we refer to as (HIV) emerged approximately 40 years ago. You will find more information on this in your workbook. However, in addition to the immune system, HIV can also impact the brain. This is more common in people who had a low CD4 count before they begin HIV treatment, or when PWH are not on treatment or are not taking their treatment correctly. We will take a closer look at this in the next section of your workbook.	
Open the discussion to the group by asking a question about CI. If someone raises their hand,	Question 1: Can anyone tell me what they think CI involves?	

ask them to respond to the question. If no one raises their hand, ask one or two volunteers for their thoughts.	Question 2: Can someone tell me about what they have heard about CI among PWH.
Give a positive response after someone has volunteered. This is if participants say things that fit the criteria for CI	Thank you for responses. Those were great answers to the question.
If someone has said something that does not fit the criteria	Thank you for responses. That was an excellent try. Let us look at CI a bit more so that we can figure out what it involves.
Refer the participants to page 11 of their workbook. Describe history of CI among PWH	We will be looking at the section beginning on page 11 of your workbook. In the early 1980s ART was not yet widely available. Doctors and scientists noticed signs of cognitive decline across all stages of HIV, but most especially when a patient had progressed to AIDS.
Explain how HIV impacts the CNS	HIV has the ability to cross the blood brain barrier and has been known to do this during acute infection. The presence of the virus causes inflammation in most cases and this causes impairment in the central nervous system.
Describe which cognitive functions are impacted by HIV	Individuals with some form of CI, experienced more difficulty than others in thinking, their ability to pay attention, concentrate, learn new things, remember, make decisions, solve problems and their ability to perform daily functions and/or fulfil occupational duties.
Explain the definitions, classification system and diagnostic criteria for CI	As research in this field increased, definitions, classification systems and diagnostic criteria for CI were developed. These terms were developed for use in research but have also been used in clinical settings.
Ask the participants if they have heard of any these terms previously. Read out the term and	Have you heard any of the terms that are used in research to classify CI? Which of these terms have you heard of

the acronym one at a time. Count by show of hands.

previously? You may raise your hand if you have heard of the following:

- HIV-associated neurocognitive disorders (HAND)
- HIV-associated dementia (HAD)
- Mild neurocognitive disorder (MND)
- Asymptomatic neurocognitive impairment (ANI)

These terms are usually used in a research setting we will simply refer to this as CI among PWH.

Highlight some of the causes CI among people living with HIV.

CI problems may arise due to a number of factors. These may be pathogenic or risk factors.

Let us look at the pathogenic factors:

- Damage to brain cells caused by the HIV virus
- Poorly controlled chronic diseases of the brain or organs or co-morbidities
- Inflammation

Some of the risk factors include:

- History of low CD4 count
- Older age at AIDS onset
- Non-adherence to treatment or not on ART

These factors may also cause milder forms of CI to become worse over time.

Describe Signs and Symptoms of CI

In many cases, PWH may not experience CI, especially when taking ART. However, if someone has more CI difficulties than other people of the same age, this may be described as CI.

Let us look at some examples below.

- Shorter attention span, e.g. these individuals may find that they have drifted away in thought even during a brief conversation.
- Working memory, e.g. remembering instructions that have

	been given to them to complete a task. • Slowness in processing and understanding of information, e.g. you may need to repeat a sentence multiple times because the patient did not understand. • Difficulty in planning and organising everyday life that they may have been able to do before, e.g. making appointments or taking their medication at a particular time. • Less fluency when speaking. These individuals may have difficulty remembering the words they wish to use, forming a complete sentence or say something different than what they mean to say, for example less frequently used words such as the name of an item like a calculator. However, language problems are rare in CI and may only found in severe cases.	
Allow group to ask questions.	Does anyone have any questions before we continue?	
Discussion: A patient who has recently tested positive for HIV. Ask the trainees what information this patient will receive. (Allow anyone to answer)	Let us consider a patient who has come into the clinic and they have just tested positive.	
Guide the discussion on pre and post-test counselling, followed by ART readiness counselling. Use examples that your participants have mentioned. Add to the points using the following.	PWH receive information about: • The benefits of taking ART • Possible lifestyle changes that the patient needs to make for example, a patient who consumes much alcohol, • The benefits of ART • The effects of taking ART including possible side effects	
This will highlight why it is important to consider CI among patients who are initiating or have a low CD4.	For patients with CI, they may have trouble paying attention to all of the information, understanding this new information, learning about the illness and medication and remembering all the details and carrying out a task, for	

	example taking their ART every day. This may make it harder for them to be completely adherent to their ART. Someone with a low CD4 may also have these challenges due to CI. Does this show us why it is important to consider CI among our patients? Let us now talk about which patients we should investigate.	
Discuss which patients should not be investigated through elimination	Healthcare facilities in South Africa, experience high patient volumes and as a result, it would be difficult for healthcare workers to look for CI in all patients who are accessing HIV services. If you suspect that a patient may be experiencing symptoms of CI or receive a report from the patient of a family member, first establish whether there are any alternate reasons for CI. Determine whether the patients have any of the following: • Severe psychiatric conditions • Abuse of drugs • Alcohol abuse • Previous brain trauma or neurological diseases • Current neurological diseases • Cryptococcal meningitis These factors may contribute to challenges with cognitive functions among PWH	
Discuss which patients should be investigated	Since it is difficult to screen everybody, we will use a red-flag approach which includes patients who are at risk for treatment failure, have a low CD4 or are non-adherent to treatment. Once you have eliminated other causes for cognitive challenges, ask the patient the following questions. 1. Have you been more forgetful than usual? For example, are you forgetting to do things at home or at work, that	

	you have to do, or do you often forget what to buy when you go shopping? 2. Are you more easily distracted than usual? For example, when you watch television or have a conversation, do you start thinking of other things instead of paying attention to what is happening? 3. Have you noticed that you think more slowly than usual? For example, does it take longer, or is it more difficult, for you to sort out problems around the house, to plan activities, or to follow new instructions? 4. Have you noticed that your hands are clumsy? For example, do you drop things, or do you find it more challenging to work with money or to open your medication and take out the tablets? 5. Have you been moving slower than before? For example, are you walking slower? If a patient answers yes to one or more of these questions, they should be flagged for a CI test.	
Refer the participants to page 16 of their workbook.	Before we conclude today's session, we are going to explore a few case studies. Please read each case carefully. You will then need to answer the questions that follow. These will be marked as an assessment. Please turn to page 16 of your workbook.	
Explore case studies answer questions at the end. Case studies will introduce the participants to the many ways in which CI may present among PWH.	If anyone has any questions, please feel free to ask at any time.	

End of Session 1

Bring the session to a close by thanking the participants and providing information about the next session. For example, date and time.

Close session

In the next session we will be learning how to use a screening tool to identify CI among PWH.

Thank you for your time, attention and participation.

Session 2 HIV-associated cognitive impairment screening

Section 5 Welcome back

In this section you will welcome participants back and introduce session 2

Section objectives:

1. Welcome participants back to the training
2. Describe session 2

Duration: 2 minutes

Section directions	Speech Guide	Materials
Welcome all participants and introduce next section	Welcome back everyone. I hope that you had a wonderful week. It is great to see you all again. Today we are going to move on to the next section of our training which is all about screening for HIV-associated CI. At the end of this session you will also be assessed on your ability to administer the screening tool.	

Section 6 Introduction to cognitive impairment screening tools

Section objectives

Duration: 45 minutes

Section directions	Speech Guide	Materials
Refer the participants to their workbook for Assessment 2.	We are going to begin this section a with short questionnaire which can be found at the back of your workbook. Please turn to the back of your workbook and complete the questions for Assessment 2.	Workbook, pen, stopwatch or watch, demonstration video
Introduce screening tools to participants on page 22 of the workbook.	Last week we learned how to identify patients who may have CI. Today, you will be introduced to two brief screening tools that have been used in a South African setting to identify CI among PWH. The name of the tools that we will be using are the International HIV Dementia Scale (IHDS) and the CAT-Rapid. You will find it useful to have a hardcopy of the test on hand so that you can refer to the times and scores when administering this test. Please ensure that you use your hard copy as a guide and make sure to demonstrate all actions the patients with your own hands.	

Demonstrate the sentence “my name is John” by saying each word 1 second apart.	You will notice the text in green in your workbook. These are the instructions which you will give to your participants. You must say these words exactly as they are. Try to say them 1 second apart. For example, my name is John. You will also need something to time your test like a stopwatch or the timer on your phone, or a watch with a second hand.	
Play video demonstration of the IHDS (video 1) The video demonstration will provide participants with an opportunity to see how the test is administered.	We are going to watch a video demonstration of the first tool called the IHDS.	
Introduce practical administration of the IHDS	Let us take 5 minutes to read the instructions on how to administer the IHDS. You are now going to try and administer the IHDS. Let us begin by trying each step together. To perform this test, follow the steps in your workbook. For this activity you will simply be practicing how to say the instructions in a clear voice, each word 1 second apart. There are a few things to remember before you begin. Make sure you are seated across from your patient with a clear desk in front of you to demonstrate and observe the patient’s performance. Don’t forget your watch with a second hand or stopwatch. There are four activities in the IHDS test.	

