
Article:
Watt, Christine L, Scott, Mary, Webber, Colleen et al. (7 more authors) (2021) Delirium screening tools validated in the context of palliative care:A systematic review. Palliative Medicine. pp. 683-696. ISSN 0269-2163

https://doi.org/10.1177/0269216321994730

PALLIATIVE MEDICINE

Review Article

Delirium screening tools validated in the context of palliative care: A systematic review

Palliative Medicine
2021, Vol. 35(4) 683–696

DOI: 10.1177/0269216321994730
journals.sagepub.com/home/pmj
SAGE

Christine L Watt[1,2*], Mary Scott[2,3*], Colleen Webber[2,3], Lindsey Sikora[4], Shirley H Bush[1,2,3], Monisha Kabir[2], Jason W Boland[5], Rebecca Woodhouse[6], Megan B Sands[7] and Peter G Lawlor[1,2,3]

Abstract

Background: Delirium is a distressing neuropsychiatric disorder affecting patients in palliative care. Although many delirium screening tools exist, their utility, and validation within palliative care settings has not undergone systematic review.

Aim: To systematically review studies that validate delirium screening tools conducted in palliative care settings.

Design: Systematic review with narrative synthesis (PROSPERO ID: CRD42019125481). A risk of bias assessment via Quality Assessment Tool for Diagnostic Accuracy Studies-2 was performed.

Data sources: Five electronic databases were systematically searched (January 1, 1982–May 3, 2020). Quantitative studies validating a screening tool in adult palliative care patient populations were included. Studies involving alcohol withdrawal, critical or perioperative care were excluded.

Results: Dual-reviewer screening of 3749 unique titles and abstracts identified 95 studies for full-text review and of these, 17 studies of 14 screening tools were included (n = 3496 patients). Data analyses revealed substantial heterogeneity in patient demographics and variability in screening and diagnostic practices that limited generalizability between study populations and care settings. A risk of bias assessment revealed methodological and reporting deficits, with only 3/17 studies at low risk of bias.

Conclusions: The processes of selecting a delirium screening tool and determining optimal screening practices in palliative care are complex. One tool is unlikely to fit the needs of the entire palliative care population across all palliative care settings. Further research should be directed at evaluating and/or adapting screening tools and practices to fit the needs of specific palliative care settings and populations.

Keywords

Delirium, palliative care, screening, systematic review, cognitive assessment screening instrument

What is already known about the topic?

- Delirium is a common neuropsychiatric disorder that can be highly distressing to patients and caregivers.
- The palliative care population has a higher risk of delirium, given rates of medical illness, frailty, and proximity to end of life.
- Timely identification of delirium is a priority; while multiple screening tools exist, they have been largely validated in patient populations other than palliative care.

What this paper adds?

- This systematic review identifies and provides an overview of 14 unique delirium screening tools validated in the palliative care population.

[1]Department of Medicine, Division of Palliative Care, University of Ottawa, Ottawa, ON, Canada
[2]Bruyère Research Institute, Ottawa, ON, Canada
[3]The Ottawa Hospital Research Institute, Ottawa, ON, Canada
[4]University of Ottawa, Health Sciences Library, Ottawa, ON, Canada
[5]Wolfson Palliative Care Research Centre, Hull York Medical School, University of Hull, Hull, UK
[6]Hull York Medical School and Department of Health Sciences, University of York, York, UK
[7]University of New South Wales Prince of Wales Clinical School, Randwick, NSW, Australia

*Reflects joint first authorship.

Corresponding author:
Christine L Watt, Elisabeth Bruyère Hospital, 273J - 43 Bruyere Street, Ottawa, Canada ON K1N 5C8.
Email: cwatt@bruyere.org

- This study illustrates the challenges with delirium screening in the palliative care setting, including variability in patient population and care setting, screening tools, and diagnostic reference standards.
- A formal risk of bias assessment identifies priorities to improve methodological rigor and a more standardized approach to delirium screening and diagnosis in future studies.

Implications for practice, theory or policy

- This systematic review identifies new considerations for clinicians when selecting delirium screening tools and initiating screening practices in palliative care populations.
- Future research should be directed at comparatively evaluating, validating, or developing delirium screening tools that are specifically suited to the particular palliative care setting and patient population of interest.

Introduction

Delirium is an acute neurocognitive condition characterized by acute changes in cognition, attention, and behavior with psychomotor subtypes ranging from extreme agitation to profound hypoactivity.[1–3] The risk of delirium increases with age, medical frailty, and underlying cognitive impairment,[4–6] and thus delirium occurs frequently in the palliative care population. A recent systematic review reported that one-third of patients were delirious at the time of admission to an inpatient palliative care unit, with the prevalence upwards of 58%–88% in the days preceding death.[1] Delirium is highly distressing for patients, families, and caregivers[7] and is associated with numerous adverse outcomes, including longer hospitalizations, functional decline, and mortality.[8,9]

Given the high burden of disease, timely identification of delirium in palliative care settings is recommended.[10,11] Unfortunately, the literature suggests that delirium is misdiagnosed and under recognized in palliative care patients.[12–15] This is particularly true in hypoactive delirium, the most commonly occurring psychomotor subtype.[16,17] To aid in the identification of delirium, clinicians often rely on a combination of clinical judgment, and a diagnostic reference standard.[18] Gold standard diagnostic criteria for delirium exist (such as the Diagnostic and Statistical Manual of Mental Disorders (DSM)),[2,19] but their clinical application may be time-consuming and require a substantial level of practitioner expertise. As a result, these gold standard criteria have been operationalized by developing validated delirium reference standards; tools which are used to diagnose delirium efficiently and reliably.[18]

In addition to reference standard criteria, numerous delirium screening tools have been developed and validated for delirium detection.[20] Screening tools are patient assessments which, when positive, prompt a comprehensive clinical assessment to confirm a delirium diagnosis.[21] The ideal delirium screening tool should have a high level of sensitivity, be validated against a diagnostic reference standard, and be brief and easy to use with minimal training.[10,22]

Currently, the use of delirium screening tools in palliative care is varied and their utility is unclear.[1,23] A recent survey of UK and Irish palliative care physicians reported that 59% do not use a formal screening tool on patients admitted to inpatient palliative care units.[24] There is also variability in the timing of delirium screening and the training of staff performing screening which may limit delirium detection.[23] Furthermore, many delirium screening tools were not specifically developed for use in palliative care populations, who are often highly symptomatic, easily fatigued, and more likely to require non-verbal or observational assessments.[25,26] As a result, studies which validate delirium screening tools in other care settings may not be generalizable to palliative care settings. Delirium remains under recognized in the palliative care population and the optimal method for delirium diagnosis remains unclear.[12–15]

Previous studies examining delirium in palliative care settings have identified the need to further understand delirium screening tools.[1,27] Thus, this systematic review aims to (1) identify and evaluate studies which validate delirium screening tools in palliative care populations and (2) identify gaps in the literature with respect to delirium screening tools in the palliative care population.

Methods

This systematic review was conducted using established systematic review methodology for tests of diagnostic accuracy.[28] Data were reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA).[29] The protocol for the systematic review was prospectively registered with the international prospective register of systematic reviews (PROSPERO).[30,31] Formal ethical approval was not sought as no primary data were collected.

Study selection

Inclusion and exclusion criteria

This review included primary quantitative research studies that assessed the validation of delirium screening tools

in adult (18+ years old), palliative care eligible populations (as defined by Lawlor et al.[27]). Qualitative studies, conference abstracts, editorials, magazine articles and studies conducted in pediatric, peri-operative, and critical care populations were excluded. Studies were included only if they validated screening tools against a diagnostic reference standard, which included gold standard diagnostic criteria (such as the DSM) and tools which operationalized gold standard criteria. Studies published in a language other than English and those examining delirium in patients with alcohol withdrawal were also excluded.

