Review Article

Strategies for Pain Assessment in Adult Patients With Delirium: A Scoping Review

Dr. Thomas Fischer, MPH, Annmarie Hosie, PhD, Tim Luckett, PhD, Meera Agar, PhD, and Jane Phillips, PhD
Evangelische Hochschule Dresden (T.F.), Dresden, Germany; and IMPACCT—Improving Palliative, Aged and Chronic Care through Clinical Research and Translation (T.F., A.H., T.L., M.A., J.P.), Faculty of Health, University of Technology Sydney, Ultimo, Australia

Abstract

Context. Pain and delirium are highly prevalent in the same patient groups. Disturbances in attention, awareness, and cognition are characteristics for delirium and can compromise pain assessment.

Objectives. The aim of this review was to examine and map models and understandings of pain and delirium as well as pain assessment instruments and strategies for adult patients with delirium.

Methods. A scoping review of all publications that reported on pain assessment in adult patients with delirium was conducted with no time and language constraints, searching Medline, CINAHL, Scopus, Embase, and PsycINFO and systematically assessing for inclusion. Standardized data extraction and a narrative synthesis followed.

Results. A total of 90 publications were included in the final analysis. Despite being recommended for practice, no evidence for the use of self-report or behavioral pain assessment instruments in patients with delirium was identified, with the exception of limited evidence for the validity of the Critical Care Pain Observation Tool and Behavioral Pain Scale in delirious intensive care patients. Proxy ratings of pain and comprehensive pain assessment hierarchies were also recommended, but not supported by evidence. Current models and/or understandings of pain and delirium were not applied in most publications.

Conclusion. The current literature is insufficient to guide clinical practice in pain assessment in patients with delirium. Future research will be needed to address the validity of existing pain assessment instruments, apply theoretical and conceptual understandings of pain and delirium, and build on prior studies to close evidence gaps. J Pain Symptom Manage 2019;58:487–502.

Key Words
Pain, delirium, pain assessment, pain measurement, scoping review

Introduction

Pain is a common problem for patients across all health care settings with a prevalence rate between 37.7% and 84%[1] in hospitals and up to 79.5% in residential aged care.[2] Like pain, delirium is also highly prevalent in acute, aged, and palliative populations[3–5] and therefore likely to often co-exists with pain. Delirium is a neurocognitive disorder of multifactorial etiology that is characterized by a disturbance in attention and awareness that develops over a short period of time and tends to fluctuate.[6] In addition, disturbances in cognition occur which may affect memory, orientation, language, perception, or other areas. Although delirium is usually a transient disorder, a significant number of patients suffer from prolonged or even persistent delirium.[7]

Pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"[8] that, as a highly subjective phenomenon, is best assessed via the patient's self-report.[9] Delirium, as a common cause of cognitive impairment, may compromise the capacity of patients to self-report pain, due to a variety of reasons including disturbances of attention, memory, thinking, and language disturbance

Address correspondence to: Dr. Thomas Fischer, MPH, Evangelische Hochschule Dresden, Dürerstraße 25, 01307 Dresden, Germany. E-mail: Thomas.Fischer@ehs-dresden.de

Accepted for publication: May 31, 2019.

0885-3924/$ - see front matter
https://doi.org/10.1016/j.jpainsymman.2019.05.020

(such as word finding difficulty, incoherent speech, and problems with writing).[4,10] It also can be difficult for clinicians to administer and interpret pain assessment instruments. In intensive care patients, who are known to have especially high rates of delirium, mechanical ventilation and sedation further compound the challenges of obtaining patients' self-reports of pain. In all delirium subtypes (hyperactive, hypoactive, or mixed-delirium), symptoms fluctuate, so that delirious patients' capacity to self-report pain can vary at different times along a continuum from full capacity (i.e., able to provide comprehensive self-report that can easily be interpreted by someone else) to no capacity at all.

The validity and reliability of standard pain self-report tools in patients with delirium is unclear, including the Numerical Rating Scale (NRS), Visual Analog Scale (VAS), Verbal Descriptor Scale, Faces Pain Scale, and pain assessment questionnaires. Pain assessment practices in patient groups with limited ability to communicate have tended to rely on observation of patient behaviors that may indicate pain. At least 28 observational tools are available for use with patients with dementia,[11] many of them based on consensus-based recommendations that suggest pain behaviors in "cognitively impaired elderly persons" fall into six categories (facial expressions; verbalizations, vocalizations; body movements; changes in interpersonal interaction; changes in activity patterns or routines; and mental status change).[12] However, these recommendations are aimed at persons with dementia and do not specifically consider persons with delirium as a fundamentally different cognitive disorder. Furthermore, none of the behavioral pain instruments for persons with dementia can be fully recommended as evidence for their validity, reliability, and clinical utility is lacking.[11] The utility and validity of these tools for persons with delirium are unclear and the list of pain behaviors that are based on shows overlap with symptoms of delirium, for example, mental status change, vocalizations, or body movements.

Furthermore, self-report and observational pain tools may not necessarily address the same aspects of the pain experience, which encompasses three dimensions:[13]

- Sensory-discriminative dimension: reflects if a person feels a painful sensation in their body, where they feel it, how they describe painful sensations, and rate the intensity of the pain;
- Motivational-affective dimension: reflects emotions and affects associated with a painful experience;
- Cognitive-evaluative dimension: reflects how the pain experience is understood in terms of expectations and past experiences.

All three dimensions are important to make decisions about adequate pain management strategies. Different types of pain assessment instruments are reflective of different aspects of the pain experience. Self-report instruments like the NRS predominantly assess pain intensity, that is, the sensory-discriminative dimension, whereas behavioral instruments appear to be more reflective of motivational-affective aspects of the pain experience encoded in certain behaviors. How delirium affects the expression and assessment of the three pain dimensions is unclear.

In summation, there appears to be no definitive body of evidence focused on pain assessment in persons with delirium. There is the need to summarize what knowledge exists for this common but poorly conceptualized clinical conundrum and identify in which areas further research is needed.

Aim

To examine underlying models and understandings of pain and delirium and to map instruments and strategies for assessing pain in adult patients with delirium.

Materials and Methods

A scoping review was conducted, following the Joanna Briggs Institute's[14] methodology.

Inclusion Criteria

Publications from all countries and languages and without time constraints were included if they referred to adult patients (aged more than 18 years) in any care setting identified as having delirium, irrelevant of how this diagnosis was reached.

Transient, prolonged, and persistent cases of delirium were included. Publications on patients with delirium superimposed on dementia were included, whereas those on non-delirious patients with dementia were excluded. Publications that used alternative terminology for delirium were included, if reviewers were satisfied, that the texts referred to delirium. Publications were excluded if they referred to confusion and/or agitation in association with other psychiatric illnesses such as psychosis.

Publications were included if they reported on pain assessment in patients with delirium. The terms pain assessment and pain measurement are used as equivalent for inclusion purposes in accordance with the

respective MeSH definitions and describe the process used to determine the intensity, perceptual qualities, and time course of pain.[13] Pain assessment includes screening for pain, a focused assessment of pain and the re-assessment over the course of treatment and care. Assessing pain in patients with delirium includes all aspects of the assessment of all dimensions of pain in this patient group, including any instruments or algorithms used, as well as the clinical judgment process that supports it.

All types of published articles were accepted because of an assumed lack of publications on the topic; including quantitative and qualitative studies, reviews, case reports, commentaries, letters, as well as economic and epidemiological evidences.

Search Strategy

A three-step search strategy (1. Limited database search to identify search terms, 2. Database search, and 3. Citation tracking) was used with Medline, CINAHL, Scopus, Embase and PsycINFO databases in June 2016 and updated in July 2018. The search strategy was devised with support from a medical research specialist librarian. Publications in all languages were included and no time constraints were set. Two researchers independently reviewed titles, abstracts, and (where necessary) full texts for inclusion. Any disagreements were resolved through discussion, with a 3rd reviewer involved as needed.

Extraction of Results

One reviewer (TF) extracted data from the selected articles using a prepared data extraction chart that was informed by current conceptualizations of pain and delirium as described in the Introduction. Data extraction was checked by a research assistant in 15% of cases, randomly chosen. Only minor differences were detected in this step, that were resolved by discussion in the research team.

Reference lists of all analyzed publications were checked for additional relevant publications and six additional publications identified.

Synthesis

A narrative approach to synthesis was used as the most appropriate for the range of publication types included. The lead researcher (TF) developed a first draft of the synthesis based on the extracted data. A second researcher (TL) checked the presented propositions and content on the basis of the original publications. All disagreements were discussed and resolved.

Assessment of bias is typically considered outside the remit of a scoping review (Joanna Briggs Institute, 2015), the purpose of which is largely descriptive. Non-empirical publications (e.g., editorials, letters) do not lend themselves to bias assessment.

Results

From a total of 1715 publications returned by searches after duplicates were removed and six articles identified through citation tracking, 90 were included in the final analysis (Fig. 1). Detailed information about the articles included can be found in Appendix Table 1. Publication characteristics are summarized in Table 1.

Origin and Type of Publications

Publications predominantly originated from the U.S. ($n = 43$, 48%) and Canada ($n = 15$, 17%). All were published in English, except for two German articles,[15,16] between 1992 and 2018, with publications becoming more frequent in recent years.

Journal articles accounted for 84 publications (93%), four were doctoral dissertations and one was a conference abstract. Of the journal articles, 25 (28%) were unsystematic literature reviews, of which Herr et al. 2011[17] is an update of Herr et al. 2006[18] Empirical research was reported in 42 publications (47%). Of these, 23 (26%) were cohort studies and eight were cross-sectional studies. Three controlled trials were identified. Four doctoral dissertations were cohort ($n = 3$; 3%) and cross-sectional ($n = 1$; 1%) studies.

Of the 41 research articles, seven studies (8%) stated an aim related to pain assessment in patients with delirium.[19–25] All other studies discussed aspects of pain assessment in delirium or reported on how pain was assessed in patients with delirium, without referring to pain assessment as the aim.

Populations and Settings

Most publications referred to older persons with different age limits used ($n = 48$, 53%) and adult patients in general ($n = 36$; 40%). Main patient groups were as follows: critically ill ($n = 21$; 23%), surgical ($n = 17$; 19%), those with dementia and/or delirium and/or other causes of cognitive impairment ($n = 16$; 18%), and cancer ($n = 13$; 14%). Some publications also focused on older/geriatric patients in general ($n = 6$) or on palliative care or end-of-life patients ($n = 34$; 38%). However, patient groups were not mutually exclusive. Publications from general hospital settings ($n = 42$; 47%) and intensive care settings ($n = 18$; 20%) dominated the literature. A variety of palliative care settings (stand-alone facilities, hospital units, long-term care centers, and hospices) were reported in nine publications and residential care in another seven.

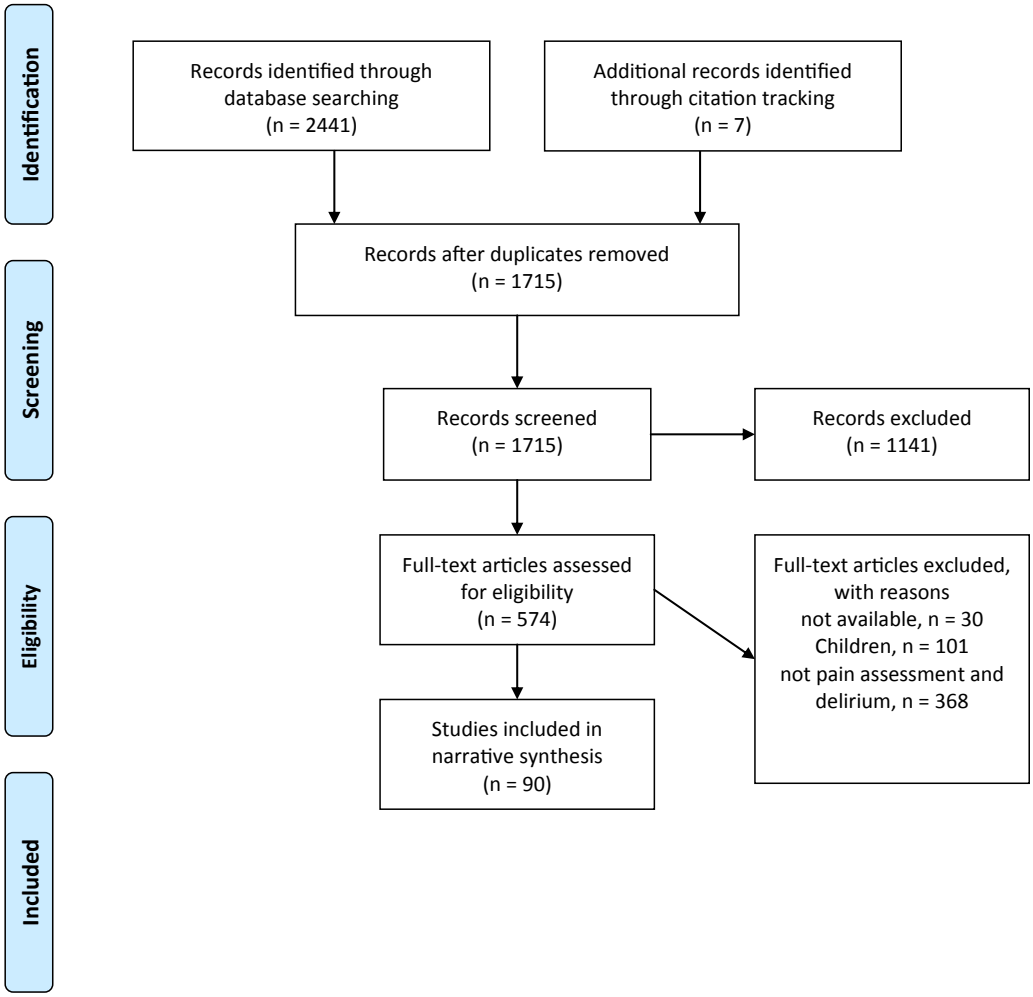

Fig. 1. Flow chart.