	Let us try to say the instructions together. “We are going to perform a few activities now. None of these activities will hurt, but will simply involve the use of your hands and saying some words. If you are comfortable we will begin with the first activity.”	
Ask participants to practice activity 1 on their own.	The first activity is the memory registration activity. You will need to say a list of 4 words, 1 second apart. You will need to recall these words at a later stage. Lets try an example of saying a sentence where each word is one second apart. Try this “My name is John”. Now read what it says in green in your workbook, remember to say each word 1 second apart.	
Ask participants to practice activity 2 on their own.	Now read what it says in green for activity 2. For this activity you will ask the patient to tap the first two fingers of the non-dominant hand as widely and as quickly as possible. Look at the diagram to see how the fingers need to be positioned for this activity. The patient may score between 0 and 4. Start your timer. Count the number of taps performed in 5 seconds: Record Number of Taps in the box provided: Scoring: ≥ 15 taps = 4 points	

	11-14 taps = 3 points 7-10 taps = 2 points 3-6 taps = 1 point 0-2 taps = 0 points	
Ask participants to practice activity 3 on their own.	Next, you will ask the patient to perform the sequence of movements with the non-dominant hand as quickly as possible. Look at the diagram to see how the hand needs to be positioned for each step in the sequence. Begin by saying the words in green. Ask the participant to practice this sequence twice. 1. Clench hand in fist on flat surface. 2. Put hand flat on surface with palm down. 3. Put hand perpendicular to flat surface on the side of the 5th digit (baby finger). Start your timer. Count the number of sequences performed in 10 seconds: Record Number of Sequences: In this activity the patient may score between 0 and 4. Scoring: ≥ 4 sequences = 4 points 3 sequences = 3 points 2 sequences = 2 points 1 sequence = 1 point unable to perform = 0 points Write you score in the block	

Ask participants to practice activity 4 on their own.	For the final activity on the IHDS ask the patient is they remember the words you said to them earlier. They will need to say them back to you. If they say the wrong word or cannot remember you may give them the clue provided for each word. For example, if the person could not remember dog, you will say one of the words was a type of animal. animal? dog piece of clothing? hat vegetable? bean colour? Red	
Role playing will allow the participants to actively practice administering the tools. Explain role playing activity.	Now its your turn to practice. We are now going to split into pairs. Each pair will take a turn to be the healthcare worker and the patient. The healthcare worker will need to administer the IHDS using the steps we have discussed. Then you will swop and your partner will get chance to administer the test.	
Explain IHDS scoring and interpretation	At the end we will add up the scores for each activity. For this test, the maximum possible score is 12 points.	

	A patient with a score of ≤ 10 should be evaluated further for possible HAD.	
Refer the participants to page 28 of their workbook. Introduce participants to the CAT-RAPID.	I hope you enjoyed that. Are you ready to learn about the next test. Please turn to page 28 of your workbook. We are now going to learn how to administer the CAT- RAPID which is another brief tool that has been tested in a South African setting.	
The video demonstration will provide participants with an opportunity to see how the test is administered.	We are going to watch a video demonstration of the first tool called the CAT-RAPID.	
Ask the participants to practice administering the CAT-RAPID on their own. Ask participants to practice activity 1 on their own.	The first part of the CAT-RAPID are 4 questions about CI symptoms. You will begin the CAT-RAPID by saying the following: "I am now going to ask you some questions." You will ask the patient all four questions and give them a score at the end. A yes answer gets a score of 0 and a No gets a score of 1. You will give them a score between 0 and 4 for this activity.	
Ask participants to practice activity 2 on their own.	You then conduct a trail making activity. You will read the words written in green. The patient should go as quickly as they can without making mistakes. If they make a mistake they should go back to the last correct circle. You will give them a score between 0 and 4 for this activity as follows:	

	1-A =1 A-2-B =1 B-3-C =1 C-4-D =1	
Ask participants to practice activity 3 on their own.	The next activity is the memory registration activity. You will need to say a list of 4 words. Again, if the patient does not say the correct words, say words again. Tell the patient you will ask for all 4 words a bit later. Read the words written in green.	
Ask participants to practice activity 4 on their own.	The next activity is the motor speed activity. Ask the patient to tap the first two fingers of the non-dominant hand as widely and as quickly as possible. Look at the diagram to see how the fingers need to be positioned for this activity. Record how many taps they can perform in 5 seconds. You will give them a score between 0 and 4 for this activity.	
Ask participants to practice activity 5 on their own.	The next activity is the psychomotor speed activity. Ask the patient to perform the pictured movements with the non-dominant hand as quickly as possible. Look at the diagram to see how the hand needs to be positioned for each step in the sequence. Demonstrate and have the patient perform the sequence twice for practice. Record how many sequences they can perform in 10 seconds. You will give them a score between 0 and 4 for this activity.	

Ask participants to practice activity 6 on their own.	Ask the patients to recall the words of the memory activity by saying the words in green. Every correct word recalled is give 1 point. For words not recalled, provide a clue. If the person gets the word correct, they are given 0.5 points. If they do not recall the word, they are given 0 points.	
Explain role playing activity. Role playing will allow the participants to actively practice administering the tools	Now its your turn to practice. We are now going to split into pairs. Each pair will take a turn to be the healthcare worker and the patient. The healthcare worker will need to administer the CAT-RAPID using the steps we have discussed. Then you will swop, and your partner will have a chance to administer the test.	

Section 7 Training Evaluation

In this section you will explain the direct observation of procedural skills.

Section objectives

1. Participants to answer questions about the training, make recommendations or suggestions to improve the training.

Duration: 10 minutes

Section directions	Speech Guide	Materials
Instruct participants to answer the training evaluation.	Please may you fill out the training evaluation at the back of your workbooks. This will help us to understand which parts of the training worked well and where we could improve the training. Please feel free to make recommendations and suggestions to help us improve the training.	Training evaluation questions

Section 8 Assessment 2(Post-test)

In this section you will explain the post-assessment to the participants.

Section objectives:

1. The objective is for participants to complete the post-assessment (Assessment 3)

Duration: 15 minutes

Section directions	Speech Guide	Materials
Refer the participants to their workbook for the post-assessment.	We are going to end this section a with short questionnaire which can be found at the back of your workbook. Please turn to the back of your workbook and complete the questions for Assessment 3.	Workbook, pen

Section 9 Assessment 3

In this section you will explain the direct observation of procedural skills.

Section objectives

1. Participants to administer screening tools
2. Assess the accuracy of administration of screening tool using checklist

Duration: 10 minutes per participant (All to return to duties and return for individual assessments)

Section directions	Speech Guide	Materials
Instruct participants to return to their duties and inform them of the time allocated to them to return and perform the DOP. Each person will have a 15 min time slot. You will use the checklist on Annexure 1 to score each participant. Thank participants	We have now come to the final part of the assessments. Each of you has been given a timeslot. Please see the list below. You will each return to demonstrate the screening tool and will be assessed. At this time, I would like to thank you all for your time, commitment and participation.	Patient, timer, assessment checklist (annexure 1)

Introduction to Cognitive Impairment

Trainee Workbook

Prepared by

Ms. Adele

An introductory training for primary healthcare workers providing HIV services in South Africa



Psychiatry
&
Mental Health

Introduction



Welcome To A Basic
Training Course In
Cognitive Impairment
Among People Living With
Hiv For Primary Healthcare
Workers In South Africa



Background

This training workbook was developed as part of a PhD by Ms. Adele Munsami. The PhD has received ethical approval from the University of Cape Town (624/2018) and the Department of KwaZulu-Natal Research Ethics Committee. The training workbook and trainer manual are being piloted to explore appropriateness, efficacy and feasibility of training primary healthcare workers to identify cognitive impairment among people living with HIV.

Who can use this information?

This training is designed for healthcare workers who provide HIV care at a primary healthcare level in South Africa.

Contact

Please contact me for any queries or discussion

Ms Adele Munsami
mnsade002@myuct.ac.za

Purpose of this training

The purpose of this training is to introduce cognitive impairment (CI) among people living with HIV, to healthcare workers who are providing HIV services in South Africa. This training will help medical doctors, nurses and counsellors to understand how HIV impacts the brain. The training will enable healthcare providers to recognise symptoms of CI, functional problems linked to CI, as well as to equip healthcare providers with the skills to use a brief CI assessment tool.