Electronic databases

The search strategy was developed by an information specialist (LS) and externally peer-reviewed using Peer Review of Electronic Search Strategy (PRESS) guidelines. Relevant references were obtained from Medline, Embase, PsycINFO, CENTRAL (all via Ovid) and the Cumulative Index of Nursing and Allied Health Literature – CINAHL (via EBSCO Host). The search strategy broadly included a combination of various terms in relation to "palliative care," "delirium," and "screening," and was modified as appropriate in accordance to each database. An example of the search strategy is included in Supplemental Figure 1. Pilot screening of a random sample of retrieved records was performed to further refine the search strategy. All databases were searched from January 1, 1980 to May 3, 2019. An update was performed from May 1, 2019 to May 3, 2020. The start date was chosen to match the earliest formal addition of delirium diagnostic criteria to the DSM – version III in 1980.[2,32] A gray literature search of PsycNet was also conducted, and the reference lists of included primary studies were hand searched for additional relevant studies.

Screening

Eight authors (MS, CW, CLW, MK, JB, RW, SB, PL) independently performed primary title and abstract screening in Covidence,[33] with each title/abstract reviewed by two investigators. Two investigators (MS and CW) performed independent full text screening. Studies which did not meet *a priori* inclusion criteria were excluded. A third author (CLW) was available to discuss and make a final decision when there was lack of consensus between the first and second reviewer at each stage of screening.

Data extraction and risk of bias

Two reviewers (MS and CLW) extracted data from the included articles using a standardized Excel spreadsheet. Data extracted included baseline demographic information, delirium epidemiological data, and the results of screening tool validation studies (i.e. sensitivity, specificity). A third reviewer (CW) validated the extracted data.

The risk of bias of each included study was assessed using the revised Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2).[34] Two reviewers (MS and CLW) independently rated the risk of bias and results were validated by a third party (PL). The QUADAS-2 examines the potential for bias in four domains: (1) patient selection, (2) conduct and interpretation of index testing (screening tools), (3) the diagnostic reference standard, and (4) flow and timing (e.g. exposure of all study patients to testing and the time interval between index and reference tests).[34] Each domain was assessed individually and given a rating of *yes* (at risk of bias), *no* (not at risk of bias) or *unclear* (unable to assess risk of bias due to unreported data). Afterwards, each study was assigned an overall risk of bias. A study was determined to be at low risk if no risk of bias was identified across all four domains. A moderate risk of bias was assigned to studies with a risk of bias in one domain. A high risk of bias was assigned to studies with a risk of bias reported in two or more domains. Domains reported as *unclear* due to missing data were not considered in the overall risk of bias determination and should be interpreted with caution. The QUADAS-2 also assesses the external validity (applicability) of the study to the research question across three domains: patient selection, index testing, and reference standard. Each of these domains was assessed individually.

Results

Study selection

Database searches identified 5377 articles and together with an additional 28 articles identified via gray literature and hand searching, resulted in a total of 5405 articles. After removal of duplicates, a total of 3749 articles underwent title and abstract screening. Ninety-five articles met eligibility criteria and required full text screening. Ultimately, 17 studies met study inclusion criteria (Figure 1).

Study demographics

A summary of the 17 included studies is shown in Table 1. The included studies originated from 11 different countries and presented data on a total of 3496 patients, with individual sample sizes ranging 19–2343. Most studies (n = 11) included data from one type of clinical care setting,[35–45] while six studies recruited patients from more than one type of care setting.[46–51] The included studies examined patients from inpatient palliative care units (PCU) (including inpatient hospice PCU) (n = 9), inpatient general medicine and inpatient oncology units (n = 8), and outpatient settings (including community hospice, outpatient clinics and emergency departments) (n = 5). One study examined patients in residential long-term care homes.[36] The majority of studies (n = 12) included patients with either mostly or exclusively oncologic diagnoses.

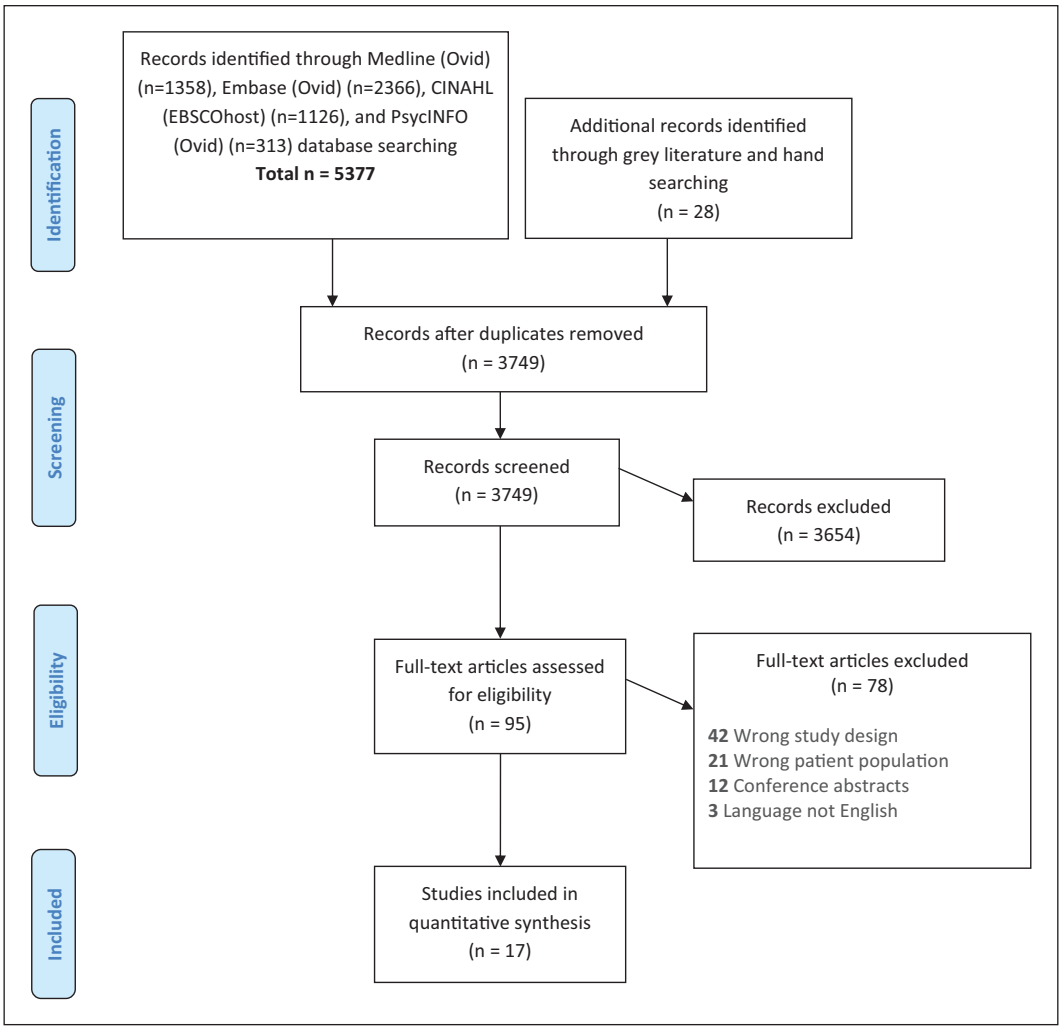

Figure 1. The number of articles captured and screened using the preferred reporting items for systematic reviews and meta-analyses[28] diagram.
Source: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed100009. For more information, visit www.prisma-statement.org.

