**Supplementary materials**

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**Appendix e-1 PRISMA checklist**

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| --- | --- | --- | --- |
| **Section/topic**  | **#** | **Checklist item**  | **Reported on page #**  |
| **TITLE**  |  |
| Title  | 1 | Identify the report as a systematic review, meta-analysis, or both.  | 1 |
| **ABSTRACT**  |  |
| Structured summary  | 2 | Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.  | 2 |
| **INTRODUCTION**  |  |
| Rationale  | 3 | Describe the rationale for the review in the context of what is already known.  | 3 |
| Objectives  | 4 | Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).  | 4 |
| **METHODS**  |  |
| Protocol and registration  | 5 | Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.  | 5 |
| Eligibility criteria  | 6 | Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.  | 5&6 |
| Information sources  | 7 | Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.  | 6 |
| Search  | 8 | Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.  | Supp materials |
| Study selection  | 9 | State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).  | Supp materials |
| Data collection process  | 10 | Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.  | 6 |
| Data items  | 11 | List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.  | Supp materials |
| Risk of bias in individual studies  | 12 | Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.  | 7 |
| Summary measures  | 13 | State the principal summary measures (e.g., risk ratio, difference in means).  | Supp materials |
| Synthesis of results  | 14 | Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I2) for each meta-analysis.  | 7&8 |

**Appendix e-2: Search terms**

1. IQCODE.mp.

2. AD8.mp.

3. AD-8.mp.

4. GPCOG.mp.

5. GP-COG

6. SED.mp.

7. AQ.mp.

8.STIDA.mp.

9.BSCI.mp

10.DECO.mp.

11. "Observation List of Possible Early Signs of Dementia".mp.

12. "Informant Questionnaire for Cognitive Decline in the Elderly".mp.

13. "Ascertain Dementia 8 item questionnaire".mp.

14. "General Practitioner Assessment of Cognition".mp.

15. "Symptoms of Early Dementia Questionnaire".mp.

16. "Alzheimer’s Questionnaire".mp.

17. “Deterioration cognition observe”.mp.

18. “Blessed dementia scale”.mp.

19. “Blessed dementia rating scale”.mp.

20. “Concord informant dementia scale”.mp.

21. “Short memory questionnaire”.mp.

22. “Symptoms of dementia screener”.mp.

23. “Brief cognitive rating scale”.mp.

24. “Dementia questionnaire”.mp.

25. "Structured Telephone Interview for Dementia Assessment".

26. "Brief Scale Cognitive Impairment"

27. ("screening test\*" adj2 (dement\* or alzheimer\*))

28. "cognit\* screen\*".mp.

29. dementia/di [Diagnosis]

30. cognitive defect/di [Diagnosis]

31. Alzheimer disease/di [Diagnosis]

32. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31

33. MEDLINE.tw.

34. exp systematic review/ or systematic review.tw.

35. meta-analysis/

36. intervention$.ti.

37. 33or 34 or 35 or 36

38. 32 and 37

**Appendix e-3: Data extraction proforma**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Review** | **Primary tools searched for** | **Primary setting focus**  | **Sensitivity** | **Specificity** | **Included studies** | **Total number included in review** | **Total number with dementia** | **Method used to assess study quality** | **Subgroups within review** | **Population of interest** | **Date of last search** | **Aims and rational & Review Summary of evidence** |
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**Appendix e-4: Modified AMSTAR-2**