Breakdown of Sessions

Session 1 HIV-associated cognitive impairment theory	
Duration 2 hours	Section
10 minutes	Introduction
5 minutes	Overview of training
15 minutes	Assessment 1
45 minutes	HIV-associated cognitive impairment theory
Session 2 HIV-associated cognitive impairment screening	
Duration 2 hours	Section
10 minutes	Welcome
45 minutes	Introduction to cognitive impairment screening tools
40 minutes	Role playing
10 minutes	Training evaluation
15 minutes	Assessment 2
10 minutes	Assessment 3



Workbook Navigation

There are 3 sections in this workbook



Cognitive Impairment Theory



Step-by-step guide to administering a screening tool



Assessments

Learning Objectives

01

Theory

- Understand how HIV impacts the brain
- Describe cognitive impairment among people living with HIV
- Identify signs and symptoms of cognitive impairment among this population

02

Practical

- Learn about cognitive impairment screening tools for people living with HIV
- Administer a screening tool
- Interpret a screening tool

03

Assessment

- Complete a pre test of knowledge, attitude and skills
- Complete a post test of knowledge, attitude and skills
- Complete practical assessments
- Complete post training assignment

A new document
will be created



Section 1

Theory



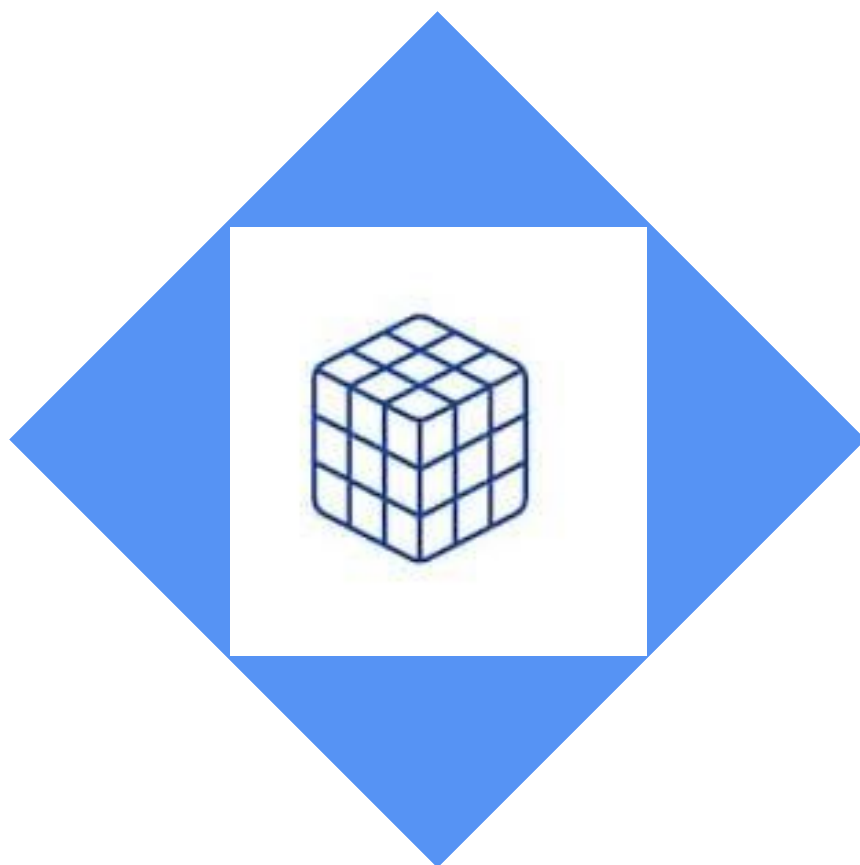
Assessment 1

HIV and the Brain

Cognitive impairment among people living with HIV

A closer look at cognitive impairment

Which patients to investigate



Assessment 1

Pre-test

Please turn to assessment one
at the back of your workbook

Section 1.1

HIV and the Brain

What is HIV?

The human immunodeficiency virus (HIV) emerged approximately 40 years ago. HIV attacks the cells that help the body fight infection, making a person more vulnerable to other infections and diseases. It is spread through contact with certain bodily fluids of a person with HIV, most commonly during unprotected sex (sex without a condom or HIV medicine to prevent or treat HIV), or through sharing injection drug equipment. If left untreated, HIV can lead to acquired immunodeficiency syndrome (AIDS). By taking antiretroviral therapy or ART, people with HIV can live long and healthy lives[1], making HIV a chronic illness.

Global response to HIV

In response to the HIV epidemic, the UNAIDS launched the 90-90-90 campaign in 2017. This campaign aimed to test 90% of people with HIV (PWH), initiate 90% of PWH onto treatment and achieve virologic suppression among 90% of those on treatment[2].

HIV in South Africa

South Africa has the biggest HIV epidemic and is home of the largest ART roll-out programme, worldwide. By the end of 2019 there were 7.5 million PWH in South Africa[3]. To date, 92% of South Africans are aware of their HIV status, 70% of PWH are on ART, and 64% of PWH are virologically suppressed[4]. However, South Africa continues to experience challenges with treatment adherence[5].

Did you know?

In addition to the immune system, HIV can also impact the brain. This is more common in people who had a low CD4 count before they begin HIV treatment, or when PWH are not on treatment or are not taking their treatment correctly. We are going to further explore the impact of CI on PWH in the next section of this training manual.

Section 1.2

Cognitive impairment among people living with HIV

What is Cognitive Impairment?

By CI we mean that certain brain functions are not working normally. A person with CI may have trouble remembering, learning new things, concentrating, making decisions that affect their everyday life. They may also experience difficulties with language, speed of thinking or planning and organising their thoughts and behaviours. CI ranges from mild to severe.

A brief history of cognitive impairment

Although the link between HIV and the brain was not clearly understood in the 1980s, healthcare providers noticed signs of cognitive difficulties among PWH. Before the introduction of ART, studies found evidence of CI across all stages of HIV disease, more commonly among patients with AIDS[6].

CI became less common after ART became available. However, individuals with some form of CI, experienced more difficulty than others in thinking, their ability to pay attention, concentrate, learn new things, remember, make decisions, solve problems and their ability to perform daily functions and/or fulfil occupational duties[7]. As research in this field increased, definitions, classification systems and diagnostic criteria for CI were developed[7]. These terms were developed for use in research, but have also been used in clinical settings.

You may have heard some of these terms being used instead of CI among PWH:

- HIV-associated dementia (HAD)
- Mild neurocognitive disorder (MND)

Section 1.3

Taking a closer look at cognitive impairment

What are some of the causes of CI among people living with HIV?

CI problems may arise due to a number of factors. These may be pathogenic factors or related to other risk factors[8]:

Pathogenic factors

- Damage to brain cells caused by the HIV virus
- Poorly controlled chronic diseases of the brain or organs or co-morbidities, such as hypertension, high cholesterol, heart disease, psychological disorders, substance abuse, high plasma viral loads
- Inflammation

Risk Factors

- History of low CD4 count
- Older age at AIDS onset
- Non-adherence to treatment or not on ART

These factors may also cause milder forms of CI to become worse over time.

How do I know if someone has CI?

In many cases, PWH may not experience CI, especially when taking ART. However, if someone has more difficulties with cognitive functions such as memory, attention or thinking for example, more than other people of the same age, this may be described as CI.

[Let us look at some examples on the next page.](#)

Patients may experience one or more of the following:

Shorter attention span, e.g. These individuals may find that they have drifted away in thought even during a brief conversation.

- Working memory, e.g. remembering instructions that have been given to them to complete a task.
- Slowness in processing and understanding of information, e.g. you may need to repeat a sentence multiple times because the patient did not understand.
- Difficulty in planning and organising everyday life that they may have been able to do before, e.g. making appointments or taking their medication at a particular time.
- Less fluency when speaking. These individuals may have difficulty remembering certain words, forming a complete sentence or may say something different than what they mean to say. An individual may have difficulty remembering words used less frequently, like the name of an item, for example a calculator. However, language problems are rare in CI and may only be found in severe cases.

Let us think about a patient who has recently tested positive for HIV.

They receive pre and post-test counselling, followed by ART readiness counselling.

During these sessions, PWH receive information about:

- The benefits of taking ART
- Possible lifestyle changes that the patient needs to make, for example, a patient who consumes large amounts of alcohol
- The effects of taking ART, including possible side effects

Patients with CI may have trouble paying attention during the information session and find it difficult to remember the new information they receive about the illness and medication. In addition to the new information, these individuals will need to make changes to their everyday activities in order to take their medication. Patients with CI may find it difficult remembering the instructions and planning ahead. This may make it harder for them to be completely adherent to their ART.

Which patients should I investigate?

Healthcare facilities in South Africa, experience high patient volumes and as a result, it would be difficult for healthcare workers to look for CI in all patients who are accessing HIV services.

If you suspect that a patient may be experiencing symptoms of CI or receive a report from the patient or a family member, first establish whether there are any alternate reasons for CI.

Determine whether the patients have any of the following:

1. Severe psychiatric conditions
2. Abuse of drugs
3. Alcohol abuse
4. Previous brain trauma or neurological diseases
5. Current neurological diseases

If a patient does not have any of the above, use the following guide to explore CI concerns:

1. Have you been more forgetful than usual? For example, are you forgetting to do things at home or at work that you have to do, or do you often forget what to buy when you go shopping?
2. Are you more easily distracted than usual? For example, when you watch television or have a conversation, do you start thinking of other things instead of paying attention to what is happening?

3. Have you noticed that you think slower than usual? For example, does it take longer, or is it more difficult, for you to sort out problems around the house, to plan activities, or to follow new instructions?
4. Have you noticed that your hands are clumsy? For example, do you drop things, or do you find it more challenging to work with money or to open your medication and take out the tablets?
5. Have you been moving slower than before? For example, are you walking slower than you usually do?

For each question, patients have a yes or no option. If a patient answers yes to one or more of these questions, they should be flagged for an CI investigation[9].

