UNIVERSITY OF AMSTERDAM

UvA-DARE (Digital Academic Repository)

Pain in patients with dementia: a review of pain assessment and treatment challenges

Husebo, B.S.; Achterberg, W.P.; Lobbezoo, F.; Kunz, M.; Lautenbacher, S.; Kappesser, J.; Tudose, C.; Strand, L.I.

Publication date
2012
Document Version
Final published version
Published in
Norsk Epidemiologi

Link to publication

Citation for published version (APA):
Husebo, B. S., Achterberg, W. P., Lobbezoo, F., Kunz, M., Lautenbacher, S., Kappesser, J., Tudose, C., & Strand, L. I. (2012). Pain in patients with dementia: a review of pain assessment and treatment challenges. *Norsk Epidemiologi*, *22*(2), 243-251. http://www.ntnu.no/ojs/index.php/norepid/index

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, P.O. Box 19185, 1000 GD Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (https://dare.uva.nl)

Download date:08 Oct 2026

Pain in patients with dementia: A review of pain assessment and treatment challenges

Bettina S. Husebo, Wilco P. Achterberg, Frank Lobbezoo[4,5] , Miriam Kunz[6], Stefan Lautenbacher[6], Judith Kappesser[7], Catalina Tudose[8] and Liv Inger Strand[1]

1) Department of Public Health and Primary Health Care, Centre for Elderly- and Nursing Home Medicine, University of Bergen, Bergen, Norway

2) Center for Age-Related Medicine, University Hospital, Stavanger, Norway

3) EMGO Institute, VU Medical Centre, Department of Nursing Home Medicine, Amsterdam, The Netherlands

4) Department of Public Health and Primary Care, Centre for Institutional Care and Elderly Care Medicine, Leiden University Medical Center, The Netherlands

5) VU University Amsterdam, MOVE Research Institute Amsterdam, Amsterdam, The Netherlands

6) Physiological Psychology, Otto Friedrich University Bamberg, Bamberg, Germany

7) Department of Clinical Psychology, Justus-Liebig-University, Giessen, Germany

8) Department of Neurology, Neurosurgery and Psychiatry, University of Medicine and Pharmacy "Carol Davila", Bucharest, Romania

Correspondence: Bettina S. Husebo, University of Bergen, Department of Public Health and Primary Health Care, Kalfarveien 31, NO-5020 Bergen, Norway
E-mail: Bettina.husebo@isf.uib.no Telephone: +47 48094660 Telefax: +47 55586130

ABSTRACT

Pain represents a major treatment challenge in older people with dementia. The majority of healthy older people experience regular pain and around 50% take regular analgesics. Pain is likely to be equally prevalent in people with dementia, yet only a small minority are prescribed regular analgesics. This is a key issue since recent work has provided evidence that untreated pain may be a major contributor to reduced quality of life and increases the likelihood of emergence of behavioural and psychological symptoms such as agitation. Better assessment and treatment of pain may therefore substantially improve outcomes for people with dementia. In this context, we reviewed the literature and summarised the best available evidence regarding the frequency of pain and pain diagnosis in patients with dementia based on pain assessment and treatment recommendations for these individuals. Hardly any randomized, controlled studies of pain treatment efficacy in patients with dementia are available, with the consequence that most pain treatment recommendations are not based on the highest level of evidence.

INTRODUCTION

Untreated chronic pain is a devastating symptom in older people with moderate to severe dementia who are unable to explain their suffering.[1] Persistent pain results in a progressive decline of functional and mental capacity,[2] social interaction[3] and quality of life,[4-6] appetite[7,8] and sleep disturbances,[9,10] and increased behavioural disturbances including agitation, depression and anxiety.[11-13] Pain causes immense stress for the patient, their formal and informal care givers[14,15] and increases health care costs.[16,17]

In the last decades, clinicians and scientists concentrated on the prevalence,[18] assessment[19,20] and treatment of pain in older people with mental impairment and the consequences of undetected and untreated pain.[21-25] Such issues include the development of observational and behavioural pain assessment instruments, pain treatment recommendations, and staff educational programs. Although these are necessary and central investments, the most pressing matter for mentally impaired individuals is the analgesic treatment of pain.

Compared to community-dwelling older adults who experience daily pain in 35% to 48% of the cases,[26] nursing home patients with dementia are described to be in daily pain in around 45% to 80% of the cases.[18] Numerous prevalence studies give a description of the under-treatment of pain in these settings. There are several explanations for insufficient management of pain in patients with mental impairment.

Today, the evidence base is still limited with regard to the balancing act between under- and over-treatment of pain in dementia and guides for treatment decisions. The type and dosage of analgesics are still based on clinical judgment of older adults without dementia. Although efficacy studies of analgesics in nursing home patients with dementia are challenging, these trials are possible and tremendously necessary.

In this review, we present a summary of the evidence for the assessment of pain in patients with dementia, the frequency of pain in these individuals, and benefit and harm related to the use of analgesics. We will also briefly present current pain assessment tools and treatment recommendations.

With respect to the source of the treatment group, older adults, the American Geriatric Society (AGS) Panel on Persistent Pain in Older Persons defined persistent pain as “an unpleasant, sensory and emotional

Box 1. Unsystematic review.

This review is informed by a unsystematic search of the PubMed (N=186), EMBASE (N=143) and Cochrane (N=11) databases conducted in collaboration with the library of the University of Bergen, Norway.