Delirium Terminology and Measurement

Of the 90 publications, 79 (88%) used the term delirium throughout the publication and five (6%) used delirium interchangeably with other terms, namely, (acute) confusion ($n = 3$; 3%) and agitation, cognitive failure, and terminal restlessness ($n = 2$, 2%).

No clear definition of delirium was given in 54 publications (60%), whereas 28 (31%) referred to different versions of the American Psychiatric Association Diagnostic and Statistical Manual[6] diagnostic criteria for delirium. A total of 21 publications (23%) differentiated between hypoactive, hyperactive, and mixed delirium sub-types. Voyer et al.[26] also differentiated "delirium without motoric component," whereas Denny[27] and Schiemann et al.[28] additionally considered sub-syndromal delirium (defined as not fulfilling all Diagnostic and Statistical Manual criteria).

Over one-third of publications ($n = 34$; 38%) did not report the use of a standardized screening or diagnostic test or instrument to establish delirium cases. Of those publications that reported standardized testing for delirium, the Confusion Assessment Method (CAM)[29] ($n = 25$; 28%) and CAM for intensive care units (CAM-ICU)[30] ($n = 18$; 20%) were the most frequently used instruments. Three studies relied on the Mini Mental State Examination[31] to detect delirium.

Underlying Models and Understanding of Pain

The underlying understanding of pain guiding the assessment strategy or instrument development were discussed by five publications (6%).[32–36] These discussions were mostly on a general level and there was no indication of how this understanding of pain directly linked or interacted with delirium (Table 2). Decker and Perry[32] suggested that, although the VAS aims to measure pain intensity, the Pain Assessment Tool in Confused Older Adults as a behavioral pain assessment tool may tap into different aspects of the pain experience, but did not further elaborate. In a narrative review, Yennurajalingam et al.[33] recommended that "affective components of pain should be taken into consideration when assessing pain in patients

Table 1
Origin, Language, Type of Included Material and Patient Group

Country of Origin (Study Conducted or First Author)	Number
U.S.	43
Canada	15
France	4
The Netherlands	3
Australia	2
Germany	2
Japan	2
Spain	2
China	1
Denmark	1
Egypt	1
Finland	1
India	1
Iran	1
Korea	1
Norway	1
South Korea	1
Switzerland	1
Taiwan	1
U.K.	1
More than one country	5
Language	
English	88
German	2
Type of Material	
Journal article, review	25
Journal article, case report	7
Journal article, educational	5
Journal article, guideline	1
Journal article, project report	1
Journal article, study protocol	1
Journal article, commentary & opinion	1
Journal article, news/journal club	1
Journal, recommendation for implementation	1
Journal article, original research, of which:	41
Cohort study	23
Cross-sectional	8
Chart review	4
Qualitative	1
Randomized controlled trial	3
Other	2
Doctoral dissertations, of which	4
Cohort study	3
Cross-sectional study	1
Conference abstract	1

with cognitive impairment, as they could […] worsen the pain." (p. 95).

Raway[36] demonstrated differences between postoperative patients with and without confusion (assumed delirium) in verbal and non-verbal communication of pain, but this observation was not further explored in any other publication included in this review. None of the included publications differentiated between chronic and acute pain in patients with delirium. No specific classifications for pain (e.g., Edmonton Classification System for Cancer Pain) was mentioned in the literature.

Signs of Pain in Persons With Delirium

Decker[21] asked clinicians about behavioral indicators of postoperative pain in older persons with delirium, and Gagliese et al.[22] did the same in a palliative care setting (Table 3). Indicators identified include changes in usual behavior, other behavioral cues, such as guarding and restlessness, facial expressions, and vocalizations. Clinicians were not educated regarding pain signs before those surveys.

Some authors listed delirium (e.g., Booker 2016[37]) or confusion and agitation (e.g. Herr et al. 2006[18], Herr 2011[17]) as behavioral indicators of pain. Gagnon et al.[38] argued that nurses may misinterpret agitation for pain. Overlap between the symptoms of delirium and pain behaviors were noted by further authors.[25,39–43]

Timing and Circumstances of Pain Assessment in Delirium

Three publications (3%) addressed aspects of timing of pain assessment in patients with delirium. For intubated ICU patients with fluctuating delirium, Herr et al.[17,18] recommended that "serial assessments for the ability to self-report should be conducted" (p. 49) and Hadjistavropoulos et al.[40] recommended that pain assessments be repeated when transient delirium subsided.

Tate et al.[44] demonstrated that critically ill patients with delirium were less likely to initiate communication about symptoms, including pain, than those without delirium, and argued that clinicians, therefore, must take the initiative rather than time assessments based on patient report.

Gagliese et al.[22] concluded from a chart audit that clinicians tended to use two behavioral pain assessment strategies, either looking for spontaneous pain behaviors or observing patients for pain behaviors during potentially painful interventions, for example, repositioning. Herr et al.[18] and Hadjistavropoulos et al.[40] also recommended assessing behavioral indicators of pain during movement-based tasks.

Influences of Delirium Type on Pain Assessment

Authors of two publications (2%) argued that clinicians are more likely to rate pain higher in patients with hyperactive delirium than in those with hypoactive delirium, presumably because they interpret agitation as a sign of pain.[19,38] Gagnon et al.[38] posited a moderating effect of delirium sub-type on breakthrough pain, arguing that hyperactive delirium leads to more movement which in turn is likely to precipitate breakthrough pain, whereas hypoactive delirium was associated with less movement and may thus cause less breakthrough pain. Hypoactive delirium may even be mistakenly interpreted as the absence of pain, and delirium in general may mask physiological alterations that can cause pain.[45]

Table 2
Publications Discussing the Underlying Concept of Pain in People With Delirium

Publication	Sensory-Discriminative Dimension	Motivational-Affective Dimension	Cognitive-Evaluative Dimension	Reference to Patients With Delirium
Decker & Perry[32]	If "Pain intensity" is assessed as the only dimension of pain, this may provide "a less comprehensive picture of pain" (p. 83)	No explicit mention	No explicit mention	Study included patients with "acute confusion"
Yennurajalingam, Braiteh & Bruera[33]	Location, radiation, character, intensity frequency, and syndromal presentation referred to as the "classic view of pain" that "does not take into account the multidimensional nature of pain" (p. 94)	Expression and perception of cancer pain can be influenced by affective phenomena such as agitation, catastrophizing, somatization, depression and anxiety	As self-report requires cognition, it should not be attempted in patients with delirium	Sensory-discriminative and motivational-affective aspects discussed in a general way, not specific to delirium
Lints-Martindale[34]	Dimension mentioned	Dimension mentioned	Dimension mentioned	Study focusses on patients with delirium
Butler et al.[35]	Implicitly mentioned in conjunction with the assessment of pain intensity	No explicit mention	Term "cognitive-behavioral strategies" mentioned in conjunction with non-pharmacological interventions against pain	Aspects discussed in a general way, not specific to delirium
Raway[36]	Explicitly discussed	Explicitly discussed and assessed in verbal patients	Included in measurement for verbal patients	Study includes patients with dementia and/or delirium

Pain Assessment Strategies for Patients With Delirium

The strategies used for pain assessment varied across the publications (Table 4) ranging from self-report to comprehensive assessment strategies.

Self-Report

A total of 20 studies (22%) relied entirely on patients' self-report of pain, predominantly using an NRS or a VAS for pain intensity (Appendix Table 1), mirroring clinicians' practice preferences when patients are able to communicate verbally.[22] Although no studies supporting the validity of self-report instruments of pain in persons with delirium were identified, Lynch et al.[46] questioned the validity of the VAS for persons with delirium, without indicating the basis of their concerns. With regards to reliability, Leung et al.[47] reported that patients with postoperative delirium demonstrated acceptable test-retest reliability in their pain ratings using a VAS; and DeCrane et al.[48] argued the same for the NRS without providing evidence for this claim. Miller et al.[49] suggested investigating which cue words for pain are best understood by patients with delirium (e.g., pain vs. discomfort), and considering the formatting of self-report scales best suited to people with delirium.

Proxy Reporting

Although some publications reported or recommended (e.g., Buffum et al. 2007 and D'Arcy 2006[45,50]) the use of proxy reports of pain in patients with delirium by a clinician, researcher or a patient's family member, others cautioned against it (e.g.,

Table 3
Suggested Signs of Pain in Patients With Delirium

Context	Indicator	Reference
Postoperative older persons	Change in usual behavior (reluctant to move; patient is not acting right (family input); quiet; irritable; agitation (see also: nonverbal cues); reluctant to do anything; Nonverbal cues/behavior (guarding the affected side; restless; agitation (see also: Change in usual behavior); Facial expression (grimacing, frowning, clenching jaws, gloomy face) Vocalizations (sighing, moaning, crying, yelling) Not categorized (elevated vital signs; reluctant to be touched; reluctant to deep breath and cough; points to where hurts; quivering; whiny)	[21]
Palliative care	Moaning Groaning Grimacing	[22]

Table 4
Used or Suggested Strategies for Pain Assessment in Patients With Delirium

Strategy	Reference	Evidence
Self-report of pain presence and intensity Using direct question or standardized tools (e.g., NRS or VRS)	15,16,19,22,24,28,32,35,40,46–49,53,56,78–112	No evidence for reliability or validity in patients with delirium reported in the literature
Proxy-report of pain presence and pain intensity	19,38,45,50,97,104,113,114	No evidence for reliability or validity in patients with delirium reported in the literature
Establish baseline behaviors and/or assess patient's behavior or behavioral response for signs of pain	15,16,18,20,22–24,26,28,32,35,40,42,43,45,49,50,52–57,60,78–84,87,90,92,95,96,99,101,102,104,107,111,115–122	No evidence for reliability or validity in patients with delirium reported in the literature; for behavioral pain assessment tools, see Table 5
Analgesic trial	50,60	No evidence for reliability or validity in patients with delirium reported in the literature
Comprehensive assessment/identify potential causes of pain	49,59	No evidence for reliability or validity in patients with delirium reported in the literature
Hierarchical pain assessment strategy, including self-report, proxy rating, behavioral assessments and analgesic trials	17,18,33,36,37,40,57,58,123	No evidence for reliability or validity in patients with delirium reported in the literature

Lynch et al. 1998[46]). No evidence for the validity of proxy-reports was identified. Bruera et al.[19] highlighted that differing interpretations of agitated behaviors as a sign of either pain or delirium may be a source of conflict between clinicians and the patient's family. However, this aspect of pain assessment practice was not explored elsewhere in the reviewed literature.

Behavioral Pain Assessment

The Behavioral Pain Scale (BPS) for non-intubated patients[20] and the Critical Care Pain Observation Tool (CPOT)[51] were the only instruments with established psychometric properties when patients with delirium are unable to provide self-report, tested in the intensive care setting (Table 5). Although Kanji et al.[23] reported favorable reliability and validity of the CPOT in a prospective cohort study with 40 ICU patients with delirium, study results may have been influenced by sedation, variations in medication and lack of blinding. Rijkenberg and van der Voort[52] commented on this study, suggesting that CPOT scores may have been inflated by agitation that was not necessarily pain-related and could have been associated with delirium, and Chookalayia et al.[53] found CPOT to be not valid in agitated

Table 5
Behavioral Pain Assessment Tools

Instrument Validation Studies			
Instrument (Discussed or Used)	Reference	Context	Evidence Reported
CPOT	23	Intensive care	Acceptable internal consistency; Good interrater reliability; Discriminant validity demonstrated (painful stimulus vs. rest)
BPS-NI	20	Intensive care	Discriminant validity demonstrated (nociceptive vs. non-nociceptive stimulus)
Other instruments used, discussed, or recommended			
Abbey Pain Scale	79	Aged care/patients with cognitive impairment, usually dementia	No evidence for reliability or validity in patients with delirium reported in the literature
Algoplus	90		
CNPI	18,56,116		
DisDAT	58		
Doloplus, Doloplus-II	16,18,26,40,42,55,81		
NOPPAIN	18,56		
PACSLAC	18,40,56,59,81,92		
PADE	56		
PAINAD	18,35,56,57,92,120		
PATCOA	32		
Behavioral Indicators of Pain Scale	124	Mechanically ventilated patients	No evidence for reliability or validity in patients with delirium reported in the literature
MOPAT	125	Hospice Patients	No evidence for reliability or validity in patients with delirium reported in the literature

CPOT = Critical Care Pain Observation Tool; BPS-NI = Behavioral Pain Scale for non-intubated patients; CNPI = Checklist of Non-Verbal Pain Indicators; DisDAT = Disability Distress Assessment Tool; NOPPAIN = Non-Communicative Patient's Pain Assessment Instrument. Activity Chart Check List; PACSLAC = Pain Assessment Checklist for Seniors with Limited Ability to Communicate; PADE = Pain Assessment for the Dementing Elderly; PAINAD = Pain Assessment in Advanced Dementia Scale; PATCOA = Pain Assessment Tool in Confused Older Adults; MOPAT = Multidimensional Objective Pain Assessment Tool.

patients, although it remains unclear if the cause for agitation was delirium. Varndell et al.[54] recommend further testing of the CPOT in patients with delirium and remark that the influence of delirium severity on pain measurements has never been studied in the ICU population.

Chanques et al.[20] studied discriminant validity of a version of the BPS-NI in non-intubated patients in a sample of 30 ICU patients unable to provide self-report of pain, where 25 patients scored positive for delirium on the CAM-ICU. However, lack of a power calculation and blinding posed threats to the validity of these results. A mix of patients with and without delirium along with heterogeneity of the sample (regarding diagnosis, sedation level, illness severity, and other factors) make it difficult to draw clear conclusions for a specific patient group.

In aged-care settings, a variety of behavioral pain assessment tools were reported (Table 5). These tools have been originally developed for use with patients with dementia. No evidence for their validity when used with patients with delirium or delirium superimposed on dementia was reported.

