NEW ZEALAND DEMENTIA FOUNDATION

CIAR

Cognitive Impairment Assessment Review

Prepared by the Cognitive Impairment Assessment Review (CIAR) Working Group

Report prepared for

Ministry of Health

DHB Health of Older People Steering Group

3 April 2020

This review was conducted by a working group of experts, convened and supported by the New Zealand Dementia Foundation. A list of the professionals involved in the review and report development is provided on page 40.

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Executive summary

Issue

This report outlines the recommendations of the Cognitive Impairment Assessment Review Working Group on a national response to changes in the availability of the Montreal Cognitive Assessment™ (MoCA) test.

The Montreal Cognitive Assessment™ (MoCA) is the predominant and most recommended cognitive screening tool for General Practice in New Zealand.

The use of the MoCA will soon involve significant costs as all users of the MoCA will be required to complete a training and certification program every two years at a cost of US$125. A national response is needed.

A CIAR Working Group of assessment experts convened to identify and recommend a cognitive impairment assessment tool for general practice that could be implemented by 1 September 2020.

If action is not taken swiftly there is a risk that the HeathPathways for cognitive assessment will become unworkable, with confusion and potential delays.

Considerations

The Working group identified the M-ACE (Mini-Addenbrooke's Cognitive Examination)) as the preferred candidate for a recommended screening tool.

The group rapidly determined that the availability of a number of adequate brief free-to-use screening tools meant that there was no need to pursue costly nationwide licensing options for the MoCA.

A short list of five free-to-use well-accepted alternate tools was identified and scored by the CIAR Working Group. The MoCA was included in the critique.

Through a process of considering the insights from a rating process, prioritising key desirable characteristics, and gaining feedback from the key informants, the Working group reached consensus that the M-ACE was the best fit for purpose.

Feedback

Once the review group selected the M-ACE as the preferred tool - before making a final recommendation, feedback on the introduction of the M-ACE was gained from a national purposive sample, which confirmed the perceived ease of adoption of the M-ACE.

100% of the 49 experienced professionals agreed or strongly agreed that it would be easy for them to transfer to using the M-ACE. The respondents described the M-ACE as easy to use, brief, familiar, and simple for the administrator and less stressful for the patient. All 49 participants commented on one or more of these aspects.

Recommendations

- **Endorse the M-ACE as the preferred tool for dementia screening.**

  The M-ACE stood out as the best fit for purpose. Informants in general practice stressed brevity as a priority criterion. The M-ACE is seen as fast, simple, familiar, and easy to use. The experienced survey respondents universally agreed that it would be easy for them to transition to the M-ACE.

- **Endorse the integration of the M-ACE with a guidance booklet during the initial stages of the transition.**

  A guidance booklet was refined to remind users of the factors that may impact on performance and to clarify scoring, followed by the M-ACE forms. 98% of the survey respondents agreed that the guidance booklet was useful.

- **Endorse the development of a brief online training package for the M-ACE cognitive screening tool.**

  The Working group strongly recommends that appropriate training support is provided on a national basis to back best practice use of the M-ACE. The core of this should be a national online training resource.

- **Endorse further work to inform best process for the use of interpreters and assessments with culturally and linguistically diverse (CALD) individuals.**

  It is recommended that training includes guidance on the potential impact of CALD factors, and the use of interpreters.

- **Endorse the dissemination and integration of the alternate kaupapa Māori screening tool when available.**

  It is recommended that, when available, there is planned integration of the kaupapa Māori Assessment of Neuropsychological Abilities (MANA) that is being developed by Dr Makarena Dudley (University of Auckland, LiLACS NZ study).

- **Endorse the update of NZ's Community HealthPathways.**

  Endorse that New Zealand's Community Health Pathways are updated as soon as possible to recommend the M-ACE for cognitive screening in primary and community care, and the Hospital Pathways to recommend the use of M-ACE in non-dementia specific secondary care.

- **Endorse the development of a communications plan.**

  Endorse that the CIAR working group develop a communication plan to advise all relevant health professionals to cease using the MoCA and commence using the M-ACE from 1 September 2020

- **Endorse an update available online education.**

  Endorse that a comprehensive refresh of the dementia online education suitable for primary care and other health professionals is undertaken within 12 months of the launch of M-ACE as the recommend tool. This will support NZ going forward to transition to the M-ACE.

1. Rationale

This report outlines the findings of the Cognitive Impairment Assessment Review Working Group to achieve a national response to changes in the availability of the Montreal Cognitive Assessment™ (MoCA) test.

1.1 The MoCA is the predominant recommended cognitive screening tool for General Practice in New Zealand

The Montreal Cognitive Assessment™ (MoCA) is listed as a preferred assessment tool for the cognitive impairment (dementia) pathway in Community and Hospital HealthPathways across the country. As such, the MoCA is widely used throughout New Zealand in the assessment of cognitive impairment by general practice, as well as by many secondary care services that do not offer dementia-specific services.

1.2 The use of the MoCA will soon involve significant costs

In June 2019, the MoCA Clinic and Institute announced that, from 1 September 2020, all users of the MoCA will be required to complete a training and certification program every two years at a cost of US$125. Access to the test resources will be restricted to people who have completed the training. The potential cost of this announcement to the New Zealand health sector, in both time and money, is significant. There was widespread concern about this change among clinicians throughout New Zealand. (The MoCA Institute is currently reviewing this deadline given the Covid-19 situation, with a new deadline to be announced, potentially giving New Zealand more time to embed a change before it comes into effect.)

1.3 A national response is needed

The current status is that the use of the MoCA will not be viable after September 2020. In late 2019 the Ministry of Health and the DHB Health of Older People Steering Group sponsored a Cognitive Impairment Assessment Review to inform a national response, to be conducted by a working group of experts convened by the New Zealand Dementia Cooperative. The review was supported by the New Zealand Dementia Framework Collaborative. The purpose of the review was to identify and recommend a solution to the situation that could be implemented by 1 September 2020. If action is not taken now there is a risk that the HeathPathways for cognitive assessment will become unworkable, with confusion and delayed diagnosis and management of cognitive impairment for New Zealand citizens.

1.4 The priority is to identify and recommend a cognitive impairment assessment tool for general practice

The Working group determined that the priority for the review is to identify a screening tool that is appropriate for primary care settings, reflecting the predominance of this setting for screening for dementia and use of the MoCA. It was also considered desirable that the recommended tool had the potential to allow seamless intersections, in particular that it was also appropriate for use in hospital-based services that are not dementia specific. The CIAR Working Group acknowledges its treaty responsibilities to tangata whenua, but defers to a separate project led by Dr Makarena Dudley for a kaupapa Māori cognitive screening tool which is in development (see 5.5).

Further detail

Appendix H: Cognitive Impairment Assessment Review Group (CIAR) members

Appendix I: CIAR terms of reference

2. Identification of preferred cognitive screening tool

The CIAR Working Group identified the M-ACE (mini Addenbrooke's Cognitive Examination) as the preferred candidate for a recommended screening tool.

2.1 A short list of potential cognitive screening tools was identified

It has been estimated that over 130 cognitive screening tools are available, many of which have adequate psychometric properties. Pragmatically only a small number of tests could be considered in depth, so a short list of five free-to-use well-accepted alternate tools was identified and considered by the CIAR Working Group. Basic evidence of adequate validity and psychometric properties was taken as a prerequisite to inclusion in the list, with the process of identifying a preferred option centering on the best fit for purpose in the New Zealand context. The group rapidly determined that the availability of a number of adequate brief free-to-use screening tools meant that there was no need to pursue costly nationwide licensing options for the MoCA.

Members of the group with relevant expertise systematically rated the short-listed tools on a number of relevant dimensions. Through a process of considering the insights from the rating process, prioritising the key desirable characteristics, and gaining feedback from the CIAR Working Group key informants, there was a consensus that the M-ACE was the preferred option for recommendation.

2.2 Table: Short-listed screening tools eliminated

Tool	Strengths	Deciding feature
MoCA Nasrreddine et al (2005)	Familiar	Cost / restricted access
RUDAS	Less influenced by culture	Length: 20 minutes makes it unsuitable for primary care
ACE-III	Comprehensive, familiar in some settings	Length: 20 minutes makes it unsuitable for primary care
SMMSE	Used in Australia under a national licensing agreement	Relationship with MMSE: NZ has moved away from the MMSE
GPCOG Bodaty et al (2002)	Developed for primary care	Requires informant

Further detail

Appendix A: Summary of short-listed tools
Appendix B: Average ratings for short-listed tools

3. M-ACE

The M-ACE was identified as the preferred potential tool for recommendation.

3.1 The M-ACE is a short test derived from the ACE

The Addenbrooke's Cognitive Examination (ACE) and its later revised version (ACE-R) were developed to provide a more comprehensive cognitive assessment that was sensitive to mild dementia than the dominant MMSE with increased sensitivity for mild dementia. A number of studies have concluded that the ACE-R has good validity as a screening tool for dementia (e.g., Mioshi et al., 2006; Larner, 2007; Terpening et al, 2011). A new version, the ACE-III was released to remove copyright issues with the MMSE, with a New Zealand edition published in 2014 (the ACE-III (NZ).

The M-ACE (Mini-Addenbrooke's Cognitive Examination) is an abbreviated version of the ACE-III that was derived by statistical data reduction methods. The M-ACE consists of 5 items with a maximum score of 30: attention / orientation, memory (7-item name and address), letter fluency, clock drawing, and memory recall. While acknowledging that there is less research on the newer ACE-III and M-ACE particularly in primary care settings (Beishon et al, 2019), the available research suggests that the sensitivity of the M-ACE for dementia is good, comparable to the MMSE and MOCA (Hobson 2016; Hodges & Larner, 2017; Hseih et al; Larner, 2015a; Larner, 2015b; Larner, 2016; Larner 2019; Luzka et al., 2018; Matias-Guiu et al., 2017; Miranda et al., 2018; Peixoto et al., 2019; Senda et al., 2019; Williamson & Larner, 2018).