Search terms: "dementia", "Alzheimer disease", "pain management", "analgesics", "anti-inflammatory agents, non-steroidal", "acetaminophen", "paracetamol", analgesics, opioid", "opioid", "morphine", buprenorphine", "oxycodone". Sensitive for EMBASE, we used the filter for therapy: Random OR clinical trial OR exp. health care quality.

Box 2. European COST-Action TD 1005.

Authors of this article represent European COST-Action TD 1005 (Pain Assessment in Patients with Impaired Cognition, especially in Dementia), Work Group 1 (Psychometrics and Algesimetry). COST-Action TD 1005 consists of basic and clinical scientists in pharmacy, dementia, pain, nursing and palliative care with members from Belgium, Cyprus, Denmark, France, Germany, Israel, Italy, Norway, Romania, Spain, Switzerland, The Netherlands, United Kingdom, and Australia. http://www.cost-td1005.net/home.html. It is the task of this work group to investigate whether the existing pain behavioural instruments are appropriate to use for people with moderate and severe dementia. We will particularly consider whether pain behaviours related to facial expression, vocalization and body movements are assessed in line with recommendations for pain assessment in dementia by the American Geriatric Society. The results of psychometric testing will also be considered. Outputs will be delivered to the other working groups (WG 2-5) for a second opinion and further work in the development of a comprehensive toolkit for pain assessment in cognitively impaired patients.

experience that continues for a prolonged period of time that may or may not be associated with a recognizable disease process".[21] The definition is based on the declaration by the International Association for the Study of Pain (IASP), who underlines that the most exact and trustworthy verification of the assessment of pain is the patient's self-report, depending on the patient's memory, verbal capacity, expectations and emotions.[27]

Because of their inherent subjectivity, pain and suffering are difficult to objectively verify, disprove, or quantify. Given that pain self-report is often no longer available in patients with moderate to severe dementia, the AGS Panel underlined the wide variability and complexity of pain diagnosis, physical disabilities and analgesic use in these individuals.[21,22,28] A comprehensive, disease-specific, individual assessment of the patients' typical pain behaviour are recommended, using a validated pain assessment tool as a prerequisite for appropriate pain treatment. Following this, an increasing number of population-based and cross-sectional studies suggest that pain-related problems are highly present in community-dwelling elderly people and those living in care homes, with and without dementia.

PAIN PREVALENCE IN OLDER ADULTS

Chronic musculoskeletal pain affects over 100 million people in Europe and is by far the most common limiting factor on activities of the ageing population. Musculoskeletal pain increases the risk of reduced mobility, disability and muscle weakness, and reduces the health-related quality of life.[26] In older people, chronic pain is often experienced in major joints, the back, legs and feet, and it is reported more often than visceral pain and headaches.[29] Chronic pain is mostly nociceptive, around 10% is neuropathic, and 1 of 3 patients is believed to suffer from a combination of neuropathic and nociceptive pain.

In a cross-sectional survey of an older rural community in Italy, about one third of the population was affected by symptomatic peripheral osteoarthritis in knees, hands, and hips, which were strongly associated with disabilities.[30] About 71% of the veterans in a primary care clinic in New York described pain with multiple localizations, also in coexistence with psychological and social problems.[31] Other studies have shown that musculoskeletal pain caused by osteoarthritis is associated with decreased balance, week knee strength[32] and risk of falls.[33]

PAIN PREVALENCE IN NURSING HOME PATIENTS

Between 45% to 83% of the patients living in nursing homes experience acute or chronic pain, particularly those with moderate to severe dementia. Most of them (about 94%) suffer from persistent pain (3-6 months or more),[34] often located in the musculoskeletal system.[35] But pain problems are not only movement related. About 40% experience pain in internal organs, head and skin, which is more challenging to quantify.[36]

Elderly patients with visceral painful conditions are far more likely than younger adults to present atypical pain, and often with diminished intensity.[29] Silent ischemia and painless myocardial infarct caused by arteriosclerosis become more frequent with advancing age.[37,38] Peptic ulcers, intestinal obstruction, and peritonitis are other visceral conditions, often with reduced or absent abdominal complaints,[29] and about 45% of older persons with appendicitis do not have typical lower-right quadrant pain as a presenting symptom, compared with 5% of younger adults.[39] Living in a nursing home, 53% of the patients are at risk of developing a pressure ulcer,[40] and skin diseases found in 95% of the patients were described as one of the most prevalent health problems.[41]

Pain in connection with genito-urinary infections is quite often described.[42] Catheter-associated urinary tract infection is the most common nosocomial infection, accounting for more than one million cases every

year in American hospitals and NHs.[43] A large-scale epidemiological study in The Netherlands has shown that orofacial pain has an increasing incidence rate with age for most of the pain diagnoses in the general population, with rates as high as 30.6 for trigeminal neuralgia and 44.2 for post-herpetic neuralgia.[44] In nursing homes in Austria, it was found that 28.9% of the institutionalized elderly experienced acute dental pain during the preceding year, and that almost half of these individuals required dental treatment for their pain complaints.[45] Our own data from 18 nursing homes in Norway suggest that 23% of the individuals are judged to be in orofacial pain (unpublished data). A summary view of the epidemiology of pain in older people living in nursing homes would be that diseases related to head, abdominal, chest, pelvis and skin are frequent (about 40% of those who are in pain), but that pain complaints are less improved by treatment, especially in visceral pain, and orofacial pain.[29]

ASSESSMENT OF PAIN IN PEOPLE WITH DEMENTIA

Proper assessment of pain is a prerequisite for successful pain treatment and depends on the patients' memory, expectation, and self-report capacity.[46,47] Therefore, when older adults in pain also have severe cognitive impairments, lack of language and abstract thinking they are at high risk for being under-diagnosed and under-treated.

