Ancillary Tests in Cognitive Impairment

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Newcastle Centre for Brain Ageing and Vitality
Learning Objectives

At the end of this lecture, participants should be able:

- To understand the concept of cognition and classification of neurocognitive disorders
- To understand principles of assessment of cognitive function, particularly instruments relevant to SSA
- To highlight ancillary tests in cognitive impairment
Cognition

• The mental processes of:
  ✓ acquisition, organization, storage and retrieval of knowledge
  ✓ thinking, understanding, and engaging with self and the environment
Importance of Cognition

“Cogito ego sum”

Rene Descates

“I think, therefore, I am”

Essentials of cognitive ability
Alert mind / awareness of self in contact with the environment
Being able to think and reason
Cognitive Domains
Judgment
Praxis
Attention & Concentration
Memory
Language
Abstraction
Visuospatial ability
COGNITION
Neurocognitive domains

Perceptual-motor function
- Visual perception
- Visuoconstructional reasoning
- Perceptual-motor coordination

Language
- Object naming
- Word finding
- Fluency
- Grammar and syntax
- Receptive language

Executive function
- Planning
- Decision-making
- Working memory
- Responding to feedback
- Inhibition
- Flexibility

Learning and memory
- Free recall
- Cued recall
- Recognition memory
- Semantic and autobiographical
  long-term memory
- Implicit learning

Complex attention
- Sustained attention
- Divided attention
- Selective attention
- Processing speed

Social cognition
- Recognition of emotions
- Theory of mind
- Insight
Brain Networks

Bigler ED. 2016. Systems Neuroscience;10:35
Neurocognitive Disorders

Group of diseases characterized by decline/impairment in one or more cognitive domains

Diagnosis can be clinically overt or may be asymptomatic

May be combined with loss of independence/loss of capacity to do activities of daily living

The most severe form is Dementia
Cognitive Profile

Normal Cognition → Cognitive Impairment → Dementia

ADL normal, Cognitive decline

Severe cog. deficits
Impaired ADL
Need for supervision
Trajectory of Cognition

- Non-clinical Phase
- Pre-clinical Phase
- Clinical Phase

Time

Function

Threshold for dementia

Normal Aging

CIND

MCI

Dementia
Mild Cognitive Impairment

- Transitional state between normal aging and dementia
- Cognitive deficits present but functioning preserved
- Inherently ‘unstable condition’ at both extremes
- Divided into amnestic and non-amnestic types
- Amnestic type at greater risk of developing AD
Mild Cognitive Impairment

Cognitive complaint

Not normal for age
Not demented
Cognitive decline
Essentially normal functional activities

MCI

Memory impaired?

Yes

Amnestic MCI

No

Non-Amnestic MCI

Single non-memory cognitive domain impaired?

Yes

Non-Amnestic MCI

Single Domain

No

Non-Amnestic MCI

Multiple Domain

Single non-memory cognitive domain impaired?

No

Non-Amnestic MCI

Multiple Domain

Yes

Amnestic MCI

Single Domain

Amnestic MCI

Multiple Domain

Memory impairment only?

No

Non-Amnestic MCI

Multiple Domain

Petersen RC, Continuum 2004 10:9-28
Dementia

Clinical syndrome characterized by cognitive decline in one or more domain(s) [memory, language, judgment etc.], sufficiently severe to cause impairment in social or occupational functioning, in the conscious and alert state.
Approach to the patient with dementia

History:

– Try and speak to the patient and also a relative
– Ask about:
  » Symptoms at onset
  » Pattern and speed of evolution
  » Impact on work/family life/ Family history
  » Risk factors (e.g. vascular, alcohol)
  » Past medical history
  » Treatment history
Approach to the patient with dementia

- Determine dominant cognitive features and stage of disease
- Determine pattern of progression
- Exclude treatable causes (trauma, infection, drugs, metabolic diseases etc)
- Examine for focal signs
- Examine for movement disorders
- Investigate and initiate treatment
Cognitive deficits in dementia

• Memory problems – typical of Alzheimer’s disease
• Disturbed language functions (aphasia) – FTD, AD
• Problems with recognition of objects previously perceived (agnosia)
• Impaired reasoning, judgment, slow mental processing (Executive function impairment) – VCI, HAND
Pattern of presentation of some dementia syndromes
ICD-10 Dementia criteria