|  |
| --- |
| 1. Did the research questions and inclusion criteria for the review include the components ofPICO? |
| For Yes: Index test  Reference standard-Condition of interest  Population/Setting |  Yes No |
| 2. Did the report of the review contain an explicit statement that the review methods wereestablished prior to the conduct of the review and did the report justify any significantdeviations from the protocol? |
| For Partial Yes:The authors state that they had a written protocol or guide that included ALL the following: review question(s) a search strategy inclusion/exclusion criteria a risk of bias assessment | For Yes:As for partial yes, plus the protocol should be registered and should also have specified: a meta-analysis/synthesis plan, if appropriate, and  a plan for investigating causes of heterogeneity justification for any deviations fromthe protocol |  Yes Partial yes No |
| 3. Did the review authors explain their selection of the study designs for inclusion in the review? |
| For Yes, the review should satisfy ONE of the following: Explanation for including only Test accuracy OR Explanation for including only other criteria  OR Explanation for including both Test accuracy and other criteria |  Yes No |
| 4. Did the review authors use a comprehensive literature search strategy? |
| For Partial Yes (all the following): searched at least 2 databases provided key word and/or search strategy justified publication restrictions (eg, language) | For Yes, should also have (all the following): searched the reference lists/bibliographies of included studies included/consulted content experts in the field conducted search within 24months of completion of the review |  Yes Partial yes No |
| 5. Did the review authors perform study selection in duplicate? |
| For Yes, either ONE of the following: at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include OR two reviewers selected a sample of eligible studies and achieved good agreement (at least 80 per cent), with the remainder selected by one reviewer |  Yes No |
| 6. Did the review authors perform data extraction in duplicate? |
| For Yes, either ONE of the following: at least two reviewers achieved consensus on which data to extract from included studies  OR two reviewers extracted data from a sample of eligible studies and achieved good agreement (at least 80 per cent), with the remainder extracted by one reviewer |  Yes No |
| 7. Did the review authors provide a list of excluded studies and justify the exclusions? |
| For Partial Yes: provided a list of all potentially relevant studies that were read in full text form but excluded from the review | For Yes, must also have: Justified the exclusion from the review of each potentially relevant study |  Yes Partial yes No |
| 8. Did the review authors describe the included studies in adequate detail? |
| For Yes (ALL the following): described index test  described reference standard  described condition of interest  described setting described population |  Yes No |
| 9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) inindividual studies that were included in the review? |
| For Yes, must have assessedRoB in relation to Index test  Reference standard  Population/Setting  |  Yes No |
| 10. Did the review authors report on the sources of funding for the studies included in the review? |
| For Yes Must have reported on the sources of funding for individual studies included in the review. Note: Reporting that the reviewers looked for this information but it was not reported by study authors also qualifies |  Yes No |
| 11. If meta-analysis was performed did the review authors use appropriate methods for statisticalcombination of results? |
| For Yes: The authors justified combining the data in a meta-analysis  AND they used an appropriate technique that account for inherent heterogeneity and correlation of sensitivity and specificity  AND investigated the causes of any heterogeneity |  Yes No No meta-analysis included |
| 12. If meta-analysis was performed, did the review authors assess the potential impact of RoB inindividual studies on the results of the meta-analysis or other evidence synthesis? |
| For Yes: included only low risk of bias studies  OR, if the pooled estimate was based on studies at variable RoB, the authors performed analyses to investigate possible impact of RoB on summary estimates of effect |  Yes No No meta-analysis included |
| 13. Did the review authors account for RoB in individual studies when interpreting/discussing theresults of the review? |
| For Yes: included only low risk of bias studies  OR, if studies with moderate or high RoB were included, the review provided a discussion of the likely impact of RoB on the results |  Yes No |
| 14. Did the authors discuss clinical heterogeneity and potential reasons for that? |
| For Yes:  If heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results and discussed the impact of this on the results of the review |  Yes No |
| 15. If they performed quantitative synthesis did the review authors carry out an adequateinvestigation of publication bias (small study bias) and discuss its likely impact on the resultsof the review? |
| For Yes: performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias  |  YesNo No meta-analysisconducted |
| 16. Did the review authors report any potential sources of conflict of interest, including anyfunding they received for conducting the review? |
| For Yes: The authors reported no competing interests OR  The authors described their funding sources and how they managed potential conflicts of interest |  Yes No |

**Appendix e-5: PRISMA flow diagram and exclusion reasons**

Additional records identified through other sources
(n =2)

Records identified through database searching
(n =6807)

## Identification

Records after duplicates removed
(n =4865)

## Screening

Records excluded
(n =4800)

Records screened
(n =4865)

Full-text articles excluded
(n =40)

Full-text articles assessed for eligibility
(n =65)