Apart from a study conducted in male veterans,[46] studies included a mix of male and female participants. Four studies excluded patients with pre-existing dementia from their study population.[41,43,46,50] Of the remaining 13 studies that included patients with dementia, six did not report the proportion with dementia in their study sample.[37–40,45,48] The prevalence of dementia, as reported in seven studies, ranged from 3.8% to 40%.[35,36,42,44,47,49,51] The point prevalence of delirium across all study populations, as diagnosed by the study diagnostic reference standard, ranged from 19.9% to 68.3%.[35–51]

Delirium diagnostic reference standards

Four different delirium diagnostic reference standards were used to validate the accuracy of delirium screening tools in the included studies. Most studies ($n = 14$) used one delirium diagnostic reference standard,[36–40,42–50] while three studies used two different sets of diagnostic criteria.[35,41,51] Gold standard DSM criteria were used across 10 different studies and reflected contemporaneous use of the edition.[35,36,41,42,44–48,50,51] Initially developed as a screening tool,[52] the Confusion Assessment Method (CAM), when used according to strict protocol, is a recognized diagnostic reference standard. It was used as the diagnostic reference standard in five of the included studies.[37,40,41,49,51] Additionally, the Delirium Rating Scale – Revised 98 (DRS-R-98) was used as a diagnostic reference standard in two studies,[39,43] and the Memorial Delirium Assessment Scale (MDAS) was used in one study.[38]

Selected screening tools validated in palliative care eligible populations

Of 14 delirium screening tools examined across 17 studies, 12 were assessed in only one study[36–38,44–48,51] and two

Table 1. Patient population characteristics within included studies.

Author (year)	Country	Validated screening tool	Reference standard	Sample size	Patient population	Care setting	Age (SD/IQR/R)	Prevalence of dementia n (%)	Delirium incidence/ prevalence n (%)
Andrew et al.[47]	Canada	DRS-R-98	DSM-IV	145	Geriatric medicine	General inpatient, outpatient, ED, community	Mean: 81.2 (NR)	58 (40%)	P: 55 (38%)
Barahona et al.[49]	Spain	MDAS-S	CAM	67	Oncology	PCU, hospice PCU	Med: 76 (IQR 69–83)	10 (15%)	P: 28 (41.7%)
Breitbart et al.[35]	USA	MDAS	DSM-III-R, pDSM-IV	33	Oncology, AIDS	Inpatient cancer center	Med: 56.14 (NR)	8 (24.2%)	P: 17 (51.5%)
Cacchione[36]	USA	CAC – A, CAC – B, NEECHAM, VASAC	DSM-IV	74	Mixed diagnoses	LTC facility	Mean: 82 (R 66–95)	25 (33.8%)	P: 29 (39.2%)
de la Cruz et al.[38]	USA	Nu-DESC	MDAS	78	Oncology	Community hospice	Med: 69 (R 49–61)	NR	P: 34 (44%)
Detroyer et al.[40]	Belgium	DOSS	CAM	48	Mostly oncology	PCU	Med: 72 (IQR 10.8)	NR	P: 11 (22.9%)
Grassi et al.[51]	Italy	DRS-I, MDAS-I	DSM-III-R, CAM	105	Oncology	PCU, inpatient oncology	Mean: 67 (SD 13.2)	8 (7.6%)	P 66 (62.8%)
Hamano et al.[48]	Japan	Item 4 of the CCS	DSM-IV	2343	Oncology	PCU, general inpatient, outpatient	Mean: 69.1 (SD 12.8)	NR	P: 470 (19.9%)
Jorgensen et al.[39]	USA	DOSS	DRS-R-98	23	Mixed diagnoses	Community hospice	Mean: 82 (SD 10.3)	NR	P: 9 (39%)
Kang et al.[41]	South Korea	MDAS-K	DSM-IV, CAM	102	Oncology	PCU	Delirium: Mean 71.8 (SD 9.8), No delirium: Mean 62.0 (SD 14.2)	0 (0%)	P: 24/102 (23.5%), I 1 week: 13/46 (28.3%)
Klankluang et al.[50]	Thailand	MDAS-T	DSM-5	194	Mostly oncology	PC Consult: general inpatient and outpatient	Mean: 63.9 (SD 13.3)	0 (0%)	P: 99 (51%)
Lawlor et al.[42]	Canada	MDAS	DSM-IV	104	Oncology	PCU	Delirium: Mean 63.4 (SD 10.8), No delirium: Mean 58.9 (SD 13.5)	4 (3.8%)	P: 71 (68.3%), Point P: 44 (42%)
Neefjes et al.[43]	Netherlands	DOSS	DRS-R-98	187	Oncology	Inpatient oncology	DOSS +ve: Mean 68 (SD 11.1), DOSS -ve: Mean 60 (SD 12.9)	0 (0%)	P: 88 (47%)
Ryan et al.[44]	Ireland	CAM	DSM IV	52	Oncology	Hospice PCU	Med: 69.19 (R 36–93)	7 (13.5%)	P: 17 (32.7%)
Sands et al.[45]	Australia	SQiD	DSM IV	19	Oncology	Inpatient oncology	Mean: 53.21 (R 30–79)	NR	P: 5 (26%)
Stillman and Rybicki[37]	USA	BCS	CAM	31	Mixed diagnoses	PCU	Mean: 68 (SD 9)	NR	P: 18 (58.1%)
Wilson et al.[46]	USA	bCAM	DSM-5	36	Mixed diagnoses	PCU, general inpatient	Med: 67 (IQR 63–73)	0 (0%)	P: 10 (27.8%)

NR: not reported; CI: cognitive impairment; PCU: palliative care unit; P: prevalence (unless otherwise specified, numbers indicate period prevalence); I: incidence; Med: median; SD: standard deviation; IQR: inter-quartile range; R: range; DSM: diagnostic and statistical manual of mental disorders; pDSM: proposed DSM; BCS: bedside confusion scale; CCS: communication capacity scale; CAC: clinical assessment of confusion; bCAM: brief confusion assessment method; CAM: confusion assessment method; DOSS: delirium observation screening scale; DRS-I: Delirium Rating Scale Italian; DRS-R-98: Delirium Rating Scale – revised 98; MDAS: memorial delirium assessment scale (-I: Italian, -K: Korean, -S: Spanish, -T: Thai); NEECHAM: Neelon and Champagne confusion scale; Nu-DESC: nursing delirium screening scale; SQiD: single question in delirium; VASAC: visual analog scale for acute confusion.

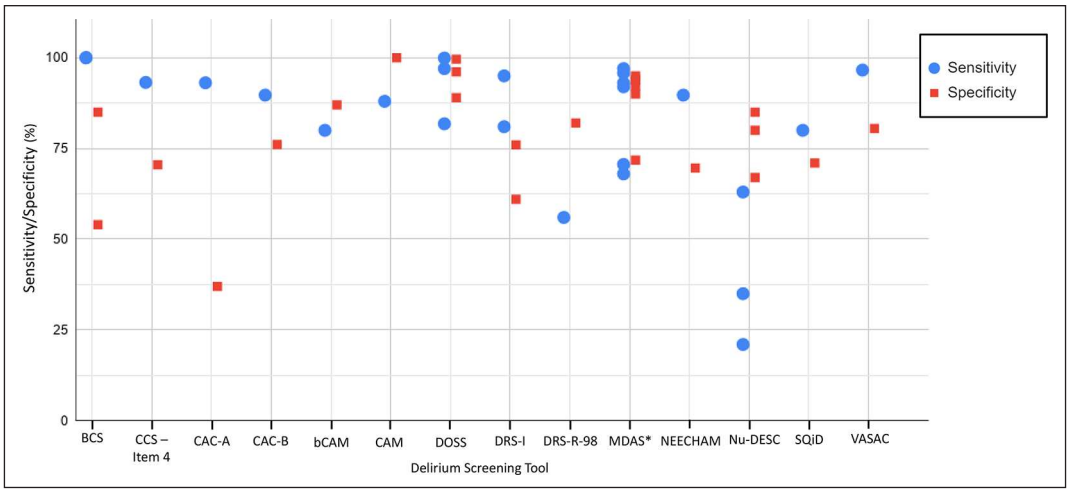

Figure 2. Sensitivity and specificity of delirium screening tools.
Values represent sensitivity and specificity of each test at optimal cut-off as reported by the authors in included studies (cut-offs reported in Table 2). BCS: bedside confusion scale; CCS: communication capacity scale; CAC: clinical assessment of confusion; bCAM: brief confusion assessment method; CAM: confusion assessment method; DOSS: delirium observation screening scale; DRS-I: Delirium Rating Scale Italian; DRS-R-98: Delirium Rating Scale – revised 98; MDAS: memorial delirium assessment scale (*includes MDAS-Italian, Spanish, Thai, and Korean); NEECHAM: Neelon and Champagne confusion scale; Nu-DESC: nursing delirium screening scale; SQiD: single question in delirium; VASAC: visual analog scale for acute confusion.