In response to a strong need to assess pain and improve the treatment, behavioural pain assessment tools have been developed and tested, and reviewed in the literature.[19,20,48-53] Instruments are based on observation of the patients' typical behaviour that might be related to pain, such as vocalization (e.g. moaning), facial expression (e.g. grimacing), and body movements (e.g. defense). There is also strong evidence that some behaviours like agitation, pacing or resisting care are related to present pain problems. However, such predictors will always be difficult to interpret, because symptoms attributed to neuropsychiatric disturbances (such as behaviour in dementia, delirium, depression and anxiety) may overlap indicators of pain.

Under-diagnosis of pain and potential side effects of medication are therefore a particular risk in older adults with dementia, especially for those in the advanced stages of dementia.[50,51] In recognition of these complicating factors, a panel on Persistent Pain in Older Persons, convened by the American Geriatric Society[41,52,53] has recommended a comprehensive disease-specific, individual assessment of the patients' typical pain behaviour using a validated pain assessment tool as a prerequisite for appropriate pain treatment. However, recommendations of the AGS Panel are based on experiences in older adults without dementia. This is of key importance, because in dementia symptoms attributed to neuropsychiatric disturbances may overlap with indicators of pain and thus, make interpretation challenging.[48]

In the last 35 years, more than 35 pain assessment instruments for older persons with dementia have been developed, tested, and reviewed in the literature.[19,20,48-51,53-55] Most of these instruments are based on the idea that the patients' acute or chronic pain experience is communicated by changes in facial expression, vocalization, and body movements.[22] It has also been suggested that one of the primary functions of pain behaviour is to elicit the aid of others.[56] One of the first instruments developed that tries to assess non-verbal behavior is the Facial Action Coding System (FACS).[56] The FACS is based on anatomical analysis of visible facial movements which are categorized as Action Units. Using the FACS, it has been shown that there is a small subset of facial actions that occur in the context of pain (e.g. narrowing the eye aperture). Since the development of the FACS in 1978, clinicians and international research groups have worked continuously and engaged with this important topic. Currently there are different types of pain assessment tools available dependent on self-report or proxy-rating by a caregiver who observe and interpret the typical pain behaviour of the patient.

SELF-REPORT ASSESSMENT

Self-report is the most appropriate method for pain assessment in the early stages of dementia, when pain can still be recognized and verbalized.[55] However, a study which aimed to assess the performance of self-assessment scales (the verbal, horizontal visual, and faces pain scales) found that only 61% of 129 severely demented patients demonstrated comprehension of at least one scale. Comprehension was defined as the ability to explain the scale use and correctly indicate positions for no pain and extreme pain on two separate occasions. Although others have described self-report approaches to be less reliable and applicable in the advanced stages of dementia, future research is needed to include and test the patients' self-report abilities, and clinicians and researchers should be careful to use a scale that suits the individual.[56]

CAREGIVERS PAIN BEHAVIOUR RATING SCALES

Most of the observational caregiver pain behaviour rating scales are developed after literature review and interviews with nursing staff, and include observational items related to facial expressions, vocalization, and body movements.[57-59] Most of these items are assessed by frequency, intensity, presence or absence of pain behaviour by the rater. Usually, staff evaluations are conducted at rest after some minutes of observation, but sometimes the patients are observed during daily life activities. Although the included items are based

on recommendations by the AGS Panel, the interpretation of the total pain intensity, the scoring method, and instructions for staff training are often not clearly established. In addition, different scoring systems of presumed intensity of pain make the use of the tools challenging and suitable for research purposes only.

Based on relevant review articles the following observational assessment tools seem to be the most promising to assess pain in patients with dementia:

- Pain Assessment for the Dementing Elderly (PADE)
- Pain Assessment in Non-Communicative Elderly (PAINE)
- The Abbey Pain Scale
- The Discomfort Scale for Dementia of Alzheimer Type (DS-DAT)[60]
- The Checklist of Nonverbal Pain Indicators (CNPI)[61,62]
- The Pain Assessment in Advanced Dementia (PAINAD)[63]
- The DOLOPLUS 2[64,65]
- The Pain Assessment Checklist for Seniors with limited Ability To Communicate (PACSLAC)[66-68]
- The Assessment of Discomfort in Dementia (ADD) Protocol[62,63]
- The Non-Communicative Patient' s Pain Assessment Instrument (NOPPAIN)[69]
- The Elderly Caring Assessment 2 (EPCA-2)[70]
- The Mobilization–Observation–Behaviour–Intensity–Dementia (MOBID-2) Pain Scale[36,71-73]

It is realized that observation of the patient at rest may not disclose the pain, especially in chronic pain, and suggestions are made that movement-related pain are better disclosed during ADL functioning. Thereby, at least four of these scales include spontaneous or guided movements during the pain observation process.[64,69,73,74]

Most of these scales are easy to use, but require training and time for proper administration. In the last years, doctors, nurses, and other caregivers have been involved in the validation processes. Although results are promising related to aspects of validity and reliability for several assessment tools, future studies are needed to define the most appropriate pain behaviour items which are able to discriminate between pain behaviour and behaviours related to other aspects of unmet needs.

In the Netherlands, the recently developed guideline "chronic pain in vulnerable elderly" identified several instruments that are available in Dutch. Based on psychometric properties and feasibility, three are recommended: PACSLAC-D (a shortened version of the PACSLAC), PAINAD and Doloplus.

