Canadian Journal on Aging / La Revue canadienne du vieillissement

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Detecting Anxiety in Long-Term Care Residents: A Systematic Review

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Article

Cite this article: Atchison K, Shafiq S, Ewert D, Leung AA, & Goodarzi Z. (2023). Detecting Anxiety in Long-Term Care Residents: A Systematic Review. *Canadian Journal on Aging / La Revue canadienne du vieillissement* **42**(1), 92–101.
https://doi.org/10.1017/S0714980822000101

Received: 22 January 2021
Accepted: 21 December 2021

Mots-clés:
vieillissement; anxiété; détection; soins de longue durée

Keywords:
aging; anxiety; detection; long-term care

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Résumé

L'anxiété est fréquemment observée dans les centres de soins de longue durée (CSLD). Cependant, la précision des outils pour sa détection n'a pas encore été comparée à une norme de référence chez les résidents des CSLD. Quatre bases de données et des sources de littérature grise ont été consultées en utilisant les mots-clés "anxiety" (anxiété) et "LTC" (CSLD). Les études incluses ont évalué la précision diagnostique d'outils de détection de l'anxiété par rapport à une norme de référence chez des résidents de CSLD. Les mesures de précision diagnostique pour ces études ont été extraites. Quatre articles parmi les 4,620 recensés répondaient aux critères d'inclusion. Malgré les données limitées et certains manques dans la documentation des méthodes et des caractéristiques d'étude, le *Geriatric Anxiety Inventory* (sensibilité: 90.0%, spécificité: 86.2%) et le *Hospital Anxiety and Depression Scale-Anxiety* (sensibilité: 90.0%, spécificité: 80.6%) présentent les meilleurs résultats pour la détection du trouble anxieux généralisé. Cette étude a montré que quatre outils pour la détection de l'anxiété sont appropriés en CSLD, ce qui constitue une première étape essentielle pour assurer le diagnostic et la gestion de l'anxiété chez les résidents des CSLD. Les troubles anxieux non généralisés et la faisabilité des outils nécessitent toutefois de plus amples études.

Abstract

Anxiety is common in long-term care (LTC), but it is unclear which anxiety detection tools are accurate when compared to a reference standard for residents of LTC. Four databases and grey literature sources were searched using the search concepts "anxiety" and "LTC". Included studies evaluated the diagnostic accuracy of an anxiety detection tool compared to a reference standard in LTC residents. Diagnostic accuracy measures were extracted. Four articles out of 4,620 met the inclusion criteria. Despite limited evidence and poorly reported study procedures and characteristics, the Geriatric Anxiety Inventory (sensitivity: 90.0%, specificity: 86.2%) and the Hospital Anxiety and Depression Scale-Anxiety (sensitivity: 90.0%, specificity: 80.6%) had the best performance when detecting generalized anxiety disorder. We identified four anxiety detection tools appropriate for use in LTC; a critical first step to diagnosing and managing anxiety in residents of LTC. Non-generalized anxiety disorders and tool feasibility must be further evaluated.

Introduction

There is limited evidence informing the detection of anxiety in older adults, with even less evidence available for those living in long-term care (LTC) (Therrien & Hunsley, 2012). LTC, also known as "nursing homes", "continuing care", or "residential care homes" provide 24-hour nursing support to residents with complex medical or physical needs (Canadian Institute for Health Information, 2021). In Alberta, the average age in LTC was reported to be 82.5, the majority of residents were female, and 59 per cent of residents had a diagnosis of dementia (Alberta Health Continuing Care, 2018). Prevalence estimates of anxiety symptoms and disorders in LTC are wide ranging, but are as high as 58.4 per cent for anxiety symptoms and 20 per cent for anxiety disorders (Creighton, Davison, & Kissane, 2016). Other common conditions such as dementia and depression impact 69 per cent and 44 per cent of residents of LTC, respectively (Canadian Institute for Health Information, 2010; Canadian Institute for Health Information, 2018). Anxiety in residents of LTC has been associated with increased suffering and negative health outcomes, including reduced levels of functioning, reduced well-being, and increased health service use (Lenze, 2003; Smalbrugge et al., 2006).

Anxiety in residents of LTC can be difficult to detect because of the medical complexity, frailty, and symptom overlap with prevalent co-morbidities such as dementia and depression

(Ballard et al., 2000; Fuentes & Cox, 1997; Seignourel, Kunik, Snow, Wilson, & Stanley, 2008). Because of the difficulties in detecting anxiety, residents of LTC may be at increased risk of experiencing the effects of unrecognized and untreated anxiety. Anxiety detection tools are often used to detect anxiety symptoms, but it is not clear which tool to use in the LTC population.

Commonly used anxiety detection tools for older adults have been identified, but the majority lack psychometric evidence for use in the older adult population and clinically relevant cut-off scores (Therrien & Hunsley, 2012). A systematic review identified 22 tools that have been used to detect anxiety in the LTC population (Creighton, Davison, & Kissane, 2018a). Although psychometrics specific to the identified tools were collected, the diagnostic performance of the identified tools was not compared to a reference standard. Without comparing a tool's diagnostic performance to a reference standard, the diagnostic accuracy, or the ability of the tool to detect true cases of anxiety within a specific population, cannot be evaluated. The lack of synthesized evidence of rigorous diagnostic accuracy studies for anxiety within LTC highlights a gap in knowledge as to which anxiety detection tools are supported for use with the LTC population, demonstrated through validation studies that utilize a reference standard.