3.2 The M-ACE is brief, easy to use, and easy to transition to

The M-ACE stands out as the best fit for its intended purpose in NZ for three primary reasons:

1. Time: A busy general practice is a time limited setting, and informants in general practice stressed brevity as a priority criterion. The M-ACE typically takes less than five minutes to complete.

2. Ease of use: Initial informant responses to the M-ACE are that it is simple, feels familiar, and is easy to use. Despite not being a tool in current use by any of the CIAR Working Group or informants, there was a willingness to adopt it that spoke strongly of its usability.

3. Ease of transition: The time frame for transition to a new recommended screening tool is tight. The M-ACE is seen as having the potential to minimise disruption by not requiring General Practices to adapt to longer testing times or markedly novel testing techniques, and to reduce the potential stress of adopting a new tool by its 'user-friendly' nature.

3.3 Any screening tool is only part of the process of diagnosis

As with any brief cognitive screening tool, the M-ACE is only part of the process of diagnosing dementia. Recent guidance from BPAC (Best Practice Advisory Council) (2020) reinforces that establishing a dementia diagnosis and management plan in general practice will typically take multiple consultations. The initial steps of the diagnostic process focus not only on conducting a brief diagnostic test, but also on taking a clinical history of functioning and ruling out alternate causes of impaired cognitive performance. BPAC recommends a brief test first, followed by a comprehensive cognitive assessment if indicated. Referral to specialist services may be useful when there is diagnostic or management uncertainty. BPAC also emphasises that clinicians in general practice should be aware of the limitations of cognitive testing, in particular the factors that may influence observed performance. While these are basic principles, it is important that they are acknowledged as the validity of the cognitive assessment afforded by the M-ACE will only be as good as the context of its use.

Further detail

Appendix C: Evidence base for M-ACE

4. Sector feedback on the M-ACE

Before making a final recommendation, feedback on the introduction of the M-ACE was gained from a national purposive sample, which confirmed the perceived ease of adoption of the M-ACE.

4.1 A regional survey of key informants was conducted

A formal regional survey was conducted to check for 'red flags', that is, perceived issues that could cause pushback against the M-ACE. A list of key informants was drawn up, with care taken that the participant pool included rural and urban health professionals, doctors and nurses in general practice and secondary care as well as other relevant disciplines, such as occupational therapy and clinical psychology, and each of the four regions. An organiser for each region sent out an email 'pack' to key informants including a cover letter, a copy of the proposed M-ACE guidance booklet, and a link to a brief survey monkey questionnaire. The survey gathered feedback from 49 key informants.

4.2 The survey confirmed the perceived usability of the M-ACE

100% of the survey respondents agreed or strongly agreed that it would be easy for them to transfer to using the M-ACE. The predominant qualitative overarching theme reinforced the perceived usability of the M-ACE. The respondents described the M-ACE as easy to use, brief, familiar, and simple for the administrator and less stressful for the patient. All 49 participants commented on one or more of these aspects.

Some participants noted issues, including questions highlighting cultural sensitivity and suggestions for the test layout. There were also some comments, including about omitted domains that are covered in longer tests, clarity around the choice of threshold score, and other queries, that will guide the development of training to support the change over to the M-ACE.

Further detail

Appendix D: M-ACE survey results

5. Recommendations

The CIAR Working Group believe the following recommendations support consistent best practice of the use of cognitive screening tools as part of the assessment of dementia in New Zealand.

5.1 Integrate the M-ACE with a guidance booklet from the initial stages of the transition

The validity of a screening assessment depends not only on the tool itself but also on the context of its use. The CIAR Working Group emphasised that all test users should be aware of the potential impact of a range of factors on performance such as delirium status, sensory and motor impairments, language difficulties, and testing environment factors, and the role of cognitive screening tests as only a part of a comprehensive cognitive assessment.

A guidance booklet was refined to remind users of the factors that may impact on performance and to clarify scoring, followed by the M-ACE test forms. The booklet was adapted from a version that was developed at the Southern DHB for use in secondary care.

The guidance booklet was included for comment in the sector feedback survey. 98% of the key informants agreed or strongly agreed that the guidance booklet was useful. **The CIAR Working Group therefore recommends that M-ACE is initially disseminated as a booklet integrated with guidance as the sector transitions to the new recommended screening tool.**

5.2 Ensure a robust training plan is in place

The CIAR Working Group strongly recommends that appropriate training support is provided on a national basis to back best practice use of the M-ACE. The core of this should be a national online training resource. The reliability of a screening assessment depends not only on the tool itself but also on the expertise of its users. A majority of respondents to the survey (72%) indicated that online training would be useful for them. Online 'M-ACE Essentials' training was envisioned by the CIAR Working Group as focusing on the context of the assessment as well as best practice administration. This needs to be available to current users of the Cognitive Impairment Pathways who will be affected by the loss of the MoCA prior to the transition to the M-ACE. The CIAR Working Group also recommends that a broader resource on cognitive screening is subsequently developed to promote the best-practice use of the M-ACE as part of cognitive assessment for the wider health sector: (See 5.3: 'Understanding Cognitive Testing')

Face-to-face training was desired by some survey respondents. The CIAR Working Group highlighted the potential for M-ACE training to be incorporated into calendars of education in regions, DHBs, PHOs and other organisations. Depending on the budget available this might be supported by training resources, train the trainer opportunities, or dedicated trainers.

Development of the training plan should precede and inform a communications plan.

5.3 Table: Summary of recommended training

Tool	M-ACE Essentials	Understanding cognitive testing
Aim	Address the immediate urgent need of supporting health care professionals to move from the MoCA to the M-ACE	Provide specific training on cognitive testing for the general health workforce to help ensure consistency rather than relying on haphazard on-the-job learning.
Content	Basic training for anyone using the M-ACE covering how to administer the tool and core messages about valid use. The training would include a video guide of administration and would be based on the guidance booklet.	Broader and in more detail. Recommended pre-training before doing M-ACE specific training for staff new to cognitive assessment.
Length	1 hour	Potentially longer than 1 hour
Target users	All users of cognitive screening tools. Quick for mass audience. Includes experienced and newer users.	Health professionals not receiving specific training elsewhere, and people who are new to a cognitive assessment role.
Timeframe	Online by 1 September 2020	To be confirmed
Platform	Developed on HealthLearn, shared across all five NZ health professional training platforms	To be confirmed: potentially Goodfellow Unit and other platforms as part of dementia resources

5.4. Develop a communications plan

While respondents to the survey indicated that transition to the M-ACE would be easy, it still represents a significant change for many health care providers. **The Working Group therefore recommends that a comprehensive communications plan be developed to ensure everyone who needs to know is made aware of the new recommendation and the implications.**

The plan should identify the audiences, key messages and appropriate communication channels to reach them. It should also outline any risks and mitigation strategies associated with changing tests and lack of awareness of the change. The Working Group has identified the following communication themes: information about the m-ACE and the rationale for change; training and support available; other associated issues such as cultural considerations, and compatibility between the MoCA and mini-ACE for people being re-tested.

5.5 Provide guidance about the use of interpreters and use with culturally and linguistically diverse (CALD) individuals

The CIAR Working Group acknowledges that the M-ACE is not immune to the effects of culture and language, but determined that all tests appropriate to the NZ setting share these issues to some degree**. It is recommended that training includes guidance on the potential impact of CALD factors, the importance of using interpreters to administer the test, and how to train them, the difference between using a validated translation of the test versus a contemporaneous individual translation, and how inappropriate interpretation can influence performance (for example interpreters assisting with answers).**

5.6 Support the dissemination and integration of the kaupapa Māori screening tool

The CIAR Working Group acknowledges the special bi-cultural / treaty responsibilities the health sector has to tangata whenua. The CIAR Working Group is aware that there is a project led by Dr Makarena Dudley from the University of Auckland on behalf of the LiLACS NZ study to develop a kaupapa Māori Assessment of Neuropsychological Abilities (MANA). Dr Dudley considers this will be an alternative screening tool.

At the time of writing (March 2020) the kaupapa Maori MANA instrument is still an estimated 2 – 18 months away from validation. It was therefore not able to be included in the present review and will not be available by September 2020 at the time of transition from the MoCA. **The CIAR Working Group therefore recommends consideration of ways to support the dissemination and integration of this tool when it becomes available.**

5.7 Update HealthPathways

The CIAR Working Group recommend that New Zealand's Community and Hospital HeathPathways are urgently upgraded to indicate that the recommended cognitive screening tool for New Zealand primary and community care is changing to the M-ACE.

There needs to be a national access point for downloading the M-ACE, and this should also provide access to translations and parallel forms. Ideally this would be through the updated HealthPathways.