In Norway, a recently developed observational tool, the MOBID-2 Pain Scale is used in nursing home settings. Assessment of pain intensity is based on the patient's immediate pain behaviour (vocalization, facial expression, and body movements) in connection with standardized, guided movements of different body parts, and pain behaviour related to internal organs.[73] MOBID-2 part 1 assesses pain related to the musculoskeletal system, and MOBID-2 part 2 assesses pain that might originate from internal organs, head and skin, being monitored over time. Primary caregivers are encouraged to judge whether the behavioral disturbances are related to pain or to dementia and psychogeriatric conditions. The total MOBID-2 score (0-10) is derived from caregivers in a clinical bedside situation during morning care. Psychometric property studies have indicated high to excellent reliability and validity,[71-73] and the assessment tool has been found feasible to use in clinical practice.[36,75] Administration of the MOBID-2 takes approximately 5 minutes.

Including 77 nursing home residents with severe dementia, assessed by the Mini Mental State Examination (MMSE score 2.4 ± 3.6), we found that nociceptive pain (MOBID-2 Pain Scale $\geq$ 3) related to the musculoskeletal system was observed in 58% of the patients.[73] Most frequently painful was mobilizing the legs, and least was mobilizing the hands. The prevalence of pain originating from internal organs, head, and skin was slightly less frequent, as about 42% of the patients were estimated to be in pain due to these conditions. Most frequently observed and painful was pain that might originate from pelvis and/genital organs, and least was pain localized to the heart region, lung, and chest wall. Regarding the overall pain intensity, the prevalence of pain was suggested to be as high as 64% in nursing home patients with severe dementia.

LIMITATIONS OF EXISTING INSTRUMENTS

Taking together, a valid outcome measure of pain is the prerequisites for trials of pain treatment and assessment of potential analgesic side effects. In the last years, the development of single instruments is derivative of other instruments, including different aspects of pain behaviour and pain intensity, location and duration of pain, pain observed at rest or during movements, and self-report if still possible. Evaluations of the most promising observational pain assessments with nonverbal older adults with dementia indicated that although a number of tools demonstrate some potential, none of them has been shown to have sufficient practical utility as a tool that inform the physician as to when pain treatment will be beneficial.[59] A further limitation is that some instruments are not validated in an English-speaking population.[64,70,73] In addition, hardly any information is available on how to assess orofacial and/or dental pain.[49] This is of key importance, because impaired chewing, infections, and pain in the mouth may result in chronic malnutrition, poorer physical activity and more suffering.

Another concern is related to the scoring system. Most instruments add up the number of observed behaviours to present a total score. This means that a high number of behaviours indicate more pain. How-

ever, a patient may be in severe pain although it is manifested only in a few items, for instance in connection with moving a leg or an arm, and the rest of the body is pain free. Some patients with for instance Parkinson disease or a severely reduced condition would not be able to express enough behaviour to be judged to be in pain.[73] Others, such as patients with Huntington's chorea, may express too much, even when there is no pain.

TREATMENT RECOMMENDATIONS

Pharmacological management of chronic pain in older persons may be challenging. In 2009, the AGS Panel revised their previous recommendations on Pain Management in Older Adults[21,22,27] with support of the American Pain Society and the American Academy of Pain Medicine. The new guidelines included key approaches for safer opioid prescribing in older adults. However, the current treatment recommendation guidelines, which aim to update the evidence base of the 2002 Guideline, are not yet evidence based and do not consider pain treatment in patients with severe dementia, who often are excluded from randomized clinical trials and pain treatment studies.[55]

Although pharmacological treatment with analgesics is the most common form of pain treatment in older persons, the use of non-pharmacological and alternative treatment should also be considered, especially under the aspect of potentially less adverse events.[76-82]

PREVALENCE STUDIES OF ANALGESIC DRUG USE IN DEMENTIA

Traditionally, medications with analgesic effects are classified into three groups: periphery analgesics, such as acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), and opioid agents. Adjuvant medication (such as antidepressants, antiepileptic, hypnotics, anxiolytics, antipsychotics, and steroids) supports analgesic effects, but research results are only available for patients without mental impairment. Even when pain is assessed and recognized, pain management often falls short of prescription recommendations. This seems to be a worldwide challenge, documented by studies from The Netherlands,[83,84] Belgium,[85] England,[86] Norway,[36,87] Sweden,[88] United States[78,89-91] or China.[92]A study of 21,380 people living in nursing homes in 13 US states identified persistent pain in 49% of those studied.[91] Yet, 24% of those with persistent pain received no analgesics, and less than half of the medications were prescribed as standing orders. Acetaminophen was the most frequently prescribed analgesic and often at doses <1300 mg/day.

A study on the knowledge and beliefs of nurses caring for older adults with dementia in a nursing home setting found that a large number of the professionals thought patients should only receive analgesics "when necessary" rather than on a fixed schedule.[93] However, deficits or misbelieves about the care of older adults can affect all clinicians, not just nurses. Better cognition has been associated with a greater likelihood of receiving an analgesic other than acetaminophen. In a study of 551 nursing home residents in North Carolina, 56% of the individuals with severe cognitive impairment received pain medications, compared with 80% of the cognitively intact cohort ($P < .001$) despite a similar rate of pain-related conditions between the groups.[94] Notably, cognitively impaired persons were more likely to be given "as needed" pain medications while their peers had regularly scheduled analgesics. "As needed" drug regimens are particularly inappropriate for individuals with moderate-to-severe cognitive impairment who are unable to verbally communicate the presence of pain, much less a need for analgesics.[27,78,91,95]

But time is changing. Recently, increasing awareness of pain management in patients with dementia has been reported in the Swedish National Study of Aging and Care – Kungsholmen.[96] The study analyzed use of analgesics and psychotropics in 2610 participants aged > 65 years and found that 46% of the patients with dementia used at least one analgesic drug compared with 25% of those without dementia. Persons with dementia reported pain less frequently, but the prevalence of pain-related diagnoses was similar compared to persons without dementia. In this study, persons with dementia had higher probability of use of paracetamol (acetaminophen) and psychotropics, whereas there were no significant differences in use of any analgesic, opioids, and NSAIDs compared to those without mental impairment.