Section 1.4 Case Studies



Case Study 1

Mr A, a taxi driver, was diagnosed with HIV nearly 5 years ago. Mr A is now 28-years old. He has been referred for adherence counselling as his viral load has become detectable in the past year. His CD4 count at diagnosis was 345 cells/mm³ and his viral load was 150,412 copies/ml. Following ART initiation his viral load became suppressed for several years, but his last test showed his viral load had increased (6,500 copies/ml).

Mr A told the counsellor that he has been having more difficulty in planning his routes for work, especially remembering the roads or directions to places he usually drives to. He is also experiencing challenges with adding up costs and issuing change to customers. The counsellor spent some time with Mr A to try and establish why his health has declined. Mr A reported that he stopped taking his treatment once he felt better. However, when the counsellor asked him questions after they spoke she noted that Mr A did not seem to follow what was being said, and couldn't retain the information.



Please complete the following questions on the answer sheet provided.

1. What problems or symptoms can you identify?
2. What would you diagnose this as?
3. Would you use a screen this patient for CI?



Case Study 2

Mr H is a 65-year-old school teacher who has been on ART for approximately ten years. He is also diabetic and hypertensive which was diagnosed when he was 50 years old. He has come in with his wife as he has been experiencing a number of challenges at work and at school and she is concerned. He reports that he consumes alcohol daily, approximately 80 units of alcohol per week, and has done so for most of his adult life. His wife reports that he takes his ART daily as required. His CD4 count at diagnosis was 450 cells/mm³ and his last viral load was <20 copies/ml 3 months ago.

His colleagues have noticed that he has not been himself lately. He is easily confused and his ability to perform some of his usual tasks at school has declined as he cannot remember the instructions. His wife was contacted after he was found wondering around the school as he was unsure of his surroundings or how he had arrived there. He has reported greater difficulties in the past few months with planning and organizing his day, such as his lessons and classes. Some of the learners have reported that Mr H is often at the wrong class during the wrong period and on most days he cannot remember where he stopped in their syllabus. His wife also reports that he is experiencing challenges when trying to remember details about his day and making decisions.



Please complete the following questions on the answer sheet provided.

1. What problems or symptoms can you identify?
2. What would you diagnose this as?
3. Would you use a screen this patient for CI?



Case Study 3

A female patient Mrs Z, 45 years old, has reported greater difficulty paying attention, remembering and understanding information. She also reported that her family become frustrated with her as she often forgets whether she has taken her treatment or where she has placed her belongings. This has been going on for 4 or 5 years. It got a little better when she started ART 3 years ago, but some problems remain. She is now virologically suppressed and is otherwise in good health.

Upon reviewing the patients file you notice that she had a low CD4 count at diagnosis (48 cells/mm³). The counsellor noted that the treatment information and instructions had to be repeated a few times before the patient was able to understand and remember how to take her treatment. The notes also state that patient reported similar difficulties with attention and memory prior to ART initiation.



Please complete the following questions on the answer sheet provided.

1. What problems or symptoms can you identify?
2. What would you diagnose this as?
3. Would you use a screen this patient for CI?

Section 2

Practical



Assessment 2

Introduction to screening tools

International HIV Dementia Scale

Cognitive Assessment Tool–Rapid Version

Assessment 3

Section 2.1

Introduction to screening tools

In this section of the training, you will be introduced to two brief screening tools that have been used in a South African setting.

The name of the tools that we will be using are the International HIV Dementia Scale (IHDS) and the Cognitive Assessment Tool –Rapid Version (CAT-Rapid).

Before you begin.

You will need something to time your test like a stopwatch or the timer on your phone or a watch with a second hand

.

Section 2.2

International HIV Dementia Scale



Watch the tutorial video demonstration of the IHDS tool

Instructions to administer the IHDS

Make sure you are seated across from your patient with a clear desk in front of you to demonstrate and observe the patient's performance. There are four activities in this test.

Step 1: Say the following to your patient

"We are going to perform a few activities now. None of these activities will hurt, but will simply involve the use of your hands and saying some words. If you are comfortable we will begin with the first activity."

You will find it useful to have a hardcopy of the test on hand so that you can refer to the times and scores when administering this test.

Please ensure that you use your hard copy as a guide and make sure to demonstrate all actions to the patients with your own hands.

Activity 1: Memory Registration

The first activity is the memory registration activity.

You will need to say a list of 4 words, 1 second apart. You will say:

"I am going to say a few words and I want you to repeat them once I am done saying them".

1. "dog, hat, bean, red"
2. Ask the patient to say all four words after you have said them.
3. Repeat words if the patient does not recall them all immediately or says them incorrectly.
4. Tell the patient you will ask them to recall the words again a bit later.

"I will ask you to recall the words a bit later"

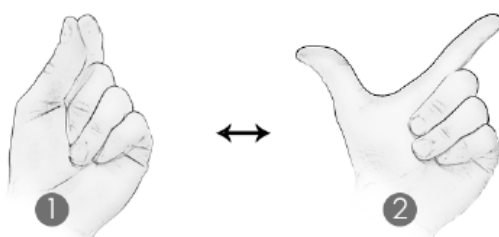
Activity 2: Motor Speed

In the next activity, ask the patient to lift up the hand that they write with.

"Please raise the hand that you write with".

Now say "Good, you may put that hand down. We will be using your non-dominant hand which is your other hand. Please place this hand on the table."

Have the patient tap the first two fingers of the non-dominant hand as widely and as quickly as possible, by demonstrating this action.



"Please tap the first two fingers of the non-dominant hand as widely and as quickly as possible. Please keep going, until I ask you to stop."

In this activity the patient may score between 0 and 4.

Start your timer. Count the number of taps performed in **5 seconds**:



Record Number of Taps.

Scoring:

≥ 15 taps	=	4 points
11-14 taps	=	3 points
7-10 taps	=	2 points
3-6 taps	=	1 point
0-2 taps	=	0 point

Write down the number of taps:

Activity 3: Psychomotor Speed

Have the patient perform the following sequence of movements with the non-dominant hand as quickly as possible. Begin by saying the following

"I am now going to show you a sequence of hand movements. You will be using your non-dominant hand. The same hand as before".

1. Clench hand in fist on flat surface.
2. Put hand flat on surface with palm down.
3. Put hand perpendicular to flat surface on the side of the 5th digit (baby finger).

Demonstrate, but do not say the actions.



Ask the participant to practice this sequence twice.

"Please practice this twice for me". Ask them to stop after the second sequence is complete.

Start your timer. Count the number of sequences performed in **10 seconds**:
Record Number of Sequences



In this activity the patient may score between 0 and 4.
Scoring:

≥ 4 sequences	=	4 points
3 sequences	=	3 points
2 sequences	=	2 points
1 sequences	=	1 point
Unable to perform	=	0 points

Write down the number of sequences

Activity 4: Memory Recall

Ask the patient to recall the four words.

"Remember the words I said to you earlier, can you say them back to me".

In this activity the patient may score between 0 and 4.

Select the words recalled below: (1 point each)

Dog, hat, bean, red

Write down the score:

For words not recalled, prompt with a semantic clue as follows:

Use a clue for the words not recalled (0.5 points each)

animal?

dog

piece of clothing?

hat

vegetable?

bean

colour?

Red

Interpretation

This is the sum of the scores on items 2-4.

The maximum possible score is 12 points.

A patient with a score of ≤ 10 should be referred for further evaluations.

Section 2.3

Cognitive Assessment Tool –Rapid Version (CAT-Rapid)



Watch the tutorial video
demonstration of the CAT-Rapid.

The Cognitive Assessment Tool –Rapid Version or C.A.T-Rapid is a brief, easy to use screening tool. It is intended to be used as a clinical aid in a busy clinic setting. It does not however, replace good clinical judgement or inform diagnosis.

This test takes approximately 4 minutes.

Say to your patient: "I am now going to ask you some questions."