To assess the diagnostic accuracy of tools to detect anxiety, the performance of the anxiety detection tool must be compared to a reference standard that is used to accurately define the target condition (Leeflang, 2014). Our research objective was to identify anxiety detection tools that have been evaluated using a reference standard, and to determine which tools are most effective at detecting anxiety disorders or symptoms in residents of LTC. The findings from this systematic review may improve the ability of practitioners to detect anxiety in residents of LTC. Time and treatment resources may also be better utilized through an understanding of which anxiety detection tools are most accurate for use in the LTC population. Through increased detection of anxiety, residents of LTC may have increased access to appropriate treatment options which may then improve the health of residents downstream.

Methods

Search Strategy

The initial search strategy was developed by K.A., S.S., and Z.G. A health sciences librarian reviewed and edited the search strategy to ensure appropriate database, keyword, and controlled vocabulary selection. Four electronic databases (MEDLINE®, Embase, PsycINFO, and the Cochrane Database of Systematic Reviews) were searched to identify literature relevant to the research objective. In addition to the electronic databases, grey literature sources including general (e.g., Google Scholar) and theses (e.g., Open Access Theses and Dissertations) databases, as well as Web sites of relevant organizations, were searched using the keyword search terms anxiety and LTC (Appendix I). The systematic review was registered with PROSPERO (CRD42020155206).

The two search concepts used were anxiety and LTC. The keywords and the controlled vocabulary (MeSH, Emtree, and PsycINFO terms) were combined within each concept using "OR". The two search concepts were then combined using "AND". No search filters or limits to language, year of publication, or publication status were applied to the search. The MEDLINE search strategy is reported in Appendix I.

Inclusion Criteria

At the level of title/abstract, included literature had to detail individuals residing in LTC who were screened or assessed for anxiety symptoms or disorders. At the level of full text, included literature had to be primary research, detail the use of a tool to detect anxiety (i.e., any tool, measure, questionnaire, or scale used to detect anxiety), and compare the anxiety detection tool to a reference or gold standard method of anxiety detection (i.e., clinical interview, *Diagnostic and Statistical Manual of Mental Disorders [DSM]* criteria, or International Classification of Diseases [ICD] criteria). The reference lists of included studies were hand searched. Google translate was used to screen any non-English articles.

Study Selection

A Population, Index Tool(s), Reference Tool(s), Diagnosis (PIRD) statement was used to articulate the inclusion criteria for the review (Munn, Stern, Aromataris, Lockwood, & Jordan, 2018). The population of interest was adults 65 years of age and older, of any cognitive status, residing in LTC settings. Given the range in cognitive status in LTC, it is useful to look at the population as a whole and not only at those with dementia to obtain a more complete understanding of which anxiety detection tools might be useful to the broader population in LTC. Anxiety detection tools were described as tools or questionnaires used to detect anxiety disorders or symptoms of anxiety. Anxiety detection tools could include co-morbidity-specific tools (e.g., Rating Anxiety in Dementia [RAID] scale [Shankar, Walker, Frost, & Orrell, 1999]), population-specific tools (e.g., Geriatric Anxiety Inventory [GAI] [Pachana et al., 2007], Geriatric Anxiety Scale [Segal, June, Payne, Coolidge, & Yochim, 2010]), or other neuropsychiatric tools that measured anxiety or included anxiety items as part of global measures (e.g., Neuropsychiatric Inventory [Cummings et al., 1994]). The reference standard was used to evaluate the diagnostic accuracy of the anxiety detection tool. Reference standards, also called "gold standards", had to be a set of criteria used by clinicians to diagnose anxiety symptoms or disorders. There is no single reference standard method for anxiety detection in older adults, therefore, the *DSM* criteria, the ICD criteria, or a clinical diagnosis by a health care practitioner were considered acceptable methods for anxiety diagnosis (American Psychiatric Association, 2013; World Health Organization, 2004). Clinical diagnoses included the use of clinical interviews based on the *DSM* or ICD criteria (e.g., Structural Clinical Interviews for *DSM* [SCID] or Schedules for Clinical Assessment in Neuropsychiatry [SCAN]). The outcome of interest was the diagnostic accuracy of the anxiety detection tool as compared to the reference standard.

Following the removal of duplicates, all citations were independently reviewed by two reviewers at the level of title/abstract. All literature that met the inclusion criteria at the level of title/abstract was then reviewed at the level of full text in duplicate. Disagreements between reviewers were resolved through discussion at the level of title/abstract screening, and by a third reviewer at the level of full text. Literature was screened and data from included studies were extracted between September and November 2019. After adequate agreement was established with the first 50 articles, reviewers evaluated consensus every 500 articles at the level of title/abstract and every 50 articles at the level of full text.

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Data Extraction

Included studies had all relevant data extracted independently by two reviewers using a standardized data extraction form. Data extracted from studies included: the study authors, year of publication, country of origin, anxiety detection tool or questionnaire, reference standard, population characteristics, cognitive assessment tool used, cognitive status of participants, LTC setting characteristics (e.g., level of care provided, funding model), co-morbidities/diagnoses, and tool administrator. The reported outcomes of diagnostic accuracy extracted for each cited anxiety detection tool included: true positives, true negatives, false positives, false negatives, sensitivity, specificity, predictive values, likelihood ratios, area under the curve, and the prevalence of anxiety.

Risk of Bias Assessment

The risk of bias assessment addressed concerns of the applicability of each study to the review question and concerns of bias within domains specific to the study population, anxiety detection tool, reference standard, and flow and timing of the study. The risk of bias assessment for all included studies was completed independently in duplicate using the Quality Assessment for Diagnostic Accuracy Studies-2 (QUADAS-2) tool (Whiting et al., 2011). The QUADAS-2 tool was selected to account for blinding, verification bias, and spectrum bias. Each domain was assessed to have an overall low, unclear, or high risk of bias based on questions within the domain. For example, the three questions (1) was a consecutive or random sample of patients enrolled; (2) was a case-control design avoided; and (3) did the study avoid inappropriate exclusions, were used to assess an overall level of bias within the domain of patient selection for each study (Whiting et al., 2011). Any conflict among reviewers in the risk of bias assessment was discussed and resolved by reviewers.