These results are supported by another study which compared the use of central nervous system drugs and analgesics among 546 people aged 85 years and older, with and without dementia living at home or institutions in Sweden and Finland.[97] A significantly higher proportion of patients with dementia used paracetamol, antipsychotics, antidepressant and anxiolytics. No differences were found for opioids. The first national population study in Finland to investigate opioid analgesic use among persons with and without dementia found that the use of strong opioids, especially due to transdermal fentanyl, was higher in patients with dementia. In Finland, sales of transdermal fentanyl increased by 98% between 2002 and 2006.[98] Finally, increasing warnings have been made against morbidity and death associated events with the initiation of fentanyl in previously opioid-naïve patients[99] and the urgent request to find the balancing act between appropriate pain treatment and unbearable side effects.[100]

At the moment, we do not have comparable tends in order to the prescription of analgesic use in Norway. It will be a future task to describe available cohort data from the last years and actual nursing home trajectory studies.

CONCLUSION

Advanced age is associated with increased prevalence of pain and of dementia. Given that the ability to report about pain depends on the patient's memory, expectation, and emotion. Therefore, these patients are at high risk for being underdiagnosed and untreated for pain which may contribute to increasing behavioural disturbances like agitation, aggression: at any given time 45-89% suffer from pain and up to 80% have challenging behaviour. International recommendations to assess and treat pain have been published and an impressive number of pain behaviour rating scales have been developed and tested. However, implementation of these efforts seems to be a major shortcoming: Although, the total number of prescribed analgesics seems to increase in nursing homes, it is not guaranteed that the "right patient receives the right medication". It is, moreover, an alarming fact that these patients are still excluded from high quality RCT trials of pain treatment in dementia. This underlines high needs of research as well as excellent implementation concepts in the nursing home.

REFERENCES

1. Scherder E, Herr K, Pickering G, et al. Pain in dementia. *Pain* 2009; **145** (3): 276-278.
2. Moriarty OM, McGuire BE, Finn DP. The effect of pain on cognitive function: A review of clinical and preclinical research. *Pro Neurobiol* 2011; **93** (3): 385-404.
3. Lin PC, Lin LC, Shyu YIL, Hua MS. Predictors of pain in nursing home residents with dementia: a cross-sectional study. *J Clin Nurs* 2011; **20** (13-14): 1849-1857.
4. Cipher DJ, Clifford RA. Dementia, pain, depression, behavioral disturbances, and ADLs: toward a comprehensive conceptualization of quality of life in long-term care. *Int J Geriatr Psychiatry* 2004; **19** (8): 741-748.
5. Cordner Z, Blass DM, Rabins PV, et al. Quality of life in nursing home residents with advanced dementia. *J Am Geriatr Soc* 2010; **58** (12): 2394-2400.
6. Jakobsson U, Hallberg IR. Pain and quality of life among older people with rheumatoid arthritis and/or osteoarthritis: a literature review. *J Clin Nurs* 2002; **11** (4): 430-443.
7. Bosley BN, Weiner DK, Rudy TE, et al. Does chronic nonmalignant pain impair appetite in community dwelling older adults? *J Am Geriatr Soc* 2003; **51** (4): S205.
8. Bosley BN, Weiner DK, Rudy TE, et al. Is chronic nonmalignant pain associated with decreased appetite in older adults? Preliminary evidence. *J Am Geriatr Soc* 2004; **52** (2): 247-251.
9. Giron MST, Forsell Y, Bernsten C, et al. Sleep problems in a very old population: Drug use and clinical correlates. *J Gerontol A-Biol Sci Med Sci* 2002; **57** (4): M236-M240.
10. Vitiello MV, Borson S. Sleep disturbances in patients with Alzheimer's disease – Epidemiology, pathophysiology and treatment. *CNS Drugs* 2001; **15** (10): 777-796.
11. Husebo BS, Ballard C, Aarsland D. Pain treatment of agitation in patients with dementia: a systematic review. *Int J Geriatr Psychiatry* 2011; **26** (10): 1012-1018.
12. Kovach CR, Logan BR, Noonan PE, et al. Effects of the Serial Trial Intervention on discomfort and behavior of nursing home residents with dementia. *Am J Alzheimers Dis Other Demen* 2006; **21** (3): 147-155.
13. Snow AL, Shuster JL. Assessment and treatment of persistent pain in persons with cognitive and communicative impairment. *J Clin Psychol* 2006; **62** (11): 1379-1387.
14. Buffum MD, Haberfelde M. Moving to new settings: Pilot study of families' perceptions of professional caregivers' pain management in persons with dementia. *J Rehab Res Develop* 2007; **44** (2): 295-303.
15. Hall-Lord ML, Johansson I, Schmidt I, et al. Family members' perceptions of pain and distress related to analgesics and psychotropic drugs, and quality of care of elderly nursing home residents. *Health Soc Care Commun* 2003; **11** (3): 262-274.
16. Cipher DJ, Fernandez E, Clifford PA. Cost-effectiveness and health care utilization in a multidisciplinary pain center: Comparison of three treatment groups. *J Clin Psychol Med Sett* 2001; **8** (4): 237-244.
17. Ferrell BR, Griffith H. Cost Issues Related to Pain Management – Report from the Cancer Pain Panel of the Agency for Health-Care Policy and Research. *J Pain Sympt Manage* 1994; **9** (4): 221-234.
18. Takai Y, Yamamoto-Mitani N, Okamoto Y, et al. Literature review of pain prevalence among older residents of nursing homes. *Pain Manage Nurs* 2010; **11** (4): 209-223.
19. Hadjistavropoulos T, Herr K, Turk DC, et al. An interdisciplinary expert consensus statement on assessment of pain in older persons. *Clin J Pain* 2007; 23 (1): S1-S43.
20. Herr K. Pain assessment strategies in older patients. *J Pain* 2011; **12** (3): S3-S13.
21. AGS Panel. The management of chronic pain in older persons. *J Am Geriatr Soc* 1998; **46**: 635-651.
22. AGS Panel. Pharmacological management of persistent pain in older persons. *J Am Geriatr Soc* 2009; **57**: 1331-1366.