Activity 1: Symptoms

1. Do you often have problems remembering information?

Y	=	0
N	=	1

2. Are your hands clumsy, shaky or weak?

Y	=	0
N	=	1

3. Have you found it hard to follow a conversation or a story?

Y	=	0
N	=	1

4. Do you have trouble planning or doing daily activities?

Y	=	0
N	=	1

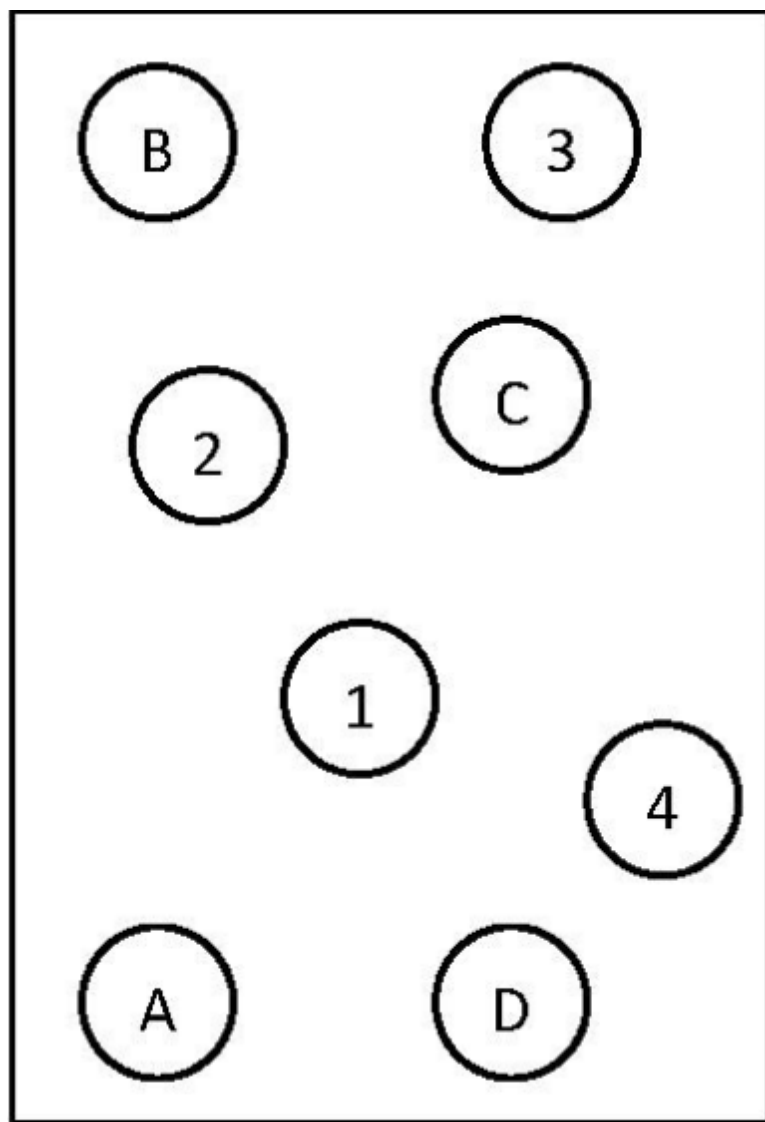
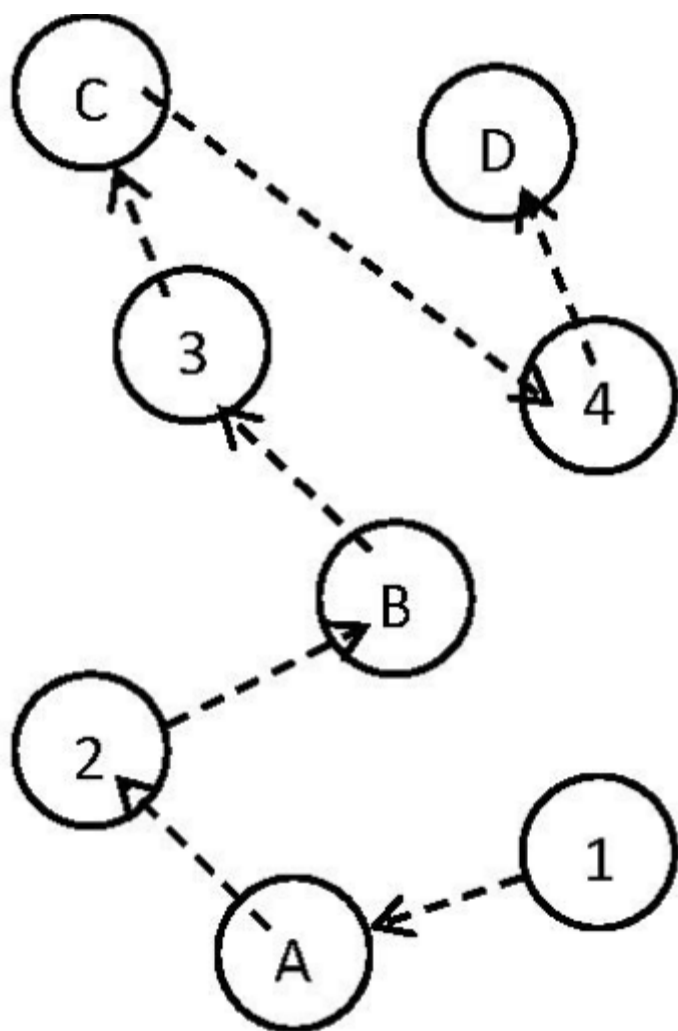
You will give them a score between 0 and 4 for this activity.

Activity 2: Trail Making

You will say:

"I am going to show you an image on my page. I would like you to draw a line connecting the numbers and letters starting from the lowest number and then switch to the first letter, to the second-lowest number and so on. You must switch between the letters and the numbers from start to finish in one continuous line. You must not lift your pen/pencil off the page. The example shows how to do it. This example shows you how to do it. You must complete the sequence in the block"

(They should go as quickly as they can without making mistakes). You will give them a score between 0 and 4 for this activity.



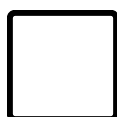
Score

1-A =1

A-2-B =1

B-3-C =1

C-4-D =1



Activity 3: Memory Registration

The next activity is the memory registration activity. You will need to say a list of 4 words. Again, if the patient does not say the correct words, say words again. Tell the patient you will ask for all 4 words a bit later.

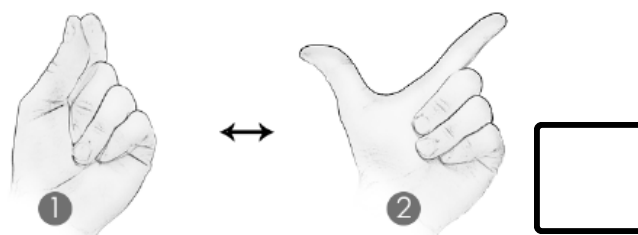
"Apple, watch, table, red"

Activity 4: Motor Speed

Ask the patient to tap the first two fingers of the non-dominant hand as widely and as quickly as possible. Record how many taps they can perform in 5 seconds.

You will give them a score between 0 and 4 for this activity.

15 in 5 seconds	=	4 points
1-14 in 5 seconds	=	3 points
7-10 in 5 seconds	=	2 points
3-6 in 5 seconds	=	1 point
0-2 in 5 seconds	=	0 points

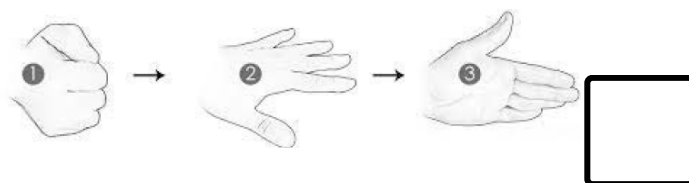


Activity 5: Psychomotor Speed

Ask the patient to perform the pictured movements with the non-dominant hand as quickly as possible. Demonstrate and have the patient perform the sequence twice for practice. Record how many sequences they can perform in 10 seconds.

You will give them a score between 0 and 4 for this activity.

≥ 4 sequences	=	4 points
3 sequences	=	3 points
2 sequences	=	2 points
1 sequences	=	1 point
Unable to perform	=	0 points



Activity 6: Word Recall

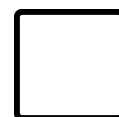
"Remember those words I said to you earlier, can you say them back to me?"

Ask the patient to recall the 4 words.

For words not recalled, provide a clue.

Apple	=	1 point
Watch	=	1 point
Table	=	1 point
Red	=	1 point

Fruit	=	½ point
Jewellery	=	½ point
Furniture	=	½ point
Colour	=	½ point



Scoring and Interpretation

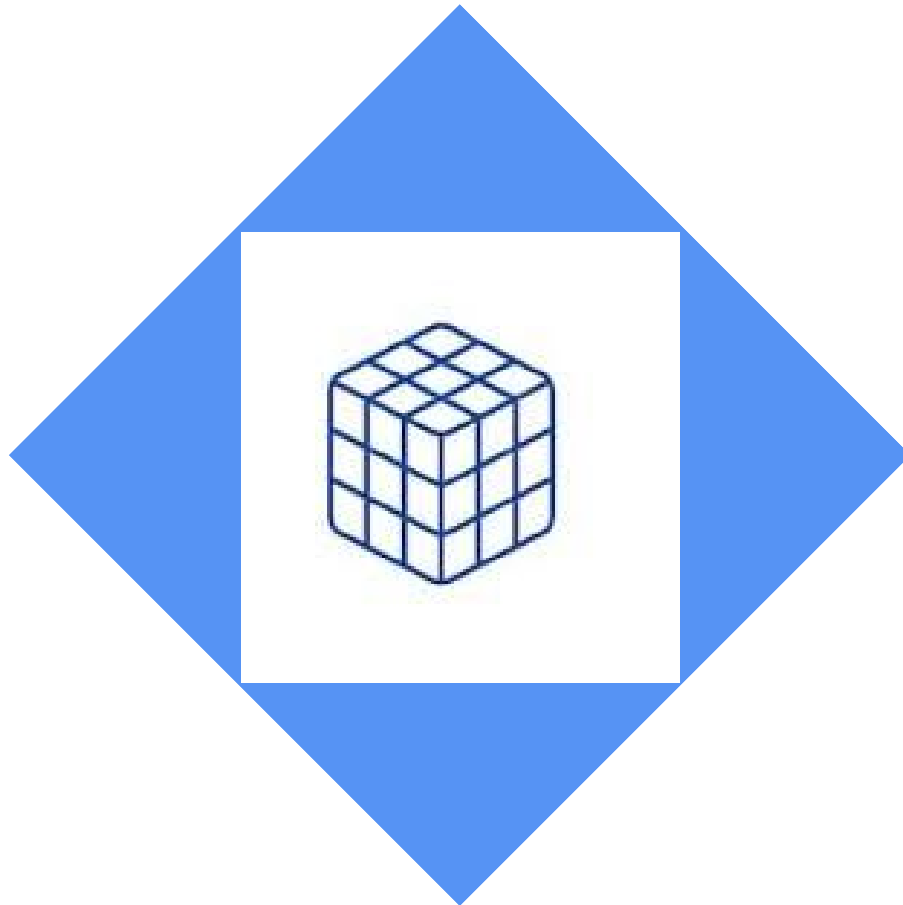
You will now need to score the patient using the combined tool score.