## Eligibility

**Reviews** included in qualitative synthesis
(n =25)

## Included

**Studies** included in quantitative synthesis (meta-analysis)
(n =37)

|  |  |  |
| --- | --- | --- |
| Appels 2010 | The Diagnostic Accuracy of Dementia-Screening Instruments With an Administration Time of 10 to 45 Minutes for Use in Secondary Care: A Systematic Review | Excluded Informant tools |
| Arevalo-Rodriguez 2014 | Diagnostic tools for alzheimer's disease dementia and other dementias: an overview of diagnostic test accuracy (DTA) systematic reviews | Overview |
| Aslam 2016 | Automated tests for diagnosing and monitoring cognitive impairment: A diagnostic accuracy review | No informant tools described |
| Athilingam 2015 | Cognitive Screening in Persons With Chronic Diseases in Primary Care | Does not report Sn/sp  |
| Boustani 2003 | Screening for Dementia in Primary Care: A Summary of the Evidence for the U.S. Preventive Services Task Force | No informant tools described |
| Cameron 2016 | Diagnostic Accuracy of Cognitive Screening Instruments in Heart Failure: A Systematic Review | No informant tools described |
| Cheung 2012 | An evaluation on the neuropsychological tests used in the assessment of postchemotherapy cognitive changes in breast cancer survivors | No informant tools described |
| Creavin 2018 | Cognitive tests to help diagnose dementia in symptomatic people in primary care and the community | Wrong study design |
| Culverwell 2008 | Screening for dementia in primary care: how is it measuring up? | Does not report Sn/sp |
| DeRoeck 2019 | Brief cognitive screening instruments for early detection of Alzheimer's disease: A systematic review | Excluded informant tools |
| Elliott-King 2016 | A critical literature review of the effectiveness of various instruments in the diagnosis of dementia in adults with intellectual disabilities | Wrong patient population |
| García-Casal ‎2017 | Electronic Devices for Cognitive Impairment Screening: A Systematic Literature Review | No informant tools described |
| Genis 2019 | Factors associated with informant-reported cognitive decline in older adults: A systemised literature review | Wrong outcome |
| Ghafar 2019 | Cognitive screening instruments to identify vascular cognitive impairment: A systematic review | No informant tools described |
| Herr 2013 | A critical review of the use of telephone tests to identify cognitive impairment in epidemiology and clinical research | Does not report Sn/sp |
| Ismail 2009 | Brief cognitive screening instruments: an update | Wrong study design |
| Jansen 2007 | A meta-analysis of the sensitivity of various neuropsychological tests used to detect chemotherapy-induced cognitive impairment in patients with breast cancer | No informant tools described |
| Kaasalainen 2008 | Review: some screening tests for dementia are accurate and practical for use in primary care | Conference paper |
| Kamminga ‎2013 | Validity of cognitive screens for HIV-associated neurocognitive disorder: a systematic review and an informed screen selection guide | No informant tools described |
| Kwan 2013 | Can smartphones enhance telephone-based cognitive assessment (TBCA)? | Telephone-based assessment only |
| Lees 2012 | Cognitive and mood assessment in stroke research: focused review of contemporary studies | Wrong outcome |
| Lees 2014 | Test accuracy of direct to patient cognitive screening tests for diagnosis of post stroke cognitive impairment and dementia-Systematic review and meta-analysis | Excluded informant tools |
| Li 2018 | Utility-Based Instruments for People with Dementia: A Systematic Review and Meta-Regression Analysis | No informant tools described |
| Lonie 2009 | Screening for mild cognitive impairment: a systematic review | Excluded informant tools |
| Martin-Khan 2010 | A systematic review of the reliability of screening for cognitive impairment in older adults by use of standardised assessment tools administered via the telephone | Telephone-based assessment only |
| McGovern 2015 | Test properties of informant (proxy)-based cognitive screening tools when used in stroke settings | Conference paper |
| McKenzie 2018 | A review of measures used in the screening, assessment and diagnosis of dementia in people with an intellectual disability | Wrong patient population |
| Milne 2008 | Screening for dementia in primary care: a review of the use, efficacy and quality of measures | Wrong study design |
| Mitchell ‎2010 | Screening and case finding tools for the detection of dementia. Part I: evidence-based meta-analysis of multidomain tests | Does not report Sn/sp |
| Naqvi 2015 | Cognitive assessments in multicultural populations using the Rowland Universal Dementia Assessment Scale: a systematic review and meta-analysis | No informant tools described |
| Ortega 2019 | Screening for Alzheimer's disease in low-educated or illiterate older adults in brazil: A systematic review | No informant tools described |
| Ozer ‎2016 | A systematic review of the diagnostic test accuracy of brief cognitive tests to detect amnestic mild cognitive impairment | Excluded informant tools |
| Paddick ‎2017 | Cognitive screening tools for identification of dementia in illiterate and low-educated older adults, a systematic review and meta-analysis | Excluded informant tools |
| Pye 2017 | Screening tools for the identification of dementia for adults with age-related acquired hearing or vision impairment: A scoping review | Excluded informant tools |
| Shulman ‎2000 | Clock-drawing: is it the ideal cognitive screening test? | Excluded informant tools |
| Slater 2013 | A review of brief cognitive assessment tests | Excluded informant tools |
| Tsoi 2018 | Comparison of Computerized and Paper-and-Pencil Memory Tests in Detection of Mild Cognitive Impairment and Dementia: A Systematic Review and Meta-Analysis of Diagnostic Studies | No informant tools described |
| Van Heugten ‎2015 | Can we forget the Mini-Mental State Examination? A systematic review of the validity of cognitive screening instruments within one month after stroke | No informant tools described |
| Velayudhan 2014 | Review of brief cognitive tests for patients with suspected dementia | Excluded informant tools |
| Yokomizo ‎2014 | Cognitive screening for dementia in primary care: a systematic review | Overview |
| Zeilinger ‎2013 | A systematic review on assessment instruments for dementia in persons with intellectual disabilities | Does not report Sn/sp |

**Appendix e-6: Sub-group and Sensitivity analyses**

**Primary analysis:** sensitivity analysis removing delirium and depression population studies

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Threshold** | **Sensitivity (95%CrI)** | **Specificity (95%CrI)** |
| **IQCODE26** | 3.3 | 0.87 (0.76,0.93) | 0.76 (0.66,0.85) |
| **IQCODE26** | 3.6 | 0.74 (0.62,0.84) | 0.86 (0.77,0.91) |
| **IQCODE 16** | 3.3 | 0.88 (0.78,0.93) | 0.75 (0.62,0.83) |
| **IQCODE 16** | 3.6 | 0.88 (0.76,0.94) | 0.84 (0.72,0.91) |
| **AD8** | 2 | 0.9 (0.82,0.95) | 0.69 (0.55,0.81) |
| **AD8** | 3 | 0.85 (0.69,0.94) | 0.77 (0.61,0.89) |