23. Barber JB, Gibson SJ. Treatment of chronic non-malignant pain in the elderly safety considerations. *Drug Safe* 2009; **32** (6): 457-474.
24. Ferrell BA. Pain management in elderly people. *J Am Geriatr Soc* 1991; **39** (1): 64-73.
25. Gloth FM. Pharmacological management of persistent pain in older persons: focus on opioids and nonopioids. *J Pain* 2011; **12** (3): S14-S20.
26. Woolf AD, Zeidler H, Haglund U, et al. Musculoskeletal pain in Europe: its impact and a comparison of population and medical perceptions of treatment in eight European countries. *Ann Rheumat Dis* 2004; **63** (4): 342-347.
27. Lindblom U, Merskey H, Mumford JM. Pain terms – a current list with definitions and notes on usage. *Pain* 1986; **3**: 215-221.
28. AGS Panel. The management of persistent pain in older persons. *J Am Geriatr Soc* 2002; **50** (6 Suppl): S205-S224.
29. Helme RD, Gibson SJ. The epidemiology of pain in elderly people. *Clin Geriatr Med* 2001; **17** (3): 417-431.
30. Mangoni AA, Jackson SHD. Age-related changes in pharmacokinetics and pharmacodynamics: basic principles and practical applications. *Br J Clin Pharm* 2004; **57** (1): 6-14.
31. Crosby FE, Colestro J, Ventura MR, et al. Survey of pain among veterans in Western New York. *Pain Manage Nurs* 2006; **7** (1): 12-22.
32. Jadelis K, Miller ME, Ettinger WH, et al. Strength, balance, and the modifying effects of obesity and knee pain: Results from the Observational Arthritis Study in Seniors (OASIS). *J Am Geriatr Soc* 2001; **49** (7): 884-891.
33. Leveille SG, Bean J, Bandeen-Roche K, et al. Musculoskeletal pain and risk for falls in older disabled women living in the community. *J Am Geriatr Soc* 2002; **50** (4): 671-678.
34. Miro J, Paredes S, Rull M, et al. Pain in older adults: A prevalence study in the Mediterranean region of Catalonia. *Eur J Pain* 2007; **11** (1): 83-92.
35. Grimby C, Fastbom J, Forsell Y, et al. Musculoskeletal pain and analgesic therapy in a very old population. *Arch Gerontol Geriatr* 1999; **29** (1): 29-43.
36. Husebo BS, Strand LI, Moe-Nilssen R, et al. Who suffers most? Dementia and pain in nursing home patients: A cross-sectional study. *JAMDA* 2008; **9** (6): 427-433.
37. Stern S. Angina pectoris without chest pain – Response. *Circulation* 2003; **108** (6): E37.
38. Stern S. Symptoms other than chest pain may be important in the diagnosis of "silent ischemia" or "the sounds of silence". *Circulation* 2005; **111** (24): E435-E437.
39. Wroblewski M, Mikulowski P. Peritonitis in geriatric inpatients. *Age Ageing* 1991; **20** (2): 90-94.
40. Horn SD, Bender SA, Bergstrom N, et al. Description of the National Pressure Ulcer Long-Term Care Study. *J Am Geriatr Soc* 2002; **50** (11): 1816-1825.
41. Black BS, Finucane T, Baker A, et al. Health problems and correlates of pain in nursing home residents with advanced dementia. *Alzheimer Dis Assoc Dis* 2006; **20** (4): 283-290.
42. Leoni F, Benni E, Iacobucci T, et al. Pain control with low-dose alfentanil in children undergoing minor abdominal and genito-urinary surgery. *Eur J Anaesthesiol* 2004; **21** (9): 738-742.
43. Tambyah PA, Maki DG. Catheter-associated urinary tract infection is rarely symptomatic – A prospective study of 1497 catheterized patients. *Arch Int Med* 2000; **160** (5): 678-682.
44. Koopman JS, Dieleman JP, Huygen FJ, et al. Incidence of facial pain in the general population. *Pain* 2009; **147** (1-3): 122-127.
45. Gluhak C, Arnetzl GV, Kirmeier R, et al. Oral status among seniors in nine nursing homes in Styria, Austria. *Gerodontol* 2010; **27** (1): 47-52.
46. Merskey H. Introduction: The need of taxonomy. *Pain Suppl* 1986; **3**: 3-9.
47. Merskey H, Bogduk N. Classification of chronic pain: descriptions of chronic pain syndromes and definitions of pain terms. *Int Assoc Pain: Seattle,* 1994.
48. Herr K, Bjoro K, Decker S. Tools for assessment of pain in nonverbal older adults with dementia: A state-of-the-science review. *J Pain Symp Manage* 2006; **31** (2): 170-192.
49. Lobbezoo F, Weijenberg RAF, Scherder EJA. Topical review: Orofacial pain in dementia patients. A diagnostic challenge. *J Orofac Pain* 2011; **25** (1): 6-14.
50. Park J, Castellanos-Brown K, Belcher J. A review of observational pain scales in nonverbal elderly with cognitive impairments. *Res Soc Work Pract* 2010; **20** (6): 651-664.
51. Stolee P, Hillier LM, Esbaugh J, et al. Instruments for the assessment of pain in older persons with cognitive impairment. *J Am Geriatr Soc* 2005; **53** (2): 319-326.
52. van Herk R, Baar FP, Tibboel D, et al. Observation scales for pain assessment in older adults with cognitive impairments or communication difficulties. *Nurs Res* 2007; **56** (1): 34-43.
53. Zwakhalen SM, Hamers JP, Abu-Saad HH, et al. Pain in elderly people with severe dementia: a systematic review of behavioural pain assessment tools. *BMC Geriatr* 2006; **6**: 3.

