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Maija Rantala

Nurses' Evaluations of Postoperative Pain Management in Patients with Dementia

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ABSTRACT: NURSES' EVALUATIONS OF POSTOPERATIVE PAIN MANAGEMENT IN PATIENTS WITH DEMENTIA

The purpose of this study was to describe and explain postoperative pain management in hip fracture patients with dementia as reported by nurses. These include nursing practices, barriers to pain management, pharmacological pain treatment and registered nurses' (RNs) knowledge of potentially clinically relevant adverse effects of analgesics. In addition, factors associated to the nurses' opinion of sufficient pain management were explained.

Data were collected between March and May 2011 from orthopedic units in seven university hospitals and ten central hospitals in Finland (n=333). Statistical descriptions were used. Logistic regression analysis was also applied in order to find out which variables were associated with the knowledge of adverse effects of analgesics and sufficiency of pain management.

Over half of the respondents considered that postoperative pain management is sufficient in patients with dementia. This finding contradicts the result that major barrier to postoperative pain management was difficulties to assess pain due to patients cognitive impairment and less than one third of nurses reported that pain scales were in use on their unit. The use of pain scales was significantly related to the respondents' opinion that pain was sufficiently treated. The pharmacological postoperative pain treatment seemed to be based on the use of strong opioids and paracetamol. This study shows a deficiency in RNs' knowledge, especially regarding renal and cardiovascular adverse effects of NSAIDs and younger RNs' better knowledge of adverse effects of strong and weak opioids as compared with older RNs'.

In conclusions, the opinion of sufficient pain management was associated mostly the use of "analgesics treatment practices" including regular assessment of pain, assessment and documentation of effects of analgesics and the use of pain scales on units. The findings can be utilized when developing the acute pain management in surgical patients with dementia. Further research is needed to assess and improve the pain management in hip fracture patients with dementia from the viewpoint of patients.

National Library of Medicine Classification: WY 161; WO 184
Medical Subject Headings: Pain, Postoperative; Pain Management; Dementia; Hip Fractures; Analgesics; Nursing Staff, Hospital; Nurses

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TIIVISTELMÄ: MUISTISAIRAIDEN POSTOPERATIIVINEN KIVUN HOITO HOITOHENKILÖKUNNAN ARVIOIMANA

Tämän tutkimuksen tarkoituksena oli kuvata ja selittää muistisairaiden lonkkamurtumpotilaiden postoperatiivista kivun hoitoa hoitohenkilökunnan arvioimana. Tässä tutkimuksessa kuvataan hoitotyön käytäntöjä, kivun hoidon esteitä, kivun lääkehoitoa, sekä sitä, miten sairaanhoitajat tiesivät potentiaalisesti kliinisesti merkittävät kipulääkkeiden sivuvaikutukset. Lisäksi selitettiin, mitkä tekijät olivat yhteydessä hoitohenkilökunnan mielipiteeseen kivun hoidon riittävyydestä.

Aineisto kerättiin maalis- toukokuussa 2011 seitsemän yliopistollisen ja kymmenen keskussairaalan kirurgisten vuodeosastojen hoitohenkilökunnalta (n=333). Aineisto analysoittiin tilastollisin menetelmin. Logistisen regressioanalyysin avulla selvitettiin, mitkä tekijät olivat yhteydessä kipulääkkeiden sivuvaikutusten tuntemiseen ja hoitajien mielipiteeseen kivun hoidon riittävyydestä.

Yli puolet hoitohenkilökunnasta arvioi muistisairaiden lonkkamurtumapotilaiden kivun hoidon olevan riittävää. Kuitenkin hoitohenkilökunnan mielestä suurin este postoperatiiviselle kivun hoidolle oli vaikeus arvioida kipua potilaan kognitiivisten ongelmien vuoksi. Toisaalta alle kolmannes vastaajista raportoi, että kipumittareita oli käytössä heidän osastollaan. Kipumittareiden käyttö kivun arvioinnissa oli yhteydessä hoitohenkilökunnan mielipiteeseen siitä, että kivun hoito on riittävää. Tulosten mukaan kivun lääkehoito näyttää perustuvan vahvojen opioidien ja parasetamolin käyttöön. Sairaanhoitajilla oli tiedollisia puutteita erityisesti tulehduskipulääkkeiden munuaisperäisistä ja kardiovaskulaarisista sivuvaikutuksista. Nuoremmilla sairaanhoitajilla oli vahvojen ja heikkojen opioidien sivuvaikutuksista parempi tietämys verrattuna vanhempiin sairaanhoitajiin.