The IHDS will be a score out of 12. The CAT-Rapid will be a score out of 16. The total score will be out of 28.

A score that is ≤ 18 will suggest some form of CI.

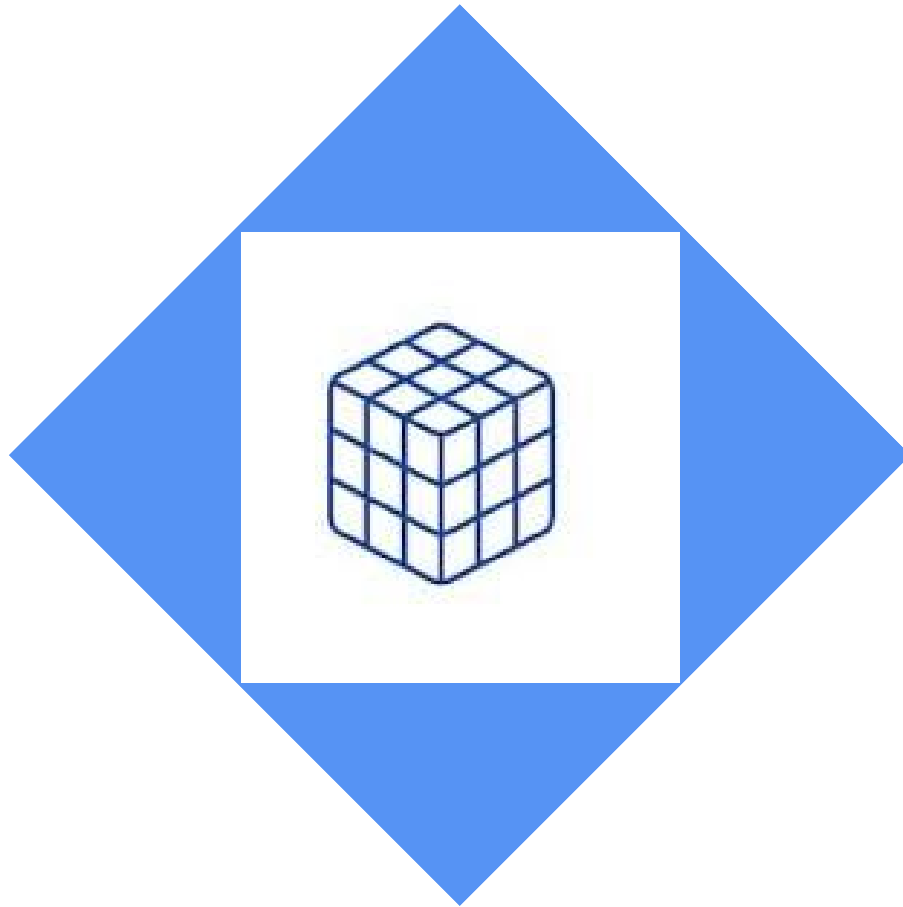
A score that is ≤ 16 will suggest severe CI.

These patients will require further investigations to make more informed diagnoses.



Assessment 2

Please turn to assessment two
at the back of your workbook



Assessment 3

Pre-test

Please turn to assessment three
at the back of your workbook

References

1. Woods SP, Moore DJ, Weber E, Grant I. Cognitive neuropsychology of HIV-associated neurocognitive disorders. *Neuropsychology review* 2009; 19(2):152-168.
2. UNIADS. 90-90-90 An ambitious treatment target to help end the AIDS epidemic. In; 2014.
3. AVERT.org. HIV and AIDS in South Africa. In; 2020.
4. UNAIDS. AIDSinfo. In; 2019.
5. Satoh S, Boyer E. HIV in South Africa. *The Lancet* 2019; 394(10197):467.
6. Nightingale S, Winston A, Letendre S, Michael BD, McArthur JC, Khoo S, et al. Controversies in HIV-associated neurocognitive disorders. *The Lancet Neurology* 2014; 13(11):1139-1151.
7. Antinori, Arendt G, Becker J, Brew B, Byrd D, Cherner M, et al. Updated research nosology for HIV-associated neurocognitive disorders. *Neurology* 2007; 69(18):1789-1799.
8. Njamnshi A, Bissek AZ-K, Ongolo-Zogo P, Tabah E, Lekoubou A, Yepnjio F, et al. Risk factors for HIV-associated neurocognitive disorders (HAND) in sub-Saharan Africa: the case of Yaounde-Cameroon. *Journal of the neurological sciences* 2009; 285(1-2):149-153.
9. Simioni S, Cavassini M, Annoni J-M, Abraham AR, Bourquin I, Schiffer V, et al. Cognitive dysfunction in HIV patients despite long-standing suppression of viremia. *AIDS (London, England)* 2010; 24(9):1243-1250.



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
Grootes Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

22 November 2018

HREC REF: 624/2018

Prof John Joska
Psychiatry & Mental Health
2nd Floor, Room H74
Human Resources and Development Centre
(aka Doctors' Bungalows)

Dear Prof Joska

PROJECT TITLE: INTEGRATING NEUROCOGNITIVE IMPAIRMENT SCREENING AND HEALTH SERVICES WITHIN PRIMARY HEALTH CARE FACILITIES IN SOUTH AFRICA
(Doctoral Candidate - Ms A. Munsami)

Thank you for submitting your response to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 November 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

The HREC acknowledges that the student, Adele Munsami will also be involved in this study.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 624/2018

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines.

The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code of Federal Regulation Part 312.61, 312.62 and 312.63.

Integrating Brief Cognitive Impairment Testing Within Primary Health Care Facilities in South Africa

Professor John Joska and team at the Univeristy of Cape Town, Department of Neuropsychiatry and HIV Mental Health, are conducting a research study exploring HIV associated cognitive impairment knowledge, practices and views among health care providers.

This survey will take approximately 5 minutes to complete.

We would be grateful if you would take a few minutes to complete this brief survey. We aim to use this information to improve services for people affected by this condition in South Africa.

You are being asked to participate in this brief survey because you provide healthcare services to people living with HIV in South Africa. Please note that participation in the online survey is completely voluntary and all data collected will be anonymous and will remain confidential.

If you would be open to answering more questions on cognitive impairment at a later stage please provide your email address at the end of the survey.

I would like to complete the survey

☐ Yes
☐ No

Thank you for your time. Kindly assist us by sending our link to health care workers that you may know of who can provide insight into HIV associated knowledge, practices and views in South Africa.

Kind Regards
INCREASE Research Team

Introduction

Cognitive impairment, also referred to as neurocognitive impairment, suggests problems with thinking, memory, attention, learning, planning and decision-making, and can be caused by HIV. It can lead to difficulties with daily activities, employment and medication adherence. Cognitive impairment associated with HIV is sometimes called HIV associated neurocognitive disorders (HAND). The most severe form of this is called HIV associated dementia (HAD). International guidelines recommend testing patients for this condition, but this is not routinely done in South Africa.

I am:

☐ Male
☐ Female
☐ Other

How old are you?

Select the province/provinces in which you currently practice? (You may select more than one)

- ☐ Eastern Cape
- ☐ Free State
- ☐ Gauteng
- ☐ KwaZulu-Natal
- ☐ Limpopo
- ☐ Mpumalanga
- ☐ North West
- ☐ Northern Cape
- ☐ Western Cape

Current employer

- ☐ Department of Health
- ☐ Non-Governmental Organization
- ☐ Private
- ☐ Other

Please specify current employer

What is your highest qualification?

- ☐ Primary school level
- ☐ Secondary school level (Standard 8)
- ☐ Matric
- ☐ Higher certificate in respective field
- ☐ Diploma in HIV management
- ☐ Diploma in respective field
- ☐ Undergraduate degree in respective field
- ☐ Honours Degree
- ☐ Master's Degree
- ☐ PhD
- ☐ Other

Please specify highest qualification?

At which facility level do you provide HIV health care services:

- ☐ Rural clinic
- ☐ Community health care centre
- ☐ Primary health care centre
- ☐ Specialist hospital
- ☐ Private practice
- ☐ Mobile clinic unit
- ☐ None of the above facilities (Please specify)
- ☐ I do not provide direct patient care at my professional role

Please specify where you provide services (HIV specific)?

Although you have indicated that you do not provide direct patient care, we are still interested in your input. Please select the options that best describe your current professional role.