5.8 Outside the scope of the initial project

The CIAR Working Group noted a number of work streams that were desirable, but outside the groups' time-frame

- Developing the required training and education programme for transition from the MoCA to the M-ACE
- New Zealand validation research / New Zealand norms for the M-ACE
- Development of a New Zealand generated cognitive screening tool
- Developing computerised testing including a digital repository for completed tests
- The Working Group also noted that the transition to the new screening tool should provide an impetus to update the Cognitive HealthPathways more broadly. The Canterbury DHB community pathway is the current model suggested for adoption

Further detail

Appendix E: M-ACE integrated guidance booklet and instrument
Appendix F: Selected evidence base for guidance
Appendix G: Selected evidence base for CALD factors

Appendix A

Summary of short-listed screening tools

C.1 Montreal Cognitive Assessment™ (MoCA)

"The MoCA was developed as a cognitive screening tool that could be sensitive for detecting mild cognitive impairment as well as dementia (Nasreddine et al., 2005). It is well validated in a range of dementing illnesses and has high sensitivity and specificity for detecting mild cognitive impairment (Nasredinne et al., 2005; Smith et al, 2007; Dalrymple-Alford et al., 2010). The MoCA is a one page, 10-minute cognitive screening tool. It covers multiple cognitive domains to provide a single score with a maximum of 30. The validation study compared healthy volunteers recruited from the community (n = 90, mean age = 72.8) with groups with mild cognitive impairment (n = 94, mean age = 75.2), and Alzheimer's disease (n = 93, mean age = 76.7) recruited from memory clinics. The developers add 1 point to the score of individuals with 12 or less years of education to correct for education effects. The MoCA differentiated well between the control group and both the MCI and Alzheimer's groups. The recommended cut-point is 25 / 26 (sensitivity for dementia = 100%; sensitivity for MCI = 90%; specificity = 87%)."

The MoCA has been freely available from http://www.mocatest.org, but new charged training requirements are to be introduced. Multiple translation into various languages and other alternate versions are available.

Extract from: Cheung, G., Clugston, A., Croucher, M., Malone, D., Mau, E., Sims, A., & Gee, S. (2015). Performance of three cognitive screening tools in a sample of older New Zealanders. *International Psychogeriatrics, 27*(6), 981-989.

Original test: Nasreddine, Z. et al. (2005). The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. Journal of the American Geriatric Society, 53, 695-699, 2005

C.2 Addenbrooke's Cognitive Examination III (ACE-III)

"The Addenbrooke's Cognitive Examination (ACE) and its later version the Addenbrooke's Cognitive Examination-revised (ACE-R), were developed to provide a more comprehensive bedside cognitive assessment than the MMSE that was sensitive to mild dementia and could differentiate frontal temporal dementia (FTD) from Alzheimer's disease (Pagliautile et al., 2011). A number of studies have concluded that the ACE-R has good validity and reliability as a screening tool for dementia (Mioshi et al., 2006; Larner, 2007; Terpening et al, 2011). Like its predecessor, the well-validated ACE-R, the ACE-III covers five cognitive domains for which individual subscale scores can be derived. The memory and fluency domains are unchanged. The attention, language, and visuospatial sections have been modified and no longer contain items from the Mini Mental Status Examination. The original Australian validation study based on a total of 81 participants (12 with behavioural variant frontal temporal dementia, mean age 64.7; 21 with primary progressive aphasia, mean age 64.7; 28 with Alzheimer's disease, mean age 69.9; and 25 control, mean age 66.1) provided evidence of concurrent validity between the revised subscales and relevant neuropsychological tests and a very strong association with the ACE-R (Hseih et al., 2013). The ACE-III takes approximately 20 minutes to complete. It is scored out of a maximum of 100 and retains the recommended cut-points of 88 / 89 (sensitivity = 100%; specificity = 96%) and 82 / 83 (sensitivity = 93%; specificity = 100%)."

The ACE-III is freely available from https://www.sydney.edu.au/brain-mind/resources-for-clinicians/dementia-test.html . A New Zealand version is available, and the test is available in English and 25 other languages on the website.

Extract from: Cheung, G., Clugston, A., Croucher, M., Malone, D., Mau, E., Sims, A., & Gee, S. (2015). Performance of three cognitive screening tools in a sample of older New Zealanders. *International Psychogeriatrics, 27*(6), 981-989.

Original test: Hsieh, S., Schubert, S., Hoon, C., Mioshi, E., & Hodges, J. R. (2013). Validation of the Addenbrooke's Cognitive Examination III in frontotemporal dementia and Alzheimer's disease. *Dementia and Geriatric Cognitive Disorders, 3*6(3-4), 242-250.

C.3 The Rowland Universal Dementia Assessment Scale (RUDAS)

"The RUDAS developers aimed to provide a brief cognitive screening tool that could be easily be interpreted into other languages and be fair across diverse cultural backgrounds (Storey et al, 2004). The RUDAS correlates well with the MMSE and is as accurate in predicting cognitive impairment while being less influenced by language and education (Pang et al., 2006). The RUDAS is a 6-item cognitive screening assessment encompassing multiple cognitive domains, taking around 20 minutes to complete, and gives a single score with a maximum of 30. The validation study (Storey et al., 2004) involved 90 community dwelling older people referred to an age-care service stratified by age and cognitive status (45 participants with dementia, mean age = 81.4; 45 control participants, mean age 78.1). It reported high inter-rater and test-retest reliability, and excellent diagnostic accuracy (AUC = .95). The RUDAS has a recommended cut-point of 22 / 23 (sensitivity = 89%; specificity = 98%)."

The test is freely available from http://www.multiculturalmentalhealth.ca/wp-content/uploads/2014/04/20110311_2011NSWRUDASscoring_sheet.pdf

Extract from: Cheung, G., Clugston, A., Croucher, M., Malone, D., Mau, E., Sims, A., & Gee, S. (2015). Performance of three cognitive screening tools in a sample of older New Zealanders. *International Psychogeriatrics, 27*(6), 981-989.

Original test: Storey J, Rowland J, Basic D, Conforti D, and Dickson H. (2004). The Rowland Universal Dementia Assessment Scale (RUDAS): A multicultural cognitive assessment scale. *International Psychogeriatrics*, 16(1), 13-31.

C.4 The Standardised Mini-Mental State Examination (SMMSE)

"The Standardised MMSE (SMMSE) (Molloy & Standish, 1997), although identical to the original MMSE with respect to test content, follows strict guidelines and instructions for standardised administration and scoring. Specifically, the SMMSE provides verbatim instructions to be read aloud to the examinee for each item, detailed rules for scoring, and time limits on all tasks (see Molloy and Standish for a review) (Molloy & Standish, 1997)."

"The Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) has been the most widely utilised screening tool for dementia for more than 25 years. Mitchell (2009) conducted a meta-analysis of 39 studies examining the utility of the MMSE for detecting cognitive impairment across a variety of clinical settings. In memory clinic settings, the MMSE was found to have a pooled sensitivity of 0.79, a positive predictive value of 0.86, and a negative predictive value of 0.73 for detection of dementia. Despite these relatively promising findings, the problem of high false-negative rates has surfaced repeatedly across 3 decades of literature on the MMSE (Benedict & Brandt, 1992; Faustman, Moses, & Csernansky, 1992; Friedman, Yelland, & Robinson 2012; Nadler, Richardson, & Malloy, 1994; Schwamm, Van Dyke, Kiernan, Merrin, & Mueller, 1987).The lack of sufficient memory assessment may be the most limiting characteristic of the test, as detection of memory impairment is fundamental to the diagnosis of amnestic mild cognitive impairment and dementia."

The SMMSE takes approximately 10.5 minutes to administer. It is covered by a separate copyright agreement with the author rather than via the owners of the MMSE copyright. The guide is online at https://www.swlstg.nhs.uk/images/Standardised_mini-mental_state_examination.pdf

Extracts from: Lacy, M., Kaemmerer, T., & Czipri, S. (2015). Standardized mini-mental state examination scores and verbal memory performance at a memory center: implications for cognitive screening. *American Journal of Alzheimer's Disease & Other Dementias®*, *30*(2), 145-152.

Original test: Molloy, D. W., & Standish, T. I. (1997). A guide to the standardized Mini-Mental State Examination. *International Psychogeriatrics, 9*(S1), 87-94.

C.5 General Practitioner assessment of Cognition (GPCOG)