were assessed in more than one study.[35,39–43,49–51] A description of each delirium screening tool is outlined in Supplemental Table 1. The results of each validation study are presented in Figure 2 and Table 2.

Bedside Confusion Scale (BCS). Stillman et al. created and validated the BCS in 31 patients admitted to inpatient an inpatient palliative care unit.[37] Two distinct cut-offs (the score on the tool above which the patient was considered to screen positive) were used. A score of ⩾1 (typically considered a "borderline" score) had a sensitivity of 100% (95% confidence interval (CI) 81%–100%) and a specificity of 54% (95% CI 25%–81%). A cut-off point of ⩾2 was reported with a sensitivity of 100% (95% CI 81%–100%) and specificity of 85% (95% CI 55%–98%).

Communication Capacity Scale (CCS) – Item 4. Hamano et al. examined item-4 of the CCS as a single item screen for delirium.[48] Their study included 2343 patients with an active diagnosis of extensive or metastatic cancer (including hematological neoplasms) who were receiving palliative care across inpatient and outpatient settings (including PCUs, general medicine inpatient admissions, and home palliative care). This study used two cut-off points, resulting in a sensitivity and specificity of 93.2% (95% CI 90.6%–95.1%) and 70.5% (95% CI 69.9%–71.0%), respectively for a score of ⩾1; and a sensitivity and specificity of 76.7% (95% CI 73.4%–79.7%) and 89.3% (95% CI 88.5%–90.0%), respectively, for a score of ⩾2.

Clinical assessment of confusion – A (CAC – A). The CAC-A was one of four tools validated in the study by Cacchione et al.[36] This study included 74 patients from a residential long-term care home with a mix of diagnoses, including patients with diagnoses of underlying dementia (33.8%, $n = 25$) and delirium (39.2%, $n = 29$). The sensitivity and specificity of the CAC-A were reported as 93.1% and 37% (no CI reported) respectively. The cut-off score used for the screening test was not reported.

Clinical assessment of confusion – B (CAC – B). Cacchione et al. also assessed the CAC-B as a delirium screening tool, using the same population, and diagnostic reference standard as for CAC-A.[36] The sensitivity and specificity of the CAC-B was reported as 89.7% and 76.1%, respectively. Neither CIs nor cut-off scores were reported.

Confusion assessment method (CAM). One study by Ryan et al. validated the CAM using 52 oncology patients admitted to a palliative care unit.[44] The CAM is an operationalized algorithm which requires a positive result in multiple categories in order to achieve a positive screen for delirium (see Supplemental Table 1). However, unlike other screening tools, the CAM does not rely of a specific score; the outcome of the tool is binary (either a positive or negative screen). The sensitivity and specificity of the CAM were reported as 88% (95% CI 62%–98%) and 100% (95% CI 88%–100%), respectively.

Brief CAM (bCAM). Wilson et al. validated the bCAM,[46] a modified version of the CAM for the intensive care unit (CAM-ICU).[53] The study population consisted of 36 patients admitted to PCU or general medical inpatient settings, who were followed by palliative care teams. Similar to the CAM,

Table 2. Results of screening tool validation with optimal cut-off scores.

Reference	Screening tool(s) validated	Screening tool optimal cut-off	Diagnostic reference standard	Diagnostic score	Sensitivity (95% CI)	Specificity (95% CI)
Andrew et al.[47]	DRS-R-98	⩾17.75	DSM-IV	B	56% (–)	82% (–)
Barahona et al.[49]	MDAS-S	⩾7	CAM	B	92.9% (–)	71.8% (–)
Breitbart et al.[35]	MDAS	⩾13	DSM-III-R, pDSM-IV	B	70.6% (–)	93.8% (–)
Cacchione[36]	CAC – A, CAC – B, NEECHAM, VASAC	CAC – A: NR, CAC – B: NR, NEECHAM: NR, VASAC: NR	DSM-IV	B	CAC – A: 93.1% (–), CAC – B: 89.7% (–) NEECHAM: 89.7% (–), VASAC: 96.6% (–)	CAC – A: 37% (–), CAC – B: 76.1% (–) NEECHAM: 69.6% (–), VASAC: 80.5% (–)
de la Cruz et al.[38]	Nu-DESC	NR	MDAS	⩾7	Nurse: 63% (–), caregiver (eve): 35% (–), caregiver (night): 21% (–)	Nurse: 67% (–), caregiver (eve): 80% (–), Caregiver (night): 85% (–)
Detroyer et al.[40]	DOSS	⩾3	CAM	B	81.8% (52–95)	96.1% (90–98)
Grassi et al.[51]	DRS-I, MDAS-I	DRS-I: 10, 12, MDAS-I: 13	DSM-III-R, CAM	B, B	DRS-I 10: 95% (–), 12: 81% (–), MDAS-I: 68% (–)	DRS-I 10: 61% (–), 12: 76% (–), MDAS-I: 94% (–)
Hamano et al.[48]	Item 4 of the CCS	⩾1, ⩾2	DSM-IV	B	⩾1: 93.2% (90.6–95.1), ⩾2: 76.7% (73.4–79.7)	⩾1: 70.5% (69.9–71.0), ⩾2: 89.3% (88.5–90.0)
Jorgensen et al.[39]	DOSS	⩾3	DRS-R-98	⩾18	97% (81–100)	89% (75–96)
Kang et al.[41]	MDAS-K	>9	CAM, DSM-IV	B, B	95.8% (–)	92.1% (–)
Klankluang et al.[50]	MDAS-T	>9	DSM-5	B	92% (85–96)	90% (82–94)
Lawlor et al.[42]	MDAS	7	DSM-IV	B	97% (–)	95% (–)
Neefjes et al.[43]	DOSS	⩾3	DRS-R-98	⩾17.75	>99.9% (95.8–100)	99.6.% (95.5–100)
Ryan et al.[44]	CAM	B	DSM-IV	B	88% (62–98)	100 (88–100)
Sands et al.[45]	SQiD	B	DSM-IV	B	80% (28.4–99.5)	71% (41.9–91.6)
Stillman and Rybicki[37]	BCS	>1, >2	CAM	B	⩾1: 100% (81–100), ⩾2: 100% (81–100)	⩾1: 54% (25–81), ⩾2: 85% (55–98)
Wilson et al.[46]	bCAM	B	DSM-5	B	80% (40–96)	87% (67–96)

NR: not reported; CI: confidence interval; DSM: diagnostic and statistical manual of mental disorders; pDSM: proposed DSM; B: binary (refers to tools/reference standards where the result is either delirium or no delirium); BCS: bedside confusion scale; CCS: communication capacity scale; CAC: clinical assessment of confusion; bCAM: brief confusion assessment method; CAM: confusion assessment method; DOSS: delirium observation screening scale; DRS-I: DRS Italian; DRS-R-98: Delirium Rating Scale – revised 98; MDAS: memorial delirium assessment scale (-I: Italian, -K: Korean, -S: Spanish, -T: Thai); NEECHAM: Neelon and Champagne confusion scale; Nu-DESC: nursing delirium screening scale; SQiD: single question in delirium; VASAC: visual analog scale for acute confusion.

the outcome for this tool was binary. The sensitivity and specificity of the bCAM was found to be 80% (95% CI 40%–96%) and 87% (95% CI 67%–96%), respectively.