I currently function as a/an:

- ☐ Specialist Doctor
- ☐ District Surgeon
- ☐ Consultant
- ☐ Registrar
- ☐ Junior Doctor
- ☐ General Practitioner
- ☐ Professional Nurse
- ☐ Midwife
- ☐ Staff Nurse
- ☐ Pharmacist
- ☐ Epidemiologist
- ☐ Public Health Specialist
- ☐ Psychologist
- ☐ Social Worker
- ☐ HIV Counsellor
- ☐ Community/Home Based Care Provider
- ☐ Occupational Therapist
- ☐ Physiotherapist
- ☐ Radiographer
- ☐ Researcher
- ☐ Student
- ☐ Other

Please specify current role?

Do you work in an HIV clinic?

- ☐ Yes
- ☐ No
- ☐ I do not work in a health care facility

On average, how often do you provide health care services to HIV positive patients?

- ☐ Never (I do not have direct contact with patients)
- ☐ Every day
- ☐ 2-3 days a week
- ☐ Once a week
- ☐ Once a month
- ☐ 2-3 times a month

You have indicated that you do not provide direct patient services. You will not be required to complete questions on patient care, instead you will be directed to the next section exploring your current knowledge of cognitive impairment.

Please select the options that best describe your professional role and your facility.

Cognitive Impairment Practices

The following questions refer to HIV positive patients accessing care at your facility in the past 12 months.

At your facility:

How often did you suspect cognitive impairment in your HIV patients?

- ☐ Never
- ☐ Rarely
- ☐ Occasionally
- ☐ Often
- ☐ All of the time

How often have you encountered patients or their family members reporting cognitive problems to you (e.g. poor memory, attention or planning) ?

- ☐ Never
- ☐ Rarely
- ☐ Occasionally
- ☐ Often
- ☐ All of the time

How often have you asked your HIV patients about cognitive problems?

- ☐ Never
- ☐ Rarely
- ☐ Occasionally
- ☐ Often
- ☐ All of the time

Among patients with poor medication adherence, how often have you asked about cognitive problems that might contribute to poorer adherence? (e.g. memory, poor attention or planning)

- ☐ Never
- ☐ Rarely
- ☐ Occasionally
- ☐ Often
- ☐ All of the time

How frequently have you used a cognitive test among HIV positive patients?

- ☐ Never
- ☐ Rarely
- ☐ Occasionally
- ☐ Often
- ☐ All of the time

Which of the following tests have you used to assess HIV patients' cognitive function? (Please select all relevant options):

- ☐ Mini-Mental State Examination (MMSE)
- ☐ International HIV Dementia Scale (IHDS)
- ☐ Montreal Cognitive Assessment (MoCA)
- ☐ CAT-Rapid
- ☐ Other
- ☐ None of the above

If other please specify

How often have you referred an HIV positive patient for further cognitive testing?

- ☐ Never (this service is not available to me)
- ☐ Rarely
- ☐ Occasionally
- ☐ Often
- ☐ All of the time

Cognitive Impairment Knowledge

The following questions refer to your knowledge of cognitive impairment among HIV positive patients, prior to this survey.

Please select the degree to which you agree/disagree with the following statements.

Prior to this survey:

I was aware that cognitive problems are more common in people with HIV?

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ I do not know

I was aware that cognitive impairment is more common in people with poor medication adherence.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ I do not know

I was aware of one/more of the following terms (select all relevant terms):

- ☐ Cognitive impairment or Neurocognitive impairment
- ☐ HIV associated neurocognitive disorders (HAND)
- ☐ Mild neurocognitive disorder (MND)
- ☐ Asymptomatic neurocognitive impairment (ANI)
- ☐ HIV associated dementia (HAD)
- ☐ All of the above
- ☐ None of the above

Which of the following tests have you heard of or read about before? (select all relevant tests)

- ☐ Mini-Mental State Examination (MMSE)
- ☐ International HIV Dementia Scale (IHDS)
- ☐ Montreal Cognitive Assessment (MoCA)
- ☐ CAT-Rapid
- ☐ None of the above

At your facility / practice:

I would like to have a brief cognitive test available for use among HIV positive patients.

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ I do not know

Administering a brief test to identify cognitive impairment among HIV patients would be feasible for me.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neutral
- ☐ Agree
- ☐ Strongly Agree
- ☐ I do not know

Future Training

The following questions refer to cognitive impairment training that will provide health care workers with skills to identify possible impairment and/or symptoms among HIV positive patients at your facility.

Please select the degree to which you agree/disagree with the following statements.

Have you ever received training or information about HIV associated cognitive impairment in any of the following formats (tick all that apply).

- ☐ Lecture
- ☐ Workshop
- ☐ Read textbook
- ☐ Read journal article
- ☐ Read guideline
- ☐ Read information online
- ☐ Other
- ☐ I have never received any specific training or information on HIV associated cognitive impairment

Please specify:

I would like to receive training to identify HIV associated cognitive impairment.

- ☐ Yes
- ☐ No

Please specify if other

Would you be willing to answer a few more questions on cognitive impairment practices in South Africa?

- ☐ Yes
- ☐ No

Please provide an email address or contact number

Developed by: American Academy of Orthopaedic Surgeons® Pediatric Orthopaedic Society of North America

American Academy of Pediatrics Shriners Hospitals

Appendix B (Consolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	7
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	7
Occupation	3	What was their occupation at the time of the study?	7
Gender	4	Was the researcher male or female?	7
Experience and training	5	What experience or training did the researcher have?	7
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	6
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	6
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	6
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	6
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	6
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	6
Sample size	12	How many participants were in the study?	6
Non-participation	13	How many people refused to participate or dropped out? Reasons?	7
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	7
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	7
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	9
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	7
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	7
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	7
Field notes	20	Were field notes made during and/or after the interview or focus group?	7
Duration	21	What was the duration of the interviews or focus group?	7
Data saturation	22	Was data saturation discussed?	7
Transcripts returned	23	Were transcripts returned to participants for comment and/or	8

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	8
Description of the coding tree	25	Did authors provide a description of the coding tree?	8-9
Derivation of themes	26	Were themes identified in advance or derived from the data?	8
Software	27	What software, if applicable, was used to manage the data?	8
Participant checking	28	Did participants provide feedback on the findings?	8
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	9-16
Data and findings consistent	30	Was there consistency between the data presented and the findings?	18-20
Clarity of major themes	31	Were major themes clearly presented in the findings?	9-16
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	18-20

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Appendix C

Qualitative focus group interview schedule

1. How long have you been working as a ____ (healthcare worker role)?
2. What type of training have you received for hiv care or workshops you have attended since you have started working with people with HIV?
3. In your opinion, what are some of the critical services for people with HIV?
Probe for examples
4. What about mental illness among pwh? Do you see mental illnesses among pwh?
5. What would make you suspect someone of having a common mental disorders?
6. What are some of the most common symptoms you see among pwh whom you suspect of cmd? What steps do you follow for these patients?
7. a) did any of the training that you attended, focus on mental health among pwh?
Can you elaborate? Ask participant do describe which illnesses these training focused on, screening and management. Is this implemented at the facility? Frequency? Who is responsible? At which part of the clinic flow? How long does it take?
b) can you tell me about the training itself. Which healthcare worker did the training target? Where was it conducted? How? What did you like about it? How long was it? Were there any assessments? Was it useful for this setting? How would you improve the training to be more appropriate for your healthcare worker or more applicable for the patients that see?
8. Have you heard anything about hiv and the brain?
The participant is to describe in their own words. Probe for details on signs, symptoms, terms, tests.
9. What do you know about H-NCI? Elaborate on knowledge of H-NCI and tests.
10. Where did you hear about H-NCI? If training probe for more details.
11. Do you know some of the signs and symptoms associated with H-NCI?
If the participant does not know any inform them after the interview.
12. Have you ever suspected H-NCI among your patients? Have you conducted a test? Which test have you used? What was the management of the patient?
13. Do you know that H-NCI has been associated with treatment non-adherence?
14. Have you ever considered H-NCI among your non-adherent patients?
15. Do you think that it would be beneficial to identify H-NCI among non-adherent patients?

16. Would you recommend training for phc workers to be able to use a tool to identify H-NCI?
17. In your opinion, which cadre of healthcare worker is best positioned and should be responsible for identifying H-NCI?
18. You mentioned training methods before, which would you recommend for the training of primary healthcare workers?
19. Do you think face-to-face or online training is best for healthcare worker in this setting?
20. In your opinion, how long should training be?
21. Do you have any other comments?

In-depth interview schedule

1. Can you tell me a little bit about your role here at the clinic with patients living with hiv?
2. Given your experience working with patients living with hiv what are the most important services for this population?
3. You mention that adherence is an issue with hiv patients, what are some of the things that are affecting adherence?
4. Have you received any mental health training? Can you describe the training received, for example the topics covered in this training or tests used?
5. How was this training conducted? How long was the training?
6. I'd like to read you a case study and then ask you a few questions about it.
7. Begin with finding a common term for the problem or illness. A what would you diagnosis this as? What do you call this illness or problem? What name does it have?
8. Why do you think this problem started?
9. What do you think this problem does to the person? How does it work?
10. How severe is this problem? Will it have a short or long course?
11. What kind of treatment do you think the patient should receive?
12. Have you seen patients presenting with these kind of concerns? (yes no).
13. If yes, how often? Do you know what actions are/were taken?
14. You seem to really have a grasp on this patient's experience / nci. If the participant needs further info, then say you will explain more about it next. Including who would be at-risk (non-adherent/ unsuppressed).
15. There are screening tools available to screen nci. How useful do you think screening at risk patients with these symptoms would be? Why or why not?
16. Probe for detail: have you heard of any tools for hiv-nci? Have you ever used a screening tool?
17. If screening for hiv-nci among at-risk patients was to be integrated into hiv services, can think of any challenge to this (nurses too busy, lack of knowledge etc.).
18. If screening among at-risk patients was to be integrated, do you have any suggestions of who would be the most appropriate cadre of healthcare worker and why?
19. What type of training have you received for hiv care or workshops you have attended since you have started working with pwh?