- **G1- Decline in memory** (first, inability to learn new information then loss of previously learned information)
- This should be supported by cognitive testing and interview of a reliable informant
- AND
- **Decline in other cognitive areas** such as judgement and thinking and planning and organising (must be decline from previous level of functioning NB learning disability)
- **G2 - no clouding of consciousness** (i.e. no delirium)
- **G3 Decline** in social functioning, motivation or emotional control (apathy, coarsening of social behaviour, irritability) Essentially evidence of a change in functional ability
- **G4 Present for at least 6 months**
- Mild/Moderate/Severe
- **With additional symptoms** (behavioural and psychological symptoms of dementia (depression, delusions, psychosis) Up to 90% have these
DSM-V Major Neurocognitive Disorder (Dementia)

• 1. Evidence of significant cognitive decline from a previous level of performance in one or more cognitive domains – such as complex attention, executive function, learning, memory, language, perceptual-motor or social cognition
  • Evidence should consist of history of significant decline (from patient, reliable informant or clinician)
  AND
  • Impairment in cognitive performance from standardised neuropsychological testing (or another assessment if this is not available)

• 2. The cognitive deficits interfere with independence in everyday (functional) activities (at a minimum, assistance with complex activities of daily living such as paying bills)
• 3. Not occurring only in delirium and not better explained by another mental disorder

• Specify subtype (see criteria for subtypes of dementia)
Differences with DSM-V criteria

- NCD – acquired, rather than developmental disorders - represent decline. Due to underlying brain pathology.
- ‘Dementia’ typically refers to degenerative diseases in older people, whereas NCD expands category to diseases in younger people.
- Allows for one area of deficit only (i.e. amnestic syndrome, cognitive impairment post head injury) except in Alzheimers disease
- For degenerative dementias, use consensus guidelines for dementia subtype in addition to DSM-V.
NOT dementia

- **DELIRIUM**: an acute confusional state (causes include infection, malignancy, etc.)

- **PSYCHIATRIC PROBLEMS** ("pseudodementia"): e.g. depression, anxiety. Relatively abrupt onset often with identifiable trigger. Should not progress
Delirium: definition

A complex disorder typically of acute onset and fluctuating course which manifests as

- **attention deficit or disturbance of awareness**
- impaired cognition that may involve any or all of the following domains: memory, orientation, visuospatial and executive functions
- sleep wake cycle disturbance
  - Psychomotor disturbances (hypo- or hyperactivity and mixed forms with unpredictable shifts from one to the other
  - Perceptual disturbances
- of enough severity to have a negative impact on the individual
Delirium: “off the track”

‘Acute confusional state’

Major Causes of Delirium (HIDE)

- Hypoxia
- Infections
- Drugs
- Electrolyte disturbances
## Delirium vs. Cognitive impairment/Dementia

<table>
<thead>
<tr>
<th>Feature</th>
<th>Delirium</th>
<th>Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onset</strong></td>
<td>Acute</td>
<td>Gradual (insidious)</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>Hours - weeks</td>
<td>Months - years</td>
</tr>
<tr>
<td><strong>Course</strong></td>
<td>Fluctuating</td>
<td>Progressive deterioration</td>
</tr>
<tr>
<td><strong>Consequences</strong></td>
<td>Impaired</td>
<td>Motor skills</td>
</tr>
<tr>
<td><strong>Perceptual disturbance</strong></td>
<td>Common</td>
<td>Occurs late stage</td>
</tr>
<tr>
<td><strong>Sleep-wake cycle</strong></td>
<td>Disrupted</td>
<td>Usually normal (except late stages)</td>
</tr>
<tr>
<td><strong>Prognosis</strong></td>
<td>Potentially reversible</td>
<td>Irreversible</td>
</tr>
<tr>
<td><strong>Primary effects</strong></td>
<td>Attention</td>
<td>Memory (Working / amestic)</td>
</tr>
<tr>
<td><strong>Medical Emergency</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Figure 1. Factors Contributing to Changes in Neurotransmitters, Leading to Delirium

↓ACH = Neuronal Excitability
- Anticholinergic drugs
- Age/dementia
- Hypoxia
- Anemia
- Hypotension
- Poor nutrition
- Infection
- Surgery
- Alzheimer’s disease

↑DA = ↓Release of ACH
- Drugs: dopamine agonists
- Infection
- Surgery
- Age/dementia

↑Cortisol & Beta-Endorphins
- Exogenous glucocorticoids
- Disruption of circadian rhythm

↓GABA = Neuronal Excitability
- Benzodiazepines
- Alcohol withdrawal

↑Serotonin
- Antidepressants
- Infection
- Hepatic encephalopathy

Mechanisms of Delirium Neurotransmitters

ACH: acetylcholine; DA: dopamine; GABA: gamma-aminobutyric acid.
Source: References 1, 7-11.
How to diagnose delirium without investigations?