Delirium Observation Screening Scale (DOSS). Three of the included studies validated the DOSS, using a pre-specified cut-off score ⩾ 3.[39,40,43] Two of the three studies included mainly oncology patients,[40,43] while one study was conducted in patients with a mix of diagnoses including oncology, dementia, and neurologic diseases.[39] Three distinct care settings were used and included patients admitted to PCU,[40] inpatient oncology,[43] and those followed through community hospice programs.[39]

Detroyer et al., reported the sensitivity and specificity of the DOSS as 81.8% (95% CI 52%–95%) and 96.1% (95% CI 90%–98%), respectively.[40] Jorgensen et al. reported the sensitivity and specificity of the DOSS as 97% (95%CI 81%–100%) and 89% (95% CI 75%–96%), respectively.[39] Finally, Neefjes et al. reported a sensitivity >99.9% (95% CI 95.8%–100%) and a specificity of 99.6% (95%CI 95.5%–100).[43]

Delirium Rating Scale (DRS). One study validated the DRS Italian version as a delirium screening tool.[51] In this study, 105 palliative care and oncology inpatients were recruited. Two cut-offs were used in validation. A cut-off of 10 showed a sensitivity and specificity of 95% and 61%, respectively (no CIs), whereas as cut-off of 12 revealed a sensitivity of 81% and specificity of 76%.

Delirium Rating Scale – Revised 98 (DRS-R-98). One study validated the DRS-R-98 as a delirium screening tool.[47] In this study, 145 geriatric medicine inpatients and outpatients were recruited. Using a cut-off score of ⩾17.75, the sensitivity of the DRS-R-98 was 56.0% and the specificity was 82.0% (no CIs reported).

Memorial Delirium Assessment Scale (MDAS). Six studies validated the MDAS: two validated the original English version,[35,42] while Italian, Spanish, Korean, and Thai versions were validated in the remaining four studies.[41,49–51] All studies included predominantly oncology patients and were conducted in mostly inpatient care settings, including PCUs,[41,42,49,51] and inpatient oncology settings.[35,51] One study included general inpatients and outpatients that were receiving palliative care consultative services.[50]

Breitbart et al., examined the MDAS in 33 patients admitted to an oncology inpatient service.[35] An optimal cut-off of ⩾13 on the MDAS gave a sensitivity of 70.6% and specificity of 93.8% (no CIs reported). Lawlor et al.,[42] examined the MDAS in 104 patients admitted to a PCU. Fifty-six sets of patient data (those with complete as opposed to partly pro-rated MDAS data) were used in the factor analyses, which revealed a sensitivity of 97% and specificity of 95%, using an optimal cut-off score of 7 (no CIs reported). Grassi et al., examined the MDAS-Italian in 105 inpatient PCU and oncology patients as described with respect to the DRS.[51] Using a cut-off score of 13, the sensitivity and specificity of the MDAS Italian was 68% and 94%, respectively (no CIs reported). Klankluang et al., examined the MDAS-Thai in 194 patients and reported an optimal cut-off score of >9 with a sensitivity of 92% (95% CI 85-96%) and specificity of 90% (95% CI 82%–94%).[50] Barahona et al., employed the MDAS-Spanish in 67 oncology patients.[49] An optimal cut-off score of ⩾7 gave a sensitivity of 92.9% and specificity of 71.8% (no CIs reported). Finally, Kang et al. examined the MDAS-Korean in 102 oncology patients.[41] An optimal cut-off score of >9 provided a sensitivity of 95.8% and specificity of 92.1% (no CIs reported).

Neelon and Champagne (NEECHAM) Confusion Scale. Cacchione et al. used the same patient cohort and diagnostic reference standard as previously described in relation to the CAC-A, CAC-B.[36] No cut off was reported for the sensitivity of 89.7% and specificity of 69.6% (no CIs reported).

Nursing Delirium Screening Scale (Nu-DESC). One study validated the Nu-DESC as a delirium screening tool when used by nurses and caregivers (untrained family and friends) at different times of the day.[38] This study was a secondary analysis of a larger randomized control trial of community hospice patients[54] and included 78 patients who had undergone symptom assessment 3–7 days before death.[38] No cut-off for the Nu-DESC was reported. The authors identified a sensitivity of 63% and specificity of 67% when the Nu-DESC was used by a nurse. However, when the Nu-DESC was used by caregivers, sensitivities ranged from of 21%–35% and specificities ranged from 80% to 85%, based on time of day.

Single question in delirium (SQiD). The SQiD was assessed in one study of oncology inpatients.[45] In this pilot study, sensitivity of the SQiD as a delirium screening tool was calculated as 80% (95% CI 28.4%–99.5%) and specificity as 71% (95% CI 41.9%–91.6%). The SQiD uses a binary outcome of "yes" (positive screen) or "no" (negative screen).

Visual analog scale for acute confusion (VASAC). Cacchione et al. used the same patient cohort and diagnostic reference standard as previously described in relation to the CAC-A and CAC-B.[36] The study reported a sensitivity of 96.6% and a specificity of 80.5% for the VASAC (neither CIs nor cut-off points were reported).

Quality assessment, risk of bias and applicability

Quality and applicability assessments for the included studies are outlined in Figure 3. Ultimately, three studies were

Study Demographics			Risk of Bias				Overall Risk of Bias	Concerns of Applicability		
Author (year)	Screening Tool	Reference Standard	Patient selection	Index Test(s)	Reference standard	Flow and Timing		Patient selection	Index Test(s)	Reference standard
Andrew (2009)[47]	DRS-R-98	DSM-IV	☹	•	•	☹	**HIGH**	☹	☺	☺
Barahona (2018)[49]	MDAS-S	CAM	•	☹	☺	☺	**MODERATE**	☺	☺	☺
Breitbart (1997)[35]	MDAS	DSM-III-R, pDSM-IV	•	☺	☺	☺	**UNCLEAR**	☺	☺	☺
Cacchione (2002)[36]	CAC – A, CAC – B, NEECHAM, VASAC	DSM-IV	☹	•	☹	•	**HIGH**	☹	☹	☺
de la Cruz (2015)[38]	Nu-DESC	MDAS	☹	•	•	•	**MODERATE**	☹	☺	☺
Detroyer (2014)[40]	DOSS	CAM	☺	☺	☺	☹	**MODERATE**	☺	☺	☺
Grassi (2001)[51]	DRS-I, MDAS-I	DSM-III-R, CAM	☹	•	•	•	**MODERATE**	☺	☺	☺
Hamano (2015)[48]	Item 4 of the CCS	DSM-IV	☹	☹	☹	☹	**HIGH**	☺	☺	☺
Jorgensen (2017)[39]	DOSS	DRS-R-98	☹	•	☹	☹	**HIGH**	☺	☺	☹
Kang (2019)[41]	MDAS-K	DSM-IV, CAM	☺	☺	☺	☺	**LOW**	☹	☺	☺
Klankluang (2020)[50]	MDAS-T	DSM-5	☹	☺	☺	☺	**MODERATE**	☹	☺	☺
Lawlor (2000)[42]	MDAS	DSM-IV	☺	☹	☹	☹	**HIGH**	☺	☺	☺
Neefjes (2019)[43]	DOSS	DRS-R-98	☹	☺	☹	☹	**HIGH**	☹	☺	☺
Ryan (2009)[44]	CAM	DSM IV	☺	☺	☺	☺	**LOW**	☺	☺	☺
Sands (2010)[45]	SQiD	DSM IV	☺	☺	☺	☺	**LOW**	☺	☺	☺
Stillman (2000)[37]	BCS	CAM	☺	☹	☹	☺	**HIGH**	☺	☺	☺
Wilson (2019)[46]	bCAM	DSM-5	☹	☺	☺	☺	**MODERATE**	☹	☺	☺