20. Would you be interested in attending a training about hiv-nci? Will this help you with your patients?

HIV-associated Cognitive Impairment Training

Assessment 1: Pre-assessment of knowledge, attitudes and views

Please circle the correct answer to questions in the table below.

Question		A	B	C	D
1.	HIV is able to impact the brain	True	False		
2.	Which of the following is not part of the HIV-associated CI spectrum	HIV-associated dementia	Mild neurocognitive disorder	Bi-polar disorder	All of the above
3.	HIV-associated CI is no longer a problem among PWH	True	False		
4.	A PWH with HIV-associated CI may complain of difficulties with	Suicidal thoughts	Hearing voices, seeing things or feeling angry	Memory, learning, attention, problem solving planning, decision making,	None of the above
5.	Substance abuse and alcohol abuse are caused by cognitive impairment	True	False		
6.	My patient who is ART naïve and has a low CD4 count will not be at risk for CI	True	False		
7.	Which of the following tools can be used to detect CI among PWH	IHDS	Depression scale	Screening Tool for Mental Health Disorders	Self-report
8.	Mild CI can get worse if my patient is non-adherent to ART	True	False		
9.	Which of the following are examples of a HIV-associated CI screening tool	International HIV-dementia scale	Becks Depression scale	CT scan	Lumbar puncture
10.	HIV-associated CI screening tools measure cognitive functions	True	False		

HIV-associated Cognitive Impairment Training

Please tick the response that best describes your views in the table below.

	Question	Strongly disagree	Disagree	I do not know enough about this to answer	Agree	Strongly agree
1.	I am able to explain how HIV affects the brain					
2.	I am able to describe the symptoms of cognitive impairment among people living with HIV					
3.	I learned about cognitive impairment among people living with HIV in my previous training					
4.	I have heard previously that HIV can affect the brain					
5.	I am able to identify cognitive impairment among people living with HIV					
6.	I believe that it is important to know about cognitive impairment among PWH					
7.	I feel confident using a cognitive impairment screening tool among my patients					
8.	I believe that a cognitive impairment screening tool will benefit my patients					
9.	I would like to have access to a cognitive impairment screening tool at my clinic					
10.	Screening for cognitive impairment among people living with HIV is unnecessary					

HIV-associated Cognitive Impairment Training

Key feature responses

Case Study 1

1. What problems or symptoms can you identify?

2. What would you diagnose this as?

3. Would you use a screen this patient for CI?

HIV-associated Cognitive Impairment Training

Case Study 2

1. What problems or symptoms can you identify?

2. What would you diagnose this as?

3. Would you use a screen this patient for CI?

HIV-associated Cognitive Impairment Training

Case Study 3

1. What problems or symptoms can you identify?

2. What would you diagnose this as?

3. Would you use a screen this patient for CI?

HIV-associated Cognitive Impairment Training

Assessment 3: Post-assessment of knowledge, attitudes and views

Please circle the correct answer to questions in the table below.

Question		A	B	C	D
11.	HIV is able to impact the brain	True	False		
12.	Which of the following is not part of the HIV-associated CI spectrum	HIV-associated dementia	Mild neurocognitive disorder	Bi-polar disorder	All of the above
13.	HIV-associated CI is no longer a problem among PWH	True	False		
14.	A PWH with HIV-associated CI may complain of difficulties with	Suicidal thoughts	Hearing voices, seeing things or feeling angry	Memory, learning, attention, problem solving planning, decision making,	None of the above
15.	Substance abuse and alcohol abuse are caused by cognitive impairment	True	False		
16.	My patient who is ART naïve and has a low CD4 count will not be at risk for CI	True	False		
17.	Which of the following tools can be used to detect CI among PWH	IHDS	Depression scale	Screening Tool for Mental Health Disorders	Self-report
18.	Mild CI can get worse if my patient is non-adherent to ART	True	False		
19.	Which of the following are examples of a HIV-associated CI screening tool	International HIV-dementia scale	Becks Depression scale	CT scan	Lumbar puncture
20.	HIV-associated CI screening tools measure cognitive functions	True	False		

HIV-associated Cognitive Impairment Training

HIV-associated Cognitive Impairment Training

Please tick the response that best describes your views in the table below.

	Question	Strongly disagree	Disagree	Somewhat agree	Agree	Strongly agree
11.	I am able to explain how HIV affects the brain					
12.	I am able to describe the symptoms of cognitive impairment among people living with HIV					
13.	I learned about cognitive impairment among people living with HIV in my previous training					
14.	I have heard previously that HIV can affect the brain					
15.	I am able to identify cognitive impairment among people living with HIV					
16.	I believe that it is important to know about cognitive impairment among PWH					
17.	I feel confident using a cognitive impairment screening tool among my patients					
18.	I believe that a cognitive impairment screening tool will benefit my patients					
19.	I would like to have access to a cognitive impairment screening tool at my clinic					
20.	Screening for cognitive impairment among people living with HIV is unnecessary					
21.	HIV-associated CI should be an integral part of future HIV training curriculum					
22.	HIV-associated CI screening tools will be used more in my future practice at as a healthcare worker					

HIV-associated Cognitive Impairment Training

Training evaluation

Please tick the response that best describes your views on future practices in the table below.

Question		Strongly disagree	Disagree	I do not know enough about this to answer	Agree	Strongly agree
1.	I enjoyed learning about HIV-associated CI					
2.	I enjoyed the learning how to use a HIV-associated CI screening tool					
3.	The structure of the training was suitable for me to learn					
4.	The way the training was delivered was appropriate					
5.	The training was relevant to my work and for my patients					
6.	I would recommend this training to my colleagues					
7.	I would attend another training like this one in the future					

Suggestions/recommendations for future trainings

HIV-associated Cognitive Impairment Training

Direct observation of procedural skills checklist

Observe the administration of the IHDS to simulated patient		Correct (2)	Partially correct (1)	Incorrect (0)
	Read out the pre-test introduction to the patient			
	Memory			
	Read out words 1 second apart			
	Informed patient that he/she would ask them for the words at a later stage			
	Motor speed			
	Accurately read instructions for the motor speed activity			
	Remembered to check if patient is using their non-dominant hand			
	Demonstrated the finger tapping motion accurately			
	Set timer to record number of seconds			
	Stopped the patient at 5 seconds			
	Accurately counted the number of taps			
	Wrote down the number of taps			
	Correct score			
	Psychomotor speed			
	Accurately read instructions for the psychomotor speed activity			
	Remembered to check if patient is using their non-dominant hand			
	Demonstrated the sequence accurately			
	Allowed patient to practice the sequence twice			
	Set timer to record number of seconds			
	Stopped the patient at 10 seconds			
	Accurately counted the number of sequences			
	Wrote down the number of correctly completed sequences			
	Wrote down the correct number of completed sequences			
	Noticed error in sequence			
	Correct score			

HIV-associated Cognitive Impairment Training

	Memory recall			
	Asked the patient to recall the words			
	Provided clue for the word not recalled			
	Correct score			
	Correct total for IHDS			
Observe the administration of the CAT-RAPID to simulated patient		Correct (2)	Partially correct (1)	Incorrect (0)
	Symptoms			
	Asks patient all 4 questions			
	Scores the response correctly			
	Correct total score			
	Trail making			
	Accurately read instructions for the trail making activity			
	Accurately demonstrated trail making activity			
	Set timer			
	Noted patient lifted their finger			
	Recorded the time after patient completed the trail			
	Correct score			
	Memory			
	Read out words 1 second apart			
	Informed patient that he/she would ask them for the words at a later stage			
	Motor speed			
	Accurately read instructions for the motor speed activity			
	Remembered to check if patient is using their non-dominant hand			
	Demonstrated the finger tapping motion accurately			
	Set timer to record number of seconds			
	Stopped the patient at 5 seconds			

HIV-associated Cognitive Impairment Training

	Accurately counted the number of taps			
	Wrote down the number of taps			
	Correct score			
	Psychomotor speed			
	Accurately read instructions for the psychomotor speed activity			
	Remembered to check if patient is using their non-dominant hand			
	Demonstrated the sequence accurately			
	Allowed patient to practice the sequence twice			
	Set timer to record number of seconds			
	Stopped the patient at 10 seconds			
	Accurately counted the number of sequences			
	Wrote down the number of correctly completed sequences			
	Wrote down the correct number of completed sequences			
	Noticed error in sequence			
	Correct score			
	Memory recall			
	Asked the patient to recall the words			
	Provided clue for the word not recalled			
	Correct score			
	Correct total for CAT-Rapid			
	Correct combined total			
	Correct referral made			
	Total scores			