# Diagnostic test accuracy of self-reported frailty screening instruments in identifying community-dwelling older people at risk of frailty and pre-frailty: a systematic review protocol

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**Review question/objective:** The question of this systematic review is: What is the diagnostic test accuracy of self-reported frailty screening instruments among community-dwelling older people against any of the following reference standard tests: the frailty phenotype, frailty index and comprehensive geriatric assessment?

**Keywords** Community-dwelling older people; frailty; pre-frailty; self-reported frailty screening instruments

*JBI Database System Rev Implement Rep* 2017; 15(10):2464–2468.

## Background

Aging is universal and inevitable, however, there is considerable variability in the health and functional abilities of individuals of the same age due to factors such as frailty, disability and chronic disease.[1] Frailty results from a cumulative decline over multiple body systems and is commonly described as a state of decreased functional reserve and reduced resistance to stressor events.[2] This increased vulnerability results in higher rates of morbidity, health service utilization and mortality.[3] Frailty is commonly observed amongst older people, and while there is currently no broad consensus on its prevalence, a meta-analysis conducted by Collard *et al.* suggested a weighted prevalence of 10.7% among those aged 65 years and over, increasing commensurately with age.[4,5]

There are currently two main approaches to defining frailty. The first is the frailty phenotype, which describes frailty as a biologic syndrome that is present when three or more of the following five physical signs are present: unintentional weight loss, self-reported exhaustion, weakness, slow walk speed and low physical activity.[6] The alternate approach is the cumulative deficits model which incorporates both physical and psychosocial variables and defines frailty as the proportion of deficits present in the individual, represented as a frailty index.[7] Despite the differences between the methods for defining and measuring frailty, the two approaches are moderately correlated.[8]

Regardless of how it is defined, frailty is a dynamic state in which individuals may move between non-frail and at-risk states, and a number of interventions have been identified which may potentially reverse or prevent frailty.[3,9] Screening for frailty in the primary care setting has been highlighted as an important component in the management of older adults to ensure that they receive timely and appropriate interventions.[9] Despite calls for widespread frailty screening of persons within the study age group, and the existence of a range of frailty measures, there is not yet a standard approach to screening for frailty.[10] One of the key challenges in frailty screening is to identify tools with high sensitivity to ensure frail individuals are correctly identified, and with high specificity to correctly diagnose non-frail individuals, so as to avoid unnecessary assessment and potential stress to patients.[11]

A number of studies have investigated the suitability of frailty screening measures and have highlighted that the different conceptual approaches and methods affect prevalence and accuracy, making comparison between instruments difficult.[12,13] Furthermore, high false positive rates, limited discriminative capability, and the limited quality of psychometric properties of different instruments mean that frailty screening is an emerging area of clinical practice.[14-16]

The use of self-report measures is another important element in frailty screening as physical measurement of frailty in the clinical setting is potentially time-consuming, and it is difficult to incorporate a comprehensive geriatric assessment into routine primary care.[12,13] Identification of a suitable, simple, self-report screening tool that reliably identifies frailty and allows referral for a more detailed assessment may avoid costs and unnecessary assessment.[10,13] The potential value of self-report measures of frailty in the primary care setting is strengthened by the finding that self-report and test-based measurement identify similar frailty characteristics.[17]

A number of systematic reviews have investigated the suitability of a variety of frailty screening measures for use in the primary care setting, however, these have focused on the performance of a combination of self-report and test-based measures.[13-15,18] A preliminary search of *JBI Database of Systematic Reviews and Implementation Reports*, The Cochrane Library, PROSPERO, PEDro, PubMed, PsycINFO, CINAHL, Scopus, Web of Science and Embase identified no listed systematic reviews either published or currently in progress investigating the diagnostic test accuracy of frailty self-report measures.

## Inclusion criteria
### Types of participants
Participants will be community-dwelling older people, defined as either being of a mean age in a study population of 65 years and over, or at least half of the study participants being aged 65 years and over. Studies in which participants have been recruited from hospitals but self-report measures have been used in a community setting will be included. Studies including participants who have been resident in a residential care facility (long-term care or nursing home) will be excluded.

### Index test
The index tests for this review will be all currently available, diagnostic tests intended to identify frailty using self-report measures. Some examples of these self-report frailty instruments include the Reported Edmonton Frail Scale[19] and the Kihon Checklist.[20]

### Reference standards
The reference standards for this review will be the Frailty Phenotype,[6] the Frailty Index[7] and/or Comprehensive Geriatric Assessment.[21]

### Diagnosis of interest
The diagnosis of interest is presence of frailty or pre-frailty.

### Types of studies
This review will consider all observational, cross-sectional studies assessing the diagnostic test accuracy of self-reported frailty screening instruments against one or more of the specified reference standards. It will include studies in which the self-report frailty instrument has been completed by a family member or nominated person on behalf of the older person as well as studies where the older person has completed the instrument himself/herself.