Data Synthesis and Analysis

A descriptive synthesis of the systematic review findings was completed. The diagnostic anxiety detection tool and reference standard findings were reported in tabular format. The sensitivity, specificity, and likelihood ratios were collected for each tool at each reported cut-off point. There were limited studies per anxiety detection tool; therefore, combined analyses were not pursued. Diagnostic accuracy outcomes were not plotted on the receiver operating characteristic (ROC) space nor was a summary estimate generated. With only two studies per anxiety detection tool, the heterogeneity among studies made combined analyses inappropriate, as the statistical models for such analyses are not accurate. All findings from this systematic review were reported in adherence to the Preferred Reporting Items for a Systematic Review and Meta-analysis of Diagnostic Test Accuracy (PRISMA-DTA) studies checklist (McInnes et al., 2018).

Results

Study Selection

A total of 4,620 articles were returned from the four databases searched. After the removal of duplicates, 3,464 articles were screened at the level of title/abstract. A total of 167 articles were reviewed in full text, with four articles meeting the inclusion criteria and being included in the final descriptive synthesis. An additional 1,018 records from grey literature sources and reference lists of included articles were reviewed at the level of title/abstract but none met inclusion for full text review. Web sites of relevant organizations were searched with no relevant records identified.

The greatest number of articles were excluded at the level of full text because of the absence of a reference tool when assessing for anxiety using an anxiety detection tool ($n = 82$). Other reasons for exclusion at the level of full text included the study population not being residents of LTC ($n = 21$) or the absence of an anxiety detection tool or anxiety assessment (e.g., global measures of mood) ($n = 20$). All other reasons for full text exclusion are reported in Figure 1.

Characteristics of Included Studies

The study and participant characteristics of the four included studies are summarized in Table 1. All studies were published between 2008 and 2019. Studies originated from either Australia, Norway, or the Netherlands (Boddice, Pachana, & Byrne, 2008; Creighton, Davison, & Kissane, 2019; Dozeman et al., 2011; Goyal, Bergh, Engedal, Kirkevold, & Kirkevold 2017). LTC settings included nursing homes ($n = 2$) and residential care homes ($n = 2$), with multiple locations being included within the analysis of each study. Residential care homes were reported to provide daily care to residents over the age of 65 and a lower level of care than that provided by nursing homes, according to one study (Dozeman et al., 2011), whereas another study used the term "residential aged care facilities" to refer to nursing homes, assisted living, LTC/residential homes, and hostels (Creighton et al., 2019). No further information on the level of care within the settings of included studies was provided. The sample size of included studies ranged between 27 and 277 participants with a combined total of 585 participants from all studies. Females made up between 63 and 78.2 per cent of study participants. The mean age of participants ranged from 82.8 to 86 years of age. Information about the co-morbidities of the study participants was absent from all studies. The mean Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) score of participants, a measure of cognitive function, was reported by three studies (Boddice et al., 2008; Creighton et al., 2019; Goyal et al., 2017). The mean MMSE scores and standard deviations were found to be 24(4.1), 24.7(3.6), and 14(5.6) indicating samples with both mild and moderate levels of cognitive impairment (Boddice et al., 2008; Creighton et al., 2019; Goyal et al., 2017). The prevalence of diagnosed anxiety ranged from 6.5% to 27.7%. Two studies investigated GAD as the outcome of interest (Creighton et al., 2019; Goyal et al., 2017), one study assessed for *DSM*-IV defined anxiety disorders (Boddice et al., 2008), and the remaining study separately assessed for GAD and anxiety disorders inclusive of GAD, panic disorder, social phobia, and agoraphobia (Dozeman et al., 2011).

Risk of Bias Assessment

The complete risk of bias assessment is reported in Table 2. There were no concerns related to applicability to the research question in the four included studies. One study had a low risk of bias across all four domains (Goyal et al., 2017). The remaining three studies had unclear ratings for anxiety detection tool and reference standard categories (Boddice et al., 2008; Creighton et al., 2019; Dozeman et al., 2011). The unclear ratings were a result of inadequate reporting on who administered the anxiety detection and reference tools and whether or not the tool administrator was blinded to the

https://doi.org/10.1017/S0714980822000101 Published online by Cambridge University Press