Pain tool items that relate to social behaviors may be particularly problematic.[55] One study[34,56] sought expert consensus to determine which items in behavioral pain assessment tools for persons with dementia may not be specific to pain but overlap with signs of delirium. Items identified as ambiguous referred to restlessness, vocal behaviors, agitated behaviors, and others.[56] After removal of these items, Checklist of Non-Verbal Pain Indicators, Pain Assessment Checklist for Seniors with Limited Ability to Communicate, Pain Assessment for the Dementing Elderly, Pain Assessment in Advanced Dementia Scale, and Non-Communicative Patient's Pain Assessment Instrument—Activity Chart Check List retained validity to detect pain (influenza vaccination or movement exacerbated pain vs. no pain stimulus [skin swabbing before vaccination]) in patients with dementia. Although this study was intended to "delirium-proof" dementia pain scales, it provided no direct information about performance of the tools in patients with delirium. Hadjistavropoulos et al.[55] demonstrated that the item "problems with behavior" from the Doloplus-II pain scale in persons with dementia is associated with delirium presence and delirium severity, and "washing and dressing" with delirium severity, likely resulting in inflated pain scores in patients with delirium. A minority of clinical experts also judged "narrowing eyes, closing eyes, raising upper lip, opened mouth, clenched teeth, pale face, looking tense, and looking frightened" as indicative of delirium rather than pain or delirium,[43] whereas "empty gaze and seeming disinterested" were judged to be no indication of pain at all.

Comprehensive Assessment

Several authors recommended the development of a comprehensive, hierarchical pain assessment strategy in patients with cognitive impairment with a combination of different pain assessment approaches.[18,36,40,57] Using this approach, it was suggested that a self-report of pain should be attempted first, followed by the search for potential causes of pain, behavioral pain assessments, proxy ratings of pain and finally an analgesic trial. In critically ill patient with delirium, however, self-report of pain and behavioral pain assessments were not correlated.[24] Herr et al.[18] recommended that clinicians assume that pain is present whenever a potentially painful stimulus is known to be present, regardless of whether the patient's behavior suggests pain. A toolkit for use in patients with cognitive impairment that followed this hierarchy was developed based on a review by Chatterjee[58] but has not yet been validated in patients with delirium or cognitive impairment. Also, Buffum et al.[45] stated that "Serial assessments and empirical trials of medications may be necessary for the differentiation of pain, terminal agitation, and hyperactive delirium" (p. 322).

Agar[59] recommended a full assessment of the patient which should not only include a delirium assessment scale, but also a behavioral pain scale and a physical assessment and medical history that may point to specific causes of the patient's potential pain, such as inflammation. A patient-centered approach where clinicians try to understand the patient's unique response to pain and pain treatment as part of the assessment process, was also strongly advocated for, including baseline assessment of the patient's behaviors with the help of family members who know the patient well.[45] A strong role for regular reassessment of pain in the context of analgesic trials and upward titration of pain medication was also suggested to discern if the patient is in pain (in which case signs will reduce) or suffers from delirium, which may be aggravated by increased analgesic medication.[50,60]

Discussion

This is the first scoping review of pain assessment in patients with delirium. It presents a comprehensive overview of publications of all types addressing this overlap. The findings reveal a lack of agreed and/or validated instruments and strategies for pain assessment in patients with delirium. Although opinion was described, there was a paucity of direct evidence to guide clinical practice. The literature was also limited in the extent to which it draws on the current understanding of the nature of pain and the specific impact delirium may have on the pain assessment

process, especially in contrast to other cognitive disorders such as dementia. How specific features of delirium, such as fluctuating symptoms and different delirium subtypes, might influence pain experience and assessment was minimally addressed. The current literature predominately concentrated on pain presence and sometimes intensity, neglecting other pain characteristics, such as localization, that are critical to inform pain management. Potential differences in the presentation and interdependence of pain and delirium across different settings and contexts (e.g., delirium and pain in a postoperative patient vs. a patient at the end of life) are not addressed in the literature.

Appraisal of Available Instruments and Suggested Strategies

The need for and methodological issues in establishing psychometric properties of existing pain assessment tools in people with delirium were not widely considered, despite the urgent need for validated pain assessment tools in delirium to take this field forward and enhance clinical care. Equally, the performance of commonly used self-report instruments of pain intensity is yet to be studied in patients with delirium, and it is unlikely the findings when used with persons with dementia are synonymous with the pain experiences of people with delirium. This is primarily because of manifestly different neuropathophysiology, etiology, and symptoms (both cognitive and behavioral) of dementia and delirium.

Notwithstanding this limitation, several behavioral pain assessment tools originally developed for dementia have been used in patients with delirium, despite no evidence being provided to support the validity and reliability of the use of these tools in this context. On the contrary, many behavioral pain assessment tools contain items that are not pain-specific but also reflect symptoms of delirium.[34,42,55,56,60,61] Guidance for such instrument development is often from the most cited list of nonverbal pain behaviors in older persons,[12] which explains why overlap is present in most tools. Furthermore, the understanding of the impact and diagnostic criteria for delirium superimposed on dementia is only developing,[62] which may help to better inform research and instrument development in the future for the group of three conditions overlapping, namely, delirium, dementia, and pain.

Delirium in the ICU setting has received more attention in both clinical practice and research, an area where pain and contribution of analgesia and sedation to delirium is also a critical clinical issue, which may explain why only in the ICU setting pain assessment instruments (COPT and BPS) have been tested specifically for patients with delirium. However, although they show promise, both the CPOT[23] and the BPS[20] will need further investigation into their reliability and validity.

Although use of proxy assessment of pain was reported, no evidence was provided to support the adoption of this approach. Furthermore, pain is frequently under- or overestimated by proxies[63] and Herr et al.[18] and Chatterjee[58] rank the validity of proxy ratings as low. Therefore, we caution against the use of proxy-reports for pain assessment in persons with delirium until compelling evidence is provided.

The hierarchies for pain assessment that recommend clinicians to attempt pain self-report first, consider painful conditions, and rely on the assessment of behavioral signs of pain as a last resort[18,58] appear to be widely aligned with clinical practice, as demonstrated by current guidelines.[64,65] However, it should be noted that both current guideline recommendations[64,65] and the hierarchies described above are based on expert opinion and not robust evidence and that correlation between pain self-report and behavioral assessment appears to be lacking.[24] Specific hierarchies for patients with delirium and pain are urgently needed with their outcomes systematically investigated. Furthermore, although these hierarchies may appear clear in general, the reviewed literature did not provide any guidance on how to detect whether delirious patient self-report is unreliable and should be substituted by a behavioral pain assessment. In patients with dementia, Sirsch[66] has studied this problem and devised an algorithm to aid clinical judgment, which is awaiting testing, and this approach may lead the way forward for patients with delirium as well.

Understanding of Delirium

Unfortunately, large parts of the literature have not been informed by a current understanding of delirium. This was evident from a lack of reference to diagnostic criteria or delirium assessment instruments, and absence of differentiation between cognitive impairment in a broader sense and delirium more specifically. In many cases, the Mini Mental State Examination was used to assess cognitive impairment, which cannot differentiate whether patients suffered from delirium, dementia, both, or other forms of cognitive impairment. More specifically, delirium subtypes were neither regularly reported nor were their consequences for pain assessment taken into consideration sufficiently. These results reflect that a thorough understanding of the nature, prevalence, and outcomes of delirium only started to build over recent years and could not have informed older research and publications.

It appears reasonable to hypothesize that the ability to self-report pain may differ depending on delirium

subtype. Hypoactive delirium causes lethargy, drowsiness, slowdown, and withdrawal from the environment, reducing initiative to talk about pain or slowing down of self-report. Hyperactive delirium presents as agitated, restless, and overactive behavior, making it difficult to concentrate on pain assessment. Similarly, performance of observational pain assessment tools will most likely differ with the delirium subtype. Agitation in hyperactive delirium may inflate behavioral pain scores that often consider agitation to be a sign of pain.[52,53]

Other typical features of delirium, such as significant fluctuations in symptom severity and sudden onset, and implications for the timing of pain screening and interacting with pain assessment findings were also not considered and could alter the course of pain management significantly. Pain monitoring in particular needs to be adaptive to ever changing presentations of delirium. Any strategy for pain assessment must account for these specific features of delirium and consider where on a continuum between "no capacity for self-report possible at all" and "full capacity for self-report" a given patient may be positioned at the time of pain assessment, re-evaluating this on each separate occasion.

In the absence of reference to diagnostic criteria, delirium was sometimes incorrectly referred to as agitation or confusion, which could be symptoms of delirium, signs of pain or differential diagnoses. In clinicians' assessments, the same may be true for withdrawal and inactivity as signs of hypoactive delirium.[19,45] Listing delirium as a pain behavior[37] is unhelpful because of the manifold forms delirium may take. Unclear terminology of this kind is likely to blur concepts and challenge clinical practice.

Potential causal relationships between delirium, pain, and pain management were not explored in any detail in the reviewed literature. Although analgesic trials have been suggested as part of hierarchical assessment strategies,[18,58] these should only be undertaken with an understanding that analgesic drugs are associated with the occurrence of delirium.[67,68] Giving an analgesic may therefore contribute to an ongoing delirium, that may then be mistaken for either behavioral signs of (increased) pain in hyperactive delirium, leading to even higher doses of analgesia, or for hypoactive delirium that is wrongly accepted as successful pain management.

Understanding of Pain

On the most fundamental level, our current understanding of pain as a phenomenon with distinct dimensions was rarely reflected in the reviewed literature. As pain was not discussed on a conceptual level in most publications, it can only be assumed that most authors referred to the sensory-discriminative aspect of pain, operationalized as pain intensity. However, pain localization, which is part of the same dimension of the pain experience, was not discussed in the literature, despite its outstanding importance for patient care. More specific clinically challenging pain situations, for example, like allodynia or hyperalgesia, were not mentioned in the literature at all.

To meet patients' needs and facilitate instrument development, it should be acknowledged that different types of assessment have been shown to tap into different aspects of the pain experience and that results of a pain assessment may differ depending on the aspect a clinician focuses on.[69,70] Behavioral pain tools more closely reflect the motivational-affective dimension of the pain experience than self-report instruments, which may be more closely linked to the sensory-affective component.[69,71] Cognitive filters may also influence the self-report of pain, and it can be assumed that cognitive impairment has an effect on pain-related cognitions. What cognitions (if any) patients with delirium might experience with regard to pain was not mentioned in the literature. Furthermore, for the management of acute pain,[72] which aims for the greatest possible reduction of pain intensity, the sensory dimension of the pain experience may be more important than for chronic pain lasting longer than three months,[72] where emotions and cognitions associated with the pain experience are much more important to achieve positive patient outcomes. How delirium affects the pain experience across the three dimensions, and how assessment strategies might account for differences in chronic versus acute pain was never discussed in the literature.

Furthermore, other perspectives on pain, such as the concept of total pain, and how they may inform pain assessment, for example, for patients with a terminal illness and delirium, were not addressed in the literature. No reference to existing pain assessment strategies and classifications for defined populations, such as patients with cancer,[73] could be identified.

Implications for Practice

Practice recommendations are limited by the shortcomings of the literature outlined above and the absence of randomized controlled trials. However, a number of tentative recommendations can be made, as described below.

1. Comprehensive assessment: As standard practice for all seriously ill patients, a comprehensive assessment of the patient, including a physical assessment and a complete history, should be taken[59] as a basis for all further investigations and clinical decision making, tailored

to the clinical situation of the patient and the setting.
   - Ability to self-report: As part of this, clinicians should assess to what extent a patient with delirium can self-report pain. As delirium fluctuates and may subside, ability to self-report should be assessed repeatedly and a self-report of pain attempted whenever possible.[18,40]
   - Communication about pain should be initiated by the clinician when delirium is suspected.[44]
2. Identify all potential causes of pain: All potential causes of pain should be taken into consideration for clinical decision making.[18,36,40,57]
3. Behavioral pain instruments:
   - In intensive care patients with delirium, the CPOT[23] and BPS-NI[20] may be considered for the assessment of pain.
   - When using behavioral pain tools, items that describe social behaviors and items identified by Lints-Martindale et al.[56] to describe both pain behaviors and delirium symptoms (restlessness, vocal behaviors, agitated behaviors, and others) should be interpreted with caution.

These recommendations do not provide comprehensive guidance, as further research is needed for specific answers to the many clinical challenges of pain assessment in patients with delirium, especially with regard to delirium sub-types, different patient populations (e.g., differentiating between postoperative, long-term care, or terminally ill patients) and settings. Furthermore, the complex needs of patients need to be considered as in addition to pain and delirium other symptoms may occur and interact (e.g., breathlessness, pruritus, nausea, etc.).

Implications for Patients, Health Professionals, and Health Systems

Although the access to pain management has been acknowledged as a fundamental human right (Declaration of Montreal, 2010), our review of the literature indicates that to date hardly any steps have been taken to guarantee this right for patients with delirium, as the pain experience, the expression of pain and constituents of adequate pain assessment are fundamentally unknown for this patient group. It must therefore be assumed that, given the prevalence of delirium, a very significant number of patients across all health care settings are subject to under-detection of pain, causing suffering for the individual and families.

Implications for Research

Future research should use and report rigorous detection and assessment of delirium.[74] Also, the underlying understanding of pain, including which dimensions are addressed, should be clearly reported. Efforts are especially needed in assessing pain dimensions beyond the presence of pain or intensity alone.

Future research should systematically address how delirium influences pain communication and decision making about pain across a continuum between "no capacity to self-report" and "full capacity to self-report," to establish a firm basis for the development of pain assessment instruments and strategies. Chronic as well as acute pain and different pain dimensions need to be addressed and a model of pain communication (e.g., Snow et al. 2004[70]) may prove helpful in directing this research. Similarly, basic research needs to address how different subtypes of delirium and typical characteristics of delirium, such as rapid onset and symptom fluctuation, influence pain communication.

It may also be helpful to investigate which cue words for pain are used by patients with delirium,[49] and the patient and carer experience of concurrent pain and delirium should be explored using qualitative research methodology as this may inform the development of pain assessment strategies. To the same end, research should endeavor to elucidate how experienced clinicians interpret behavioral signs that may be indicative both for pain and delirium, and investigate how these strategies may be used to help other clinicians.