- **Single Question in Delirium (SQiD):** 'Do you think [name of patient] has been more confused lately? Sensitivity and specificity of 80% (95% CI 28.3-99.49%) and 71% (41.90-91.61%) respectively compared to CAM

Ask family members

“Is this a change?”

Cognitive Function Assessment
Neuropsychometric Assessment

• Cognitive function tests have been used and developed over several years

• Neuropsychometric batteries may contain several components to test different cognitive abilities, e.g. CANTAB, CAMCOG, ADAS-Cog etc.

• The Mini-Mental State Examination (MMSE)- widely used. Montreal Cognitive Assessment (MoCA) test.

• Value of informant questionnaires eg IQCODE
Neuropsychological Test Criteria: General considerations

- Quality of the standardization sample
- Psychometric qualities
- Portability
- Brevity
- Cost
- Ease of use
- Domain specificity (for 1-hour battery)
- Availability of multiple forms
- International or cross-cultural capability
- The lack of ceiling and floor effects

Hachincki V et al, 2006
Mini-Mental State Examination

• MMSE is a short test which measures general cognitive status including short-term memory (Folstein, et al, 1975)

• MMSE includes tests for orientation (e.g. year, season, etc.), registration, attention and calculation, recall, and language

• MMSE is a 30 points score test. Mildly cognitively impaired subjects can have scores 26 to 21
Montreal Cognitive Assessment (MoCA)

MoCA also includes tests for orientation (e.g. year, season, etc.), registration, attention and calculation, recall, and language biased towards Executive Dysfunction.

- MoCA a 30 points score test. Mildly cognitively impaired subjects can have scores 26 to 21.
MoCA and ACE-R had good sensitivity and specificity for MCI defined using the NINDS-CSN Battery (Hachinski et al, 2006) 1 year after TIA and stroke but MMSE showed a ceiling effect.
CogFAST – Nigeria: Vascular Neuropsychological Battery

<table>
<thead>
<tr>
<th>Cognitive Domain</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Function</td>
<td>Category (Animal) Fluency Test</td>
</tr>
<tr>
<td>/Activation</td>
<td>Phonemic (Letter) Fluency Test</td>
</tr>
<tr>
<td></td>
<td>Verbal Reasoning (Similarities Test)</td>
</tr>
<tr>
<td></td>
<td>Ideational Fluency Test</td>
</tr>
<tr>
<td>Language/ Lexical Retrieval</td>
<td>Boston Naming Test (2nd version)</td>
</tr>
<tr>
<td>Memory/ Learning</td>
<td>Word List Test (Learning, Recall, Recognition)</td>
</tr>
<tr>
<td></td>
<td>Delayed Recall of Stick Design</td>
</tr>
<tr>
<td>Visuospatial/</td>
<td>Stick Design Test</td>
</tr>
<tr>
<td>Visuoconstruction</td>
<td>Modified Tokens Test (IU Token Test)</td>
</tr>
<tr>
<td>General Cognitive Functioning</td>
<td>Community Screening Instrument for Dementia (CSID</td>
</tr>
<tr>
<td></td>
<td>Minimental State Examination (MMSE)</td>
</tr>
</tbody>
</table>

- Based on the 60 min VCI Harmonization Standards – Neuropsychological Protocol proposed by the NINDS – CSN (Hachinski et al, 2006).

- Multiple test items assessing each cognitive domain were selected in consonance with the recommendations of the Harmonization standards.

- Utility of tests in previous cognitive evaluations in environment of study population.

Refs: Folstein, 1995; Hall et al, 1993; 2000; Gureje et al., 1995; Blessed et al, 1991; Unverzagt et al., 1999; Ballard et al, 2002; Baiyewu et al., 2005; Akinyemi et al., 2008
The Vascular Neuropsychological Battery

- CAMCOG – Executive Function/Activation
  - i. Category (Animal) Fluency Test
  - ii. Phonemic (Letter) Fluency Test
  - iii. Verbal Reasoning (Similarities Test)
  - iv. Ideational Fluency Test
  - v. Visual Reasoning Test

- Language/Lexical Retrieval
  - Boston Naming Test (2nd version)

- Memory/Learning
  - Word List Test (Learning, Recall, Recognition)
  - Delayed Recall of Stick Design

- Visuospatial/Visuoconstruction
  - Stick Design Test
  - Modified Tokens Test

- Computerized test items (Choice Reaction Time)

Hachinski et al, Stroke. 2006;37:2220-2241
Screening tools for dementia designed for use in SSA?

