Cognitive Impairment and Dialysis

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Senior Lecturer, Griffith University
Figure 1.1
Percentage of the total population aged 60 years and over, by country income level, 2015 to 2050

<table>
<thead>
<tr>
<th>Year</th>
<th>LIC</th>
<th>L-MIC</th>
<th>UMIC</th>
<th>HIC</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>5.2</td>
<td>8.1</td>
<td>13.3</td>
<td>22.0</td>
<td>12.2</td>
</tr>
<tr>
<td>2030</td>
<td>6.0</td>
<td>11.2</td>
<td>20.5</td>
<td>27.3</td>
<td>16.3</td>
</tr>
<tr>
<td>2050</td>
<td>8.4</td>
<td>16.3</td>
<td>28.9</td>
<td>31.6</td>
<td>21.2</td>
</tr>
</tbody>
</table>

Table 5.4
The 12 leading contributors to Years Lived with Disability among people aged 60 years and over, according to the WHO GBD (2004) and IHME GBD (2010) methodology

<table>
<thead>
<tr>
<th>Chronic disease/condition</th>
<th>Million YLD (% contribution to total)</th>
<th>Rank order (YLD)</th>
<th>Chronic disease/condition</th>
<th>Million YLD (% contribution to total)</th>
<th>Rank order (YLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual impairment</td>
<td>30.9 (26.4%)</td>
<td>1</td>
<td>Musculoskeletal disorders</td>
<td>42.0 (25.8%)</td>
<td>1</td>
</tr>
<tr>
<td>Dementia</td>
<td>15.4 (12.1%)</td>
<td>2</td>
<td>Mental disorders</td>
<td>16.2 (10.0%)</td>
<td>2</td>
</tr>
<tr>
<td>Hearing loss</td>
<td>13.0 (11.1%)</td>
<td>3</td>
<td>Chronic respiratory</td>
<td>11.8 (7.2%)</td>
<td>3</td>
</tr>
<tr>
<td>Musculoskeletal disorders</td>
<td>11.2 (9.6%)</td>
<td>4</td>
<td>Visual impairment</td>
<td>10.4 (6.4%)</td>
<td>4</td>
</tr>
<tr>
<td>Mental disorders</td>
<td>7.0 (6.0%)</td>
<td>5</td>
<td>Diabetes/ endocrine</td>
<td>9.0 (5.5%)</td>
<td>5</td>
</tr>
<tr>
<td>Chronic respiratory</td>
<td>5.8 (5.0%)</td>
<td>6</td>
<td>Hearing loss</td>
<td>7.5 (4.6%)</td>
<td>6</td>
</tr>
<tr>
<td>Heart disease</td>
<td>4.7 (4.0%)</td>
<td>7</td>
<td>Genitourinary disorders</td>
<td>6.6 (4.1%)</td>
<td>7</td>
</tr>
<tr>
<td>Diabetes/ endocrine</td>
<td>4.8 (3.9%)</td>
<td>8</td>
<td>Dementia</td>
<td>6.2 (3.8%)</td>
<td>8</td>
</tr>
<tr>
<td>Stroke</td>
<td>4.4 (3.9%)</td>
<td>9</td>
<td>Heart disease</td>
<td>4.8 (2.3%)</td>
<td>9</td>
</tr>
<tr>
<td>Cancer</td>
<td>2.6 (2.2%)</td>
<td>10</td>
<td>Stroke</td>
<td>3.0 (1.8%)</td>
<td>10</td>
</tr>
<tr>
<td>Genitourinary disorders</td>
<td>0.8 (0.7%)</td>
<td>11</td>
<td>Cancer</td>
<td>2.9 (1.5%)</td>
<td>11</td>
</tr>
<tr>
<td>Digestive disorders</td>
<td>2.2 (1.9%)</td>
<td>12</td>
<td>Digestive disorders</td>
<td>1.0 (0.5%)</td>
<td>12</td>
</tr>
<tr>
<td>Total YLD burden (all diseases)</td>
<td>117.0 (100%)</td>
<td></td>
<td>Total YLD burden (all diseases)</td>
<td>162.8 (100%)</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2.3
Estimated prevalence of dementia for those aged 60 and over, standardised to Western Europe population, by GBD region