A better understanding of pain communication in delirium is a prerequisite to subsequently investigate the reliability and validity of self-report instruments for pain (VAS, NRS, and Verbal Descriptor Scale) as well as behavioral pain instruments (CPOT, BPS-NI, Checklist of Non-Verbal Pain Indicators, Pain Assessment Checklist for Seniors with Limited Ability to Communicate, Pain Assessment for the Dementing Elderly, Pain Assessment in Advanced Dementia Scale, Non-Communicative Patient's Pain Assessment Instrument—Activity Chart Check List, etc.). It is important that delirium sub-type be taken into consideration when designing studies to develop pain assessment instruments or strategies.[52] As delirium often occurs super imposed on dementia, patients with both conditions should also be subjected to sub-group analysis.[45]

Future research in behavioral pain instruments should follow on from earlier results[34,56] and aim to establish which items are unique to pain[40] and do not overlap with symptoms of delirium. The recommendations concerning pain behaviors in older persons[12] should be revised accordingly to be more

specific for different types of cognitive impairment. Consequently, delirium-related items should be removed from behavioral pain tools following the lead of Lints-Martindale et al.[56] When the validity of behavioral pain tools is studied, patients with delirium should be given specific consideration, which is especially important in patient groups where pain and delirium are both highly prevalent.

Such research should test the validity of individual instruments and also investigate the outcomes of the more complex clinical hierarchies and strategies recommended for pain assessment in the literature. The COSMIN criteria (Consensus-based Standards for the selection of health Measurement Instruments) may be helpful in guiding instrument development.[75]

The published literature was focused on hospital and acute care settings. Patients in residential and long-term care as well as palliative care were less represented, despite a high prevalence of delirium[3–5] and pain[2,76] in these populations. Therefore, these settings should be included in future research, and delirium should be addressed as part of existing assessment classification systems for specific populations, for example, for cancer patients,[73,77] where it is currently not addressed.

Strengths and Limitations

Efforts were made to search the literature comprehensively by including databases covering a broad range of literature, both in content area and type of literature, and a search terminology carefully selected and tested to cover various delirium terminology. However, sources of bias exist. Most publications in this review were published in English, and the majority originated from the U.S. or Canada. However, as no language was excluded from the literature search, we are confident that the results of this review represent accurately the content of the databases used. Some doctoral dissertations that were identified from the literature search could not be obtained and therefore some content may be missing from this scoping review.

No systematic search of sources available on the internet was performed. It is therefore possible that information published on the internet only and not included in databases is missing from this scoping review.

Like all reviews, this scoping review depends on the information contained within the analyzed publications. Although all sources included some form or aspect of pain assessment in patients with delirium, the exact rationale and procedures for this assessment were not always reported. Therefore, this review is subject to publication bias in the source literature. In many cases, inferences had to be made about how the authors of the analyzed publications conceptualized pain and delirium. Underlying studies were conducted in different populations and languages. However, cross-cultural differences in the expression and perception of pain in patients with delirium could not be addressed as part of this scoping review.

Methodological quality and evidence level of the included literature were not systematically assessed, being outside the remit of a scoping review.[78] Given the limited nature of literature available on the topic, as reported in this scoping review, grading of quality and level of evidence would not have added value.

Conclusion

The literature on pain assessment in patients with delirium indicates that research on this topic is only in its infancy, despite some promising first steps. Gaps exist regarding the nature of the pain experience, the expression or communication of pain, pain assessment instruments, and strategies in patients with delirium. Currently, health professionals cannot find adequate guidance on how pain assessment in patients with delirium can be achieved in the literature. This may lead to inadequate pain management and avoidable suffering for the patient. However, it remains to be seen if the exact level of pain in a patient who is unable to provide self-report can ever be fully assessed.

The growing understanding of the nature, outcomes, and prevalence of delirium across all major health care settings will hopefully also inform research into pain assessment and pain management in this patient group and help to grow the evidence base. As unrelieved pain can cause delirium, improved pain assessment practices may also contribute to improved delirium prevention and management.

Disclosures and Acknowledgments

Thomas Fischer received an Endeavor Research Fellowship from the Australian Government, Department of Education and Training that supported this research. No other funding was received for the work presented here.

The authors would like to acknowledge the valuable contribution of Helen Chan (Librarian) and Ingrid Amgarth-Duff (Research Assistant) to this research.

References

1. Gregory J, McGowan L. An examination of the prevalence of acute pain for hospitalised adult patients: a systematic review. J Clin Nurs 2016;25:583–598.

2. Takai Y, Yamamoto-Mitani N, Okamoto Y, Koyama K, Honda A. Literature review of pain prevalence among older residents of nursing homes. Pain Manag Nurs: Official J Am Soc Pain Management Nurses 2010;11:209–223.

3. Young J, Inouye SK. Delirium in older people. BMJ (Clinical research ed.) 2007;334:842–846.

4. Caraceni A, Grassi L. Delirium. Acute confusional states in palliative medicine. Oxford: Oxford University Press, 2011.

5. Hosie A, Davidson PM, Agar M, Sanderson CR, Phillips J. Delirium prevalence, incidence, and implications for screening in specialist palliative care inpatient settings: a systematic review. Palliat Med 2013;27:486–498.

6. Association AP. Diagnostic and statistical manual of mental disorders (DSM-5). Washington: American Psychiatric Publishing, Inc., 2013.

7. Cole MG, Ciampi A, Belzile E, Zhong L. Persistent delirium in older hospital patients: a systematic review of frequency and prognosis. Age and Ageing 2009;38:19–26.

8. Merskey H, Bogduk N. Pain terms. A current list with definitions and notes on usage. In: Merskey H, Bogduk N, Taxonomy ITFo, eds. Classification of chronic pain. Seattle: IASP Press, 1994::209–214.

9. Turk D, Melzack R. The measurement of pain and the assessment of people experiencing pain. In: Turk D, Melzack R, eds. Handbook of pain assessment. New York: The Guilford Press, 2011::3–16.

10. Agar M. Alici Y and Breitbart W Delirium. In: Cherny N, Fallon M, Kaasa S, Portenoy R, Currow D, eds. Oxford textbook of palliative medicine. Oxford: Oxford University Press, 2015::1092–1100.

11. Lichtner V, Dowding D, Esterhuizen P, et al. Pain assessment for people with dementia: a systematic review of systematic reviews of pain assessment tools. BMC Geriatr 2014;14:138.

12. Adults APoPPiO. The management of persistent pain in older persons. J Am Geriatr Soc 2002;50:205–224.

13. Melzack R, Katz J. Pain measurement in adult patients. In: McMahon S, Koltzenburg M, Tracey I, Turk D, eds. Wall and Melzack's textbook of pain. Philadelphia: Elsevier, 2013::301–314.

14. Adelaide, Institute TJB Joanna Briggs Institute Reviewers' Manual 2015. Methodology for JBI Scoping Reviews 2016.

15. Lütz A, Spies C. ICU delirium: consequences for management of analgesia and sedation in the critically ill. Anästhesiologie, Intensivmedizin, Notfallmedizin, Schmerztherapie: AINS 2011;46:568–572.

16. Ulrich-Hermann A, Kramer F, Spirig R. Caregiving interventions for non drug-based delirium treatments. Therapeutische Umschau Revue Therapeutique 2010;67:87–90.

17. Herr K, Coyne PJ, McCaffery M, Manworren R, Merkel S. Pain assessment in the patient unable to self-report: position statement with clinical practice recommendations. Pain Management Nurs 2011;12:230–250.

18. Herr K, Coyne P, Key T, et al. Pain assessment in the nonverbal patient: position statement with clinical practice recommendations. Pain Management Nurs 2006;7:44–52.

19. Bruera E, Fainsinger RL, Miller MJ, Kuehn N. The assessment of pain intensity in patients with cognitive failure: a preliminary report. J Pain Symptom Manage 1992;7:267–270.

20. Chanques G, Payen J-f, Mercier G, et al. Assessing pain in non-intubated critically ill patients unable to self report: an adaptation of the Behavioral Pain Scale. Intensive Care Med 2009;35:2060–2067.

21. Decker SA. Behavioral indicators of postoperative pain in older adults with delirium. Clin Nurs Res 2009;18:336.

22. Gagliese L, Rodin R, Chan V, Stevens B, Zimmermann C. How do healthcare workers judge pain in older palliative care patients with delirium near the end of life? Palliat Support Care 2016;14:151–158.

23. Kanji S, MacPhee H, Singh A, et al. Validation of the critical care pain observation tool in critically ill patients with delirium: a prospective cohort study. Crit Care Med 2016;44:943–947.

24. Bouajram RH, Sebat CM, Love D, Louie EL, Wilson MD, Duby JJ. Comparison of self-reported and behavioral pain assessment tools in critically ill patients. J of Intensive Care Med 2018. 885066618757450.

25. Mah K, Rodin RA, Chan VWS, Stevens BJ, Zimmermann C, Gagliese L. Health-care workers' judgments about pain in older palliative care patients with and without delirium. Am J of Hosp Palliat Care 2017;34:958–965.

26. Voyer P, Richard S, Doucet L, Danjou C, Carmichael P-H. Detection of delirium by nurses among long-term care residents with dementia. BMC Nurs 2008;7:4.

27. Denny DL. Subsyndromal delirium and postoperative pain in older adults. Ann Arbor: The University of North Dakota, 2014:167.

28. Schiemann A, Hadzidiakos D, Spies C. Managing ICU delirium. Curr Opin In Crit Care 2011;17:131–140.

29. Inouye S, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. Ann Intern Med 1990;113.

30. Ely EW, Inouye S, 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.

31. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 1975;12:189–198.

32. Decker SA, Perry AG. The development and testing of the PATCOA to assess pain in confused older adults. Pain Management Nurs 2003;4:77–86.

33. Yennurajalingam S, Braiteh F, Bruera E. Pain and terminal delirium research in the elderly. Clin In Geriatr Med 2005;21:93–119.

34. Lints-Martindale AC. An examination of observational pain assessment tools for dementia patients and the role of delirium. Ann Arbor: The University of Regina (Canada), 2010:142.

35. Butler Maher A, Meehan AJ, Hertz K, et al. Acute nursing care of the older adult with fragility hip fracture: an international perspective (Part 1). Int J Orthopaedic Trauma Nurs 2012;16:177–194.

36. Raway B Pain behaviors and confusion in elderly patients with hip fracture. Catholic University of America, 1994.

37. Booker SQ. Assessing pain in nonverbal older adults. Nursing 2016;46:66–69.

38. Gagnon B, Lawlor PG, Mancini IL, Pereira JL, Hanson J, Bruera ED. The impact of delirium on the circadian distribution of breakthrough analgesia in advanced cancer patients. J Pain Symptom Manage 2001;22:826–833.

39. Bjoro K, Herr K. Assessment of pain in the nonverbal or cognitively impaired older adult. Clin Geriatr Med 2008; 24:237.

40. Hadjistavropoulos T, Fitzgerald TD, Marchildon GP. Practice guidelines for assessing pain in older persons with dementia residing in long-term care facilities. Physiother Can 2010;62:104–113.

41. Kaasalainen S, Coker E, Dolovich L, et al. 'Pain management decision making among long-term care physicians and nurses': response by Kaasalainen, Coker, Dolovich, Papaioannou, Hadjistavropoulos, Emili, and Ploeg. West J Nurs Res 2007;29:586–588.

42. Voyer P, Richard S, Doucet L, Carmichael P-H. Predisposing factors associated with delirium among demented long-term care residents. Clin Nurs Res 2009;18:153.

43. van Dalen-Kok AH, Achterberg WP, Rijkmans WE, et al. Pain Assessment in Impaired Cognition (PAIC): content validity of the Dutch version of a new and universal tool to measure pain in dementia. Clin Interventions in Aging 2017;13: 25–34.

44. Tate JA, Sereika S, Divirgilio D, et al. Symptom communication during critical illness: the impact of age, delirium, and delirium presentation. J Gerontological Nurs 2013;39: 28–38.

45. Buffum MD, Hutt E, Chang VT, Craine MH, Snow AL. Cognitive impairment and pain management: review of issues and challenges. J Rehabil Res Development 2007;44: 315–329.

46. Lynch EP, Lazor MA, Gellis JE, Orav J, Goldman L, Marcantonio ER. The impact of postoperative pain on the development of postoperative delirium. Anesth and Analgesia 1998;86:781–785.

47. Leung JM, Sands LP, Paul S, Joseph T, Kinjo S, Tsai T. Does postoperative delirium limit the use of patient-controlled analgesia in older surgical patients? Anesthesiology 2009;111:625–631.

48. DeCrane SK, Sands L, Ashland M, et al. Factors associated with recovery from early postoperative delirium. J Perianesthesia Nurs 2011;26:231–241.

49. Miller J, Neelon V, Ng'andu N, Bailey D, Layman E, Hosfeld A. The assessment of discomfort in elderly confused patients: a preliminary study. J Neurosci Nurs 1996;28: 175–182.

50. D'Arcy Y. Managing postop pain in a patient who's delirious. Nursing 2006;36:17.

51. Gelinas S, Fillion L, Puntillo KA, Viens C, Fortier M. Validation of the critical-care pain observation tool in adult patients. Am J Crit Care 2006;15:420–427.

52. Rijkenberg S, van der Voort PHJ. Can the critical-care pain observation tool (CPOT) be used to assess pain in delirious ICU patients? J Thorac Dis 2016;8:E285–E287.

53. Chookalayia H, Heidarzadeh M, Hassanpour-Darghah M, Aghamohammadi-Kalkhoran M, Karimollahi M. The Critical care Pain Observation Tool is reliable in non-agitated but not in agitated intubated patients. Intensive Crit Care Nurs 2018;44:123–128.

54. Varndell W, Fry M, Elliott D. A systematic review of observational pain assessment instruments for use with nonverbal intubated critically ill adult patients in the emergency department: an assessment of their suitability and psychometric properties. J Clin Nurs 2017;26:7–32.