- MMSE is still the most widely used test – but almost useless in those with low education
- CSI-D validated in >2000 older people in LMICs (but only 20 from SSA)
- False positive rate still 25% in low edu.
- Both tests take over 30-40 min to complete – too long for screening

<table>
<thead>
<tr>
<th>Test</th>
<th>Questions</th>
<th>Sensitivity</th>
<th>AUROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSI-D</td>
<td>30 + 30</td>
<td>92</td>
<td>0.9191 (90–92)</td>
</tr>
<tr>
<td>TEST OF SENEGAL</td>
<td>39</td>
<td></td>
<td>0.967</td>
</tr>
</tbody>
</table>
The IDEA six-item cognitive screen

- Developed for low-literacy settings in sub-Saharan Africa
- Takes 5-10 minutes to administer
- Validated for dementia screening in community and geriatric OPD (Tanzania)
- Validated for major cognitive impairment (dementia or delirium) in older inpatients (Tanzania, Nigeria and Zambia)

The IDEA study brief screening test

- 6 item screening test
- Designed for non specialists and low literacy population
- Designed to cover all lobes of the brain
- Most discriminating questions from CSI-D (used in Hai dementia prevalence study)
- CERAD 10 word list learning
- Baiyewu matchstick test

<table>
<thead>
<tr>
<th>Name</th>
<th>First attempt</th>
<th>Second attempt</th>
<th>Third attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siagi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mkono</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barua</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mfalme</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tikiti</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nyasi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kona</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jiwe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kitabu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fimbo</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### IDEA Screening tool -2

<table>
<thead>
<tr>
<th>Task</th>
<th>Score Criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I will tell you the name of something and I want you to describe what it is. What is a bridge? (correct answer: something that goes across a river, canyon or road)</td>
<td>0 if incorrect 2 if correct</td>
<td></td>
</tr>
<tr>
<td>I want you to name as many different animals as you can in one minute.</td>
<td>Number of animals named: 0 for 0-3 animals named 1 for 4-7 animals named 2 for 8 or more animals</td>
<td></td>
</tr>
<tr>
<td>Who is the chief/head/leader of this village?</td>
<td>0 if incorrect 1 if correct</td>
<td></td>
</tr>
<tr>
<td>What day of the week is it?</td>
<td>0 if incorrect 2 if correct</td>
<td></td>
</tr>
<tr>
<td>Can you tell me any of the words you learned earlier?</td>
<td>1 one word 2 two words 3 three words 4 four words 5 5 or more words</td>
<td></td>
</tr>
</tbody>
</table>

Can you make the design shown below using these four matchsticks. I will show you once and then you have to copy exactly.

<table>
<thead>
<tr>
<th>Score 1 for each part of the design that is performed correctly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Middle two matchstick heads pointing same way</td>
</tr>
<tr>
<td>1 Outside two matchsticks pointing at an angle</td>
</tr>
<tr>
<td>1 Matchstick heads are orientated correctly</td>
</tr>
</tbody>
</table>

Total points: __/3

Total Score: ____/15

Matchsticks (Orientation) Test
(Baiyewu et al 2003)

Subject asked to make the design shown above using four matchsticks. He/She is shown once and then they have to copy exactly.

Score 1 for each part of the design that is performed correctly.
Comparison with other cognitive screening tools commonly used in high income countries