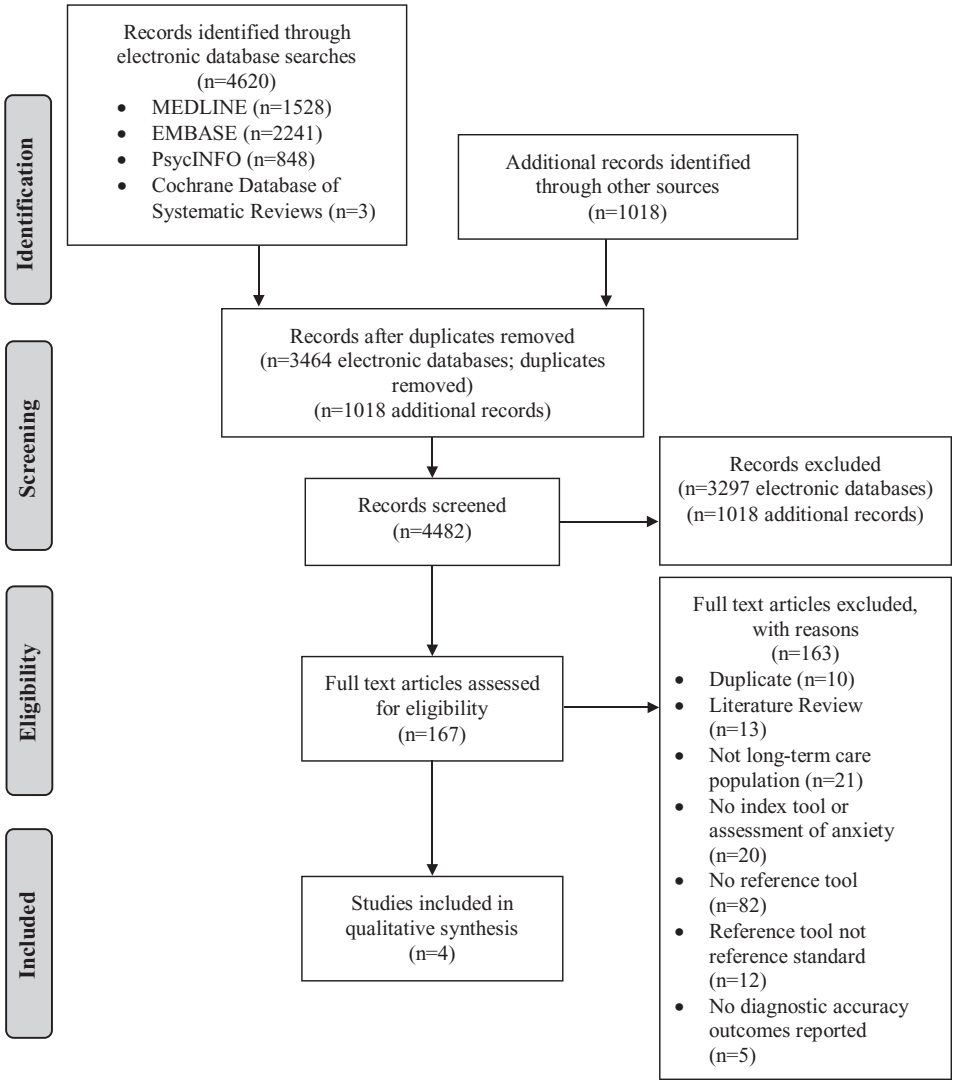

Figure 1. PRISMA flow diagram of the study review process

results of the other tool. One study also scored a high risk of bias in patient selection because of participant exclusions for reference standard testing and analysis. Specifically, only participants with a Center of Epidemiologic Studies Depression Scale (CES-D) tool score above the cut-off of 8, indicating a suspected depressive or anxiety disorder, were tested using the reference standard (Dozeman et al., 2011).

Anxiety Detection Tools and Reference Standards

Four anxiety detection tools were identified from the four included studies (Table 3). Three studies reported on the use of only one tool (Boddice et al., 2008; Dozeman et al., 2011; Goyal et al., 2017), whereas one study reported on the use of three different tools, all in comparison to a single reference standard (Creighton et al., 2019). Two studies investigated the diagnostic accuracy of the Geriatric Anxiety Inventory (GAI) (Boddice et al., 2008; Creighton et al., 2019). Two studies looked at the Rating Anxiety in Dementia (RAID) scale. One study each looked at the English and Norwegian versions of the RAID scale (Creighton et al., 2019; Goyal et al., 2017). The diagnostic accuracy of the CES-D and Hospital Anxiety and Depression Scale-Anxiety (HADS-A) were each investigated by one study (Creighton et al., 2019; Dozeman et al., 2011).

The number of cut-offs reported per tool ranged from one to seven. Three studies reported the diagnostic accuracy of the anxiety detection tool(s) using multiple cut-offs. The cut-offs tested in the three studies were not pre-specified but did include the tool's original recommended cut-off. Study authors identified an optimal threshold when multiple cut-offs were reported (Table 4). Optimal cut-offs were defined by a sensitivity and specificity above 80 per cent and 60 per cent, respectively (Creighton et al., 2019); a sensitivity above 80 per cent (Dozeman et al., 2011); and the highest sensitivity (Goyal et al., 2017).

Two studies reported on RAID and identified $\geq$ 11 as the optimal cut-off with sensitivities of 85.0 per cent and 85.7 per cent (Creighton et al., 2019; Goyal et al., 2017). Although the sensitivities were similar, one study reported a higher specificity at the $\geq$ 11 cut-off (Creighton et al., 2019). Additionally, two studies reported on the GAI and either examined the GAI at only the $\geq$ 9 cut-off or identified the $\geq$ 9 cut-off as optimal, which produced sensitivities of 80.0 per cent and 90.0 per cent (Boddice et al., 2008; Creighton et al., 2019).

https://doi.org/10.1017/S0714980822000101 Published online by Cambridge University Press

Table 1. Sample and study characteristics of the included studies

Author, Year, Country	Anxiety Type	Index Tool	Reference Tool	*n*	Age Mean (SD)	Prevalence of Anxiety (%)	LTC Setting	Female (%)	MMSE Mean (SD)	Reported Symptom Assessment Rater
Boddice, Pachana, & Byrne, 2008, Australia	Anxiety Disorders[a]	GAI	CIDI 2.1	27	82.8 (8)	18.5	Small, private, family run nursing homes	63	24 (4.1)	Unclear
Creighton, Davison, & Kissane, 2019, Australia	GAD	GAI (20 items) HADS-A (7 items) RAID (20 items)	MINI	180	85.4 (7.4)	11.1	12 residential aged care facilities	66.7	24.7 (3.6)	Unclear
Dozeman et al., 2011, The Netherlands	GAD, Anxiety Disorders[b]	CES-D (20 items)	MINI	277	84.6 (7.2)	6.5,10.8	14 residential homes	73.6	Not Reported	Unclear
Goyal, Bergh, Engedal, Kirkevold, & Kirkevold, 2017, Norway	GAD	RAID-N	*DSM*-5	101	86 (6.5)	27.7	7 nursing homes	78.2	14 (5.6)[c]	Resident's primary nurse (RAID-N) Clinician (GAD diagnosis)