55. Hadjistavropoulos T, Voyer P, Sharpe D, Verreault R, Aubin M. Assessing pain in dementia patients with comorbid delirium and/or depression. Pain Management Nurs 2008;9: 48–54.

56. Lints-Martindale AC, Hadjistavropoulos T, Lix LM, Thorpe L. A comparative investigation of observational pain assessment tools for older adults with dementia. Clin J of Pain 2012;28:226–237.

57. Phillips LA. Delirium in geriatric patients: identification and prevention. Medsurg Nurs 2013;22:9–12.

58. Chatterjee J. Improving pain assessment for patients with cognitive impairment: development of a pain assessment toolkit. Int J Palliat Nurs 2012;18:581–590.

59. Agar M. Pain and delirium. CME J Geriatr Med 2012; 14:9–15.

60. Panke JT. Difficulties in managing pain at the end of life. J Hosp Palliat Nurs 2003;5:83–90.

61. Sampson EL, van der Steen JT, Pautex S, et al. European palliative care guidelines. How well do they meet the needs of people with impaired cognition? BMJ Support Palliat Care 2015;5:301.

62. Morandi A, Davis D, Bellelli G, et al. The diagnosis of delirium superimposed on dementia: an emerging challenge. J Am Med Directors Assoc 2017;18:12–18.

63. Kappesser J, de C Williams AC. Pain judgements of patients' relatives: examining the use of social contract theory as theoretical framework. J Behav Med 2008;31:309–317.

64. Sirsch E, Laekeman M-A, Gnass I, et al. Schmerzassessment bei älteren Menschen in der vollstationären Altenhilfe, AWMF-Registernumer 145001, AWMF 2017. Berlin.

65. Goucke R ed. Pain in residential aged care facilities: management strategies, 2nd ed.. Sydney, Australian Pain Society.

66. Sirsch E. Selbst- und Fremdeinschätzung von Schmerzen bei Menschen mit Demenz im Krankenhaus. Weinheim: Beltz Juventa, 2018.

67. Clegg A, Young JB. Which medications to avoid in people at risk of delirium: a systematic review. Age and Ageing 2011;40:23–29.

68. Swart LM, van der Zanden V, Spies PE, de Rooij SE, van Munster BC. The comparative risk of delirium with different opioids: a systematic review. Drugs & Aging 2017;34: 437–443.

69. Hadjistavropoulos T, Craig KD. A theoretical framework for understanding self-report and observational measures of pain: a communications model. Behav Res Ther 2002;40:551–570.

70. Snow AL, O'Malley KJ, Cody M, et al. A conceptual model of pain assessment for noncommunicative persons with dementia. Gerontologist 2004;44:807–817.

71. Scherder E, Oosterman J, Swaab D, et al. Recent developments in pain in dementia. BMJ (Clinical Research Ed.) 2005;330:461–464.

72. Treede R-D, Rief W, Barke A, et al. A classification of chronic pain for ICD-11. Pain 2015;156:1003–1007.

73. Fainsinger R, Nekolaichuk C. Edmonton zone palliative care program. Edmonton Classification System for Cancer Pain (ECS-CP). 2012. Available from http://www.palliative.org/NewPC/_pdfs/tools/(ECS-CP)Edmonton%20Classification%20System%20for%20Cancer%20Pain%20Manual-Jan13.pdf. Accessed May 31, 2019.

74. Neufeld KJ, Nelliot A, Inouye SK, et al. Delirium diagnosis methodology used in research: a survey-based study. Am J Geriatr Psychiatry: Official J Am Assoc Geriatr Psychiatry 2014;22:1513–1521.

75. Mokkink L, Terwee C, Patrick D, et al. COSMINchecklist manual. Amsterdam: VU University Medical Center, 2012.

76. van den Beuken-van Everdingen MHJ, Hochstenbach LMJ, Joosten EAJ, Tjan-Heijnen VCG, Janssen DJA. Update on prevalence of pain in patients with cancer: systematic review and meta-analysis. J Pain Symptom Manage 2016;51:1070–1090.e9.

77. Caraceni A, Shkodra M. Cancer Pain Assessment and Classification. Cancer 2019;11:510.

78. Acevedo-Nuevo M, González-Gil MT, Romera-Ortega MÁ, Latorre-Marco I, Rodríguez-Huerta MD. The early diagnosis and management of mixed delirium in a patient placed on ECMO and with difficult sedation: a case report. Intensive Crit Care Nurs 2018;44:110–114.

79. Akashi M, Yano E, Aruga E. Under-diagnosis of pain by primary physicians and late referral to a palliative care team. BMC Palliat Care 2012;11:7.

80. Altshuler J, Spoelhof B. Pain, agitation, delirium, and neuromuscular blockade. Crit Care Nurs Q 2013;36:356–369.

81. Aubrun F, Marmion F. The elderly patient and postoperative pain treatment. Best Pract Res Clin Anaesthesiology 2007;21:109–127.

82. Avidan MS, Fritz BA, Maybrier HR, et al. The Prevention of Delirium and Complications Associated with Surgical Treatments (PODCAST) study: protocol for an international multicentre randomised controlled trial. BMJ Open 2014;4.

83. Azzam PN, Alam A. Pain in the ICU: a psychiatric perspective. J Intensive Care Med 2013;28:140–150.

84. Balas MC, Devlin JW, Verceles AC, Morris P, Ely EW. Adapting the ABCDEF bundle to meet the needs of patients requiring prolonged mechanical ventilation in the long-term acute care hospital setting: historical perspectives and practical implications. Semin in Respir And Crit Care Med 2016;37:119–135.

85. Bowman AM. Sleep satisfaction, perceived pain and acute confusion in elderly clients undergoing orthopaedic procedures. J Adv Nurs 1997;26:550–564.

86. Chanques G, Viel E, Constantin JM, et al. The measurement of pain in intensive care unit: comparison of 5 self-report intensity scales. Pain 2010;151:711–721.

87. Coldrey JC, Upton RN, MacIntyre PE. Advances in analgesia in the older patient. Best Pract Res Clin Anaesthesiology 2011;25:367–378.

88. Davidson JE, Harvey MA, Bemis-Dougherty A, Smith JM, Hopkins RO. Implementation of the pain, agitation, and delirium clinical practice guidelines and promoting patient mobility to prevent post-intensive care syndrome. Crit Care Med 2013;41:S136–S145.

89. Davis MP, Srivastava M. Demographics, assessment and management of pain in the elderly. Drugs and Aging 2003;20:23–57.

90. Falzone E, Hoffmann C, Keita H. Postoperative analgesia in elderly patients. Drugs and Aging 2013;30:81–90.

91. Fann JR, Alfano CM, Burington BE, Roth-Roemer S, Katon WJ, Syrjala KL. Clinical presentation of delirium in patients undergoing hematopoietic stem cell transplantation. Cancer 2005;103:810–820.

92. Helfand M, Freeman M. Assessment and management of acute pain in adult medical inpatients: a systematic review. Pain Med 2009;10:1183–1199.

93. Herndon CM, Zimmerman E. High-dose propofol drip for palliative sedation: a case report. Am J of Hosp Palliat Care 2008;25:492–495.

94. Hilliard N, Brown S, Mitchinson S. A case report of dexmedetomidine used to treat intractable pain and delirium in a tertiary palliative care unit. Palliat Med 2015;29:278–281.

95. Lacoske J. Sedation options for intubated intensive care unit patients. Crit Care Nurs Clin North America 2015;27:131–145.

96. Mehta SS, Siegler EL, Henderson CR Jr, Reid MC. Acute pain management in hospitalized patients with cognitive impairment: a study of provider practices and treatment outcomes. Pain Med (Malden, Mass) 2010;11:1516–1524.

97. Morita T, Takigawa C, Onishi H, et al. Opioid rotation from morphine to fentanyl in delirious cancer patients: an open-label trial. J Pain Symptom Manage 2005;30:96–103.

98. Moryl NMD, Kogan MMD, Comfort CMD, Obbens EMD. Methadone in the treatment of pain and terminal delirium in advanced cancer patients. Palliat Support Care 2005;3:311–317.

99. NN. Revised guidelines identify tools for pain, agitation, delirium assessment and monitoring. AACN Bold Voices 2013;5:12.

100. Pesonen A, Suojaranta-Ylinen R, Tarkkila P, Rosenberg PH. Applicability of tools to assess pain in elderly patients after cardiac surgery. Acta Anaesthesiologica Scand 2008;52:267–273.

101. Song H-N, Lee US, Lee G-W, Hwang IG, Kang JH, Eduardo B. Long-term intermittent palliative sedation for refractory symptoms at the end of life in two cancer patients. J Palliat Med 2015;18:807–810.

102. Tate JA, Seaman JB, Happ MB. Overcoming barriers to pain assessment: communicating pain information with intubated older adults. Geriatr Nurs 2012;33:310.

103. Vaurio LE, Sands LP, Wang Y, Mullen EA, Leung JM. Postoperative delirium: the importance of pain and pain management. Anesth and Analgesia 2006;102:1267–1273.

104. Winell J, Roth AJ. Psychiatric assessment and symptom management in elderly cancer patients. Oncology (Williston Park, NY) 2005;19:1479.

105. Brooks E, Freter SH, Bowles SK, Amirault D. Multimodal pain management in older elective arthroplasty patients. Geriatr Orthopaedic Surg Rehabil 2017;8:151–154.

106. Elsersy HE, Metyas MC, Elfeky HA, Hassan AA. Intraoperative magnesium sulphate decreases agitation and pain in patients undergoing functional endoscopic surgery: a randomised double-blind study. Eur J Of Anaesthesiology 2017;34:658–664.

107. Gregersen M, Melin AS, Nygaard IS, Nielsen CH, Beedholm-Ebsen M. Reliability of the Danish Abbey Pain Scale in severely demented and non-communicative older patients. Int J of Palliat Nurs 2016;22:482–488.

108. Kumar A, Jayant A, Arya V, Magoon R, Sharma R. Delirium after cardiac surgery: a pilot study from a single tertiary referral center. Ann Card Anaesth 2017;20.

109. Leung JM, Sands LP, Chen N, et al. Perioperative Gabapentin does not reduce postoperative delirium in older surgical patients: a randomized clinical trial. Anesthesiology 2017;127:633–644.

110. Lin YT, Lan KM, Wang L-K, et al. Incidence, risk factors, and phenomenological characteristics of postoperative delirium in patients receiving intravenous patient-controlled analgesia: a prospective cohort study. Neuropsychiatr Dis and Treat 2016;12.

111. Malec M, Shega JW. Symptom evaluation using observational assessment. Prog Palliat Care 2017;25:17–22.

112. Mu D-L, Zhang D-Z, Wang D-X, et al. Parecoxib supplementation to morphine analgesia decreases incidence of delirium in elderly patients after hip or knee replacement surgery: a randomized controlled trial. Anesth and Analgesia 2017;124:1992–2000.

113. Benítez-Rosario MA, Feria M, Salinas-Martín A, Martínez-Castillo LP, Martín-Ortega JP. Opioid switching from transdermal fentanyl to oral methadone in patients with cancer pain. Cancer 2004;101:2866–2873.

114. Fu J, Ngo A, Shin K, Bruera E. Botulinum toxin injection and phenol nerve block for reduction of end-of-life pain. J Palliat Med 2013;16:1637–1640.

115. Breitbart W, Alici Y. Agitation and delirium at the end of life: "We couldn't manage him". JAMA - J Am Med Assoc 2008;300:2898–2910.

116. Bjoro K, Herr K. Pain treatment: a risk factor for delirium in older adults with hip fracture…Fourth European Nursing Congress. J Clin Nurs 2010;19:125–126.

117. Chanques G, Pohlman A, Kress JP, et al. Psychometric comparison of three behavioural scales for the assessment of pain in critically ill patients unable to self-report. Crit Care (London, England) 2014;18:R160.

118. Cohen SP, Christo PJ, Moroz L. Pain management in trauma patients. Am J Phys Med Rehabil 2004;83:142–161.

119. Haslam L, Dale C, Knechtel L, Rose L. Pain descriptors for critically ill patients unable to self-report. J Adv Nurs 2012;68:1082.

120. Kolanowski A, Mogle J, Fick DM, et al. Pain, delirium, and physical function in skilled nursing home patients with dementia. J Am Med Directors Assoc 2015;16:37–40.

121. Rijkenberg S, Stilma W, Endeman H, Bosman R, Oudemans-van Straaten H. Pain measurement in mechanically ventilated critically ill patients: behavioral pain scale versus critical-care pain observation tool. J Crit Care 2015;30:167–172.

122. Stites M. Observational pain scales in critically ill adults. Crit Care Nurse 2013;33:68–78.

123. LK Pain treatment. A risk factor for delirium in older adults with hip fracture. Ann Arbor: The University of Iowa, 2008:348.

124. Latorre-Marco M, Acevedo-Nuevo M, Solís-Muñoz L, et al. Psychometric validation of the behavioral indicators of pain scale for the assessment of pain in mechanically ventilated and unable to self-report critical care patients. Medicina Intensiva 2016;40:463–473.

125. McGuire D, Reifsnyder J, Soeken K, Kaiser K, Yeager K. Assessing pain in nonresponsive hospice patients: development and preliminary testing of the Multidimensional Objective Pain Assessment Tool (MOPAT). J Palliat Med 2011;14:287–292.