**Subgroup analysis:** lower risk of bias studies only

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tool** | **Threshold** | **Setting** | **Condition** | **Sensitivity** | **Specificity** |
| **IQCODE-26** | 3.6 | Community | Dementia | 45% | 96% |
| **IQCODE-16** | 3.3 | Community | Dementia | 88% | 63% |
| **IQCODE-16** | 3.6 | Community | Dementia | 67% | 93% |
| **IQCODE-16** | 3.3 | Community | MCI | 41% | 67% |
| **AD8** | 2 | Community | Dementia | 73% | 61% |
| **AD8**  | 3 | Community | Dementia | 100% | 67% |
| **AD8**  | 3 | Community | Any cognitive impairment | 78% | 73% |
| **AD8**  | 2 | Secondary | Dementia | 97% | 11% |
| **AD8**  | 2 | Secondary | Any cognitive impairment | 92% | 46% |
| **AD8** | 3 | Secondary | Any cognitive impairment | 90% | 67% |
| **IQCODE 16** | 3.3 | Primary | Dementia | 80% | 80% |

**Key: IQCODE= Informant Questionnaire on Cognitive Decline in the Elderly; AD8= 8-item interview to Ascertain Dementia**

**Appendix e-7: GRADE results**

**GRADE Tables**

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality criteria** | **Rating** (circle one for each criterion) | **Footnotes**(explain reasons for up- or downgrading) | **Quality of the evidence** (Circle one per outcome) |
|  **Outcome # 1: Sensitivity of IQCODE and AD8** |
| **Risk of bias** | Serious (-1) | **Majority of included studies were at risk of bias and lack of blinding could exaggerate sensitivity. No study achieved low risk of bias in all domains.**  | HighModerateLowVery Low |
| **Inconsistency** | No issue | **Inconsistency is present but is largely driven by known factors i.e. setting or severity of cognitive impairment being assessed.**  |
| **Indirectness** | No issue | **Judgement based on ‘intermediate outcome’ i.e. diagnostic test accuracy, rather than clinical outcome.**  |
| **Imprecision** | Serious (-1) | **Confidence intervals are wide for sensitivity at most cut points.** |
| **Publication Bias** | Unlikely | **Rarely evaluated but in one review that did, no issues were highlighted.**  |
| **Large effect** | NA | **NA** |
| **Dose-response gradient** | No | **NA** |
| **Plausible confounding would change the effect** | No | **NA** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality criteria** | **Rating** (circle one for each criterion) | **Footnotes**(explain reasons for up- or downgrading) | **Quality of the evidence** (Circle one per outcome) |
|  **Outcome # 2: Specificity of IQCODE**  |
| **Risk of bias** | Serious (-1) | **Majority of included studies were at risk of bias; community studies in particular biased in ways that could enhance specificity. No study achieved low risk of bias in all domains. However, lower risk of bias studies display similar overall diagnostic test accuracy to pooled results.**  | HighModerateLowVery Low |
| **Inconsistency** | No issue | **Inconsistency is present but is largely driven by known factors i.e. setting or severity of cognitive impairment being assessed.**  |
| **Indirectness** | No issue | **Judgement based on ‘intermediate outcome’ i.e. diagnostic test accuracy, rather than clinical outcome.**  |
| **Imprecision** | Serious (-1) | **Confidence intervals are wide for specificity throughout analysis.** |
| **Publication Bias** | Unlikely | **Never evaluated for IQCODE reviews**  |
| **Large effect** | NA | **NA** |
| **Dose-response gradient** | No | **NA** |
| **Plausible confounding would change the effect** | No | **NA** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality criteria** | **Rating** (circle one for each criterion) | **Footnotes**(explain reasons for up- or downgrading) | **Quality of the evidence** (Circle one per outcome) |
|  **Outcome # 1: Sensitivity of AD8** |
| **Risk of bias** | Serious (-1) | **Majority of included studies were at risk of bias. Poor reporting on blinding and participant recruitment mean cannot determine potential for exaggerated sensitivity. No study achieved low risk of bias in all domains. However, lower risk of bias studies display similar overall diagnostic test accuracy to pooled results.**  | HighModerateLowVery Low |
| **Inconsistency** | No issue | **Inconsistency is present but is largely driven by known factors i.e. setting or severity of cognitive impairment being assessed.**  |
| **Indirectness** | No issue | **Judgement based on ‘intermediate outcome’ i.e. diagnostic test accuracy, rather than clinical outcome.**  |
| **Imprecision** | Serious (-1) | **Confidence intervals are wide for sensitivity at most cut points.** |
| **Publication Bias** | Unlikely | **Rarely evaluated but in one review that did, no issues were highlighted.**  |
| **Large effect** | NA | **NA** |
| **Dose-response gradient** | No | **NA** |
| **Plausible confounding would change the effect** | No | **NA** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality criteria** | **Rating** (circle one for each criterion) | **Footnotes**(explain reasons for up- or downgrading) | **Quality of the evidence** (Circle one per outcome) |
|  **Outcome # 2: Specificity of AD8** |
| **Risk of bias** | Serious (-1) | **No study achieved low risk of bias in all domains. Poor reporting and inappropriate exclusions during recruitment could exaggerate specificity. Lower risk of bias studies indicate lower rates than pooled results suggest.**  | HighModerateLowVery Low |
| **Inconsistency** | No issue | **Inconsistency is present but is largely driven by known factors i.e. setting or severity of cognitive impairment being assessed.**  |
| **Indirectness** | No issue | **Judgement based on ‘intermediate outcome’ i.e. diagnostic test accuracy, rather than clinical outcome.**  |
| **Imprecision** | Serious (-1) | **Confidence intervals are wide for specificity throughout analysis.** |
| **Publication Bias** | Unlikely | **Rarely evaluated but in one review that did, no issues were highlighted.**  |
| **Large effect** | NA | **NA** |
| **Dose-response gradient** | No | **NA** |
| **Plausible confounding would change the effect** | No | **NA** |