Note. CES-D = Center for Epidemiologic Studies Depression Scale; CIDI = Composite International Diagnostic Interview; *DSM*-5 = *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*; GAD = generalized anxiety disorder; GAI = Geriatric Anxiety Inventory; HADS-A = Hospital Anxiety and Depression Scale-Anxiety Subscale; LTC = long-term care; MINI = Mini-International Neuropsychiatric Interview; MMSE = Mini-Mental State Examination; *n* = sample size; RAID = Rating Anxiety in Dementia Scale; RAID-N = Rating Anxiety in Dementia Scale-Norwegian version; SD = standard deviation

[a]Anxiety disorders defined using DSM-IV include: GAD, obsessive-compulsive disorder, panic disorder (with or without agoraphobia), post-traumatic stress disorder, and social anxiety disorder.

[b]Anxiety disorders included one or more of the following: GAD, panic disorder, social phobia, agoraphobia.

[c]Mini-Mental State Examination-Norwegian Revised 2 (MMSE-NR2) used to assess 94 of 101 patients.

Table 2. Risk of bias and applicability assessment of included studies using the QUADAS-2 tool

Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2)			Boddice et al., 2008	Creighton et al., 2019	Dozeman et al., 2011	Goyal et al., 2017
Domain 1 Patient Selection	Risk of bias	Could the selection of patients have introduced bias?	Low	Low	High	Low
	Applicability concerns	Is there concern that the included patients do not match the review question?	Low	Low	Low	Low
Domain 2: Index Tool	Risk of bias	Could the conduct or interpretation of the index tool have introduced bias?	Unclear	Unclear[a]	Unclear	Low
	Applicability concerns	Is there concern that the index tool, its conduct, or interpretation differ from the review question?	Low	Low[a]	Low	Low
Domain 3: Reference Standard	Risk of bias	Could the reference standard, its conduct, or its interpretation have introduced bias?	Unclear	Unclear	Unclear	Low
	Applicability concerns	Is there concern that the target condition as defined by the reference standard does not match the review question?	Low	Low	Low	Low
Domain 4: Flow and Timing	Risk of bias	Could the patient flow have introduced bias?	Unclear	Low	High	Low

Note. Unclear indicates that sufficient information to support a definitive answer of yes/no was not reported in the study.
[a]Applies to all three index tools (Geriatric Anxiety Inventory [GAI], Hospital Anxiety and Depression Scale-Anxiety Subscale [HADS-A], Rating Anxiety in Dementia Scale [RAID]) reported by Creighton et al. (2019).

The study that used the CES-D tool identified an optimal cut-off of ≥ 18 for the detection of both GAD and anxiety disorders in the LTC population (Dozeman et al., 2011). In the study that looked at three different tools, the GAI appeared to have the best balance of sensitivity and specificity at the optimal cut-off; however, both the GAI and HADS-A had sensitivities of 90.0 per cent at the author identified optimal cut-offs (Creighton et al., 2019). In the studies that provided diagnostic accuracy data at more than one cut-off, lower cut-offs that produced high sensitivities and adequate specificities were generally selected as optimal for use in the LTC population.

All reference tools used in the four included studies were based on or derived from the *DSM*, which was considered a reference standard method for detecting anxiety. One study used the Composite International Diagnostic Interview (CIDI) 2.1, which is a structured clinical interview based on the *DSM*-IV (Boddice et al., 2008). Two studies used the Mini-International Neuropsychiatric Interview (MINI), a diagnostic interview that uses *DSM*-5 and ICD-10 criteria (Creighton et al., 2019; Dozeman et al., 2011). The final study used a clinical interview based on *DSM*-5 criteria (Goyal et al., 2017).

Discussion

We identified four tools (RAID, GAI, HADS-A, and CES-D) used to detect anxiety in residents of LTC, which were validated using a reference standard. There was a high degree of clinical heterogeneity among the four included studies that limited direct comparisons among studies. Results from the included studies found that most tools performed similarly with respect to sensitivity. The limited findings indicate that there remains an evidence gap as to which anxiety detection tool and corresponding cut-off is best for use in the LTC population.

The GAI (cut-off ≥ 9) and HADS-A (cut-off ≥ 6) appeared to have the best sensitivity (both 90%) while maintaining acceptable specificity for detecting GAD in the LTC population (Creighton et al., 2019). The performance characteristics of the GAI may have been dependent upon the condition of interest, as a lower sensitivity but higher specificity was reported when identifying anxiety disorders at the same cut-off (Boddice et al., 2008).

To maximize sensitivity for screening purposes, the studies that tested the RAID scale recommended a cut-off of ≥ 11 (sensitivity [SN]: 85.0% and 85.7%), aligned with what is suggested by the original scale, however, these sensitivities were lower when compared with other tools (Creighton et al., 2019; Goyal et al., 2017; Shankar et al., 1999). A cut-off of ≥ 12 (SN: 82.1%) was also recommended for the RAID scale to optimize clinical utility with high sensitivity and moderate specificity (Goyal et al., 2017). The studies that tested the GAI either tested the previously recommended cut-off of ≥ 9 (SN: 80.0%) (Boddice et al., 2008) or found the cut-off of ≥ 9 (SN: 90.0%) to be the optimal threshold with maximized sensitivity and specificity (Creighton et al., 2019). When the HADS-A was tested, a cut-off of ≥ 6 (SN: 90.0%) was recommended for screening purposes in residents of LTC, which is lower than the recommended threshold for the tool (Creighton et al., 2019; Zigmond & Snaith, 1983). To detect GAD, the study that used the CES-D recommended a cut-off of ≥ 18 (SN: 88.9%), compared with the recommended cut-off of ≥ 16 used for depressive symptoms (McQuaid, Stein, McCahill, Laffaye, & Ramel, 2000; Sawyer Radloff & Teri, 1986).