AD – 80%
VD – 10%
Prevalence of dementia in 65 years and over - 1 in 10 (8.8%)
### Early identification

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>CBR</td>
<td>General population screening for dementia should not be undertaken.</td>
</tr>
<tr>
<td>23</td>
<td>PP</td>
<td>Concerns or symptoms should be explored when first raised, noted or reported by the person, carer(s) or family and should not be dismissed as ‘part of ageing’.</td>
</tr>
<tr>
<td>24</td>
<td>CBR</td>
<td>Medical practitioners working with older people should be alert to cognitive decline, especially in those aged 75 years and older.</td>
</tr>
</tbody>
</table>
### Table 2: Summary of recommendations for screening older people (≥ 65 yr) for cognitive impairment from Canada and elsewhere

<table>
<thead>
<tr>
<th>Organization</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Task Force on Preventive Health Care (current)</td>
<td>Do not screen asymptomatic older adults (≥ 65 yr) for cognitive impairment</td>
</tr>
<tr>
<td>Canadian Task Force on Preventive Health Care (2001)(^{15})</td>
<td>Insufficient evidence to recommend for or against screening for cognitive impairment</td>
</tr>
<tr>
<td>National Institute for Health and Care Excellence (2011)(^{36})</td>
<td>Screening for dementia in general population should not be undertaken</td>
</tr>
<tr>
<td>BC Ministry of Health, 2014(^{39})</td>
<td>Do not screen asymptomatic population</td>
</tr>
<tr>
<td>US Preventive Services Task Force (2014)(^{40})</td>
<td>Insufficient evidence to assess the balance of benefits and harms of screening for cognitive impairment</td>
</tr>
</tbody>
</table>
Mild Cognitive Impairment
Common as brain ages
Does not consistently progress to dementia
False positive: MMSE – 1 in 8 MoCA – 1 in 4
Quality statement 1
Early screening

A patient presenting to hospital with one or more key risk factors for delirium receives cognitive screening using a validated test. In addition, the patient and their carer are asked about any recent changes (within hours or days) in the patient’s behaviour or thinking.

Purpose

To ensure patients with delirium and those at risk of delirium who present to hospital are identified early so that appropriate management and preventive measures can be put in place.

Rationale

Delirium is often missed in patients who present to hospital. A structured approach can help improve detection rates. Age > 65 years, known cognitive impairment/dementia, severe medical illness and current hip fracture are key risk factors for delirium; additional risk factors may be included. Patients with any one key risk factor should undergo cognitive screening, be asked about any recent changes in behaviour and thinking, and receive interventions to prevent delirium. Cognitive screening on presentation helps identify patients who should be assessed for delirium and is useful for monitoring delirium onset during a hospital stay. Patients who have cognitive impairment or who have had a recent change in behaviour or thinking may have delirium and need to be assessed for it.
Prevalent RRT Patients - Australia
31 December 2015

Age ≥65 – 40%
Age ≥75 – 15%

2016 ANZDATA Annual Report, Figure 2.1
Figure 4.3: Number of KRT-treated and non-KRT-treated cases, by age group at ESKD onset, 2003–2007

Source: Linked ANZDATA Registry, AIHW National Mortality Database and National Death Index.
35Y, HD 7Y, no macrovascular, diabetes or smoking history
Cognition in People With End-Stage Kidney Disease Treated With Hemodialysis: A Systematic Review and Meta-analysis

Emma O’Lone, MBChB, Michael Connors, PhD, Philip Masson, PhD, Sunny Wu, Patrick J. Kelly, PhD, David Gillespie, PhD, Daniel Parker, PhD, William Whiteley, PhD, Giovanni F.M. Strippoli, PhD, Svetlana C. Palmer, PhD, Jonathan C. Craig, PhD, and Angela C. Webster, PhD

42 cross-sectional & cohort studies (3,522 total participants) included in data synthesis