☺ = no risk of bias/no concern of applicability, ☹ = risk of bias/concern of applicability, • = unclear/data not reported

Figure 3. Risk of bias according to the revised quality assessment of diagnostic accuracy studies (QUADAS-2).
BCS: bedside confusion scale; CCS: communication capacity scale; CAC: clinical assessment of confusion; bCAM: brief confusion assessment method; CAM: confusion assessment method; DOSS: delirium observation screening scale; DRS: Delirium Rating Scale; DRS-R-98: Delirium Rating Scale – revised 98; DSM: diagnostic and statistical manual of mental disorders; pDSM: proposed DSM; MDAS: memorial delirium assessment scale (-I: Italian, -K: Korean, -S: Spanish, -T: Thai); NEECHAM: Neelon and Champagne confusion scale; Nu-DESC: nursing delirium screening scale; DOSS: delirium observation screening scale; SQiD: single question in delirium; VASAC: visual analog scale for acute confusion.

found to have a low risk of bias.[41,44,45] The remaining studies had moderate ($n = 6$) or high ($n = 7$) risk of bias. One study had an unclear risk of bias.[35] Seven studies had at least one domain reported as *unclear*, where there was insufficient information to determine risk of bias.[35,36,38,39,47,49,51] In these studies, the most common unreported data was study exclusion criteria ($n = 7$)[35,36,38,39,47–49] and the relative blinding of study investigators when using screening tools and reference criteria ($n = 4$).[38,39,47,48] The timing between administration of the index test and the reference standard was not reported in four studies.[36,38,47,51]

Concerns about study population applicability were identified in seven studies. Of the seven, four studies excluded patients with dementia,[41,43,46,50] one was focused on patients admitted to residential long term care homes,[36] one was focused on geriatric inpatients[47] and one excluded patients with a high MDAS score prior to study initiation.[38] While it was felt that all of these patient populations were eligible to receive palliative care, and thus appropriate for inclusion in this review, the generalizability of these results may not be appropriate for the entirety of the palliative care population. Reference standard applicability was a concern in one study, which used the DRS-R-98 for delirium diagnosis.[39] In this study, the required diagnostic score was higher than previously outlined by the literature, affecting the applicability of using this reference standard to the wider palliative care population.

Discussion

This systematic review includes 17 papers examining 14 different screening tools across a variety of different palliative care settings. It illustrates a wide variety of screening practices, with only two screening tools (the MDAS and DOSS) examined in multiple studies.[35,39–43,49–51] Unfortunately, heterogeneity in care settings, screening practices and diagnostic reference standards limited both generalizability between studies and further meta-analyses. Due to issues with both study quality and heterogeneity, it is difficult to make a recommendation on the relative utility of screening tools in the palliative care population as a whole. This contrasts with the findings of previous studies examining delirium screening tools in hospitalized patients, where there is often sufficient evidence to support the use of a particular screening tool in specific care settings (such as critical care units or emergency departments).[20,55,56]

An assessment of risk of bias revealed substantial flaws in most studies, with only three studies reported to have a low risk of bias. The domain at highest risk of bias appeared to be patient selection. Within this domain, six studies used non-random sampling to generate their study population,[36,39,43,46,47,51] while three employed inappropriate exclusion criteria.[38,48,50] When considering the risk of bias in the index test (screening tool) domain, six studies did not specify the delirium screening tool cut-off prior to study initiation, but rather relied on post-hoc analyses to determine optimal cut-offs.[35,37,41,42,49,50] Of these studies, four developed a new tool or translated an existing tool into a new language.[35,37,41,50] In these instances, we felt that post-hoc analyses of data was appropriate to determine optimal cut-offs. A lack of appropriate blinding of the study investigators was the most common source of bias in the reference standard domain ($n = 4$).[36,37,39,42] Finally, with respect to flow and timing, inconsistent administration of the index test or reference standard to all patients was the largest source of bias ($n = 6$).[39,40,42,43,47,48]

Strengths and limitations of the study

This systematic review was designed with the input of an information specialist and the search strategy was peer reviewed. In previous systematic reviews of delirium screening tools, the acceptable diagnostic reference standards employed to validate a screening tool were limited solely to gold standard diagnostic criteria for delirium, either the International Classification of Diseases (ICD)[19] or DSM.[20,55,56] In this systematic review, we included studies that not only used gold standard criteria as a diagnostic reference standard but also studies that operationalized these criteria into a validated diagnostic tool (such as the CAM, DRS-R-98, and MDAS).[37–41,43,49,51] Additionally, this review included patients who were followed by palliative care, as well as those with palliative care eligible diagnoses (such as organ failure and dementia, as defined by Lawlor et al.[27]) who were not specifically followed by palliative care. Given these inclusion criteria, a wider breadth of studies and larger number of participants were included, however, this likely contributed to increased heterogeneity in patient population, research methodology, and delirium detection tools.

This systematic review includes a wide range of delirium screening tools and diagnostic reference standards. Importantly, regardless of which screening tool or diagnostic reference standard was employed, variability in reference rater methods (timing and frequency of assessments, training of raters, etc.) both between raters of the same study and between different studies remains a concern. As previously outlined by Neufeld et al, standardization of reference rater methods is crucial to improving the methodological rigor in studies which focus on delirium screening or diagnosis.[18]

One important aspect of variability in reference rater methods that can impact the utility of a screening tool is the training of raters. When examining the CAM as a delirium screening tool, Ryan et al. also included the results of a pilot population of oncology patients in the PCU in which

the same screening tool and diagnostic reference standard were used. This revealed that sensitivity and specificity of the CAM as a screening tool improved significantly with enhanced training.[44] The importance of training when using the CAM has also been shown in studies outside the palliative care setting, both when using the CAM as a screening tool and a diagnostic reference standard.[20,52] The concept of enhanced training is also supported by the study examining the Nu-DESC as a delirium screening tool. In this included study, de la Cruz et al., determined that the Nu-DESC had decreased sensitivity and specificity when employed by informal caregivers compared to trained nursing staff and suggest that enhanced training may improve validity.[38]

Finally, the impact of comorbid dementia with respect to delirium identification remains an important consideration. In examining the DRS-R-98 as a delirium screening tool, Andrew et al. concluded that this tool performs well in the palliative care population, but the presence of dementia reduced its accuracy.[47] While the importance of dementia with respect to delirium identification is becoming a priority,[1,20] few included studies in this review report dementia status and assess its impact in their data analyses. Future research should be targeted to determine the impact of dementia and other forms of cognitive impairment on the performance of delirium screening tools in the palliative care setting.

What this study adds

This is the first systematic review to examine delirium screening tools exclusively in the palliative care population. It includes a quality assessment which reveals the propensity to bias in delirium screening studies and identifies strategies to improve reference rater consistency and data reporting in future studies. This study also identifies a lack of reproduced and comparative studies in the palliative care setting, with only two screening tools studied in more than one study.