All studies reported optimal cut-offs, which were those with high sensitivity and specificity. The optimal cut-offs were often selected over those producing the highest sensitivity. Maintaining a high sensitivity, or detecting most true cases of anxiety, is important for initiating treatment and decreasing anxiety morbidity. The high prevalence of anxiety in LTC may justify the use of a detection tool, as identifying cases of anxiety in residents may prove effective in benefiting residents' quality of life and caregiver resources.

The included studies provided limited descriptions of the feasibility of the tools or their ease of use in the LTC setting. The RAID and GAI tools were constructed specifically to detect anxiety in the older adult population (Pachana et al., 2007; Shankar et al., 1999). Three tools (RAID, HADS-A, and CES-D) were identified as appropriate for use in detecting anxiety in the presence of comorbidities (Creighton et al., 2019; Dozeman et al., 2011; Goyal

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Table 3. Description of index tools identified from the included studies based on the original publications

Index Tool	Rater	Items	Recommended Cut-off and Population from Original Publication	Type of Symptoms Assessed	Answer Type	Copyright & Availability
Center for Epidemiologic Studies Depression scale (CES-D)	Self-rated	20 items	≥ 16 from a total score of 60 (general population)	Depressive symptoms	Likert scale; based on occurrence of symptoms in past week	Not copyrighted; available in original article
Geriatric Anxiety Inventory (GAI)	Self- or proxy-rated	20 items	10/11 from a total score of 20 (community dwelling older adults; psychogeriatric patients)	General anxiety symptoms (dimensional anxiety)	Dichotomous; based on occurrence of symptoms in past week	Not copyrighted; available under license
Hospital Anxiety and Depression scale-Anxiety (HADS-A)	Self-rated	7 items	7/8 from a total score of 21	Presence and severity of anxiety symptoms; excludes somatic symptoms	Likert scale; ranging from 0 to 3	Copyrighted; manual available
Rating Anxiety in Dementia (RAID)	Clinician-rated based on resident, caregiver, medical notes	20 items	≥ 11 from a total score of 54 (inpatients and day-hospital patients with dementia)	Anxiety including: worry, apprehension, vigilance, autonomic hypersensitivity, phobias, panic attack symptoms	Likert scale; occurrence of symptoms in past 2 weeks	Not copyrighted; available in original article

et al., 2017). The RAID scale is a tool used to screen for anxiety and has evidence of validity in detecting GAD in those with dementia (Shankar et al., 1999). It was suggested that the RAID scale, although comprehensive in its account of the resident, caregiver, and provider perspectives may prove to be too consuming for use as a screening tool in LTC (Creighton et al., 2019; Goyal et al., 2017). The GAI is a brief measure of anxiety severity that may be applicable in the LTC setting given its ease of use. The HADS is a screening tool for the detection of anxiety and depression symptoms with a dedicated subscale for anxiety. It was noted that the low internal reliability and the limited ability of the HADS-A to capture GAD symptoms may restrict the use of this tool in the LTC setting (Creighton et al., 2019). Previous research has found older adults to be more likely than those in younger age groups to present with symptoms of both anxiety and depression (Parmelee, Katz, & Lawton, 1993). The CES-D was suggested to be a method to detect both depression and anxiety in those living in LTC, despite the tool's original purpose to screen for symptoms of depression (Dozeman et al., 2011; McQuaid et al., 2000; Sawyer Radloff & Teri, 1986).

The diagnostic accuracy outcomes and quality assessment of the included studies facilitate an understanding of the applicability and feasibility of tool use in the LTC setting. The majority of the tools used were aimed at detecting GAD, which is aligned with the high prevalence of GAD in the LTC population (Creighton, Davison, & Kissane, 2018b). Although not identical, all reference tools used across included studies were based on *DSM* criteria (Boddice et al., 2008; Creighton et al., 2019; Dozeman et al., 2011; Goyal et al., 2017). The common use of the *DSM* allowed for a degree of consistency in the reported prevalence of anxiety disorders amongst included studies. Established reference standard criteria such as the *DSM* were not created specifically for persons living in LTC; therefore, population-specific characteristics including common co-morbidities and the prevalence of anxiety must be considered when applying such criteria (Bryant et al., 2013; Shead, Rodriguez, Dreeben, & McBride, 2021). The findings from this review identified that most anxiety detection tools were used for the detection of GAD or, more generally, anxiety disorders. Following GAD, agoraphobia and other specific phobias are frequently reported in LTC (Creighton et al., 2018b). Future studies looking at detecting anxiety in LTC may aim to investigate the diagnostic accuracy of anxiety detection tools that are used to detect agoraphobia and other specific anxiety disorders. Additionally, future studies may aim to determine the utility of tools for detecting clinically relevant anxiety symptoms in persons with anxiety symptoms not meeting the established criteria for an anxiety disorder using a given tool.