Appendix

Three-step search strategy for the initial literature search (Joanna Briggs Institute 2015)
Step 1: Limited search of the databases to identify search terms

Database	Search String	Number of hits
CINAHL (EBSCO)	(MH "Pain Measurement") AND (MH "Delirium")	83
MEDLINE (PubMed	("Pain Measurement"[Mesh]) AND "Delirium"[Mesh]	79
	Combined	**162**
	Duplicates	21
	Remaining	**141**
	Excluded (did not match inclusion criteria)	78
	Final	**63**
	Not available (PhD thesis)	1

Additional search terms identified:

- *pain assessment*
- *pain management*
- *acute confusion*
- *agitation*
- *postoperative negative behavio?r*

Step 2: Database search and results (final, 21. June 2016)

Search string	No. of hits
Medline (Ebsco)	
MH psychomotor agitation OR MH delirium OR AB delirium OR TI delirium OR AB agitat* OR TI agitat* OR AB "acute confusion" OR TI "acute confusion" OR AB "postoperative negative behavio?r" OR TI "postoperative negative behavio?r" OR AB "terminal restlessness" OR TI "terminal restlessness"	491
AND	
MH pain management OR MH pain measurement OR AB pain N3 assess* OR TI pain N3 assess* OR AB pain N3 measur* OR TI pain N3 measur*	
CINAHL (Ebsco)	
MH agitation OR MH delirium OR AB delirium OR TI delirium OR AB agitat* OR TI agitat* OR AB "acute confusion" OR TI "acute confusion" OR AB "postoperative negative behavio?r" OR TI "postoperative negative behavio?r" OR AB "terminal restlessness" OR TI "terminal restlessness"	295
AND	
MH pain measurement OR AB pain N3 assess* OR TI pain N3 assess* OR AB pain N3 measur* OR TI pain N3 measur* OR AB pain N3 manage* OR TI pain N3 manage*	
PsycInfo (Ebsco)	
DE "Delirium" OR DE "Agitation" OR TI delirium OR AB delirium OR TI agitat* OR AB agitat* OR TI "acute confusion" OR AB "acute confusion" OR TI "postoperative negative behavio?r" OR AB postoperative negative behavio?r " OR TI "terminal restlessness" OR AB "terminal restlessness"	138
AND	
DE "Pain Management" OR DE "Pain Measurement" OR TI pain n3 assess* OR AB pain n3 assess* OR TI pain n3 measur* OR AB pain n3 measur* OR TI pain n3 manage* OR AB pain n3 manage*	
Embase (Ovid)	
delirium/ or delirium tremens/ or postoperative delirium/ OR acute confusion/ OR agitation/ OR delirium.ti,ab. OR "acute confusion".ti,ab. OR "negative postoperative behavio?r".ti,ab. OR "terminal restlessness".ti,ab.	1217
AND	
pain assessment/ OR pain measurement/ OR algometry/ OR (pain adj3 assess*).ti,ab. OR (pain adj3 manage*).ti,ab. OR (pain adj3 measure*).ti,ab.	189
When Medline Journals excluded	
Proquest	
(ab,ti.EXACT("acute confusion" OR "postoperative negative behavio?r" OR "terminal restlessness") OR ab,ti(delirium OR agitation)) AND ab,ti(Pain manage* OR Pain assess* OR pain measure*)	547 402
Excluded Databases from Environmental Sciences, Engineering, Technical Science, Agriculture, Business, Education, Arts, Results from Medline, Trade Journals, Newspapers, Wire News	
Scopus	
((TITLE-ABS-KEY (pain W/3 manage*) OR TITLE-ABS-KEY (pain W/3 assess*) OR TITLE-ABS-KEY (pain W/3 measur*)) AND (TITLE-ABS-KEY (delirium) OR TITLE-ABS-KEY (agitation) OR TITLE-ABS-KEY ({acute confusion}) OR TITLE-ABS-KEY ({postoperative negative behavio?r}) OR TITLE-ABS-KEY ({terminal restlessness}))) AND (not INDEX (medline))	531 483

Remaining after removal of duplicates: 1396

Appendix Table 1
Reviewed A:L Articles

Author(s)	Year	Publication Type	Country of Origin	Language	Aims/Purpose	Pain Screening/ Assessment/ Reassessment	Age Group	Population	Setting	Delirium Definition	Delirium Instrument	Delirium Terminology	Delirium Sub-Type	Strategy for Pain Assessment	Instrument for Pain Assessment	Pain Qualities/ Dimension	Study Design
Acevedo-Nuevo et al.[78]	2018	Journal, case report	Spain	English	To present the case of a patient placed on ECMO, who was diagnosed as having a mixed delirium, and outline different assessment strategies […].	Unspecified	Older persons	Critically ill patients	ICU	DSM-IV	CAM-ICU	Delirium	Hypoactive, mixed	Self-report if available; otherwise standardized behavioral observation	NRS, ESCID	Unspecified	n.a.
Agar[59]	2012	Journal, education	Australia	English	CME	Unspecified	Older persons	Older persons	Unspecified	Unspecified	n.a.	Delirium	Hypoactive, hyperactive	"Full assessment"	CNPI, PACSLAC	Unspecified	n.a.
Akashi et al.[79]	2012	Journal, original research	Japan	English	To examine the association between late referral to a PCT after admission and the under-diagnosis of pain by primary physicians	Unspecified	Adults	Cancer patients	Palliative care	DSM-IV	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	Abbey Pain Scale	Unspecified	Chart review
Altshuler et al.[80]	2013	Journal, narrative review	U.S.	English	Review management of pain and agitation	Unspecified	Unspecified	Critically ill patients	ICU	Unspecified	CAM-ICU, Intensive Care delirium Checklist	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	NRS; Behavior-Pain Scale or Critical-Care Pain Observation Scale	Unspecified	n.a.
Aubrun et al.[81]	2007	Journal, narrative review	France	English	Review postoperative pain management in older persons	Unspecified	Older persons	Postoperative patients	Hospital	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	NRS, VDS, FPS; Doloplus, PACSLAC	Unspecified	n.a.
Avidan[82]	2014	Journal, study protocol	U.S.	English	To evaluate if a single bolus dose of racemic ketamine (0.5 or 1 mg/kg) after induction of anesthesia and before surgical incision decreases the incidence or severity of postoperative delirium and pain in a mixed elderly (>60 yrs) surgical patient population.	Unspecified	Older persons	Critically ill patients	ICU	DSM-V	CAM, CAM-ICU, FAM-CAM	Delirium	Hypoactive, hyperactive	Self-report if available; otherwise standardized behavioral observation	BPS, BPS-NI, and VAS; plus study-specific "delirium and Pain Self-Assessment Questionnaire"	Unspecified	RCT
Azzam et al.[83]	2013	Journal, narrative review	U.S.	English	To review, physiologic mechanisms of nociception, present a larger, framework of suffering in the ICU, survey pain assessment, strategies, and offer considerations for analgesic management.	Unspecified	Unspecified	Critically ill patients	ICU	DSM-IV	CAM-ICU	Delirium	Hypoactive, hyperactive	Self-report if available; otherwise standardized behavioral observation	BPS-NI in non-intubated patients with delirium	Unspecified	n.a.
Balas[84]	2016	Journal, narrative review	U.S.	English	To review what is known about chronic critical illness, provide historical perspectives on the ABCDEF bundle and address controversies and practical implications of adopting the ABCDEF bundle into routine care for patients requiring prolonged mechanical ventilation in the long-term acute care hospital	Unspecified	Unspecified	Long-term ventilated patients	Long-term acute care hospital	Unspecified	CAM-ICU, Intensive Care delirium Checklist	Delirium	Hypoactive, hyperactive	Self-report if available; otherwise standardized behavioral observation	CPOT, BPS	Unspecified	n.a.

Benítez-Rosario[113]	2004	Journal, original research	Spain	English	To assess the efficacy and safety of a protocol of opioid rotation from transdermal fentanyl to methadone.	Unspecified	Adults	Cancer patients	Palliative care	DSM-IV	"Attention tests", MMSE	Delirium	Unspecified	Proxy rating by physician	None for patients with delirium	Unspecified	Cohort study
Bjoro et al.[39]	2008	Journal, narrative review	U.S.	English	To review the basis for pain assessment in three non-verbal populations, to discuss general principles and recommendations for pain management in non-verbal older adults, to critique non-verbal pain assessment tools.	Unspecified	Older persons	Older persons	Unspecified	DSM-IV	None	Delirium	Hypoactive, hyperactive, mixed	Attempt self-report, identify potential underlying causes of pain, observe behaviors that may indicate pain, solicit proxy rating by carers/ relatives, analgesic trial	None recommended	Unspecified	n.a.
Bjoro[116]	2010	Conference abstract	Norway	English	To investigate relationships between pain, pain treatment, and other factors on delirium in older hip fracture patients.	Unspecified	Older persons	Older persons	Hospital	Unspecified	CAM	Delirium	Unspecified	Standardized behavioral observation	VRS, Checklist of nonverbal pain indicators	Unspecified	n.a.
Bjoro[123]	2008	Doctoral Dissertation	U.S.	English	To describe the clinical trajectory of delirium after hip fracture, and examine relationships between pain, pain treatment, and delirium.	Unspecified	Older persons	Surgical (hip)	Hospital	DSM-IV	CAM, Memorial Delirium Assessment Scale	Delirium	Hypoactive, hyperactive, mixed	Self-report and behavioral observation	VRS-5, CNPI	Unspecified	Cohort study
Booker et al.[37]	2016	Journal, narrative review	U.S.	English	To describe an evidence-based approach to pain assessment	Unspecified	Older persons	Older persons	All settings	Unspecified	None	Delirium	Unspecified	Hierarchical pain assessment strategy	"Pain-suggestive behaviors and neurocognitive behaviors may overlap, complicating the distinction between pain and dementia or delirium signs and symptoms. Consistent use of a valid, reliable, and practical pain behavior tool that's appropriate for the patient helps identify different symptoms."	Unspecified	n.a.
Bouajram et al.[24]	2018	Journal, original research	U.S.	English	To determine the correlation of pain scores between self-reported and behavioral pain assessment scales in critical ill patients with delirium and without delirium.	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Standardized behavioral observation and self-report in parallel	NRS, Wong-Baker Faces Pain Scale, CPOT, BPS	Unspecified	Cohort study
Bowman[85]	1997	Journal, original research	Canada	English	To evaluate sleep satisfaction among people undergoing orthopedic hip surgery	Unspecified	Older persons	Surgical (hip)	Hospital	DSM-III	MMSE	Delirium	Hypoactive, hyperactive	Self-report	VAS	Unspecified	Cohort study
Breitbart[115]	2008	Journal, case report	U.S.	English	Case presentation	Unspecified	Adults	Cancer patients	Hospital	DSM-IV	DRS, CAM, Cognitive Test for Delirium, Memorial delirium Assessment Scale	Delirium	Hypoactive, hyperactive, mixed	Behavioral assessment	Not specified	Unspecified	Case study
Brooks[105]	2017	Journal, original research	Canada	English	To compare outcomes in elective arthroplasty patients with respect to postoperative delirium, self-rated pain (…)	Unspecified	Older persons	Surgical patients	Hospital	Unspecified	CAM	Delirium	Unspecified	Self-report	NRS	Unspecified	Cohort study
Bruera[19]	1992	Journal, original	Canada	English	To review the experience with pain	Unspecified	Adults	Cancer patients	Palliative care	Unspecified	MMSE	Agitation, cognitive	Unspecified	Self-report, proxy	VAS, self-reported by the patient	Unspecified	Cohort study

(Continued)

Appendix Table 1
Continued

Author(s)	Year	Publication Type	Country of Origin	Language	Aims/Purpose	Pain Screening/ Assessment/ Reassessment	Age Group	Population	Setting	Delirium Definition	Delirium Instrument	Delirium Terminology	Delirium Sub-Type	Strategy for Pain Assessment	Instrument for Pain Assessment	Pain Qualities/ Dimension	Study Design
		research			assessment in cancer patients with cognitive failure							failure, delirium		rating by nurses	or assessed by the nurse in cognitively impaired patients		
Buffum et al.[45]	2007	Journal, narrative review	U.S.	English	To provide an overview of the assessment, treatment, and management of pain in adult patients with cognitive impairments	Unspecified	Adults	Patients with cognitive impairment	All settings	Unspecified	CAM, CAM-ICU, Memorial Delirium Assessment Scale, MMSE	Delirium	Hypoactive, hyperactive, mixed	Comprehensive assessment	No recommendation	Unspecified	n.a.
Butler Maher et al.[35]	2012	Journal, review	International	English	To provide evidence-supported international perspectives about acute nursing care of the older adult with fragility hip fracture.	Unspecified	Older persons	Surgical (hip)	Hospital	DSM-IV	CAM, DOS, NEECHAM, NuDESC	Delirium	Hypoactive, hyperactive, mixed	Self-report if available; otherwise standardized behavioral observation	NRS, FPS, VDS, IOWA, PAINAD	Intensity, cognitive	Review
Chanques et al.[90]	2009	Journal, original research	France	English	To construct and validate a new pain instrument devoted to non-intubated ICU patients (BPS-NI) unable to self-report their pain.	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	BPS-NI	Unspecified	Cohort study
Chanques et al.[117]	2014	Journal, original research	U.S.	English	To compare the psychometric properties of the BPS and CPOT as well as the NVPS	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Behavioral assessment	BPS, CPOT, NVPS	Unspecified	Cohort study
Chanques[86]	2010	Journal, original research	France	English	To determine the most appropriate self-report pain scale for adult critically ill patients in the ICU setting.	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Self-report	NRS, VDS, VAS, BPS, question	Unspecified	Cohort study
Chatterjee et al.[98]	2012	Journal, project report	U.K.	English	To discuss guidelines for pain assessment in cognitively-impaired patients look at how they can be applied to practice and how they could include other forms of cognitive impairment, including delirium.	Unspecified	Adults	Patients with cognitive impairment	Palliative care	"An acute confusional state characterized by fluctuations in cognition and levels of consciousness" (Schreier, 2010).	None	Delirium	Hypoactive, hyperactive	Attempt self-report; ask patient's family about pain history, behaviors, etc.; observe behavioral signs; follow steps of the STI; analgesic trial	DisDAT	Unspecified	n.a.
Chookalayia et al.[93]	2018	Journal, original research	Iran	English	To evaluate the psychometric properties of the CPOT in patients with different RASS scores.	Unspecified	Adults	Critically ill patients	ICU	Unspecified	None	Delirium, agitation	Unspecified	Self-report, standardized behavioral observation	CPOT	Unspecified	Cross-sectional
Cohen et al.[118]	2004	Journal, narrative review	U.S.	English	Unspecified	Unspecified	Unspecified	Trauma patients	Hospital	Unspecified	None	Delirium	Unspecified	Assess pain behaviors and autonomic functions	None	Unspecified	n.a.
Goldrey et al.[97]	2011	Journal, narrative review	Australia	English	To review postoperative analgesia in old and oldest-old patients	Unspecified	Older persons	Perioperative patients	Hospital	Acute disturbance of consciousness/ mental state developing over a short time, tending to fluctuate throughout the day, and associated with changed cognition	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	NRS, VAS, VDS; behavioral tools not specified	Unspecified	n.a.
d'Arcy[20]	2006	Journal, case report	U.S.	English	To discuss pain management for a patient with delirium	Unspecified	Older persons	Surgical patient	Hospital	An acute and reversible state of confusion, is a disorder of attention and cognition.	CAM, Intensive Care delirium Checklist	Delirium	Hypoactive, hyperactive	Behavioral assessment; assess how behaviors change in reaction to pharmacological interventions (analgesia).	Not specified	Unspecified	Case study
Davidson et al.[88]	2013	Journal, recommendation for guideline implementation	U.S.	English	To explore important relationships between the PAD guidelines, mobility, and the PICS initiative	Unspecified	Adults	Critically ill patients	ICU	Unspecified	None	Delirium	Unspecified	Self-report	Not specified	Unspecified	n.a.
Davis et al.[89]	2003	Journal, review	U.S.	English	To review pain management in older persons	Unspecified	Older persons	Older persons	Unspecified	Unspecified	None	Delirium, confusion	Unspecified	Self-report	Unidimensional scales, BPI, McGill	Unspecified	Narrative review