This systematic review also illustrates that the palliative care population is not uniform or limited to one care setting. While most included patients had an underlying oncologic diagnosis, patients with other life-limiting diagnoses such as organ failure and dementia were also included. Additionally, the studies included in this review involved patients from a variety of care settings, which ranged from tertiary care hospitals and PCUs (where patients are more likely to have a shorter prognosis) to outpatient and palliative care consultative services (where patients likely have a better functional status and a longer prognosis). Thus, it is improbable that a single delirium screening tool is likely to apply in a one fits all manner; instead, screening practices may need to be further tailored to fit the specific patient population, their palliative care needs, and the specific palliative care setting. For example, patients who have better functional status may be able to engage in cognitive testing and tools which require participation (such as the CAM or MDAS), whereas those who are in the final days to weeks of their life may be better suited to the use of tools relying exclusively on non-verbal assessments or the observations of the rater (such as the Nu-DESC or DOSS). The variable risk of bias across included studies further complicates the determination of utility for these tools. For example, while the DOSS and MDAS are reported to be sensitive and specific for delirium detection in mostly oncology patients across several care settings and may seem like high quality tools (Table 2); only one of nine studies validating these tools had a low risk of bias (the others were determined to have moderate $n = 4$, high $n = 3$, and unknown $n = 1$ risk of bias) (Figure 3). Thus, it is difficult to recommend one specific tool as the target of future research or clinical application. Rather, this review illustrates the need for more rigorous, unbiased studies focused on delirium detection for all tools in the future.

Finally, while some studies have reported that delirium screening can be feasible for staff[57–59] and potentially worthwhile,[60] none of the studies included in this review examined the value of screening in terms of clinical outcomes or the burden of screening on staff, patients or families. This recapitulates the experience of Hosie et al., in which a systematic review of studies examining the incidence and prevalence of delirium in palliative care found that none of the included studies reported on the burden of delirium screening.[61] Admittedly, this review was not specifically or primarily designed to examine the beneficial and burdensome outcomes associated with screening for delirium in the palliative population. Nonetheless, this would appear to be a gap in the literature that needs to be addressed.

Conclusions

This systematic review includes 17 studies assessing 14 screening tools for delirium in palliative care populations. While the MDAS and DOSS were examined in multiple studies, heterogeneity in screening practices, care settings and reference standards limited meta-analyses and study generalizability. The risk of bias assessment highlights the need for consistency in reference rater methods and data reporting. Importantly, no studies described the burdensome or positive outcomes of screening on patient care, an area which should be prioritized in future studies. Ultimately, this review illustrates the complexity in screening for delirium in palliative care settings. Future research should be directed at comparatively evaluating, validating and/or developing delirium screening tools that specifically suit a particular palliative care population and setting.

Authors' note

Presented in part at the European Delirium Association (EDA) Annual Meeting, Edinburgh, Scotland on September 5–6, 2019.

Authorship

CLW: primary and secondary screening, data extraction, methodological support, manuscript preparation, data analyses. MS: PROSPERO registration, primary and secondary screening, data extraction, manuscript preparation. CW: primary and secondary screening, data extraction, methodological support, critical appraisal of manuscript. LS: development of search strategy, obtained records from search, critical appraisal of manuscript. SHB: primary and secondary screening, methodological support, critical appraisal of manuscript. MK: primary and secondary screening, manuscript preparation. JB: primary and secondary screening, methodological support, critical appraisal of manuscript. RW: primary and secondary screening, methodological support, critical appraisal of manuscript. MBS: primary and secondary screening, methodological support, critical appraisal of manuscript. PGL: primary and secondary screening, data extraction, methodological support, manuscript preparation, data analyses.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Christine L Watt https://orcid.org/0000-0002-6361-8815
Mary Scott https://orcid.org/0000-0002-1745-0820
Colleen Webber https://orcid.org/0000-0001-9193-5386
Monisha Kabir https://orcid.org/0000-0002-4456-7661
Jason W Boland https://orcid.org/0000-0001-5272-3057
Rebecca Woodhouse https://orcid.org/0000-0001-8374-8994
Megan B Sands https://orcid.org/0000-0002-1154-9037

Supplemental material

Supplemental material for this article is available online.

References

1. Watt CL, Momoli F, Ansari MT, et al. The incidence and prevalence of delirium across palliative care settings: a systematic review. *Palliat Med* 2019; 33: 865–877.
2. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders: DSM-5*. 5th ed. Arlington, VA: American Psychiatric Association, 2013.
3. Leonard MM, Agar M, Spiller JA, et al. Delirium diagnostic and classification challenges in palliative care: subsyndromal delirium, comorbid delirium-dementia, and psychomotor subtypes. *J Pain Symptom Manage* 2014; 48: 199–214.
4. Zaal IJ, Devlin JW, Peelen LM, et al. A systematic review of risk factors for delirium in the ICU. *Crit Care Med* 2015; 43: 40–47.
5. McCusker J, Cole MG, Voyer P, et al. Prevalence and incidence of delirium in long-term care. *Int J Geriatr Psychiatry* 2011; 26: 1152–1161.
6. Leslie DL, Marcantonio ER, Zhang Y, et al. One-year health care costs associated with delirium in the elderly population. *Arch Intern Med* 2008; 168: 27–32.
7. Breitbart W, Gibson C and Tremblay A. The delirium experience: delirium recall and delirium-related distress in hospitalized patients with cancer, their spouses/caregivers, and their nurses. *Psychosomatics* 2002; 43: 183–194.
8. van den Boogaard M, Schoonhoven L, van der Hoeven JG, et al. Incidence and short-term consequences of delirium in critically ill patients: a prospective observational cohort study. *Int J Nurs Stud* 2012; 49: 775–783.
9. Salluh JIF, Wang H, Schneider EB, et al. Outcome of delirium in critically ill patients: systematic review and meta-analysis. *BMJ* 2015; 350: h2538.
10. Leonard MM, Nekolaichuk C, Meagher DJ, et al. Practical assessment of delirium in palliative care. *J Pain Symptom Manage* 2014; 48: 176–190.
11. Lawlor PG and Bush SH. Delirium diagnosis, screening and management. *Curr Opin Support Palliat Care* 2014; 8: 286–295.
12. Elsayem AF, Bruera E, Valentine AD, et al. Delirium frequency among advanced cancer patients presenting to an emergency department: a prospective, randomized, observational study. *Cancer* 2016; 122: 2918–2924.
13. Marchington KL, Carrier L and Lawlor PG. Delirium masquerading as depression. *Palliat Support Care* 2012; 10: 59–62.
14. Smith J and Adcock L. The recognition of delirium in hospice inpatient units. *Palliat Med* 2012; 26: 283–285.
15. Irwin SA, Rao S, Bower KA, et al. Psychiatric issues in palliative care: recognition of delirium in patients enrolled in hospice care. *Palliat Support Care* 2008; 6: 159–164.
16. Meagher DJ, Leonard M, Donnelly S, et al. A longitudinal study of motor subtypes in delirium: frequency and stability during episodes. *J Psychosom Res* 2012; 72: 236–241.
17. Fang C-K, Chen H-W, Liu S-I, et al. Prevalence, detection and treatment of delirium in terminal cancer inpatients: a prospective survey. *Jpn J Clin Oncol* 2008; 38: 56–63.
18. Neufeld KJ, Nelliot A, Inouye SK, et al. Delirium diagnosis methodology used in research: a survey-based study. *Am J Geriatr Psychiatry* 2014; 22: 1513–1521.
19. World Health Organization. International classification of diseases and related health problems, 10th revision, https://icd.who.int/browse10/2019/en (2019, accessed August 1 2020).
20. De J and Wand AP. Delirium screening: a systematic review of delirium screening tools in hospitalized patients. *Gerontologist* 2015; 55: 1079–1099.
21. Oh ES, Fong TG, Hshieh TT, et al. Delirium in older persons: advances in diagnosis and treatment. *JAMA* 2017; 318: 1161–1174.
22. Lawlor PG. Cancer patients with delirium in the emergency department: a frequent and distressing problem that calls for better assessment. *Cancer* 2016; 122: 2783–2786.
23. Woodhouse R, Siddiqi N, Boland JW, et al. Delirium screening practice in specialist palliative care units: a survey. *BMJ Support Palliat Care*. Epub ahead of print May 2020. DOI: 10.1136/bmjspcare-2020-002251.
24. Boland JW, Kabir M, Bush SH, et al. Delirium management by palliative medicine specialists: a survey from the association for palliative medicine of Great Britain and Ireland.