The included studies were found to be highly variable in clinical heterogeneity and study quality, therefore limiting the ability to generate a summary estimate. Two studies each reported on the GAI and RAID scale, which was insufficient for meta-analysis comparisons. Baseline characteristics of the study populations, such as age, sex, and MMSE scores, varied among studies. Previous research has found cognitive impairment, depression, pain, and visual and other functional impairments, as well as higher education to be related to increased risk of anxiety symptoms (Smalbrugge, Pot, Jongenelis, Beekman, & Eefsting, 2005). Factors such as co-morbidities, length of stay in LTC, medication use, previous diagnoses, and indexes of frailty and activities of daily living were all unknown in the included studies. The high degree of unknown variables had the potential to introduce

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Table 4. Reported sensitivity, specificity, positive likelihood ratio, and negative likelihood ratio for each index tool identified at each cut-off reported

Author, Year	Index Tool	Reference Standard	Outcome	Cut-Off	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	LR + (95% CI)	LR - (95% CI)
Boddice et al., 2008[a]	GAI	CIDI	AxD	≥ 9	80.0 (28.4-99.5)	100.0 (84.6-100.0)	————	0.2 (0.0-1.2)
Creighton et al., 2019	GAI	MINI	GAD	≥ 7	90.0 (68.3-98.8)	82.5 (75.7-88.0)	5.1 (3.6-7.4)	0.1 (0.0-0.5)
Creighton et al., 2019	GAI	MINI	GAD	≥ 8	90.0 (68.3-98.8)	83.8 (77.1-89.1)	5.5 (3.8-8.1)	0.1 (0.0-0.5)
Creighton et al., 2019[a]	GAI	MINI	GAD	≥ 9	90.0 (68.3-98.8)	86.2 (79.9-91.2)	6.6 (4.3-9.9)	0.1 (0.0-0.4)
Creighton et al., 2019	GAI	MINI	GAD	≥ 10	85.0 (62.1-96.8)	88.8 (82.8-93.2)	7.6 (4.7-12.1)	0.2 (0.1-0.5)
Creighton et al., 2019	GAI	MINI	GAD	≥ 11	75.0 (50.9-91.3)	90.6 (85.0-94.7)	8.0 (4.6-13.8)	0.3 (0.1-0.6)
Creighton et al., 2019	GAI	MINI	GAD	≥ 12	75.0 (50.9-91.3)	92.5 (87.3-96.1)	10.0 (5.5-18.2)	0.3 (0.1-0.6)
Creighton et al., 2019[a]	HADS-A	MINI	GAD	≥ 6	90.0 (68.3-98.8)	80.6 (73.6-86.4)	4.7 (3.3-6.6)	0.1 (0.0-0.5)
Creighton et al., 2019	HADS-A	MINI	GAD	≥ 7	80.0 (56.3-94.3)	85.0 (78.5-90.1)	5.3 (3.5-8.2)	0.2 (0.1-0.6)
Creighton et al., 2019	HADS-A	MINI	GAD	≥ 8	70.0 (45.7-88.1)	88.8 (82.8-93.2)	6.2 (3.7-10.5)	0.3 (0.2-0.7)
Creighton et al., 2019	HADS-A	MINI	GAD	≥ 9	60.0 (36.1-80.9)	93.8 (88.8-97.0)	9.6 (4.8-19.3)	0.4 (0.3-0.7)
Creighton et al., 2019	HADS-A	MINI	GAD	≥ 10	45.0 (23.1-68.5)	97.5 (93.7-99.3)	18.0 (6.1-53.1)	0.6 (0.4-0.8)
Creighton et al., 2019	HADS-A	MINI	GAD	≥ 11	30.0 (11.9-54.3)	98.8 (95.6-99.8)	24.0 (5.2-111.0)	0.7 (0.5-0.9)
Creighton et al., 2019*	RAID	MINI	GAD	≥ 11	85.0 (62.1-96.8)	72.5 (64.9-79.3)	3.1 (2.3-4.2)	0.2 (0.1-0.6)
Creighton et al., 2019	RAID	MINI	GAD	≥ 12	80.0 (56.3-94.3)	74.4 (66.9-80.9)	3.1 (2.2-4.4)	0.3 (0.1-0.7)
Creighton et al., 2019	RAID	MINI	GAD	≥ 13	80.0 (56.3-94.3)	75.0 (67.6-81.5)	3.2 (2.3-4.5)	0.3 (0.1-0.6)
Creighton et al., 2019	RAID	MINI	GAD	≥ 14	80.0 (56.3-94.3)	76.2 (68.9-82.6)	3.4 (2.4-4.8)	0.3 (0.1-0.6)
Creighton et al., 2019	RAID	MINI	GAD	≥ 15	80.0 (56.3-94.3)	77.5 (70.2-83.7)	3.6 (2.5-5.1)	0.3 (0.1-0.6)
Creighton et al., 2019	RAID	MINI	GAD	≥ 16	75.0 (50.9-91.3)	80.0 (73.0-85.9)	3.8 (2.5-5.6)	0.3 (0.2-0.7)
Creighton et al., 2019	RAID	MINI	GAD	≥ 17	75.0 (50.9-91.3)	83.8 (77.1-89.1)	4.6 (3.0-7.1)	0.3 (0.1-0.6)
Dozeman et al., 2011	CES-D	MINI	GAD	≥ 16	94.4 (72.7-99.9)	53.7 (47.7-59.9)	2.0 (1.7-2.4)	0.1 (0.0-0.7)
Dozeman et al., 2011[a]	CES-D	MINI	GAD	≥ 18	88.9 (65.3-98.6)	62.5 (56.3-68.5)	2.4 (1.9-3.0)	0.2 (0.1-0.7)
Dozeman et al., 2011	CES-D	MINI	GAD	≥ 20	77.8 (52.4-93.6)	72.2 (66.3-77.6)	2.8 (2.0-3.8)	0.3 (0.1-0.7)
Dozeman et al., 2011	CES-D	MINI	GAD	≥ 22	66.7 (41.0-86.7)	78.4 (72.9-83.2)	3.1 (2.1-4.6)	0.4 (0.2-0.8)
Dozeman et al., 2011	CES-D	MINI	AxD	≥ 16	90.0 (73.5-97.9)	55.5 (49.0-61.8)	2.0 (1.7-2.4)	0.2 (0.1-0.5)
Dozeman et al., 2011[a]	CES-D	MINI	AxD	≥ 18	86.7 (69.3-96.2)	64.8 (58.5-70.7)	2.5 (2.0-3.1)	0.2 (0.1-0.5)
Dozeman et al., 2011	CES-D	MINI	AxD	≥ 20	73.3 (54.1-87.7)	74.1 (68.2-79.4)	2.8 (2.1-3.8)	0.4 (0.2-0.7)
Dozeman et al., 2011	CES-D	MINI	AxD	≥ 22	60.0 (40.6-77.3)	79.8 (74.2-84.6)	3.0 (2.0-4.4)	0.5 (0.3-0.8)
Goyal et al., 2017	RAID-N	*DSM*-5	GAD	≥ 9	89.3 (71.8-97.7)	52.1 (40.0-63.9)	1.9 (1.4-2.4)	0.2 (0.1-0.6)
Goyal et al., 2017	RAID-N	*DSM*-5	GAD	≥ 10	85.7 (67.3-96.0)	56.2 (44.1-67.8)	2.0 (1.5-2.6)	0.3 (0.1-0.6)
Goyal et al., 2017[a]	RAID-N	*DSM*-5	GAD	≥ 11	85.7 (67.3-96.0)	67.1 (55.1-77.7)	2.6 (1.8-3.7)	0.2 (0.1-0.5)
Goyal et al., 2017[a]	RAID-N	*DSM*-5	GAD	≥ 12	82.1 (63.1-93.9)	69.9 (58.0-80.1)	2.7 (1.9-4.0)	0.3 (0.1-0.6)
Goyal et al., 2017	RAID-N	*DSM*-5	GAD	≥ 13	64.3 (44.1-81.4)	72.6 (60.9-82.4)	2.4 (1.5-3.7)	0.5 (0.3-0.8)