**Appendix e-8: AMSTAR-2 and PRISMA-DTA results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Authors name** | **Yes** | **Partially yes** | **No** | **Not applicable** | **Quality** |
| Lin 2013 | 1,3,4,5,6,7,9,13,14,16 |  | 2, 8, | 10, 11,12,15 | Moderate |
| Burton 2015 | 1,3,4,5,6,8 |  | 2,7,9, 13,14,16 | 10, 11,12,15 | Critically low |
| Cherbuin 2008 | 1,3, 4, 8,16 |  | 2,5,6, 7,9,13,14 | 10, 11,12,15 | Critically low |
| Cullen 2007 | 1,3,4,7,8,13,16 |  | 2,5,6,9,14 | 10, 11,12,15 | Low |
| Harrison 2015 | 1,2,3,5,6,7,8,9,11,13,14,16 | 4 | 15 | 10,12 | High |
| Harrison 2014 | 1,2,3,4,5,6,7,8,9,13,14,16 |  |  | 10, 11,12,15 | High |
| Quinn 2014 | 1,2,3,4,5,6,7,8,9,11,13,14,16 |  | 12, 15 | 10 | Moderate |
| Jorm 2004 | 1,3,8,14 | 4 | 2,5,6,7,9,13,16 | 10, 11,12,15 | Critically low |
| Chen 2017 | 1,3,5 ,8,9,11, 13,14,15,16 | 4 | 2,6, 7, 12, | 10 | Low |
| McGovern 2016 | 1,2,3,4,5,6, 8,9,13,14,16 |  | 7,11,12,15 | 10 | Low |
| Hendry 2015 | 1,3,4,5,6,8,9,13,14,16 |  | 2,7 | 10, 11,12,15 | Moderate |
| Jorm 1997 | 1,3,4,8,11,14 |  | 2,5,6,7,9,12,15,16 | 10 | Critically low |
| Jackson 2013 | 1,3, 5,6,8,9,11,12,14,16 | 4 | 2,7,13,15 | 10 | Low |
| Rosli 2016 | 1,3,5,6,9,13,14,16 | 4,8 | 2,7, | 10, 11,12,15 | Moderate |
| Hendry 2019 | 1,2,3,4,5,6,7,8,9,11,13,14,16, |  | 12,15 | 10 | Moderate |
| Breton 2019 | 1,5,6,7,8,9,11,13,14,16 | 4 | 2,3,12,15 | 10 | Low |
| Razak 2019 | 1,3,4,5,6,7,8,16 |  | 2,9,13,14 | 10, 11,12,15 | Critically low |
| Tsoi 2017 | 1,3,4,5,6,7,8,9,11, 14 |  | 2,12, 13,15,16 | 10 | Low |
| Tsoi 2015 | 1,3,4,5,6,7,8,9,11, 14,16 |  | 2, 12, 13,15 | 10 | Low |
| Lischka 2012 | 1,3,5,7,8,9,14 | 4 | 2,6,13,16 | 10, 11,12,15 | Low |
| Harvan 2006 | 1,3,4 |  | 2,5,6,7,8,9,13,14,15,16 | 10, 11,12,15 | Critically low |
| Kansagara 2010 | 1,3,4,5,6,7,8,9,13,14,16 |  | 2 | 10, 11,12,15 | High |
| Woodford 2007 | 1,4,5,8 |  | 2,3,6,7,9,13,14,16 | 10, 11,12,15 | Critically low |
| Kosgallana 2019 | 1,3,4,7 |  | 2,5,6,8,9,13,14,16 | 10, 11, 12,15 | Critically Low |
| Carpenter 2019 | 1,3,4,5,6,7,8,9,11,13,14,16 |  | 2,12,15 | 10 | Moderate |