<table>
<thead>
<tr>
<th>TEST</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Area under ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE – specialist clinic (meta-analysis 34 studies)</td>
<td>79.8</td>
<td>81.3</td>
<td></td>
</tr>
<tr>
<td>MMSE - mixed hospital (meta-analysis)</td>
<td>71.1</td>
<td>96.6</td>
<td></td>
</tr>
<tr>
<td>RUDAS</td>
<td>89</td>
<td>98</td>
<td>0.95</td>
</tr>
<tr>
<td>Addenbrookes (meta-analysis 5 studies)</td>
<td>96.7</td>
<td>77.4</td>
<td></td>
</tr>
<tr>
<td>Six-item screener (for ER)</td>
<td>63</td>
<td>81</td>
<td>0.77</td>
</tr>
<tr>
<td>IDEA inpatients Tanzania</td>
<td>90.9</td>
<td>87.5</td>
<td>0.917</td>
</tr>
<tr>
<td>IDEA outpatients Tanzania &gt; 8</td>
<td>84.6</td>
<td>89.1</td>
<td>0.919</td>
</tr>
<tr>
<td>IDEA inpatients Nigeria</td>
<td>100</td>
<td>96.3</td>
<td>0.990</td>
</tr>
</tbody>
</table>
**Instrumental Activities of Daily Living (IADL)**

**Instructions:** Circle the scoring point for the statement that most closely corresponds to the patient's current functional ability for each task. The examiner should complete the scale based on information about the patient from the patient him/herself, informants (such as the patient’s family member or other caregiver), and recent records.

<table>
<thead>
<tr>
<th>A. Ability to use telephone</th>
<th>Score</th>
<th>E. Laundry</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operates telephone on own initiative; looks up and dials numbers, etc.</td>
<td>1</td>
<td>1. Does personal laundry completely</td>
<td>1</td>
</tr>
<tr>
<td>2. Dials a few well-known numbers</td>
<td>1</td>
<td>2. Launders small items; rinses stockings, etc.</td>
<td>1</td>
</tr>
<tr>
<td>3. Answers telephone but does not dial</td>
<td>1</td>
<td>3. All laundry must be done by others</td>
<td>0</td>
</tr>
<tr>
<td>4. Does not use telephone at all</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Shopping</th>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Takes care of all shopping needs independently</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Shops independently for small purchases</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3. Needs to be accompanied on any shopping trip</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4. Completely unable to shop</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Food preparation</th>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Plans, prepares, and serves adequate meals independently</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Prepares adequate meals if supplied with ingredients</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3. Heats and serves prepared meals, or prepares meals but does not maintain adequate diet</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4. Needs to have meals prepared and served</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. Housekeeping</th>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintains house alone or with occasional assistance (e.g., “heavy work domestic help”)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Performs light daily tasks such as dishwashing, bed making</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Performs light daily tasks but cannot maintain acceptable level of cleanliness</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Needs help with all home maintenance tasks</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Does not participate in any housekeeping tasks</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F. Mode of transportation</th>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Travels independently on public transportation or drives own car</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Arranges own travel via taxi, but does not otherwise use public transportation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Travels on public transportation when assisted or accompanied by another</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Travel limited to taxi or automobile with assistance of another</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5. Does not travel at all</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G. Responsibility for own medications</th>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is responsible for taking medication in correct dosages at correct time</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Takes responsibility if medication is prepared in advance in separate dosages</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3. Is capable of dispensing own medication</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>H. Ability to handle finances</th>
<th>Score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manages financial matters independently</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Manages day-to-day purchases, but needs help with banking, major purchases, etc.</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3. Incapable of handling money</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

(Lawton & Brody, 1969)

**Scoring:** The patient receives a score of 1 for each item labeled A – H if his or her competence is rated at some minimal level or higher. Add the total points circled for A – H. The total score may range from 0 – 8. A lower score indicates a higher level of dependence.

**Sources:**
Instrumental Activities of daily living (IADL) Scale

1. **Wanatoa Historia**/They give histories of the family, their life, past events
2. **Wana suluhisha**/They settle conflicts
3. **Wanasaidia shughuli ndogo ndogo**/They assist in small works in the home
4. **Wanatoa ushauri**/They give advice
5. **Wanadumisha na kufundisha mila/unyago**/They teach traditions of society
6. **Ni walinzi wa nyumbani**/They watch over the house when others are out.
7. **Wanatunza wajukuu**/They look after the grandchildren
8. **Wanatoa ushawishi**/Persuasion, or changing people’s ideas for the better.
9. **Wanasaidia katika maswala mazito kama sherehe**/They preside over feasts and ceremonies
10. **Wanapangia watu majukumu**/Delegation of responsibilities to others.
11. **Wanasimamia haki**/They ensure fairness.
Results of combined screening, Hai Dementia screening programme

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Auroc</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEA 6 item screen, used alone</td>
<td>0.846 (0.776-0.915)</td>
</tr>
<tr>
<td>IADL –SSA scale, used alone</td>
<td>0.896 (0.842-0.951)</td>
</tr>
<tr>
<td>IDEA 6 item screen and IADL-SSA used together</td>
<td>0.937 (0.896-0.979)</td>
</tr>
</tbody>
</table>