BMJ Support Palliat Care. Epub ahead of print March 2019. DOI: 10.1136/bmjspcare-2018-001586.
25. Lawlor PG, Davis DHJ, Ansari M, et al. An analytical framework for delirium research in palliative care settings: integrated epidemiologic, clinician-researcher, and knowledge user perspectives. *J Pain Symptom Manage* 2014; 48: 159–175.
26. Bush SH, Leonard MM, Agar M, et al. End-of-life delirium: issues regarding recognition, optimal management, and the role of sedation in the dying phase. *J Pain Symptom Manage* 2014; 48: 215–230.
27. Lawlor PG, Rutkowski N, MacDonald AR, et al. A scoping review to map empirical evidence regarding key domains and questions in the clinical pathway of delirium in palliative care. *J Pain Symptom Manage* 2019; 57: 661–681, e612.
28. The Cochrane Collaboration. Cochrane handbook for systematic reviews of diagnostic test accuracy, version 1.0.0, https://methods.cochrane.org/sdt/handbook-dta-reviews (2013, accessed 10 December 2020).
29. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015; 4: 1.
30. National Institute for Health Research. PROSPERO: international prospective register of systematic reviews, https://www.crd.york.ac.uk/prospero (2020, accessed August 1 2020).
31. Scott M, Webber C, Bush S, et al. Validated delirium screening tools in palliative care: a systematic review. PROSPERO: international prospective register of systematic reviews. Record ID CRD42019125481, https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42019125481 (2019, accessed August 1 2020).
32. Lipowski Z. *Delirium updated. Psychosomatic medicine and liaison psychiatry*. Boston, MA: Springer, 1980.
33. Covidence, https://www.covidence.org/home (2020, accessed August 1 2020).
34. Whiting PF, Rutjes AWS, Westwood ME, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. *Ann Intern Med* 2011; 155: 529–536.
35. Breitbart W, Rosenfeld B, Roth A, et al. The memorial delirium assessment scale. *J Pain Symptom Manage* 1997; 13: 128–137.
36. Cacchione PZ. Four acute confusion assessment instruments: reliability and validity for use in long-term care facilities. *J Gerontol Nurs* 2002; 28: 12–19.
37. Stillman MJ and Rybicki LA. The Bedside Confusion Scale: development of a portable bedside test for confusion and its application to the palliative medicine population. *J Palliat Med* 2000; 3: 449–456.
38. de la Cruz M, Noguera A, San Miguel-Arregui MT, et al. Delirium, agitation, and symptom distress within the final seven days of life among cancer patients receiving hospice care. *Palliat Support Care* 2015; 13: 211–216.
39. Jorgensen SM, Carnahan RM and Weckmann MT. Validity of the delirium observation screening scale in identifying delirium in home hospice patients. *Am J Hosp Palliat Med* 2017; 34: 744–747.
40. Detroyer E, Clement PM, Baeten N, et al. Detection of delirium in palliative care unit patients: a prospective descriptive study of the delirium observation screening scale administered by bedside nurses. *Palliat Med* 2014; 28: 79–86.
41. Kang B, Kim YJ, Suh SW, et al. Delirium and its consequences in the specialized palliative care unit: validation of the Korean version of memorial delirium assessment scale. *Psychooncology* 2019; 28: 160–166.
42. Lawlor PG, Nekolaichuk C, Gagnon B, et al. Clinical utility, factor analysis, and further validation of the memorial delirium assessment scale in patients with advanced cancer: assessing delirium in advanced cancer. *Cancer* 2000; 88: 2859–2867.
43. Neefjes ECW, van der Vorst M, Boddaert MSA, et al. Accuracy of the delirium observational screening scale (DOS) as a screening tool for delirium in patients with advanced cancer. *BMC Cancer* 2019; 19: 160.
44. Ryan K, Leonard M, Guerin S, et al. Validation of the confusion assessment method in the palliative care setting. *Palliat Med* 2009; 23: 40–45.
45. Sands MB, Dantoc BP, Hartshorn A, et al. Single question in delirium (SQiD): testing its efficacy against psychiatrist interview, the confusion assessment method and the memorial delirium assessment scale. *Palliat Med* 2010; 24: 561–565.
46. Wilson JE, Boehm L, Samuels LR, et al. Use of the brief confusion assessment method in a veteran palliative care population: a pilot validation study. *Palliat Support Care* 2019; 17: 569–573.
47. Andrew MK, Bhat R, Clarke B, et al. Inter-rater reliability of the DRS-R-98 in detecting delirium in frail elderly patients. *Age Ageing* 2009; 38: 241–244.
48. Hamano J, Morita T, Ozawa T, et al. Validation of the simplified palliative prognostic index using a single item from the communication capacity scale. *J Pain Symptom Manage* 2015; 50: 542–547.
49. Barahona E, Pinhao R, Galindo V, et al. The diagnostic sensitivity of the memorial delirium assessment scale-Spanish version. *J Pain Symptom Manage* 2018; 55: 968–972.
50. Klankluang W, Pukrittayakamee P, Atsariyasing W, et al. Validity and reliability of the memorial delirium assessment scale-Thai version (MDAS-T) for assessment of delirium in palliative care patients. *Oncologist* 2020; 25: e335–e340.
51. Grassi L, Caraceni A, Beltrami E, et al. Assessing delirium in cancer patients: the Italian versions of the delirium rating scale and the memorial delirium assessment scale. *J Pain Symptom Manage* 2001; 21: 59–68.
52. Inouye SK, van Dyck C, Alessi C, et al. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med* 1990; 113: 941–948.
53. Ely EW, Inouye SK, Bernard GR, et al. Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). *JAMA* 2001; 286: 2703–2710.
54. Bruera E, Hui D, Dalal S, et al. Parenteral hydration in patients with advanced cancer: a multicenter, double-blind, placebo-controlled randomized trial. *J Clin Oncol* 2013; 31: 111–118.
55. van Velthuijsen EL, Zwakhalen SM, Warnier RM, et al. Psychometric properties and feasibility of instruments for the detection of delirium in older hospitalized patients:

a systematic review. *Int J Geriatr Psychiatry* 2016; 31: 974–989.
56. Wong CL, Holroyd-Leduc J, Simel DL, et al. Does this patient have delirium? Value of bedside instruments. *JAMA* 2010; 304: 779–786.
57. Porteous A, Dewhurst F, Gray WK, et al. Screening for delirium in specialist palliative care inpatient units: perceptions and outcomes. *Int J Palliat Nurs* 2016; 22: 444–447.
58. Spiller JA and Keen JC. Hypoactive delirium: assessing the extent of the problem for inpatient specialist palliative care. *Palliat Med* 2006; 20: 17–23.
59. Rao S, Ferris FD and Irwin SA. Ease of screening for depression and delirium in patients enrolled in inpatient hospice care. *J Palliat Med* 2011; 14: 275–279.
60. Hjermstad MJ, Loge JH and Kaasa S. Methods for assessment of cognitive failure and delirium in palliative care patients: implications for practice and research. *Palliat Med* 2004; 18: 494–506.
61. Hosie A, Davidson PM, Agar M, et al. Delirium prevalence, incidence, and implications for screening in specialist palliative care inpatient settings: a systematic review. *Palliat Med* 2013; 27: 486–498.