Decker[21]	2009	Journal, original research	U.S.	English	To generate behavioral indicators of postoperative pain in older adults with delirium and to establish content validity of the behavioral indicators	Unspecified	Older persons	Postoperative patients	Hospital	Unspecified	None	Delirium	Unspecified	n.a.	n.a.	Unspecified	Qualitative (focus groups)
Decker et al.[32]	2003	Journal, original research	U.S.	English	To develop and evaluate the psychometric properties of the PATCOA and to describe differences among selected demographic variables and scores with the PATCOA, VAS, and NEECHAM Confusion Scale	Unspecified	Older persons	Surgical (orthopedic)	Hospital	DSM-IV	NEECHAM Confusion Scale	Acute confusion	Unspecified	Self-report if available; otherwise standardized behavioral observation	VAS, PATCOA	Pain intensity for VAS; other qualities for PATCOA, but not specified	Cross-sectional
deCrane et al.[48]	2011	Journal, original research	U.S.	English	To determine factors associated with recovery from early postoperative delirium.	Unspecified	Older persons	Post-surgical patients	Hospital	Acute disturbance of consciousness characterized by a fluctuating change of cognitive capacity	CAM	Delirium	Unspecified	Self-report	NRS; "We do not have evidence about the validity of NRS pain scores in delirious patients, although our prior work suggests that pain reports in patients with and without delirium have similar reliability" Of $n = 176$ patients with delirium on day one, for $n = 102$ an NRS pain score is reported	Unspecified	Cohort study
Denny[57]	2014	Doctoral Dissertation	U.S.	English	To determine the relationship between subsyndromal delirium and pain in older adults after major elective orthopedic surgery	Unspecified	Older persons	Postoperative patients	Hospital	Acute onset, fluctuating course, inattention, disorganized thinking, with or without altered level of consciousness (Inouye et al. 1990)	CAM	Delirium	Subsyndromal delirium (one or two of the CAM symptoms present)	Self-report	Iowa Pain Thermometer	Unspecified	Cohort study
Elsersy et al.[106]	2017	Journal, original research	Egypt	English	To investigate the effect of museum on agitation and postoperative pain.	Unspecified	Adults	Surgical patients (ENT)	Hospital	unspecified	none	Agitation	unspecified	Self-report	NRS	Unspecified	RCT
Falzone et al.[90]	2013	Journal, education	France	English	To discuss the modalities of postoperative analgesia in elderly patients in light of the particularities of this population and to propose strategies for the optimum management of postoperative pain in this group.	Unspecified	Older persons	Postoperative patients	Hospital	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	VAS, NRS, VRS, FPS, Doloplus, Doloplus-II, Algoplus	Unspecified	n.a.
Fann et al.[91]	2005	Journal, original research	U.S.	English	1) to use descriptive and factor analytic techniques to describe the domains and time course of delirium symptoms presenting in patients who experience delirium; 2) to describe how these symptoms differ in patients with no delirium,	Unspecified	Adults	Stem-cell transplantation patients	Hospital	Unspecified	DRS; MDAS	Delirium	Hypoactive, hyperactive, mixed	Self-report	NRS	Unspecified	Cohort study

(Continued)

Appendix Table 1
Continued

Author(s)	Year	Publication Type	Country of Origin	Language	Aims/Purpose	Pain Screening/ Assessment/ Reassessment	Age Group	Population	Setting	Delirium Definition	Delirium Instrument	Delirium Terminology	Delirium Sub-Type	Strategy for Pain Assessment	Instrument for Pain Assessment	Pain Qualities/ Dimension	Study Design
					brief delirium, and prolonged delirium; and 3) to investigate the comorbidity of delirium symptoms with affective distress, fatigue, and pain over time												
Fu et al.[114]	2013	Journal, case report	U.S.	English	To discuss the use of botulinum toxin in a cancer patient	Unspecified	Adults	Cancer patients	Hospital	Unspecified	None	Delirium	Mixed	Proxy-rating by husband	ESAS pain score	Unspecified	Case study
Gagliese et al.[22]	2016	Journal, original research	Canada	English	To examining HCWs' judgments of cancer pain and delirium in older palliative care inpatients	Unspecified	Older persons	Cancer patients	Palliative care	DSM-IV	Clinical interview	Delirium	Hypoactive, hyperactive, mixed	Self-report if available; otherwise standardized behavioral observation	Not specified	Unspecified	Chart review
Gagnon et al.[38]	2001	Journal, original research	Canada, U.S.	English	To determine the pattern of use of rescue doses for breakthrough pain in the presence and absence of delirium in an advanced cancer population	Unspecified	Adults	Cancer patients	Palliative care	DSM-IV	Clinical assessment	Delirium	Unspecified	Proxy rating	VAS rated by nurses or family members	Unspecified	Cohort study
Gregersen et al.[107]	2016	Journal, original research	Denmark	English	To validate a Danish version of the Abbey pain scale	Unspecified	Older persons	Geriatric patients	Hospital	Unspecified	Unspecified	Delirium	Unspecified	Self-report, standardized behavioral observation	VRS, Abbey Pain Scale	Unspecified	Cross-sectional
Griffiths et al.[1]	2014	Journal, guideline	U.K., Ireland	English	To guide perioperative care of older persons	Unspecified	Older persons	Perioperative patients	Hospital	DSM-IV	Short CAM	Delirium, postoperative delirium, postoperative cognitive decline, postoperative cognitive dysfunction	Unspecified	n.a.	n.a.	Unspecified	n.a.
Hadjistavropoulos et al.[60]	2010	Journal, narrative review	Canada	English	To provide practice guidelines for pain assessment among older persons with dementia	Unspecified	Older persons	Patients with dementia	Residential care	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	Doloplus-2, PACSLAC	Unspecified	n.a.
Hadjistavropoulos et al.[59]	2008	Journal, original research	Canada	English	To examine the extent to which specific items of the Doloplus II are 1) predictive of the diagnosis and severity of delirium; 2) related to depression; and 3) related to dementia severity	Unspecified	Older persons	Patients with dementia	Residential care; long-term hospital care	DSM-IV	CAM; delirium index	Delirium	Unspecified	Behavioral assessment	Doloplus-II	Unspecified	Cross-sectional
Haslam et al.[119]	2011	Journal, original research	Canada	English	To describe descriptors used by critical care nurses to document pain presence or absence for critically ill adults unable to self-report	Unspecified	Adults	Critically ill patients	ICU	Unspecified	None	Delirium	Unspecified	Behavioral or physiological observation	None	Unspecified	Cohort study
Helfand et al.[92]	2009	Journal, review	U.S.	English	To review the literature addressing effective care for acute pain in inpatients on medical wards	Unspecified	Adults	Medical patients	Hospital	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	PACSLAC, PAINAD	Unspecified	review
Herndon et al.[93]	2008	Journal, case report	U.S.	English	To describe a patient with metastatic breast cancer with a significant history	Unspecified	Adults	Palliative care patient	Hospital	Unspecified	None	Agitation/ terminal restlessness	Unspecified	Self-report	NRS	Unspecified	Case study

				of substance abuse sedated with propofol continuous infusion at higher doses than reported doses												
Herr et al.[18]	2006 Journal, narrative review	U.S.	English	To address three populations of nonverbal patients: elders with advanced dementia, infants and preverbal toddlers	Unspecified	Adults	Patients with dementia; intubated/ unconscious patients	Unspecified	Unspecified	None	Delirium	Unspecified	Hierarchy: self-report, search for potential causes of pain, observe pain behaviors, surrogate reporting of pain and behavior/activity changes, attempt an analgesic trial.	ADD, CNPI, Doloplus-2, NOPPAIN, PACSLAC, PAINAD	Unspecified	n.a.
Herr et al.[17]	2011 Journal, narrative review	U.S.	English	To address five populations of patients who may be unable to self-report pain older adults with advanced dementia, infants and preverbal toddlers, critically ill/unconscious patients, persons with intellectual disabilities, and patients at the end of life	Unspecified	Adults	Patients with dementia, critically ill patients, unconscious patients, patients with intellectual disabilities, patients at the end of life	Unspecified	Unspecified	None	Delirium	Unspecified	Hierarchy: self-report, search for potential causes of pain, observe pain behaviors, surrogate reporting of pain and behavior/ activity changes, attempt an analgesic trial.	Not clear	Unspecified	n.a.
Hilliard[94]	2015 Journal, case report	Canada	English	Not stated	Unspecified	Adults	Palliative care patient	Hospital	DSM-IV	None	Delirium	Unspecified	Self-report	NRS	Unspecified	Case study
Kaasalainen et al.[41]	2007 Journal, response to commentary	Canada	English	Response to comments	Unspecified	Older persons	Patients with dementia	Residential care	Unspecified	None	Delirium	Unspecified	n.a.	n.a.	Unspecified	Response
Kanji et al.[23]	2016 Journal, original research	Canada	English	To determine the discriminant validity, internal consistency, responsiveness, and reliability of CPOT in noncomatose, delirious adult ICU patients. Secondary objectives, included describing the percent agreement between the CPOT and the nurses' subjective assessment of pain and the percent agreement between the CPOT and objective physical criteria potentially indicative of pain in noncomatose, delirious adult ICU patients	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Behavioral assessment	CPOT	Unspecified	Cohort study
Kolanowski, et al.[20]	2015 Journal, original research	U.S.	English	To examine the effect daily pain has on delirium and physical function in patients with dementia who receive rehabilitation services in Skilled Nursing Facilities	Unspecified	Older persons	Patients with dementia and delirium	Residential care	Unspecified	CAM and "diagnostic algorithm for delirium"	Delirium	Unspecified	Behavioral assessment	PAINAD	Unspecified	Cohort study
Kumar et al.[108]	2017 Journal, original research	India	English	To assess the perioperative factors that predispose to cause delirium in cardiac surgery patients	Unspecified	Adults	Surgical patients (cardiac)	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Self-report	NRS	Unspecified	Cohort
Lacoske[95]	2015 Journal, narrative review	U.S.	English	To discuss reasons for sedation and measures for sedation and pain assessment	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	BPS, CPOT	Unspecified	n.a.
Leung et al.[109]	2017 Journal, original research	U.S.	English	To determine whether perioperative	Unspecified	Older persons	Surgical patient	Hospital	Unspecified	CAM, MDAS	Delirium	Unspecified	Self-report	VAS	Unspecified	RCT

(*Continued*)