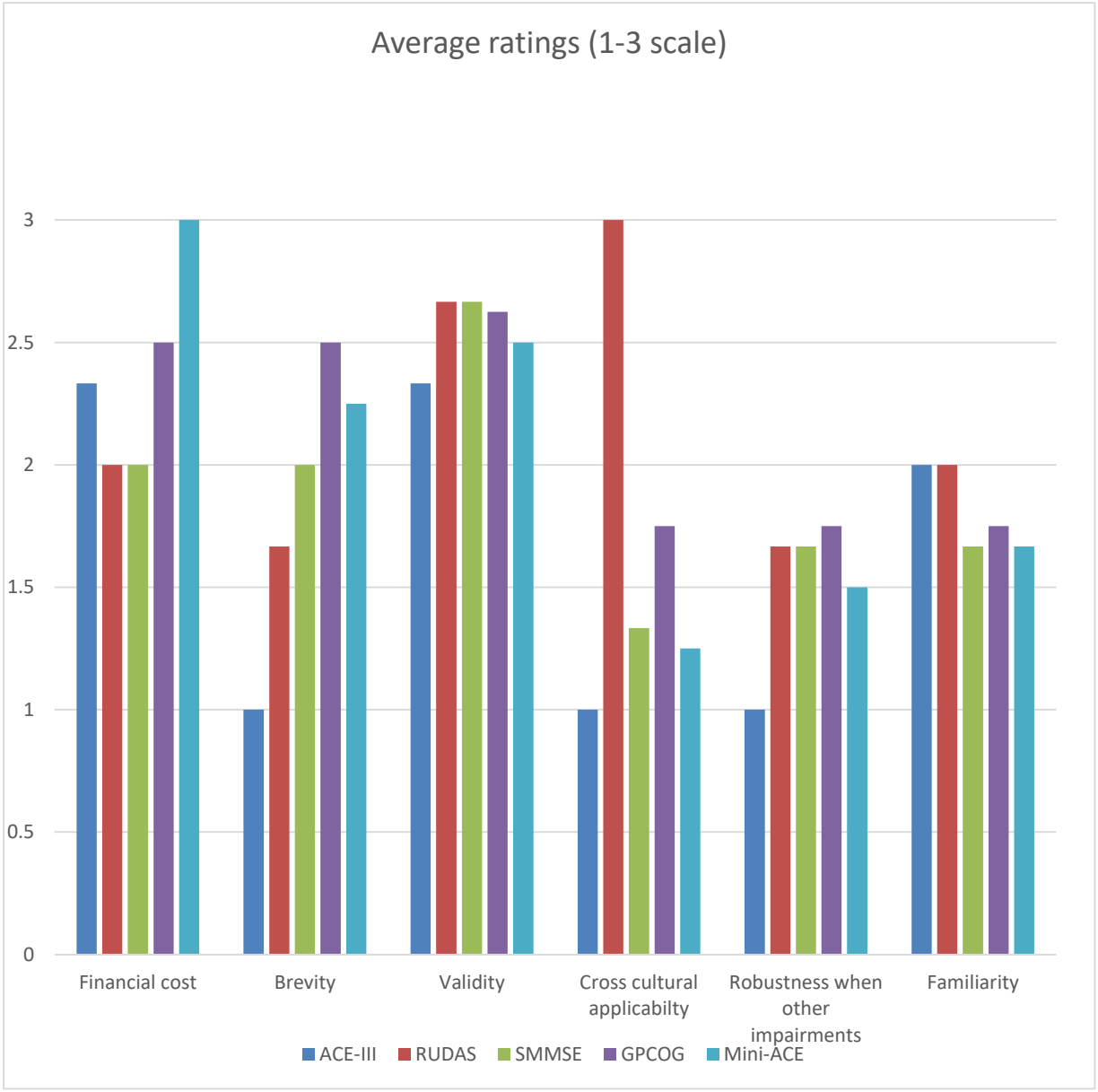
"The General Practitioner Assessment of Cognition (GPCOG) is a very brief cognitive test specifically designed for use in primary care. It is available free of charge as a paper-and-pencil test or web-based interactive instrument via the GPCOG website (http://gpcog.com.au/). Unlike other brief screening or case-finding instruments, the GPCOG consists of a four-component patient assessment and a brief informant interview (six questions). Total administration time is less than 5 min. The diagnostic performance of the GPCOG was validated against DSM-IV-defined dementia diagnosis. In comparison to other widely-used cognitive screens such as the Mini-Mental State Examination (MMSE) or the Abbreviated Mental Test (AMT) the GPCOG performed at least as well as, if not better, than the MMSE and the AMT. The sensitivity and specificity for the English GPCOG ranges from 0.81 to 0.98 and 0.72 to 0.95, respectively. Validated translations of the instrument are published and available online (www.gpcog.com.au). The informant interview, in particular has been found to be free of demographic biases. In conclusion, the GPCOG has been increasingly recommended by national and international guidelines as a first line cognitive assessment tool in primary care based on its sound psychometric properties and time efficiency."

Extract from: Seeher, K. M., & Brodaty, H. (2017). *The General Practitioner Assessment of Cognition (GPCOG)*. In Cognitive Screening Instruments (pp. 231-239). Springer, Cham.

Original test: Brodaty, H., Pond, D., Kemp, N. M., Luscombe, G., Harding, L., Berman, K., & Huppert, F. A. (2002). The GPCOG: a new screening test for dementia designed for general practice. *Journal of the American Geriatrics Society, 50*(3), 530-534.

Appendix B

Average ratings of features of short listed screening tools



Appendix C

Selected evidence base for M-ACE

Beishon, L. C., Batterham, A. P., Quinn, T. J., Nelson, C. P., Panerai, R. B., Robinson, T., & Haunton, V. J. (2019). Addenbrooke's Cognitive Examination III (ACE-III) and mini-ACE for the detection of dementia and mild cognitive impairment. *Cochrane Database of Systematic Reviews*, (12).

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Appendix D

Results of M-ACE regional survey of key informants

D.1 Region of respondents

Answer choices	Percentage	Number
Northern region	35%	17
Midlands region	12%	6
Central region	8%	4
South Island	45%	22
TOTAL		49

D.2 Health discipline of respondents

GP, urban centre	7
GP, rural centre	2
Practice nurse, urban centre	5
Practice nurse, rural centre	1
Nurse, public hospital service	1
Nurse, community setting, PHO	6
Clinical advisory pharmacist	2
Medical, public hospital service,	7
Allied health, public hospital	6
Allied health, primary/community /mixed	4
Nurse practitioner	7
Consultant (Psychiatrist of Old Age, Geriatrician)	2
Primary Care Practice Assistant	1

D.3 What respondents liked about the M-ACE

1 It is very simple, succinct and will be easy to administer and score. It is very similar to the MOCA so people who have been used to using that tool will easily transition to this one. The examination covers expected core elements that may be impacted by cognitive impairment and dementia. It is a validated tool.

2 very clear with good instructions for assessing and marking

3 Similar to other tools

4 Concise and easy to administer. Ned some clarity on what the 2 cut off scores are: 25 and 21. What are the implications of score of 21.

5 Easy to follow and easy to judge scoring with good examples.

6 I like that it is quite a quick assessment. I like that the clock can be drawn bigger that the space provided on the ACER & the MOCA.

7 validated, will take similar time to MoCA, several domains assessed,

8 Clear instructions and marking guidelines

9 Fact of naming animals not trying identify a drawn animal as that always lead to confusion. The maths/numbers removed as not everyone is strong in maths and that causes distress going further to other questions and hence the whole test than really is not accurate.

10 It is succinct, easy to use and scoring system is very detailed. 3/10/2020 11:18 PMe are less questions.

11 Great that there is no maths question as this can case anxiety.

12 Order of questions is more appropriate. Never found it in the right place when asking at the end of the MOCA, almost seemed patronising by that stage. I like that the clock has more points attached and therefore more variants in answers. I like that the address seems much more in context, and therefore achievable than the 5 random words in the MOCA. No patients liked the serial subtraction so nice that is gone!

13 A number of domains are covered and the tool is brief which is required for use in primary care.

14 it is not too long, makes sense and easy to follow the instructions.

15 User friendly, time friendly Fewer questions than MOCA Appears to be less dependent on education

16 The testing questions are on two pages only so easy to print off and store. The testing questions have face validity in screening for cognitive impairment. Most clinicians who have used the MoCA should be able to administer M-ACE without much training because the testing questions are similar.

17 Brief and easy to administer (which should make it reproducible). Is made up from items of the larger ACE-III (allowing for comparison between the 2). Reasonable Sensitivity and Specificity at proposed cut-off levels.

18 It looks straight forward to administer. Script is included on test form that will help to ensure standardisation and reduce potential variability due to operator

19 it is short

20 It does not take too long to administer. It gives patients an uncluttered feeling with plenty of room to draw a clock. The questions appear to be relatively simple to administer.

21 Its short and easy to follow as the administrator.

22 Very straightforward and easily understood

23 The small amount of screening questions which are short and concise compared to the MOCA.

24 Simple Brief Good support from instructions Covers a range of cognitive domains

25 Well laid with good space for writing answers

26 It looks quick to administer and easy to follow the instructions, especially if already familiar with the ACE-III - would be a seamless transition

27 The instructions and scoring are very specific. It is only 2 Contains similar elements to the MOCA.

28 It is relatively simple and the explanations around scoring is clear. It has some similarities to the GPCOG for driving which could be useful.

29 The simplicity. It covers all domains required to assess a person's memory. 3/5/2020 1:38 PM

30 Clear, concise and well set out. Easy to follow and contains good guidelines and clear instructions around scoring.

31 Succinct, non-threatening. Uncluttered layout, good space for clock-drawing.

32 Relatively Brief, tests are familiar to me. Includes some language and executive function tests planning clock, fluency) Memory test with cued recall is good

33 It is simple and well-constructed; ease of administration.

34 It is familiar and short

35 Excellently clear guidelines about how to administer, environment, scoring. Good amounts of space to write in information. Like the 'next steps' info. Seems to allow for illiteracy also

36 Easy to read and follow. Good spacing Clear NZ specific

37 It looks similar to tools we have been familiar with for years- MMSE then MoCA-re clock face drawing and repeating name/address in particular

38 Easy to use, covering a good range of cognitive domains

39 It is brief - so this is likely to be better for the patient as well as health professionals. The questions style is similar to other screening tools that are familiar to me.

40 short, concise

41 Short, clear The ACE appears to be perceived as easy to learn, and this will carry over those benefits and be even shorter

42 Brief, clear layout, easy to score

43 simple but clear, possibly won't seem as overwhelming to patients compared to the MOCA

44 Fairly quick to complete. Dovetails into the full ACE 111 which is completed in specialist services. Is not too anxiety provoking for the person (patient) to do as most of the questions the person will have an attempt at. This has been one of the concerns from patients about the MoCA that they didn't understand or follow what was required with some of the questions

45 It seems straightforward and similar enough to previously used dementia screening tools.

46 not too long or complicated order of questions seems reasonable

47 Short Clear layout. Plenty of space for the clock

48 Its straightforward and has reminders of how to score the answers on the page

49 simplicity

D.4 Dislikes, concerns

Note: collated across two questions could link comments from same person from individual response, response to red flag question are in italics