<table>
<thead>
<tr>
<th>Comparison population</th>
<th>Studies†</th>
<th>Participants†</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population</td>
<td>32</td>
<td>2,231</td>
</tr>
<tr>
<td>People with NDD-CKD</td>
<td>8</td>
<td>629</td>
</tr>
<tr>
<td>People on PD</td>
<td>13</td>
<td>1,144</td>
</tr>
<tr>
<td>People with nondialyzed CKF</td>
<td>7</td>
<td>248</td>
</tr>
</tbody>
</table>
## AIKD

### Cognitive Domains

<table>
<thead>
<tr>
<th>Cognitive Domain</th>
<th>Trials (N)</th>
<th>Participants</th>
<th>No. of tests utilized to measure the domain</th>
<th>Most frequent test used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation &amp; attention</td>
<td>33</td>
<td>3361</td>
<td>33</td>
<td>TMT A and B (17%)</td>
</tr>
<tr>
<td>Memory</td>
<td>24</td>
<td>2922</td>
<td>38</td>
<td>WMS (25%)</td>
</tr>
<tr>
<td>Construction &amp; Motor</td>
<td>13</td>
<td>1812</td>
<td>13</td>
<td>Clock and GPB (17% each)</td>
</tr>
<tr>
<td>Executive Function</td>
<td>12</td>
<td>1554</td>
<td>11</td>
<td>Stroop test (37%)</td>
</tr>
<tr>
<td>Concept &amp; reasoning</td>
<td>10</td>
<td>376</td>
<td>11</td>
<td>Progressive matrices (22%)</td>
</tr>
<tr>
<td>Language</td>
<td>8</td>
<td>1264</td>
<td>9</td>
<td>HVLT (20%)</td>
</tr>
<tr>
<td>Perception</td>
<td>4</td>
<td>126</td>
<td>5</td>
<td>Halstead Reitan (25%)</td>
</tr>
<tr>
<td>Global</td>
<td>27</td>
<td>2458</td>
<td>12</td>
<td>MMSE (53%)</td>
</tr>
</tbody>
</table>

**Frequency of studies testing each domain (%)**

- Orientation & attention: 79%
- Memory: 57%
- Construction & Motor: 31%
- Executive Function: 29%
- Concept & reasoning: 24%
- Language: 19%
- Perception: 10%
- Global: 64%
Cognition in People With End-Stage Kidney Disease Treated With Hemodialysis: A Systematic Review and Meta-analysis

Emma O’Lone, MBChB, Michael Connors, PhD, Philip Masson, PhD, Sunny Wu, Patrick J. Kelly, PhD, David Gillespie, PhD, Daniel Parker, PhD, William Whiteley, PhD, Giovanni F.M. Strippoli, PhD, Suetonia C. Palmer, PhD, Jonathan C. Craig, PhD, and Angela C. Webster, PhD
• Pattern of CI in CKD is does not fit in to known syndromes
• Cognition declines with advancing CKD in each domain follows a unique pattern
• Global cognition measure appear to be useful in screening
Cognitive function and advanced kidney disease: longitudinal trends and impact on decision-making

Osasuyi Iyase1, David Okai2 and Edwina Brown1

MoCA Total

<table>
<thead>
<tr>
<th>Dialysis</th>
<th>CKD</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>36</td>
</tr>
</tbody>
</table>

MoCA Executive Function

<table>
<thead>
<tr>
<th>HD</th>
<th>PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>25</td>
</tr>
</tbody>
</table>
Significantly lower MacCAT-T scores in those with CI

Dialysis – 66
CKD - 36

HD – 41
PD - 25

Error Bars: 95% CI
Impact of cognitive impairment

- Health literacy
- Self-management capability
- Delirium and depression
- Decision making capacity (w/w dialysis)
- Care giver burden
- Resource utilisation
- Mortality

- Recognition and management of depression
- Prevention, recognition and management of delirium
- Advance care planning
- Assistance to patients and their carers with:
  - Navigating care pathways
  - Weighing up treatment options
  - Compiling advice from multiple sources
  - Adherence
  - Maintaining independence
Screening of cognitive impairment in dialysis – a scoping review
A San, B Hiremagalur, W Muircroft and L Grealish

- Validated tools for global cognitive assessment
- Optimal condition and timing in relation to HD for administering the tool
- Prevalence based on global cognitive assessment
Screening