****

**Appendix e-9: Evidence map table and references**

**Individual DTA studies identified**

|  |  |  |
| --- | --- | --- |
|  | **Setting** | **Population** |
| **Tool** | **Mixed/Other/unknown setting** | **Community setting** | **Primary Care** | **Secondary care** | **Older adults/mixed population** | **Stroke/CVD only** | **Delirium only** | **Other conditions (HIV; Dementia pop only; depressed/schizophrenic)**  |
| **IQCODE** | Ehrensperger 20101; Jorm 19942; Bustamante 20033; Morales-Gonzalez 19924; Wolf 20095; Jorm 1989b6; Lim 20037; Rockwood 19988 | Jung 20159; Srikanth 200610; Fuh 199511; Law 199512; Morales 199513; Morales 199714; Jorm 199615; Ayalon 201116; Senanarong 200117; Kathriarachi 200118; Mackinnon 200319  | Cruz-Ordana 201220; Tokuhara 200621; Grober 200822 | Larner 201023; Jackson 201624; Razavi 201425; Tang 200326; Narasimhalu 200827; dos Santos Sanchez 201328; Flicker 199729; Hancock 200930; Harwood 199731; Knafelc 200332; Mulligan 199633; Perroco 200934; Li 201235; Abreu 200836; Isella 200637; Park 201738; Jorm 199139; De Jonghe 199740; Garcia 200241; Goncalves 201142; Mackinnon 199843; Sikkes 201044; Siri 200645; Ozel-Kizel 201046; Silpakit 200747; Zhou 200448; Diesfeldt 2007a49; Thomas 199450; Del-Ser 199751; Stratford 200352 | Razavi 2014; Narasimhalu 2008; Cruz-Ordana 2012; dos Santos Sanchez et al 2013; Flicker 1997; Fuh 1995; Hancock 2009; Harwood 1997; Knafelc 2003; Law 1995; Morales 1995; Morales 1997; Mulligan 1996; Perroco 2009; Tokuhara 2006; Ehrensperger 2010; Grober 2008; Li 2012; Abreu 2008; Isella 2006; Park 2017; Jorm 1991; Jorm 1994; Jorm 1996; Ayalon 2011; Garcia 2002; Goncalves 2011; Mackinnon 1998; Sikkes 2010; Siri 2006; Bustamante 2003; Morales-Gonzalez 1992; Silpakit 2007; Zhou 2004; Senanarong 2001; Kathriarachi 2001; Wolf 2009; Diesfeldt 2007a; Thomas 1994; Mackinnon 2003; Jorm 1989b; Del-Ser 1997; Lim 2003; Stratford 2003; Rockwood 1998  | Tang 2003; Jung 2015; Srikanth 2006 | Jackson 2016 | Larner 2010; De Jonghe 1997; Ozel-Kizel 2010 |
| **AD8** | Blanco 201653; Munoz 201054; Ryu 200955; Tew 201556 | Correia 201157; Galvin 200758; Meguro 201559; Yang 201660; Malmstrom 200961 | Chan 201662;  | Chio 201763; Galvin 200664; Jackson 201665; Larner 201566; Razavi 2014; Carnero-Pardo 201367; Dong 201368; Overton 201369; Carpenter 2011a70; Carpenter 2011b71; Li 2012 | Chio 2017Chan 2016; Correia 2011; Galvin 2007; Galvin 2006; Larner 2015; Meguro 2015; Yang 2016; Blanco 2016; Dong 2013; Li 2012; Munoz 2010; Ryu 2009; Tew 2015; Malmstrom 2009; Carpenter 2011a; Carpenter 2011b; Carnero- Pardo 2013 |  | Jackson 2016 | Overton 2013 |
| **GPCOG** |  | Basic 200972 | Brodaty 200273 | Lee 200974; Li 201375; Pirani 201076 | Basic 2009; Brodaty 2002; Lee 2009; Li 2013; Pirani 2010 |  |  |  |
| **BDS** | Rockwood 1998; Erkinjuntti 198877 | Yang 200678; Heun 199879 |  | Zhou 2004; Madureira 200180 | Yang 2006; Heun 1998; Zhou 2004; Rockwood 1998; Erkinjuntti 1988 | Madureira 2001 |  |  |
| **CIDS** |  | Waite 199881 |  |  | Waite 1998 |  |  |  |
| **DECO** | Ritchie 199282 |  |  |  | Ritchie 1992 |  |  |  |
| **DQ** | Kawas 199483 |  |  | Ellis 199884 | Ellis 1998; Kawas 1994;  |  |  |  |
| **SMQ** | Koss 199385; Maki 2000b86 | Maki 2000a87 |  |  | Koss 1993; Maki 2000a; Maki 2000b |  |  |  |
| **Single item questions** |  | Prince 201188; Erkinjuntti 1988; Hall 199689; Morales 1995; Perroco 2009 | Ayalon 2011 | Douglas 201190 | Prince 2011; Ayalon 2011; Erkinjuntti 1988; Hall 1996; Morales 1995; Perroco 2009; Douglas 2011 |  |  |  |
| **PAS** |  |  |  | Jorm 199591 | Jorm 1995 |  |  |  |
| **KDSQ** | Yang 200292 |  |  | Shin 201193 | Shin 2011; Yang 2002 |  |  |  |

**Key:**

Green=Lower risk of bias

Red= High risk of bias

Black= Moderate/Uncertain risk of bias\*

\*studies which were not assessed via a formal risk of bias assessment, or that we could not determine an overall risk of bias rating based on the information presented in a review, were automatically categorised as uncertain risk of bias.