54. Chapman CR. Progress in pain assessment: the cognitively compromised patient. *Cur Opin Anesthesiol* 2008; **21** (5): 610-615.
55. Corbett A, Husebo BS, Malcangio M, et al. Assessment, diagnosis and treatment of pain in people with dementia. *Nat Rev Neurol* 2012; **8**: 264-274.
56. Prkachin KM. The consistency of facial expressions of pain – A comparison across modalities. *Pain* 1992; **51** (3): 297-306.
57. Cohen-Mansfield J. Pain Assessment in Noncommunicative Elderly Persons – PAINE. *Clin J Pain* 2006; **22** (6): 569-575.
58. Cohen-Mansfield J, Lipson S. The utility of pain assessment for analgesic use in persons with dementia. *Pain* 2008; **134** (1-2): 16-23.
59. Villanueva MR. Pain assessment for the dementing elderly (PADE): Reliability and validity of a new measure. *J Am Med Dir Assoc* 2003; **4**: 1-8.
60. Hurley AC, Volicer BJ, Hanrahan PA, et al. Assessment of discomfort in advanced Alzheimer patients. *Res Nurs Health* 1992; **15** (5): 369-377.
61. Feldt K. The checklist of nonverbal pain indicators (CNPI). *Pain Manage Nurs* 2000; **1**: 13-21.
62. Jones KR, Fink R, Hutt E, et al. Measuring pain intensity in nursing home residents. *J Pain Sympt Manage* 2005; **30** (6): 519-527.
63. Warden V, Hurley AC, Volicer L. Development and psychometric evaluation of the Pain Assessment in Advanced Dementia (PAINAD) scale. *J Am Med Dir Assoc* 2003; **4** (1): 9-15.
64. Lefebvre-Chapiro S. The Doloplus 2 scale – evaluating pain in the elderly. *Eur J Palliat Care* 2001; **8**: 191-194.
65. Pautex S, Herrmann FR, Michon A, Giannakopoulos P, Gold G. Psychometric properties of the doloplus-2 observational pain assessment scale and comparison to self-assessment in hospitalized elderly. *Clin J Pain* 2007; **23** (9): 774-779.
66. Fuchs-Lacelle S, Hadjistavropoulos T. Development and preliminary validation of the pain assessment checklist for seniors with limited ability to communicate (PACSLAC). *Pain Manage Nurs* 2004; **5**: 37-49.
67. Fuchs-Lacelle S, Hadjistavropoulos T, Lix L. Pain assessment as intervention – A study of older adults with severe dementia. *Clin J Pain* 2008; **24** (8): 697-707.
68. Zwakhalen SM, Hamers JP, Berger MP. Improving the clinical usefulness of a behavioural pain scale for older people with dementia. *J Adv Nurs* 2007; **58** (5): 493-502.
69. Snow AL, Weber JB, O'Malley KJ, et al. NOPPAIN: A nursing assistant-administered pain assessment instrument for use in dementia. *Dement Geriatr Cogn Disord* 2004; **17** (3): 240-246.
70. Morello R, Jean A, Alix M, et al. A scale to measure pain in non-verbally communicating older patients: The EPCA-2 Study of its psychometric properties. *Pain* 2007; **133** (1-3): 87-98.
71. Husebo BS, Strand LI, Moe-Nilssen R, et al. Mobilization-Observation-Behavior-Intensity-Dementia Pain Scale (MOBID): Development and validation of a nurse-administered pain assessment tool for use in dementia. *J Pain Sympt Manage* 2007; **34** (1): 67-80.
72. Husebo BS, Strand LI, Moe-Nilssen R, et al. Pain behaviour and pain intensity in older persons with severe dementia: reliability of the MOBID Pain Scale by video uptake. *Scand J Caring Sci* 2009; **24**: 380-391.
73. Husebo BS, Strand LI, Moe-Nilssen R, et al. Pain in older persons with severe dementia. Psychometric properties of the Mobilization-Observation-Behaviour-Intensity-Dementia (MOBID-2) Pain Scale in a clinical setting. *Scand J Caring Sci* 2010; **24**: 380-391.
74. Nygaard HA, Jarland M. The Checklist of Nonverbal Pain Indicators (CNPI): testing of reliability and validity in Norwegian nursing homes. *Age Ageing* 2006; **35** (1): 79-81.
75. Husebo BS, Ballard C, Sandvik R, et al. Efficacy of treating pain to reduce behavioural disturbances in residents of nursing homes with dementia: cluster randomised clinical trial. *BMJ* 2011; **343**: 1-10.
76. Ballard C, Smith J, Husebo BS, et al. The role of pain treatment in managing the behavioural and psychological symptoms of dementia (BPSD). *Int J Pall Nurse* 2011; **17**: 420-423.
77. Frampton M. Experience assessment and management of pain in people with dementia. *Age Ageing* 2003; **32** (3): 248-251.
78. Reynolds KS, Hanson LC, DeVellis RF, et al. Disparities in pain management between cognitively intact and cognitively impaired nursing home residents. *J Pain Symp Manage* 2008; **35** (4): 388-396.
79. Etzioni S, Chodosh J, Ferrell BA, et al. Quality indicators for pain management in vulnerable elders. *J Am Geriatr Soc* 2007; **55**: S403-S408.
80. Chodosh J, Ferrell BA, Shekelle PG, et al. Quality indicators for pain management in vulnerable elders. *Ann Intern Med* 2001; **135** (8): 731-735.
81. Chodosh J, Shekelle PG, Ferrell B, et al. Quality of care for chronic pain among vulnerable elders. *J Am Geriatr Soc* 2001; **49** (4): S146.