Records identified through database searching (n = 334)

Additional records identified through other sources (n = 0)

Identification

Records after duplicates removed (n = 320)

Records excluded (n = 264)

Screening

Titles and abstracts screened (n = 320)

Records excluded (n = 264)

Eligibility

Full-text articles assessed for eligibility (n = 56)

Full-text articles excluded, with reasons
  • Review article (n=9)
  • Use of non-universally recognised screening tools (n=2)

Included

Studies included in the scoping review (n = 45)

Studies included in the scoping review (n = 45)

Medline, Cinhal, Embase, Psychinfo, Pubmed and Cochrane

2000 to 2015, English

ESKD on dialysis

Prospective trials using global cognitive assessment tools

"dementia" OR “dementia” [tw]
"delirium"[mh] OR “delirium”[tw]
"cognition"[mh] OR cognition[tw] OR “cognition disorders”[mh]

"renal dialysis"[mh] OR “dialysis”[mh]
N = 45

- Cross-sectional studies
- HD – 35 studies, HD+PD – 9 studies, PD – 1 study
- Control group included – 21 studies
- MMSE – 32 studies, MMSE+MoCA – 3 studies, MoCA – 1 study, 3MS – 9 studies
- Detailed neuropsychological testing – 17 studies
- Mean age 65 and over – 43 studies
The Montreal Cognitive Assessment (MoCA) - A Sensitive Screening Instrument for Detecting Cognitive Impairment in Chronic Hemodialysis Patients

Frances E. Tiffin-Richards, Ana S. Costa, Bernhard Holschbach, Rolf D. Frank, Athina Vassiliadou, Thilo Krüger, Karl Kuckuck, Theresa Gross, Frank Eitner, Jürgen Floege, Jörg B. Schulz, Kathrin Reetz

PLOS ONE | www.plosone.org | October 2014 | Volume 9 | Issue 10 | e106700

\[ N = 43 \]

CI based on NP – 70%

\[ \leq 24 - 59\% \text{MoCA} \]

- Sensitivity: 76.7
- Specificity: 78.6
- AUC: 0.755

\[ \leq 28 - 46.3\% \text{MMSE} \]

- Sensitivity: 55.2
- Specificity: 75.0
- AUC: 0.639
MoCA

- Developed as a quick tool to detect MCI
- More sensitive than MMSE in detecting MCI
- Assesses patients in more domains than MMSE
  - Executive function
  - Higher-level language
  - Complex visiospatial processing
- Covers a range of content required for assessment of CI in CVD
  - Exception – mental processing speed
- Evidence that visiospatial/executive subset makes it preferentially sensitive to VD is mixed
<table>
<thead>
<tr>
<th>Testing conditions</th>
<th>MoCA total score</th>
<th>p value (t test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate vs. group room</td>
<td>24.17±3.1 vs.</td>
<td>0.101</td>
</tr>
<tr>
<td>Before vs. after dialysis</td>
<td>24.42±2.62 vs.</td>
<td>0.013*</td>
</tr>
<tr>
<td>Before dialysis</td>
<td>23.37±3.33</td>
<td></td>
</tr>
<tr>
<td>Separate vs. group room</td>
<td>23.27±2.99 vs.</td>
<td>0.012*</td>
</tr>
<tr>
<td>Separate room vs. other conditions</td>
<td>24.96±2.84 vs.</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

Values represent mean ± SD. Statistically significant: * p < 0.05.
Statistically significant after Bonferroni correction of multiple comparisons.
Prevalence

- Global Cognitive Assessment Tool
  - HD (21/44 studies) - 6% to 66%; PD (3/10 studies) – 3 to 14%

- Neurocognitive Assessment (5/17 studies)
  - HD – 58 to 73%; PD – 67%

Where reported:
- HD>PD>CKD>Controls
- NP>GCAT
Cognitive Testing in Patients with CKD: The Problem of Missing Cases

Denise Neumann, Maxi Robinski, Wilfried Mau, and Matthias Gimdt


Missing data n = 366 (48%)
Summary

- Routine cognitive assessment
- Assessment tool
- Barriers to assessment