No dislikes

Reported by 12 respondents

Applicability / cut-offs

1. In the same way that MoCA has limitations for people of different cultures, M-ACE is likely to as well.
2. No reference to literature was given in the booklet for its psychometric properties eg sensitivity, specificity. Has this tool been validated in NZ? How did the cut point of 21 determined? The person s age and education will need to be considered when interpreting cut point. Is the cut point of 21 for dementia or MCI? The memory test questions cannot be easily used for people whose English is not their first language.
3. Is there an option for patient who are unable to draw?
4. ? [sic] the fluency section, to score highly I feel may be a challenge as it would depend on a person's knowledge of animals.
5. Score 25 and 21. What is the difference for management? Limitations for someone with sight difficulties, shaking due to Parkinsons.
6. Still quite language-dependent, but this is common to most options.
7. 2 cut-off scores make it difficult for interpretation and unclear. What would you use in a GP clinic or hospital setting? It was always helpful to have cut-off indicators that indicate "normal", "mild", "moderate", "severe" impairment as this is easier to discuss with other health professionals.
8. Unclear who the 2 cut-offs apply to [split comment]
9. *No red flags generally, but a possible red flag for use in our refugee and migrant population and people of different cultures. I'm not sure what work is being done in this space. Was there something being looked at for Maori with respect to the MoCA, or was this just being considered? So, in short, I think M-ACE would be an appropriate nationally endorsed dementia screening tool.*
10. *Clarity for scoring.*
11. *The tool being used with person with ESOL, is there a plan for translated versions or interpreter access? if an interpreter is used will this make the questions non valid as they will not be trained in taking the test. The setting the test is taken in, the clinical setting can be daunting?[sic] cause anxiety for the person. ? [sic] The possibility of completing the test in the clinical setting and in their own environment? [sic] a difference in results*
12. *Cultural sensitivity. This does come up in discussion frequently about the appropriateness of these types of 'assessment'.*

Layout

1. I needed to fold the memory recall part over otherwise someone could potentially read name and address that were repeated near to the beginning.
2. The space between the lines on the form to record Name, DOB, Occupation etc. as well at the boxes for scoring are too small for me. If this form is to be completed by hand I would like more space to write clearly
3. The layout is messy and busy.

4. It would be preferable to have the clock face drawn on a separate piece of paper that is then attached, e.g. page 3, rather than the assessment page as even if it is upside down the person can see it and could become anxious. In addition, it is cumbersome and somewhat demeaning to cover up the memory recall section while they are doing this I realise the clock drawing is validated but am not sure how long this will stay relevant in the increasing digital age
5. Make the note about covering up the "Memory Recall" in bold as I did not see it - I know that it should be routine but could be a risk if the cover moves or is forgotten. Maybe put a dotted line and ask that the page is folded under here. Please change to NHI and make address on a new line. Is there enough information about education - lifelong learning?
6. scanning a two-page doc without a double sided scanner is tedious
7. Could the first page of the tool maybe use the space under the administrator to make a note about things to take into account when interpreting (as well as in pt notes) so those points don't get separated from the form?
8. *MoCA was single sided and yet contained more detail.... ? [sic] condense to single page*
9. *I think that the instructions could be changed in a couple of ways. I think that the disclaimer that it is a screening test comment should have added that test like driving safety and capacity assessment etc. are based on clinical assessment and evaluation of task specific abilities. Also the comment about perseveration is from the full ACE. this is presumably much less likely to happen if you haven't done the letter fluency test first.*

Coverage

1. I don't consider orientation should come under the attention category, and so therefore I don't think there are any questions specifically in relation to attention, although the clock and animals do address this in some respect.
2. Language is not addressed
3. I think it is missing a pattern recognition section, e.g.; common animals or objects.
4. No direct assessments of 'working memory' (although overlap with encoding), which is a commonly encountered issue (for multiple underlying reasons). Overall though, for its proposed purpose, it seems well suited to the task.
5. I find the number letter switching in the MoCA useful, I would miss this using the Mini ACE, but as you note, this is a screening tool, and further assessment of executive function can be done with another test or a neuropsych battery if the fluency is low and there are behavioural indicators of executive problems.
6. There is a comment in the background section that it is not to be used to make a diagnosis, fitness to drive and competency. Yet on a lot of pathways we are expected to do all these things in primary care for uncomplicated dementia and in conjunction with a good hx, exam we used the MOCA for this. We aren't able to refer everyone to secondary services for more comprehensive tests. If we are not going to be able to make a diagnosis, decide on medication based on the M-ACE it seems quite limited, and will result in a lot more referrals to secondary services.
7. Utility in delineating various domains of cognitive function is necessarily sacrificed for brevity. This limits the usefulness of the tool in specialist old age psychiatry practice
8. Relatively weak on attention and abstraction (although these can be inferred qualitatively to some degree on observing the test.
9. Very memory heavy. Sounds silly, but seems too simple? Would be good to see the data around comparability of screening/cutoffs and applicability to driving
10. It does not cover abstraction or naming cognitive tasks
11. Not so much frontal/executive assessment

12. Possibly doesn't cover enough domains sequencing and other frontal lobe questions but some of these can be picked up with the GP using the IQ code for collateral history
13. No abstract reasoning No trail making - shows a lot of problem solving difficulties Don't think day/date/month/year are about attention - not enough for what we do [split comment]
14. *I find the attention/numbers part of the MoCA important, as I normally assess this further within function i.e. if someone finds it difficult to subtract 7 from 100 could they manage a shop task or their own finances. Furthermore, that abstract part of the MoCA enables me to assess their problem solving abilities more so*.
15. *Heavy focus on memory and word finding when it's easy to pick those up in conversation. It has less on the harder to screen areas as compared to MoCA*.
16. *Possibly the heading attention should be orientation. There are no specific attention questions.*

Clock

1. Interpreting the clock face completion
2. Complicated scoring of clock drawing.
3. Some subjectivity around interpretation of clock face completion
4. tests drawing on knowledge of analogue clocks may not be a valid test for future cohorts of people eg millennials as more used to digital tools
5. The clock drawing test - will get less possible for people brought up in a digital age! I appreciate our older generation are not of this era but analogue clocks are used less and less these days.

Other

1. Takes too long, doesn't have informant interview if needed

2. I am more familiar with other screening tools and so prefer to use them

3. Recognition cues for the name and address would be handy - even if they were just optional.

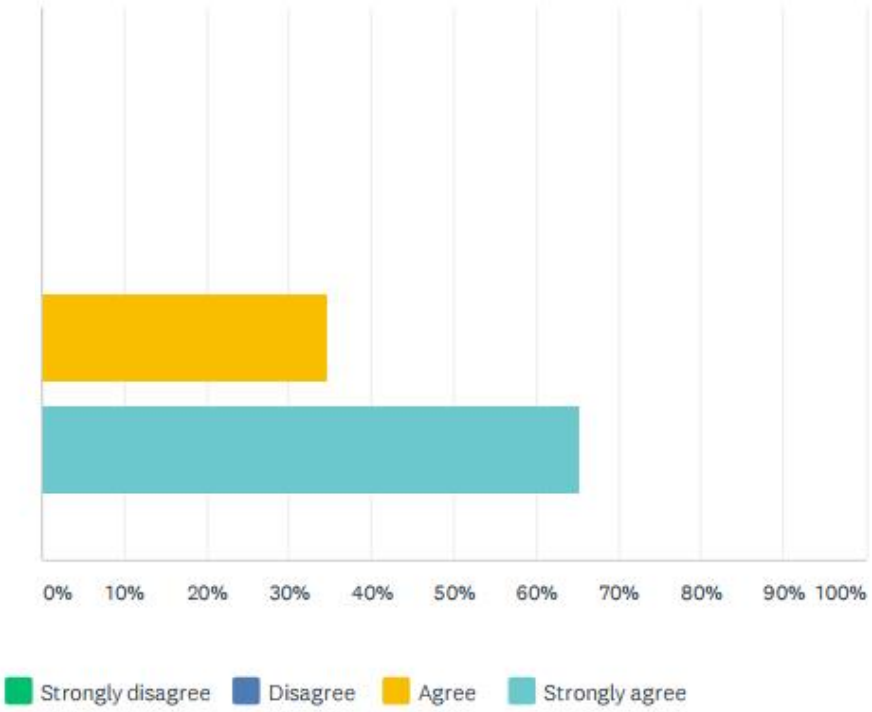
4. Is it able to be installed as a screening template in a Practice Management System? Is it able to be attached as a document to an e-referral to other clinicians? Having it as an electronic would be most acceptable in General Practice.
5. The tool should be validated in New Zealand. This can be easily done. I would be interested to do this.

6. Same concerns as with the MOCA, GPs are using as a diagnostic tool for cognitive impairment and I don't believe this should be correct for a stand-alone assessment without considering any functional difficulties.

7. the time it takes to complete. The great diagrams with regards to scoring. Makes it standardized and easy to calculate the score. [note appears to be a response about likes rather than dislikes]

8. Nothing I don't like?- but actually as a GP I don't use these tools personally, I get the practice nurse to use them, hope you have enough practice nurses in this very tiny list of people doing the survey.