82. Hawk C, Cambron J. Chiropractic care for older adults: Effects on balance, dizziness, and chronic pain. *J Manipul Physiol Ther* 2009; **32** (6): 431-437.
83. Achterberg WP, Pot AM, Scherder EJ, et al. Pain in the nursing home: Assessment and treatment on different types of care wards. *J Pain Sympt Manage* 2007; **34**: 480-487.
84. Zwakhalen SMG, Koopmans RTCM, Geels PJEM, et al. The prevalence of pain in nursing home residents with dementia measured using an observational pain scale. *Eur J Pain* 2009; **13** (1): 89-93.
85. Elseviers MM, Vander Stichele RR, Van Bortel L. Drug utilization in Belgian nursing homes: impact of residents' and institutional characteristics. *Pharmacoepidemiol Drug Safe* 2010; **19** (10): 1041-1048.
86. Closs SJ, Barr B, Briggs M. Cognitive status and analgesic provision in nursing home residents. *Br J Gen Prac* 2004; **54** (509): 919-921.
87. Nygaard HA, Jarland M. Are nursing home patients with dementia diagnosis at increased risk for inadequate pain treatment? *Int J Geriatr Psychiatr* 2005; **20**: 730-737.
88. Lovheim H, Sandman PO, Kallin K, et al. Poor staff awareness of analgesic treatment jeopardises adequate pain control in the care of older people. *Age Ageing* 2006; **35** (3): 257-261.
89. Hutt E, Pepper GA, Vojir C, et al. Assessing the appropriateness of pain medication prescribing practices in nursing homes. *J Am Geriatr Soc* 2006; **54** (2): 231-239.
90. Shega JW, Hougham GW, Stocking CB, et al. Management of noncancer pain in community-dwelling persons with dementia. *J Am Geriatr Soc* 2006; **54** (12): 1892-1897.
91. Won AB, Lapane K, Vallow S, et al. Persistent nonmalignant pain and analgesic prescribing practices in elderly nursing home residents. *J Am Geriatr Soc* 2003; **51** (4): S193-S194.
92. Tse MMY, Pun SPY, Benzie IFF. Pain relief strategies used by older people with chronic pain: an exploratory survey for planning patient-centred intervention. *J Clin Nurs* 2005; **14** (3): 315-320.
93. Cramer GW, Galer BS, Mendelson MA, et al. A drug use evaluation of selected opioid and nonopioid analgesics in the nursing facility setting. *J Am Geriatr Soc* 2000; **48** (4): 398-404.
94. Richards SCM, Scott DL. Prescribed exercise in people with fibromyalgia: parallel group randomised controlled trial. *BMJ* 2002; **325** (7357): 185-187.
95. The management of chronic pain in older persons: AGS Panel on Chronic Pain in Older Persons. Am Geriatr Soc. *J Am Geriatr Soc* 1998; **46** (5): 635-651.
96. Haasum Y, Fastbom J, Fratiglioni L, et al. Pain treatment in elderly persons with and without dementia: A population-based study of institutionalized and home-dwelling elderly. *Drugs Aging* 2011; **28** (4): 283-293.
97. Lovheim H, Karlsson S, Gustafson Y. The use of central nervous system drugs and analgesics among very old people with and without dementia. *Pharmacoepidemiol Drug Safe* 2008; **17** (9): 912-918.
98. Hamunen K, Paakkari P, Kalso E. Trends in opioid consumption in the Nordic countries 2002-2006. *Eur J Pain* 2009; **13** (9): 954-962.
99. Dosa DM, Dore DD, Mor V, et al. Frequency of long-acting opioid analgesic initiation in opioid-naive nursing home residents. *J Pain Sympt Manage* 2009; **38** (4): 515-521.
100. Mantyselka P. Balancing act with geriatric pain treatment. *Pain* 2008; **138** (1): 1-2.