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**Appendix e-10: Deviations from protocol**

We originally intended to include non-English language reviews but were unable to sufficiently translate these to the standard required to conduct our AMSTAR-2 assessments; hence we excluded these reviews.

We added additional exclusion criteria after finding reviews specifically related to telephone-based assessment. We decided that these reviews were not priority for our review question and our search was not designed to identify all reviews of this type.

We added additional search terms to our search syntax after we found that our scoping search did not capture some broader reviews.

We decided to exclude reviews of prognostic diagnostic test accuracy as this was deemed to be a different form of testing to what we were interested in reporting on.

We used WinBugs for our analysis rather than Meta-DTA as we were not able to conduct a network meta-analysis using Meta-DTA.

We decided to present individual studies included in reviews, rather than reviews themselves, in our evidence map as we felt this presented a truer reflection of the available evidence regarding informant tool diagnostic test accuracy.

We originally intended to extract individual test level data from the data reported in each review for our network meta-analysis. However, due to frequent inconsistencies in reported numbers, we extracted data directly from the original papers themselves.

For reasons of availability and expertise, we added an additional reviewer to the risk of bias assessment and PRISMA-DTA evaluation (Robyn Duffy) and the statistical analysis was completed by Rhiannon Owen rather than Amit Patel.

Finally, we decided not to perform subgroup comparisons based on tool performance for ‘any cognitive impairment’ due to it’s similarity with that of our primary analysis (cognitive impairment, generally) or for dementia vs normal cognition due to lack of ‘real world’ clinical value this type of comparison provides.

**Appendix e-11: Example WinBUGS code for the primary analysis**

#MODEL

model {

temp.var<- id[1]

# Bivariate model

 for(i in 1:nObs){ #Loop through observations

 pos[i] <- tp[i] + fn[i]

 neg[i] <- fp[i] + tn[i]

 tp[i]~dbin(pi[i,1], pos[i])

 tn[i] ~dbin(pi[i,2], neg[i])

 logit(pi[i,1]) <- mu[i,1]

 logit(pi[i,2]) <- mu[i,2]

# Model for linear predictor

MU[i,1] <- test.sens[test[i]] + threshold.sens[test[i],threshold[i]]+ study.re.sens[s[i]] + test.re.sens[s[i],test[i]]

MU[i,2] <- test.spec[test[i]] + threshold.spec[test[i],threshold[i]] + study.re.spec[s[i]] + test.re.spec[s[i],test[i]]

# For models assuming a common correlation and heterogeneity parameter across tests

mu[i,1:2] ~ dmnorm(MU[i,], Omega[,])

}

# Back transform on to sensitivity and specificity scale

for(j in 1:ntest){ # Loop through the number of tests

 for(k in 1:thr[j]){ # Loop through the number of thresholds

 sens[j,k]<- exp(test.sens[j] + threshold.sens[j,k])/(1+exp(test.sens[j] + threshold.sens[j,k]))

 spec[j,k]<- exp(test.spec[j] + threshold.spec[j,k])/(1+exp(test.spec[j] + threshold.spec[j,k]))

 DOR[j,k]<- (sens[j,k]\*spec[j,k])/((1-sens[j,k])\*(1-spec[j,k]))

 LRpos[j,k]<- sens[j,k]/(1-spec[j,k])

 LRneg[j,k]<- (1-sens[j,k])/spec[j,k]

 }

# Priors on the fixed test and threshold effects

 test.sens[j]~dnorm(0,0.1)

 test.spec[j]~dnorm(0,0.1)

for(k in 1:thr[j]){ # Loop through the number of thresholds

 threshold.sens[j,k]~dnorm(0,0.1)

 threshold.spec[j,k]~dnorm(0,0.1)

 }

}

# Priors on the random study and test effects

 for(k in 1:ns){ # Loop through the number of studies

 study.re.sens[k]~dnorm(0,taustudysens)

 study.re.spec[k]~dnorm(0,taustudyspec)

for(l in 1:ntest){ # Loop through the number of tests

 test.re.sens[k,l]~dnorm(0,tautestsens)

 test.re.spec[k,l]~dnorm(0,tautestspec)

 }

}

 taustudysens <- pow(SDstudysens,-2)

 SDstudysens ~ dunif(0,2)

 taustudyspec <- pow(SDstudyspec,-2)

 SDstudyspec ~ dunif(0,2)

 tautestsens <- pow(SDtestsens,-2)

 SDtestsens ~ dunif(0,2)

 tautestspec <- pow(SDtestspec,-2)

 SDtestspec ~ dunif(0,2)

# For models assuming common correlation and heterogeneity parameter

# Specifying covariance matrix

 Omega[1:2,1:2] <- inverse(Sigma.sq[,])

 for(m in 1:2) {

 Sigma.sq[m,m] <- pow(sd[m],2)

 }

 for(i in 1:2) {

 for(j in (i+1):2) {

 Sigma.sq[i,j] <- rho[i,j]\*sd[i]\*sd[j]

 Sigma.sq[j,i] <- Sigma.sq[i,j]