Note. [a]Rows indicate optimal cut-off for each tool or outcome as defined by the study authors.
AxD = anxiety disorder; CI = confidence interval; CES-D = Center for Epidemiologic Studies Depression Scale; CIDI = Composite International Diagnostic Interview; *DSM*-5 = *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*; GAD = generalized anxiety disorder; GAI = Geriatric Anxiety Inventory; HADS-A = Hospital Anxiety and Depression Scale-Anxiety Subscale; LR(-) = negative likelihood ratio; LR(+) = positive likelihood ratio; MINI = Mini-International Neuropsychiatric Interview; RAID = Rating Anxiety in Dementia scale; RAID-N = Rating Anxiety in Dementia Scale-Norwegian version.

significant heterogeneity, making the comparison of the study samples inappropriate.

Based on the risk of bias assessment, a general lack of clarity on how the studies were conducted resulted in poor study quality. Three studies were identified as having unclear or high concern for risk of bias given inadequate reporting on the study procedures or exclusion of select participants. The concern of bias from the included studies highlights the need to follow reporting standards when conducting diagnostic accuracy studies. The included studies were limited by the number of study participants and low prevalence of anxiety disorders (Boddice et al., 2008), the exclusion of select participants from the study or analysis (Creighton et al., 2019; Dozeman et al., 2011), the lack of understanding of scale content validity (Goyal et al., 2017), and reference standard shortcomings (Creighton et al., 2019).

https://doi.org/10.1017/S0714980822000101 Published online by Cambridge University Press

Future studies that clearly report study procedures, setting characteristics, and population characteristics may provide better quality evidence for the diagnostic accuracy of anxiety detection tools in LTC. A reduction in clinical heterogeneity among studies will allow for more meaningful comparisons of tool performance to be completed. Future research must also consider how feasible the use of tools in LTC may be when used to detect anxiety by staff who must be trained in their use. Further, there is a need for interdisciplinary collaboration to occur internationally to establish best practice standards for the complex clinical issue of anxiety detection in LTC.

At the level of full text review, the absence of a reference standard resulted in the exclusion of many anxiety detection studies. Our review found that anxiety detection tools such as the Neuropsychiatric Inventory, Anxiety in Cognitive Impairment and Dementia scales, Brief Anxiety and Depression scale, Brief Symptom Inventory, and Clinical Anxiety Scale, have been investigated in LTC settings (Gerolimatos et al., 2015; Mansbach, Mace, & Clark, 2015; McNeil, 1999; Neville & Teri, 2011; Selbaek, Kirkevold, Sommer, & Engedal, 2008). The diagnostic accuracy of these tools was assessed using other anxiety detection tools rather than a reference standard based on *DSM* or ICD criteria. More rigorous diagnostic accuracy studies should be completed with these tools to further evaluate their use in LTC.

A major strength of this study is that to the best of the authors' knowledge, it is the first study of the diagnostic accuracy of anxiety detection tools in LTC with a broad search strategy that likely captured all studies of interest. Limitations of the present systematic review include the small number of articles that met the inclusion criteria and the heterogeneity of included studies that prohibited pooling and the ability to discern optimal tools and cut-offs for use in LTC. There was a lack of information on participant co-morbidities that could have confounded the detection of anxiety. The lack of reporting on co-morbid conditions and previous diagnoses restricted the ability to complete pooled estimates of diagnostic accuracy measures (e.g., sensitivity, specificity) and further explore the results and effectiveness of the identified anxiety detection tools.

Through this review, we were able to identify anxiety detection tools for use in the LTC setting that have been evaluated using a reference standard. There is a gap in the diagnostic accuracy literature that uses a reference standard comparator to assess the detection of anxiety in LTC. The choice of which tool to use should reflect resident characteristics such as co-morbidities, as well as resource constraints. The findings from this review may be best suited to inform clinicians on which tools exist for use in the detection of anxiety in older adults living in LTC.

Supplementary Materials. To view supplementary material for this article, please visit http://doi.org/10.1017/S0714980822000101.

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https://doi.org/10.1017/S0714980822000101 Published online by Cambridge University Press