## Search strategy
The search strategy aims to find both published and unpublished studies. The search strategy will use MeSH (Medical Subject Headings) terms and relevant keywords and will be adapted as appropriate to each database.

A three-step search strategy will be utilized in this review. An initial limited search of MEDLINE and CINAHL will be undertaken, followed by analysis of the key text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. Only studies published in English will be considered for inclusion in this review. In terms of timeframe, only studies published from 1 January 2000 to the present will be considered for inclusion in this review. This date has been selected as both the physical phenotype and accumulated deficits models of frailty were first published in 2001.

The databases to be searched will include MEDLINE/PubMed, PEDro, Embase, PsycINFO, CINAHL, Scopus and Web of Science.

Searches for unpublished studies will be performed using ProQuest (Dissertations), Open Grey and The Grey Literature Report database. Research centres with a focus on gerontology will also be identified via a keyword search and expert consultation, and their websites examined for additional studies of interest.

Initial keywords to be used will be:
1. Search for frailty: frail* OR prefrail*
2. Search for self-report: self-report*, diagnostic self-evaluation, postal, self-diagnos*, survey*, questionnaire*, reported, self-assess*, self-test*, OR self-admin*
3. Search for screening tools: screen*, instrument*, tool*, OR index
4. Search for specific screening tools: eg Kihon Checklist OR Reported Edmonton Frail Scale

Items 1, 2 and 3 will be joined with search operator AND item 4 to be joined to 1–3 with OR.

## Assessment of methodological quality

Quantitative papers selected for retrieval will be assessed by two independent reviewers (RA and MT) for methodological validity prior to inclusion in the review using the JBI Critical Appraisal Checklist for Diagnostic Test Accuracy Studies[22] in association with the QUADAS 2 (Quality Assessment of Diagnostic Accuracy Studies) tool.[23] Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer (TS).

## Data extraction
### Data management
Initial literature search results will be compiled by one reviewer (RA) and uploaded to Mendeley Reference Manager (Mendeley Ltd., Elsevier, Netherlands) to aid in the process of removing duplicates. A final unique list of studies, along with abstracts, will be exported to Microsoft Excel, where the first stage of the selection and screening of studies will take place.

## Selection process

In order to select studies for inclusion, two reviewers (RA and MT) will review the literature search results independently in a two-step process. In the first step, the titles and abstracts will be reviewed for eligibility against the inclusion criteria. In the second, the full text of the articles will be obtained and reviewed for consideration of inclusion. A record will be kept of the reason for exclusion against each study. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer (MC) where appropriate. Study authors will be contacted should additional information be required.

### Data items
Quantitative data will be extracted from papers included in the review by two independent reviewers (RA and MT) using the standardized data extraction tool from the Joanna Briggs Institute (JBI),[22] which incorporates most elements of the STARD (Standards for Reporting of Diagnostic Accuracy) checklist, and entered into a standardized template within Microsoft Excel. Calibration exercises will be conducted prior to commencement of the extraction to ensure a consistent approach across reviewers. The data extracted from each eligible study will include specific details about the populations, index and reference tests, study methods, index test results and outcomes of significance to the review question. Study authors will be contacted for additional information where necessary to resolve any outstanding issues or ambiguities.

## Data synthesis

Graphic representation of the results of the systematic review will take the form of forest plots showing sensitivity and specificity for the primary studies included in the review. We will report the number of true positives, false positives, true negatives and false negatives in tabular format.

A sub-group analysis will be used to compare the diagnostic capabilities of the tests, diagnostic capabilities based on significant covariates identified in the included studies. For example, a study may report results separately for different patient age groups, gender or testing conditions.

With regard to meta-analysis, the study will adopt this basic approach as outlined in the relevant JBI literature:[22] if the same threshold is used through the primary studies, then we will estimate the summary sensitivity/specificity. If it is determined that different thresholds have been used, then we will produce a summary receiver operating

characteristic (SROC) curve and estimate the summary sensitivity/specificity for the different thresholds used in the articles.

The model used to perform the meta-analysis will be the Bivariate Model,[24] a hierarchical model recommended by the Cochrane Handbook.[25] The review team will follow the approach reported in Romano et al.[26] and use the Stata "metandi" command to compute the summarized data.

Heterogeneity between studies will be initially assessed with reference to the graphical representation of results outlined above and explored using subgroup analyses based on the different quantitative study designs included in this review. Where the extent of heterogeneity cannot be explained, the findings will be presented in a narrative form including tables and figures to aid in data presentation where appropriate.

## Acknowledgements

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