Appendix Table 1
Continued

Author(s)	Year	Publication Type	Country of Origin	Language	Aims/Purpose	Pain Screening/ Assesment/ Reassessment	Age Group	Population	Setting	Delirium Definition	Delirium Instrument	Delirium Terminology	Delirium Sub-Type	Strategy for Pain Assessment	Instrument for Pain Assessment	Pain Qualities/ Dimension	Study Design
					administration of gabapentin reduces postoperative delirium												
Leung et al.[47]	2009	Journal, original research	U.S.	English	To determine whether patients with and without delirium differ in the amount of postoperative opioid use	Unspecified	Older persons	Surgical patients	Hospital	"Delirium is an acute confusional state with alterations in attention and consciousness (Lipowski 1987)	CAM	Delirium	Unspecified	Self-report	VAS	Unspecified	Cohort study
Lin et al.[110]	2016	Journal, original research	Taiwan	English	To determine the incidence, risk factors and characteristics of postoperative delirium	Unspecified	Older persons	Surgical patients	Hospital	DSM-IV	NuDESC	Delirium	Unspecified	Self-report	NRS	Unspecified	Chart review
Lints-Martindale et al.[90]	2012	Journal, original research	Canada	English	To compare observational pain assessment measures for seniors with dementia with respect to psychometric properties	Unspecified	Older persons	Patients with dementia	Residential care	Unspecified	CAM	Delirium	Unspecified	Self-report if available; otherwise standardized Behavioral observation	CAS, ADD, CNPI, PACSLAC, PADE, PAINAD, NOPPAIN	Unspecified	Cross-sectional
Lints-Martindale[54]	2010	Doctoral Dissertation	Canada	English	To directly compare six observational pain measures using the same sample of patients, the same pain condition, and the same assessors. To investigate the role pf overlapping delirium-related items across conditions of acute and chronic pain	Unspecified	Older persons	Patients with dementia	Residential care	DSM-IV	CAM	Delirium	Hypoactive, hyperactive, mixed	Self-report, where available and behavioral pain assessment	CAS, ADD, CNPI, NOPPAIN, PACSLAC, PADE, PAINAD	Discussed, but unclear	Cross-sectional
Lütz, et al.[15]	2011	Journal, narrative review	Germany	German	To summarize main recommendations from the S3-guideline on pain management, sedation and delirium	Unspecified	Adults	Critically ill patients	ICU	Unspecified	CAM-ICU, ICDSC, NuDESC, DDS	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	BPS, BPS-NI	Unspecified	n.a.
Lynch et al.[46]	1998	Journal, original research	U.S.	English	The purpose of this study was to determine the effect of postoperative pain at rest, pain with movement, and maximal pain on the development of postoperative delirium	Unspecified	Older persons	Surgical patients	Hospital	DSM-III	CAM	Delirium	Unspecified	Self-report	VAS	Unspecified	Cohort study
Mah et al.[25]	2017	Journal, original research	Canada	English	To investigate whether clinicians judgements about pain differ between patients with and without delirium	Unspecified	Older persons	Cancer patients	Palliative care	DSM-V	Clinical interview	Delirium	Hyperactive, hypoactive, mixed	n.a.	Unspecified	Unspecified	Chart review
Malec et al.[111]	2017	Journal, narrative review	U.S.	English	To review observational assessments of pain and dyspnea	Unspecified	Older persons	End of life	Palliative care	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	PACSLAC, PAINAD, BPS, CPOT, MOPAT	Unspecified	n.a.
Mehta et al.[96]	2010	Journal, original research	U.S.	English	To describe pain assessment practices and management regimens used by physicians and other health professionals caring for cognitively impaired hospitalized patients presenting with an acute pain problem. (p. 1517)	Unspecified	Older persons	Patients with cognitive impairment	Hospital	Unspecified	None	Delirium; cognitive impairment	Unspecified	Self-report if available; otherwise standardized behavioral observation	NRS, list of behaviors	Unspecified	chart review
Miller et al.[49]	1996	Journal, original research	U.S.	English	To identify measures to assess discomfort that can also be used as an indicator of the effectiveness of nursing interventions to reduce or prevent discomfort in elderly, confused patients	Unspecified	Older persons	Medical patients	Hospital	Unspecified	NEECHAM Confusion Scale	Confusion	Unspecified	Self-report, assessment of potential causes of discomfort, behavioral assesment	Question of Discomfort; Discomfort Thermometer; Discomfort Screen; DS-DAT	Unspecified	Cross-sectional

Morita et al.[97]	2005	Journal, original research	Japan	English	To prospectively evaluate the treatment efficacy of opioid rotation from morphine to fentanyl in symptom palliation of morphine-induced delirium (p. 97)	Unspecified	Adults	Cancer patients	Hospital	DSM-IV	MDAS	Delirium	Unspecified	Self-report and team proxy rating	VDS, STAS	Unspecified	Cohort study
Moryl et al.[98]	2005	Journal, original research	U.S.	English	To examine opioid rotation to methadone in patients with uncontrolled pain and terminal agitated delirium. (p. 312)	Unspecified	Adults	Cancer patients	Hospital	DSM-IV	MDAS	Delirium; terminal delirium	Hyperactive	Self-report	NRS	Unspecified	Cohort study
Mu et al.[112]	2017	Journal, original research	China	English	To investigate the effects of parecoxib on the incidence of delirium and all the persons	Unspecified	Older persons	Surgical patients	ICU	DSM-V	CAM, CAM-ICU	Delirium	Unspecified	Self-report	NRS	Unspecified	RCT
NN[99]	2013	Journal, news/ journal Club	U.S.	English	News item	Unspecified	Adults	Critically ill Patients	Hospital	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	NRS; Behavior-Pain Scale or Critical-Care Pain Observation Scale	Unspecified	n.a.
Panke[60]	2003	Journal, education	U.S.	English	To offer a brief overview of some principles of the use of analgesics. (p. 84)	Assessment; reassessment	Unspecified	End of life	Palliative care	Unspecified	None	Delirium	Unspecified	Behavioral assessment	None	Unspecified	n.a.
Pesonen et al.[100]	2008	Journal, original research	Finland	English	To determine whether the RWS and FPS are feasible tools to measure pain intensity in elderly patients after cardiac surgery. (p. 268)	Unspecified	Older persons	Surgical (cardiac)	Hospital	Unspecified	None	Delirium	Unspecified	Self-report	VRS, VAS, RWS, FPS	Unspecified	Quasi-experimental
Phillips[57]	2013	Journal, education	U.S.	English	To educate about the assessment, prevention and management of delirium	Unspecified	Older persons	Patients with dementia and delirium	Hospital	Holly, Cantwell, & Jadotte, 2012	CAM	Delirium	Hypoactive, hyperactive, mixed	Behavioral assessment	PAINAD	Unspecified	n.a.
Raway[36]	1994	Doctoral Dissertation	U.S.	English	To describe the verbal and nonverbal pain behaviors and level of confusion that occur among elderly hip fracture patients	Unspecified	Older persons	Surgical (hip)	Hospital	DSM-III	NEECHAM Confusion Scale	Acute confusion, delirium	Unspecified	Self-report	McGill, VAS, video-taped observation, FACS	Unspecified	Cohort study
Rijkenberg et al.[121]	2015	Journal, original research	The Netherlands	English	To compare the discriminant validity and reliability of the CPOT and the BPS in mechanically ventilated patients with the purpose to find the most useful clinical pain assessment tool for patients in a mixed-adult ICU.	Unspecified	Adults	Surgical (neurosurgical)	ICU	Unspecified	CAM-ICU	Delirium	Unspecified	Behavioral assessment	CPOT, BPS	Unspecified	Cohort study
Rijkenberg et al.[92]	2016	Journal, commentary	The Netherlands	English	Comment on the validity of the CPOT for pts with delirium	Unspecified	Adults	Critically ill patients	ICU	Unspecified	None	Delirium	Unspecified	Behavioral observation	CPOT	Unspecified	n.a.
Sampson et al.[61]	2015	Journal, review	International	English	To review whether national palliative care guidelines in Europe consider pain assessment and management for the increasing numbers of adults with ID, dementia, or other forms of cognitive impairment. (p. 301)	Unspecified	Adults	Patients with impaired cognition	Palliative care	Unspecified	None	Delirium	Unspecified	n.a.	n.a.	Unspecified	Review
Schiemann et al.[28]	2011	Journal, narrative review	Germany	English	To present actual knowledge on ICU delirium concerning detection, prevention, and therapy	Unspecified	Adults	Critically ill patients	ICU	DSM-IV; ICD-10	CAM-ICU, ICDSC, NuDESC, DDS	Delirium	Subsyndromal, hypoactive, hyperactive, mixed	Self-report if available; otherwise standardized behavioral observation	NRS, VAS, VRS, BPS, BPS-NI	Unspecified	n.a.
Song et al.[101]	2015	Journal, case report	Korea	English	To discuss two cases of palliative sedation	Unspecified	Adults	Cancer patients	Palliative care	Unspecified	None	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	NRS; Faces Pain Scale	Unspecified	Case study
Stites[122]	2013	Journal, review	U.S.	English	To review behavioral pain assessment instruments for critically ill adults	Unspecified	Adults	Critically ill patients	ICU	Unspecified	None	Delirium	Unspecified	Behavioral assessment	None recommended	Unspecified	Review
Tate[102]	2012	Journal, education	U.S.	English	To discuss assisted communication with mechanically ventilated older patients	Unspecified	Older persons	Critically ill patients	ICU	Unspecified	None	Delirium	Unspecified	Self-report using assisted communication, behavioral assesment	NRS, VDS, FPS-R, CPOT	Unspecified	n.a.
Tate et al.[44]	2013	Journal, original research	U.S.	English	To explore the role age and delirium have on symptom communication between intubated ICU patients and their nurses (p. 29)	Unspecified	Adults	Critically ill patients	ICU	Ely, Inouye, et al., 2001	CAM-ICU	Delirium	Hypoactive, hyperactive	n.a.	n.a.	Unspecified	Cohort study
Ulrich-Herrmann et al.[16]	2010	Journal, review	Switzerland	German	To review non-pharmacological nursing interventions for patients with delirium	Unspecified	Older persons	Patients with delirium	Hospital	Unspecified	DOS, CAM, delirium Rating Scale	Delirium	Unspecified	Self-report if available; otherwise standardized behavioral observation	VAS, Doloplus	Unspecified	Narrative review
van Dalen-Kok et al.[45]	2018	Journal, original research	The Netherlands	English	To describe the translation procedure and content validity of the Dutch version of the PAIC	Unspecified	Older persons	Patients with dementia	Unspecified	Unspecified	None	Delirium	Unspecified	Standardized behavioral observation	PAIC	Unspecified	Validation study
Varndell et al.[54]	2016	Journal, review	Australia	English	To summarize the psychometric properties of instruments assesing pain in non-verbal critically ill intubated adult patients.	Unspecified	Adults	Critically ill patients	ICU	Unspecified	None	Delirium	Unspecified	Standardized behavioral observation	BPS, CPOT, FLACC, PAINAD, NVPS	Behavioral, physiological	Systematic review
Vaurio et al.[103]	2006	Journal, original research	U.S.	English	To investigate if the method of postoperative pain management, medication types, and the severity of postoperative pain may affect the occurrence of postoperative delirium.	Unspecified	Older persons	Surgical (major non-cardiac)	Hospital	Unspecified	CAM	Delirium	Unspecified	Self-report	VAS	Unspecified	Cohort study

(Continued)

Appendix Table 1
Continued

Author(s)	Year	Publication Type	Country of Origin	Language	Aims/Purpose	Pain Screening/ Assessment/ Reassessment	Age Group	Population	Setting	Delirium Definition	Delirium Instrument	Delirium Terminology	Delirium Sub-Type	Strategy for Pain Assessment	Instrument for Pain Assessment	Pain Qualities/ Dimension	Study Design
Voyer et al.[42]	2009	Journal, original research	Canada	English	To identify the predisposing factors associated with delirium among LTC residents with dementia.	Unspecified	Older persons	Patients with dementia	Residential care	DSM-III	CAM	Delirium	Unspecified	Behavioral assessment	Doloplus-II	Unspecified	Cross-sectional
Voyer et al.[26]	2008	Journal, original research	Canada	English	To determine the rates for nurse-detection of delirium among seniors with pre-existing dementia in LTC facilities. To identify those delirium symptoms that are most challenging for nurses to detect. To identify those factors associated with delirium that goes undetected by nurses among this specific population.	Unspecified	Older persons	Patients with dementia	Residential care	DSM-III-R	CAM, delirium symptoms using six items from MDS-2	Delirium	Hypoactive, hyperactive, mixed, without motoric component (Meagher 2000)	Behavioral assessment	Doloplus-II	Unspecified	Cohort study
Winell et al.[104]	2005	Journal, narrative review	U.S.	English	To review psychiatric issues (depression, anxiety, fatigue, pain, delirium) in relation to older persons	Unspecified	Older persons	Cancer patients	Unspecified	Unspecified	CAM, delirium Rating Scale, Memorial delirium Assessment Scale	Delirium	Unspecified	Self-report, when possible. Information from proxies, such as family and caregivers. Behavioral pain signs.	None	Unspecified	n.a.
Yennurajalingam et al.[23]	2005	Journal, narrative review	U.S.	English	To highlight new developments in assessment and management of pain and delirium	Unspecified	Older persons	Cancer patients	Unspecified	DSM-IV	MMSE, MDAS, CAM, DRS, bedside confusion scale, clock drawing test	Delirium	Hypoactive, hyperactive	Self report; assess cognitive status at the same time. If self-report is unavailable because of cognitive impairment, proxy ratings from family and staff should be sought and behavioral signs assessed.	VAS	Sensory, affective	n.a.

ICU = intensive care unit; DSM = Diagnostic and Statistical Manual; CAM = Confusion Assessment Method; NRS = Numerical Rating Scale; CNPI = Checklist of Non-Verbal Pain Indicators; PACSLAC = Pain Assessment Checklist for Seniors with Limited Ability to Communicate; PCT = palliative care team; VDS = Verbal Descriptor Scale; BPS = Behavioral Pain Scale; NI = non-intubated patients; VAS = Visual Analog Scale; CPOT = Critical Care Pain Observation Tool; MMSE = Mini Mental State Examination; NVPS = Non-Verbal Pain Scale; PAINAD = Pain Assessment in Advanced Dementia Scale; DisDAT = Disability Distress Assessment Tool; PICS = Post-Intensive Care Syndrome; PATCOA = Pain Assessment Tool in Confused Older Adults; NOPPAIN = Non-Communicative Patient's Pain Assessment Instrument. Activity Chart Check List; MDAS = Memorial Delirium Assessment Scale; STAS = Schedule for Team Assessment Scale; MOPAT = Multidimensional Objective Pain Assessment Tool; ECMO = extracorporeal membrane oxygenation; ESCID = Escala de Conductas Indicadoras de Dolor; CME = Continuing Medical Education; FPS = Faces Pain Scale; FPS-R = Faces Pain Scale Revised; FAM-CAM = Family Confusion Assessment Method; RCT = Randomized Controlled Trial; VRS = Verbal Rating Scale; DOS = Delirium Observation Screening; NuDESC = Nursing Delirium Screening Scale; IOWA = Iowa Pain Thermometer; STI = Serial Trial Intervention; RASS = Richmond Agitation Sedation Scale; PAD = Pain, Agitation/Sedation, Delirium; BPI = Brief Pain Inventory; McGill = McGill Pain Questionnaire; DRS = Delirium Rating Scale; ESAS = Edmonton Symptom Assessment System; RWS = Red Wedge Scale; LTC = Long-term Care; ICDSC = Intensive Care Delirium Screening Checklist; DDS = Delirium Detection Score; DS-DAT = Discomfort Scale for Dementia of the Alzheimer's Type; FACS = Facial Action Coding System; FLACC = Face, Legs, Activity, Cry, Consolability scale; ADD = Assessment of Discomfort in Dementia; CAS = Color Analog Scale.

Appendix Reference

1. Griffiths R, Brown A, Dhesi J, et al. Peri-operative care of the elderly. Anaesthesia 2014;68:81–98.