 }

 }

# Prior on the common between-study standard deviation

 for(m in 1:2) {

 sd[m] ~ dunif(0, 2)

 }

# Spherical parameterisation to estimate correlation parameter

 for(i in 1:2) {

 for(j in (i+1):2) {

 g[j,i] <- 0

 a[i,j] ~ dunif(0, 3.1415)

 rho[i,j] <- inprod(g[,i], g[,j])

 }

 }

 g[1,1] <- 1

 g[1,2] <- cos(a[1,2])

 g[2,2] <- sin(a[1,2])

# Calculate logit sensitivity and specificity for each test/threshold combination

#Sensitivity

 dsens[1] <- test.sens[1] + threshold.sens[1,1]

 dsens[2] <- test.sens[1] + threshold.sens[1,2]

 dsens[3] <- test.sens[2] + threshold.sens[2,1]

 dsens[4] <- test.sens[2] + threshold.sens[2,2]

 dsens[5] <- test.sens[3] + threshold.sens[3,1]

 dsens[6] <- test.sens[3] + threshold.sens[3,2]

# Specificity

 dspec[1] <- test.spec[1] + threshold.spec[1,1]

 dspec[2] <- test.spec[1] + threshold.spec[1,2]

 dspec[3] <- test.spec[2] + threshold.spec[2,1]

 dspec[4] <- test.spec[2] + threshold.spec[2,2]

 dspec[5] <- test.spec[3] + threshold.spec[3,1]

 dspec[6] <- test.spec[3] + threshold.spec[3,2]

# Calculate ranks and probability best

 for(l in 1:totaltest){

# Loop through total number of test/threshold combinatons

 rksens[l]<-totaltest+1-rank(dsens[],l)

 bestsens[l]<-equals(rksens[l],1)

 rkspec[l]<-totaltest+1-rank(dspec[],l)

 bestspec[l]<-equals(rkspec[l],1)

 }

# Relating parameters back to the Rutter model

 Sigma.a <-sqrt(Sigma.sq[1,1])

 Sigma.b <- sqrt(Sigma.sq[2,2])

 Sigma.ab <- sqrt(Sigma.sq[1,2])

 beta <- log(Sigma.b/Sigma.a)

for(j in 1:ntest){ # Loop through the number of tests

 for(k in 1:thr[j]){ # Loop through the number of thresholds

 theta[j,k] <- 1/2\*(sqrt(Sigma.b/Sigma.a)\*(test.sens[j]+threshold.sens[j,k])-(sqrt(Sigma.a/Sigma.b)\*(test.spec[j]+threshold.spec[j,k])))

 lambda[j,k] <- (sqrt(Sigma.b/Sigma.a)\*(test.sens[j]+threshold.sens[j,k]))+ (sqrt(Sigma.a/Sigma.b)\*(test.spec[j]+threshold.spec[j,k]))

 }

 }

 var.theta <- 1/2\*(Sigma.a\*Sigma.b-Sigma.sq[1,2])

 var.alpha <- 2\*(Sigma.a\*Sigma.b + Sigma.sq[1,2])

}

#DATA

list(totaltest=6, ns=37, ntest=3, nObs=46)

id[] s[] test[] threshold[] tp[] fn[] fp[] tn[]

1 1 1 1 32 7 32 159

1 1 1 2 13 3 8 206

2 2 2 2 20 1 16 140

2 2 2 1 21 0 54 122

3 3 1 2 25 8 13 30

3 3 1 1 33 0 25 18

4 4 2 2 161 19 28 61

4 4 2 1 173 7 52 37

5 5 1 1 94 6 12 88

8 6 1 2 188 28 35 48

9 7 2 2 83 7 4 19

10 8 1 2 73 12 36 23

11 9 1 2 17 7 9 36

12 10 2 2 215 14 50 44

13 11 2 2 52 6 17 31

16 12 1 1 41 11 107 525

16 12 2 1 41 11 107 525

17 13 2 1 7 1 26 45

18 14 1 1 10 1 51 82

20 15 2 2 24 12 43 567

21 16 1 1 6 1 5 56

22 17 1 1 19 4 23 114

23 18 1 1 9 2 9 77

25 19 1 2 90 22 47 264

26 20 1 2 24 8 5 109

27 21 3 1 61 12 18 233

27 21 3 2 55 18 25 226

28 22 3 2 25 7 21 56

28 22 3 1 11 4 37 57

29 23 3 1 200 17 13 11

29 23 3 2 195 22 8 16

30 24 3 1 127 4 67 14

31 25 3 1 182 176 38 176

32 26 2 1 102 27 7 50

32 26 3 1 128 1 15 42

33 27 3 1 398 46 339 1232

34 28 3 2 40 4 24 241

35 29 3 2 46 1 18 12

36 30 1 2 25 30 5 122

37 31 1 2 73 32 6 4

38 32 1 2 47 2 16 17

42 33 2 1 45 11 52 210

43 34 1 1 64 26 18 52

44 35 2 1 159 47 18 238

45 36 2 1 224 56 52 222

50 37 2 1 185 23 36 417

END

thr[]

2

2

2

END