D.5 It would be easy for you to transfer to using the M-ACE screening



STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
0.00% 0	0.00% 0	34.69% 17	65.31% 32	49	3.65

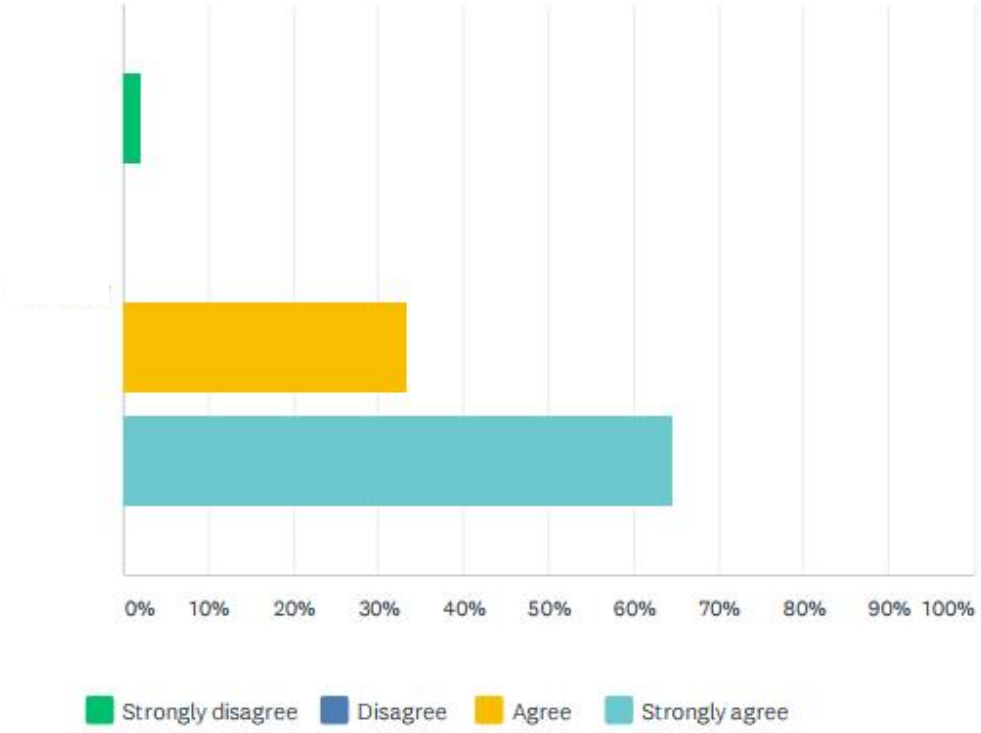
D.6 What sort of M-ACE training would be useful for you? (Select as many as apply)

Guide booklet	82% (40)
HealthPathway	33% (16)
Online training	73% (36)

Other (please specify)

1. in house teaching. All these methods would be useful
2. Face-to-face facilitated training
3. Face to face education
4. face to face training from specialist services
5. Support from DHB geriatricians and Gerontology Nurse Specialists to provide ongoing support after training
6. Integration into MCI/Dementia Case recognition training
7. HealthLearn
8. Mock-up videos of it being administered, especially for the conversations with the person and their whanau post or during the test when they know they are finding it difficult, and explaining the implications of the person's score. Suggestions for how this is handled could be in written form also. Most people currently using the MoCA will have experience in this, but for new users of the tool, this supporting information would be essential
9. Keep a flowchart and make it simple to flow
10. the instructions and scoring guide given with the test are enough for me

D.7 The guidance booklet is useful.



STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
2.08%	0.00%	33.33%	64.58%		
1	0	16	31	48	3.60

D.8 Do you have any suggestions to improve the guidance section of the booklet?

No suggestions / positive comments

1-11 No (11 respondents)

12 No pretty concise

13 It is very well written. No changes required.

14 The guidance section is very comprehensive and clear to understand. No improvements to add.

15 No. Happy with the information

16 e.g. are useful and welcomed e.g. clock face interpretation

17 No - it is helpful and reads well.

18 It looks really good!

19 No - it's clear and straightforward

20 Looks good - I like how you have specified limitations and recommend they are documented in the notes alongside the test results

21 It's fantastic as it is. Clear and concise. Pre-test guidelines a good reminder for assessor/client

participation.

22 No, it is perfect!

23 No - it is really clear. Our HCA read through it and fins the instructions much clearer and easier to follow than those for the MOcA

24 Please ask practice nurses this question- in my GP practice they are the ones who will use the tool, I just need to understand it. The guidance booklet makes good sense to me.

25 no- very easy to understand and use

26 A common cause of concern we hear in our secondary care setting is around allied health staff being directed to conduct a cognitive assessment when they feel it is inappropriate, especially because of suspected delirium. It is great to have the important messages about considerations in using and interpreting the tool emphasized.

27 No. I found it very clear and easy to understand

28 I like the detail provided about scoring e.g. the clock testing and address

Suggestions

1. It mentions 2 cut offs: 25 and 21 but I don't feel it quantifies what this mean
2. more detail on the 2 cut-offs, what is the "range of population groups" referred too.

3. Again clock face interpretation
4. I feel the address part could be scored better, in the UK the name and address is point for point out of 7. However, the NZ version "Hawkes Bay" is scored as 1 point. I feel this could be clearer in the guidance section. Thank you.

5. Orientation: can the year be "20" or must it be "2020"? 2. Fluency scoring instructions could be clearer - I am not sure why only 2 of the three 'fish' are correct. What if the person says dog and directly followed or later on says puppy? or a type of dog (e.g. Labrador)?

6. The guidance section is very good Some suggested alterations to the wording Page 2. Pre-test administration guidelines. -2nd bullet point, remove "as a rule" -7th bullet point, Make it explicit that training is expected e.g. " Should ideally have complete training & experience on a nonpatient prior to administering the M-ACE -8th bullet point , change to "NZ in line training is provided here" then provide link Page 3 -It is the maximum score that is 30 not the total score, suggest rewording for meaning -suggest change the wording re the explanation as to leaving the scoring to the end to..."so the participant cannot inadvertently see the tester ticking correct answers or crossing wrong answers; which could cause anxiety and disturb participant's performance" or similar Scoring : table Circle 1 point maximum if it (add) "is" a reasonable circle
7. Proof-reading/suggested changes Page2 Pre-test administration guidelines 2nd bullet point remove "(as a rule)" 6th bullet point change "in < 3 months" to "within 3 months" 7th bullet point change Qs to "Administrators should ideally complete training in administering and practice administering the M-ACE on a non-patient prior to using the M-ACE" (or similar) 8th bullet point: change "It is hoped that a..." to "NZ online training for M-ACE is available here: (link): or similar when available Page 2 Under post-test guidelines section: 2nd bullet point Change "mention" to "Document" p3 First paragraph Change "total M-ACE score is 30" to "maximum possible M-ACE score is 30" Last 2 sentences of first paragraph about 2 cut-off values need clarification Page 3 Re-word 2nd paragraph sentence about why to leave scoring until the end ..."so the participant cannot inadvertently see the tester ticking correct answers or crossing wrong answers; which could cause anxiety and disturb participant's performance" or similar Page 3 Under Attention section scoring instructions Last line of section: delete s after (patient) Page 4 Under Visuospatial Abilities scoring section Scoring : table Circle 1 point maximum if it (add) "is" a reasonable circle p5 , example clock score top LHS page "...numbers are unevenly spaced..." (not spaces)
8. Many, but all fairly small issues. Details forwarded to CIAR group.
9. All key messages should be on the first page The Pre-test administration guidelines should include all the aspects of the "Good practice checklist" Add in I have gained the patient's "Informed verbal assent" Post-test guidelines - add in about documentation of results, test limitations and recommendations into the patient's notes. The "Good practice guidelines" ideally are a recap of the previous information

10. These to be on hand /on line/file whenever possible
11. Easy to follow. Perhaps add a bit extra information about what to do if English is a second language for the person Add some pointers for discussion of results with the patient and family/whanau

Appendix E

M-ACE integrated guidance booklet and instrument

Mini- Addenbrooke's Cognitive Examination (M-ACE)

New Zealand Version 2020

Guideline Instructions and Screening Tool

The Mini-Addenbrooke's Cognitive Examination (M-ACE) is a very brief and sensitive cognitive screening tool for mild cognitive impairment and dementia.

This document contains:

1. An Administration Guide (pages 2 – 6). It is vital to comply with the Guide instructions for each M-ACE assessment.
2. The Screening Tool – termed Screen Tool page 1&2

   Note that Version B & Version C Screen Tools are available if re-testing is required – refer HealthPathways.
3. **For filing in patient's record, please scan and save the two Screen Tool pages only.**

Acknowledgement: We would like to acknowledge the Strategy, Primary and Community Directorate, Southern DHB for its work in developing this booklet.

M-ACE New Zealand Guide 2020

Using the Mini-Addenbrooke's Cognitive Examination (M-ACE)

The score is not diagnostic by itself. It should always be interpreted in light of other clinical information. If in doubt, seek specialist advice.

Background

The MoCA is no longer free to use. The M-ACE is now the endorsed alternative in New Zealand as it is well-validated and covers several cognitive domains. It is a screening tool and is not to be used solely to:

- make a diagnosis
- determine fitness to drive
- assess competency
- decide about safety to live independently
- qualify for therapeutic interventions (such as medication or Cognitive Stimulation Therapy (CST) where this service is available).

Pre-test administration guidelines

- Check there is a valid reason for testing. The M-ACE is not designed for assessment/diagnosis of acute confusion.
- Should not be used when someone has a delirium (as a rule).
- Make sure you are familiar with the guide before administering the test and follow it closely whilst administering the test.
- Ideally complete the test in a quiet environment with good lighting, when the person is most alert – preferably in the morning.
- Ensure the person has their glasses and/or hearing aids if required.
- If repeat tests are required to track progress in < 3 months, two alternative versions are available. The tests are available in different languages for use with an interpreter. These versions available on HealthPathways when updated.
- Have you completed any training in administering the M-ACE? Have you practised administering the M-ACE on a non-patient?
- It is hoped that a NZ online training for M-ACE will be developed and available soon. Comprehensive online training is available (only for the full ACE-III version) here: https://www.mvls.gla.ac.uk/ACEiiiTrainer/home.aspx

Person variables that might negatively affect performance:

- age – those in the oldest age groups have reduced performance on average
- sensory impairments and aphasia
- any disability affecting use of dominant hand
- depressed mood and/or anxiety
- lower education levels or intellectual or learning disability
- if English is not the person's first language

Post-test guidelines

- Carefully follow the guide while scoring the test (especially clock/ animal fluency).
- Mention any limitations affecting interpretation.
- Fill in date/time/administrator details.

New Zealand M-ACE Administration and Scoring Guide – 2020

The Mini-Addenbrooke's Cognitive Examination (M-ACE) is a very brief and sensitive cognitive screening tool for mild cognitive impairment and dementia. The total M-ACE score is 30, with higher scores indicating better cognitive functioning. Administration of the M-ACE takes, on average, 5 minutes. It was derived from the Addenbrooke's Cognitive Examination-III (ACE-III) using a data-driven scaling method. There are 2 cut-offs: 25 and 21. The latter is recommended when the test is given to a range of population groups.