- **Conclusions**
  - The IDEA brief dementia screening tool performed well in hospital inpatient, outpatient and community settings
  - This screening test should prove useful in screening for dementia in SSA
  - Less educationally biased than existing tools
  - Performance in the community was improved by addition of a functional assessment tool
  - Further testing in of this system of dementia screening in other low-resource and community settings is required
Ancillary Investigations
Goals of Ancillary Tests in Neurocognitive Disorders

- To:
  - Detect potentially reversible causes of cognitive impairment and dementia
  - Detect co-morbidities that impact on outcomes
  - Demonstrate in vivo degree of pathology in dementia subtypes.
  - Map changes in brain structure and function
Investigations

- Brain Imaging Studies
- Full Blood Count
- Folate/Vitamin B12
- Thyroid Stimulating Hormone
- Blood Glucose
- Renal and Liver Function Tests
- Serological tests for Syphilis, Borelia – VDRL
- HIV Serology
- CSF for Biomarkers and to exclude infections
- Electroencephalography
Blood Tests

- Folate
- Vitamin B12
- Thyroid Stimulating Hormone
- Calcium
- Glucose
- Full Blood Count
- Renal and Liver Function Tests
- Serological tests for Syphilis, Borelia – VDRL
- HIV Serology
CSF analysis

- Indicated when vasculitis, inflammatory, haematological and demyelinating diseases are suspected
- Elevation of 14-3-3 protein +/- neuron specific enolase reflecting acute neuronal loss suggests CJD
- Elevated total tau or phospho-tau with decreased beta-amyloid 42 (Aβ42) suggest AD [sensitivity 86%; specificity 90%]
- CSF neurofilament light (nFL) protein in TBI and VCI
Neuroimaging

- **Structural Imaging:**
  - MRI better than CT in demonstrating structural lesions and monitoring changes over time
  - Hippocampal atrophy
  - Vascular lesions including microbleeds, WMH, infarcts

- **Diffusion Tensor Imaging** – disconnection syndromes

- **Functional imaging** – fMRI, PET, SPECT
  - To detect and measure cerebral blood flow, metabolic levels, receptor binding and pathological depositions
MRI Study in Older Nigerian Stroke Survivors

Medial temporal lobe atrophy (MTLA) was independently associated with VCI/VaD in PS survivors at 12 months.

MTLA correlated significantly with cognitive performance and white matter hyperintensities (WMHs) on T2W MRI.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Normal vs vCIND</th>
<th>vCIND vs PSD</th>
<th>Normal vs (vCIND + PSD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLA rating</td>
<td>OR 2.02 1.05 – 3.87 0.035</td>
<td>OR 2.25 1.16 – 4.35 0.016</td>
<td></td>
</tr>
<tr>
<td>Log _ TBV</td>
<td>0.01 0- 1.96 0.260</td>
<td>0.25 0- 3.86 0.022</td>
<td>0- 1.996.50 0.260</td>
</tr>
</tbody>
</table>

**MTLA vs WMH score showed positive correlation (r = 0.461, p = 0.002) supporting a vascular basis for MTLA.**
# Functional Imaging: PET and SPECT Tracers

<table>
<thead>
<tr>
<th>Tracer</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>[99mTc] ethylcysteinatedimer</td>
<td>Cerebral blood flow</td>
</tr>
<tr>
<td>[18F] 2-fluoro-2-deoxy-D-glucose</td>
<td>Cerebral glucose metabolism</td>
</tr>
<tr>
<td>[123I] iodobenzamide</td>
<td>Dopamine D2/D3 receptor</td>
</tr>
<tr>
<td>[18F]Flortaucipir (AV1451)</td>
<td>Neurofibrillary tangles</td>
</tr>
</tbody>
</table>
Brain Amyloid Imaging

PET Imaging of Tau Deposits

Okamura et al. Clin and Transl Neuroimaging. 2018; 6(4); 305-16
FDG PET Imaging Metabolic Patterns in Different Dementia Phenotypes

Take Home Points

• Evaluation of subjects with cognitive and dementia requires formal cognitive testing

• Useful cognitive tools exist in SSA

• Ancillary tests are useful in detecting reversible dementias, co-morbidities and evaluating pathological deposits and metabolic activities.
THANK YOU