Measurement of Cognitive Dysfunction (Adult)

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# Faculty Disclosure

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Greetings from the Canadian Prairies and the University of Alberta
Background

• Cognitive changes in the context of fatigue experienced by individuals with cancer

• Patients described fatigue as having several components:
  – Difficulty thinking clearly
  – Emotional lability
  – Social withdrawal
  – Decreased functional ability
  – Decreased sleep quality
Fa\'gue  
Tiredness  
Exhaus\'on  

"ForgeLul,  
not sharp"  
Can\’t concentrate"  
“Confused”  

Tiredness  
Fatigue  
Exhaustion
Starting points

• Cognition is defined as a process comprised of eight domains: attention, concentration, information processing speed, memory, language, executive function, visuo-spatial ability and psychomotor ability.

• Cognitive function (sometimes called intellectual function) is the ability of the brain to acquire, process, store, and retrieve information.
The Problems

• Despite perceived changes in cognition, testing for cognitive changes using standardized assessment tools typically returned negative results.
• Many kinds of tests (screens, subjective, objective, imaging)
  – Wide variation in cognitive domains assessed
  – Questions about whether tools were sufficiently sensitive to detect changes, and about testing effects with repeated use, etc.
  – Use of some tests (standardized neuropsych tests, imaging) often require highly trained professional staff, and were too long for inclusion in busy clinical settings.
Scoping review

  - Funded by Canadian Institute of Health Research
• Inclusion criteria: Included at least 7 of the 8 domains of cognition, adults at least 18 years old, currently receiving chemo or received chemo in the past, written in any language

• Exclusion: non-cancer populations, samples that included patients with brain metastases or other injuries, dementia
• **Methods**
  – 5 step Arksey and O’Malley approach
  – Searched Medline, Psych INFO, Scopus, Web of Science, Social Science Citation Index from inception to Feb 2013, with keysections updated to May 2018
  – After removal of duplicates and articles that did not meet inclusion criteria, the full text of 279 articles was reviewed independently by 2 reviewers and 268 articles were removed, scoping review included 11 articles
Results:

- Primary reasons for exclusion: Did not include at least 7 of 8 dimensions of cognition
- Difficult to compare because of differences in type of cancer, age, gender, design (mostly cross sectional), and types of tools
• Types of assessment tools/approaches
  – Screening
  – Subjective
  – Objective
  – Imaging
Had hoped that by including only studies with measurement of at least 7 dimensions of cognition, congruence between objective and subjective measures would be higher but this was not the case.
Methodological issues

• Lack of self assessment
• Lack of baseline data
• Protocols too long for inclusion in clinical setting
• No distinction between attention and concentration
Support International Cognition and Cancer Task Force (ICCTF) recommendations:

- Focus on **four key dimensions of cognition** that are most vulnerable to adverse effects of chemotherapy

  - **Learning and Memory**: Hopkins Verbal Learning Test-Revised
  - **Executive Function** and **Processing Speed**: Trail Making
  - **Executive function**: Controlled Oral Word Association
Screening tools

• Cog Screening tools (positive results indicate that further follow up is needed, not diagnostic)
  – Mini-Mental State Exam (MMSE) (Folstein, 1975)
    • 10 minutes,
    • Sensitivity 18%, Specificity 100% compared to clinical judgement
    • Limited use for detecting mild cognitive impairment
    • Copyright now held by PAR, available for purchase at https://www.parinc.com/products/pkey/237
- **Mini Cog for dementia** (Borson, 2000)
  - 3 minutes
  - Sensitivity 94.3%, Specificity 87.4% compared to MMSE (Lycke, 2014)
  - Assesses memory, executive function, visuospatial, abstract thinking
  - [http://geriatrics.uthscsa.edu/tools/MINICog.pdf](http://geriatrics.uthscsa.edu/tools/MINICog.pdf)
  - Problem: validated using a tool with low validity (MMSE)
Montreal Cognitive Assessment (MOCA) (Nasreddine, 2005)

- 10 minutes,
- Sensitivity 90%, Specificity 87% compared to clinical judgement but also validated using neuropsych tests
- Assesses all cognitive domains except processing speed
- Used in individuals with cancer and correlates well with patient reported outcomes. (Isenberg-Grzeda, Huband, & Lam, 2017)
- Available free at https://www.mocatest.org/about/
Subjective Tests (not screens)

- FACT-Cog
  - Available in many languages
  - Measures attention, concentration, memory, language, executive function
    - Only 2 of the ICCTF recommendations
  - Validation issues:
    - Chinese version correlated well (r=0.7) with EORTC-QLQ cognitive function scale (Cheung et al, 2013)
    - French version not correlation with MMSE (Joly et al, 2012)
    - Not significantly correlated with neuropsych tests (Jacobs, 2004)
Neuropsych Tests

- Specific to cognitive domains (see scoping review)
- Require highly trained staff
- Too long to fit in a busy clinical setting
• Imaging studies (Sherling and Smith, 2013, Hu et al., 2016)
  – MRI: To investigate structural and anatomical changes
  – PET, fMRI, and EEG: To investigate functional changes
Forget-me-nots:

• Screen using ICCTF recommendations to identify those who need follow up:
  – Develop screening questions and validate by comparing results to pt. perception of cognitive changes
  – Suggested screening question with comparison to before diagnosis:
    • Learning: Do you have more trouble learning new things?
    • Memory: Do you have more trouble remembering things?
    • Executive function: Do you have more trouble making decisions? Do you have trouble finding the words you want to use?
    • Processing Speed: Does it take you longer to solve problems?

• Neuropsych follow up with valid tools:
  – Learning and Memory: Hopkins Verbal Learning Test-Revised
  – Executive Function and Processing Speed: Trail Making
  – Executive function: Controlled Oral Word Association
• Include baseline measurement, with follow up
• Stratify for age and gender
• Control possible confounders such as dementia, fatigue, depression, anxiety etc.
Questions?