These instructions have been designed in order to make the questions and their scoring clear for the tester. Please read them carefully before giving the test. If possible, leave the scoring until the end of the session, since the participant will not be able to check whether the tester is ticking for correct answers or crossing for wrong ones. This might avoid anxiety, which can disturb the participant's performance on the test.

To download the Mini-ACE or the ACE-III, as well as updates on publications and language translations, please go to the following website: https://sydney.edu.au/brain-mind/resources-for-clinicians/dementia-test.html

ATTENTION – Orientation – score 0 to 4

Administration: Ask the participant for the day, date, month, and year.

Scoring: Score 1 point for each correct answer. A mistake of ± 2 days is allowed for the date (e.g., 5th when the actual date is the 7th). If the participant says "23rd of the 3rd", then prompt for the name of the month.

For aphasic perso: Allow person to write down their answer, if unable to give verbal responses.

MEMORY – Anterograde Memory – Name and Address – score 0 to 7

Administration: Instruct the participant: *"I'm going to give you a name and address and I'd like you to repeat the name and address after me. So you have a chance to learn, we'll be doing that 3 times. I'll ask you the name and address later."* If the participant starts repeating along with you, ask them to wait until you give it in full.

Scoring: Record responses for each trial but only responses in the third trial contributes to the M-ACE-III score (0 - 7 points).

VERBAL FLUENCY – Animals – score 0 to 7

Administration: Tell the participant: "Now can you name as many animals as possible."

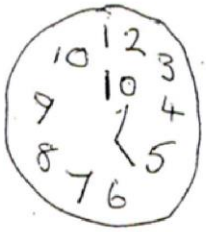
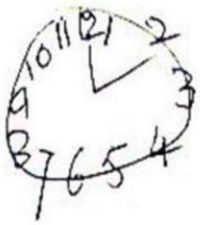
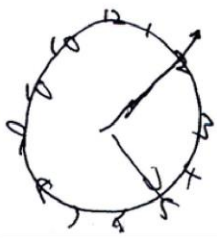
Scoring: Record the total number of animals that the participant generates. Then, count the total number of correct words, which do not include higher order categories when specific exemplars are given (e.g., "fish" followed by "salmon" and "trout" – total = 3; correct = 2). All types of animals are accepted, including insects, humans, prehistoric, extinct as well as mythical creatures (e.g., unicorn). If the participant misunderstands the instructions and perseverates by naming animals beginning with "p" (e.g., panda, possum, platypus etc.), then reiterate to the participant that they should name animals beginning with any letter.

VISUOSPATIAL ABILITIES – Clock – score 0 to 5

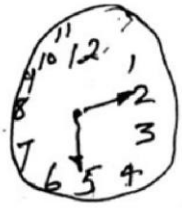
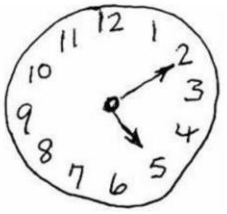
Administration: Ask the participant to draw a clock face with numbers on it. When he/she has finished, ask them to put the hands at "ten past five". If the participant does not like their first drawing and would like to do it again, you can allow for that and score the second clock. Participants may correct their mistakes by erasing it while drawing.

Scoring: The following scoring criteria are used below to give a total of 5 points.

Circle	1 point maximum if it a reasonable circle.
Numbers	2 points if all numbers are included within the circle and numbers are evenly distributed. A slight rotation to the overall clock face is acceptable. 1 point if all numbers are included but the numbers are either outside of the circle or the numbers are unevenly spaced. 0 points if not all numbers are included.
Hands	2 points if both hands are drawn, lengths are correct and placed on correct numbers (you might ask which one is the small and big one). 1 point if both hands are drawn and placed on the correct numbers but lengths are incorrect.
	1 points if both hands are drawn but only one hand is placed on the correct number and drawn with correct length. 0 points if two hands are drawn but both lengths incorrect and one number is correct. 0 points if two hands are drawn but both lengths and numbers are incorrect. 0 points is one hand is drawn

Score 1	**Score 2**	**Score 2**
Circle (1); not clear that all numbers are present (0); not clear where the hands are positioned 	Circle (1); one hand placed on the correct number and has the correct length (1) 	Circle (1); all the numbers but not placed inside the circle (1) 
Score 2	**Score 3**	**Score 3**
Circle (1); all the numbers but not placed inside the circle (1); two hands with one number correct but lengths are even (0) 	Circle (1); all the numbers present and proportionally distributed (a slight rotation of the whole clock face is OK) (2); one hand only (0) 	Circle (1); numbers are not inside the circle and there are 2 number 10s (0); hands placed correctly and correct lengths (2) 

M-ACE New Zealand Guide 2020

Score 3	Score 4	Score 4
Circle (1); numbers are unevenly spaces (1); one hand placed correctly and has the correct length (1) 	Circle (1); all the numbers but not proportionally distributed (1); both hands placed correctly and has the correct length (2) 	Circle (1); numbers are proportionally distributed (2); one hand placed correctly and has the correct length (1) 
Score 5		
Circle (1); numbers proportionally distributed on both halves of the clock face (2); hands placed correctly (2) 		

MEMORY – Recall of Name and Address – score 0 to 7

Administration: Say to the participant: *"Now tell me what you remember of that name and address we were repeating at the beginning"*.

Scoring: Score 1 point for each item recalled, using the score guide provided in the test.

Harry Barnes
73 Church Street
Woodville
Hawkes Bay

Example: 1a		
Harry Bond 78 Church Street Woodland ….	1 + 0 0 + 1 + 1 0 0	 **Score 3 / 7**
Example: 2a		
Harry Barnes 73 Woodville Street …. Hawkes Bay	1 + 1 1 + 0 + 1 0 1	 **Score 5 / 7**
Example: 3a		
Harry Bond 33 Woodland Road Woodville Bay Napier Hawkes Bay	1 + 0 0 + 0 + 0 0 + 0 0 1	 **Score 2 / 7**

GOOD PRACTICE CHECKLIST

- Testing environment (lighting, visual and auditory aides)and tools were optimised for testing
- The person gave informed verbal assent
- I have complied with the M-ACE administration and scoring guidelines
- I have documented results, test limitations, and recommendations in person's notes

Please do not sign and file the M-ACE (2 page) Screening tool until these points have been considered

NEXT STEPS

- Consult the Cognitive Impairment Pathway for management plan.
- Discuss results and plan with patient and family/whanau.
- Remember that the suggested cut-off score of ≤21/30 always needs to be interpreted in the context of a full assessment.

M-ACE Test

MINI - ADDENBROOKE'S COGNITIVE EXAMINATION
New Zealand Version A (2020)

Name:_____ Date of Birth:_____Gender _____ Address:_____ NHI _____ AFFIX PATIENT LABEL HERE ABOVE Age at leaving full-time education:_____ Occupation:_____ Handedness:_____	Date of Testing:___ / ___ /____ Time of testing:_____ Tester's name:_____ Designation:_____

ATTENTION

➢ Ask: What is the	Day _____	Date _____	Month _____	Year _____	**Attention** [Score 0 – 4] ☐

MEMORY

➢ Tell: "I'm going to give you a name and address and I'd like you to repeat the name and address after me. So you have a chance to learn, we'll be doing that 3 times. I'll ask you the name and address later."

Memory
[Score 0 – 7]
☐

Score only the third trial.

	1st Trial	2nd Trial	3rd Trial
Harry Barnes	_____ _____	_____ _____	_____ _____
73 Church Street	___ ____ ____	___ ____ ____	___ ____ ____
Woodville	_____	_____	_____
Hawkes Bay	_____	_____	_____

FLUENCY - ANIMALS

➢ **Animals**
Say: "Now can you name as many animals as possible. You have one minute. Go ahead."

Fluency
[Score 0 – 7]
☐

22	7
17-21	6
14-16	5
11-13	4
9-10	3
7-8	2
5-6	1
<5	0
total	correct

M-ACE Test

AFFIX PATIENT LABEL HERE

Name:

Date of birth: Date of Testing:___ / ____ /____

NHI:

CLOCK DRAWING

[For the clock drawing, present the form to the person as is (i.e. upside down).
Cover up the name/address in the Memory recall section so that it cannot be seen.

➢ Clock: Ask the subject to draw a clock face with the hands at ten past five. (For scoring see instruction guide: circle = 1, numbers = 2, hands = 2 if all correct).	**Visuo-spatial** [Score 0 – 5] ☐

MEMORY RECALL

➢ Cover the address below and ask "Now tell me what you remember about that name and address we were repeating at the beginning."

Harry Barnes	…… ……	**Memory** [Score 0 – 7] ☐
72 Church Street	……. …… ……	
Woodville	……	
Hawkes Bay	……	

TOTAL SCORE **/ 30**

Appendix F

Selected evidence base for guidance booklet

Contador, I., Del Ser, T., Llamas, S., Villarejo, A., Benito-León, J., & Bermejo-Pareja, F. (2017). *Impact of literacy and years of education on the diagnosis of dementia: A population-based study. Journal of Clinical and Experimental Neuropsychology, 39*(2), 112-119.

Halbach, M. M., Spann, C. O., & Egan, G. (2003). Effect of sleep deprivation on medical resident and student cognitive function: a prospective study. *American Journal of Obstetrics and Gynecology, 188*(5), 1198-1201.

Hammar, Å., Strand, M., Årdal, G., Schmid, M., Lund, A., & Elliott, R. (2011). Testing the cognitive effort hypothesis of cognitive impairment in major depression. *Nordic Journal of Psychiatry, 65*(1), 74-80.

Lim, J., & Dinges, D. F. (2010). A meta-analysis of the impact of short-term sleep deprivation on cognitive variables. *Psychological Bulletin, 136*(3), 375.

Nilsson, J. P., Söderström, M., Karlsson, A. U., Lekander, M., Åkerstedt, T., Lindroth, N. E., & Axelsson, J. (2005). Less effective executive functioning after one night's sleep deprivation. *Journal of Sleep Research, 14*(1), 1-6.

Raffield, L. M., Brenes, G. A., Cox, A. J., Freedman, B. I., Hugenschmidt, C. E., Hsu, F. C., ... & Bowden, D. W. (2016). Associations between anxiety and depression symptoms and cognitive testing and neuroimaging in type 2 diabetes. *Journal of Diabetes and its Complications, 3*0(1), 143-149.

Rosenblat, J. D., Kakar, R., & McIntyre, R. S. (2016). The cognitive effects of antidepressants in major depressive disorder: a systematic review and meta-analysis of randomized clinical trials. *International Journal of Neuropsychopharmacology, 19*(2).

Semkovska, M., Quinlivan, L., O'Grady, T., Johnson, R., Collins, A., O'Connor, J., ... & Gload, T. (2019). Cognitive function following a major depressive episode: a systematic review and meta-analysis. The Lancet Psychiatry, 6(10), 851-861.

Tavares-Júnior, J. W. L., De Souza, A. C. C., Alves, G. S., de Carvalho Bonfadini, J., Siqueira-Neto, J. I., & Braga-Neto, P. (2019). Cognitive assessment tools for screening older adults with low levels of education: a critical review. *Frontiers in Psychiatry, 10*.

Appendix G

Selected evidence base for CALD considerations

Use of translated versions

Charernboon, T. (2019). Diagnostic accuracy of the Thai version of the Mini-Addenbrooke's Cognitive Examination as a mild cognitive impairment and dementia screening test. Psychogeriatrics, 19(4), 340-344.

Habib, N., & Stott, J. (2019). Systematic review of the diagnostic accuracy of the non-English versions of Addenbrooke's cognitive examination–revised and III. *Aging & Mental Health*, *23*(3), 297-304.

Hammad, M. A., Sulaiman, S. A. S., Aly, A., & Noor, D. M. (2017). Malaysian adaptation of the mini-addenbrooke's cognitive examination (M-ACE). *World Applied Sciences Journal, 35*(11), 2315-2320.

Heo, J. H., Lee, K. M., Park, T. H., Ahn, J. Y., & Kim, M. K. (2012). Validation of the Korean Addenbrooke's Cognitive Examination for diagnosing Alzheimer's dementia and mild cognitive impairment in the Korean elderly. *Applied Neuropsychology: Adult, 19*(2), 127-131.

Miranda, D. D. C., Brucki, S. M. D., & Yassuda, M. S. (2018). The Mini-Addenbrooke's Cognitive Examination (M-ACE) as a brief cognitive screening instrument in Mild Cognitive Impairment and mild Alzheimer's disease. *Dementia & Neuropsychologia, 12*(4), 368-373. [Brazilian]

Peixoto, B., Baeta, É., Machado, M., Rocha, P., Macedo, C., Machado, A., ... & Monteiro, L. (2019). Diagnostic utility of the Portuguese version of the Mini-Addenbrooke's Cognitive Examination in early dementia. *GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry, 32*(4), 175.

Yang, L., Li, X., Yin, J., Yu, N., Liu, J., & Ye, F. (2019). A Validation Study of the Chinese Version of the Mini-Addenbrooke's Cognitive Examination for Screening Mild Cognitive Impairment and Mild Dementia. *Journal of Geriatric Psychiatry and Neurology, 32*(4), 205-210.

Considerations for developing guidelines for the use of interpreters

Stolk, Y. (2009). Approaches to the influence of culture and language on cognitive assessment instruments: The Australian context, *Australian Psychologist, 44*(1), 1-5.

Mirza, N., Panagioti, M., Waheed, M. W., & Waheed, W. (2017). Reporting of the translation and cultural adaptation procedures of the Addenbrooke's Cognitive Examination version III (ACE-III) and its predecessors: a systematic review. *BMC Medical Research Methodology, 17*(1), 141.

Franzen, S., van den Berg, E., Goudsmit, M., Jurgens, C. K., Van De Wiel, L., Kalkisim, Y., ... & Papma, J. M. (2020). A Systematic Review of Neuropsychological Tests for the Assessment of Dementia in Non-Western, Low-Educated or Illiterate Populations. J*ournal of the International Neuropsychological Society, 26*(3), 331-351.

Ward, K. T., Hess, M., & Wu, S. (2019). Geriatric assessment in multicultural immigrant populations. *Geriatrics, 4*(3), 40-49.

Appendix H

CIAR Working Group membership

Shereen Moloney (Chair) is Executive Director of the New Zealand Dementia Foundation, the organisation that is hosting and facilitating this project.

Cheryl Collier (Ngāti Porou) is a Specialty Clinical Nurse: Dementia Care working at Bay of Plenty DHB

Chris Collins is a Psychiatrist of Old Age with 32 years' experience working for CDHB and overseas. He is a Clinical Senior Lecturer with Otago School of Medicine, a member of the International Psychogeriatric Association and a previous committee member of Alzheimers NZ.

Lara Hitchcock is a registered nurse working in the CDHB's memory clinic and is actively uses and educates about cognitive assessment for dementia.

Louise Lennon is the Professional Leader for Occupational Therapy for Waitematā and sits on the national Occupational Therapy Leaders Group.

Helen Paton is a Clinical Neuropsychologist specialising in working with older adults at the Southern DHB. She provides individualised and group cognitive rehabilitation, and is involved in quality improvement projects and training aimed at optimising cognitive screening done by generalist clinicians.

Kate Sladden is the Funding and Development Manager for Health of Older People for Waitematā and Auckland DHBs and also sits on the DHBs' national HOP Steering Group for the Northern Region.

Aik Haw Tan is a Geriatrician at Mid Central DHB and has conducted research which uses cognitive screening instruments.

Esther Willis is a GP connected with a large practice in Palmerston North.

Phil Wood is a Geriatrician working in both public and private and as the Chief Advisor for Health Ageing to the MoH, as well as being active in research.

Resource people:

Matthew Croucher is a Psychiatrist of Old Age working for the CDHB and has local, regional, and national leadership roles in the dementia sector including being Chair of the New Zealand Dementia Cooperative.

Jane Large is Chair of the National Dementia Framework Collaborative. She is Regional Programme Facilitator - Health of Older People Service Level Alliance in the South Island.

Susan Gee is Lead Researcher, Psychiatry of Old Age Academic Unit, Canterbury DHB and Sector Liaison Officer with the New Zealand Dementia Cooperative.

Appendix I

CIAR Working Group terms of reference

Purpose

The purpose of this project is to safeguard the access of New Zealand clinicians and citizens to the most appropriate, reliable, and acceptable cognitive test in our context.

Aims

The key aim of the group is to perform a health technology assessment of the MoCA and other candidate substitute cognitive testing instruments in the New Zealand setting, and to rank the options.

The group is expected to make recommendations about:

a) Which instrument should be endorsed as New Zealand's primary recommended cognitive test in the context of dementia assessment and management for primary care and for secondary care services that do not offer dementia-specific services. There is no intention for any test for which a national agreement is required but cannot be reached to be adopted as a New Zealand standard by the sector.

b) Training and/or certification and about safe use of the recommended test, but responsibility for this at present lies with each DHB's cognitive impairment pathway and local clinical governance. There are weaknesses and threats to the public in relation to this issue but they are common to all candidate instruments rather than being MoCA-specific.

c) The potential for the Ministry of Health to negotiate and/or commission a nationally accessible internet-based platform for the recommended instrument. There is no intention for any test to be adopted as a New Zealand standard by the sector for which a national agreement is required but cannot be reached

The group may comment on options for the appropriate cognitive examination of Māori and for people from culturally and linguistically diverse communities, but it is not expected to solve these more complex issues as a primary aim because there are as yet very limited instruments on which to perform a health technology assessment in these areas. Other dementia assessment projects relating to tangata whenua are in process separately.

The group may choose to make recommendations about New Zealand normative data research for the recommended instrument and/or the future research development of a local instrument.

The group may choose to give guidance about the use of the recommended instrument outside of the context of non-specialist dementia assessment and management.

Other aims suggested by the Working Group may be determined in conjunction with the NZDC and the project sponsors.

There is no aim to restrict clinical freedom in New Zealand via this process, especially not for dementia specialty services and clinicians.

Key deliverable

The group will write a report on its findings and recommendations by 31 March 2020 to the Ministry of Health and the National HOP Steering Group. The report and recommendations will assist the Ministry of Health to make a decision about any potential national negotiations with the vendor of any test for which copyright and/or financial agreements need to be reached.

Once the Ministry of Health and the National HOP Steering Group have endorsed the action for New Zealand, information will be provided to the dementia sector at large.

Membership

The group will include professional group representation as follows:

- Neuro psychologist (older persons mental health and/or dementia expertise)
- Psychiatrist of old age
- Occupational therapist (older persons mental health and/or dementia expertise)
- General practitioner
- Geriatrician
- Senior nurse (with general practice and/or dementia expertise)
- GM DHB Planning & Funding
- MOH Health of Older People Clinical Advisor

Members will be invited by virtue of their known interest and expertise in the field. The CIAR Working Group may co-opt involvement from others as required. The group will be reviewed for dissolution after its report is reviewed by the Ministry of Health and the National HOP Steering Group, and the final communications and roll-out plan have been confirmed.

Working methods

Meetings will be held monthly from October 2019 in a digital meeting space until the project is complete.