Johtopäätöksenä esitetään, että hoitohenkilökunnan mielipiteeseen riittävästä kivun hoidosta yhteydessä olevia tekijöitä olivat pääasiallisesti hyvät ”lääkkeellisen kivun hoidon käytännöt” osastoilla mukaan lukien säännöllinen kivun arviointi, kipulääkkeiden vaikutusten arviointi sekä dokumentointi sekä kipumittareiden käyttö työyksiköissä. Tutkimuksen tuloksia voidaan hyödyntää kehitettäessä akuutin kivun hoitoa muistisairailla kirurgisilla potilailla. Jatkotutkimuksissa tulisi arvioida ja kehitää muistisairaiden lonkkamurtumapotilaiden postoperatiivisen kivun hoidon nykytilaa potilaiden näkökulmasta.

Yleinen Suomalainen asiasanasto: kipu, postoperatiivinen hoito, dementia, kipulääkkeet, sivuvaikutukset; hoitohenkilöstö, sairaanhoitajat, hoitotyö

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dedicate my work the memory of my late father Einari, who passed away at the beginning of this research process.

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June 2014 *Maija Rantala*

List of the original publications

This dissertation is based on the following original publications, which are referred to by their Roman numerals

I Rantala M, Kankkunen P, Kvist T & Hartikainen S. Post-operative pain management practices in patients with dementia- the current situation in Finland. *The Open Nursing Journal. 6: 71-82, 2012.*

II Rantala M, Kankkunen P, Kvist T & Hartikainen S. Barriers to post-operative pain management in hip fracture patients with dementia as evaluated by nursing staff. *Pain Management Nursing*. *15(1): 208-219, 2014.*

III Rantala M, Hartikainen S, Kvist T & Kankkunen P. Analgesics in postoperative care in hip fracture patients with dementia- reported by nurses. *Journal of Clinical Nursing.* Accepted for publication 05.12.2013.

IV Rantala M, Hartikainen S, Kvist T & Kankkunen P. Nurses knowledge about adverse effects of analgesics when treating postoperative pain in patients with dementia. Resubmission 2/2014

Contents

Abbreviations, Palatino (Linotype) 21 pt

AGS	the American Geriatrics Society
ASPMN	American Society for Pain Management Nursing
ATC	Anatomic Therapeutic Chemical
CI	Confidence Interval
IASP	International Association for Study of Pain
ICD-10	International Classification of Diseseases, tenth revision
NPI	Neuropsychiatric Inventory
NRS	Numerical Pain Rating Scale
OR	Odds Ratio
OSF	Official Statistics of Finland
SD	Standard Deviation
TENS	Transcutaneous Electrical Nerve Stimulation
VAS	Visual Analogue Scale
VRS	Verbal Rating Scale
WHO	World Health Organization

1 Introduction

Nurses play a pivotal role in advocating qualified pain treatment for the vulnerable group of patients with dementia and spend more time with patients suffering from pain than any other health care team members (Dunn 2004; McCaffery & Ferrell 1997). Managing pain in older persons is a complex task which requires knowledge and skills to assess and manage pain through pharmacological and nonpharmacological means (Denny & Guido 2012). Nurses have direct responsibilities related to tailoring analgesics and preventing and recognizing potential adverse effects. Effective postoperative pain management is an essential component for the quality of care (Abdalrahim et al. 2011). Proper pain management is included in the patients' rights, and insufficient pain management increases human suffering in addition to increased costs to the society as a consequence from long term care in which functional recovery fails.

Dementia is a form of cognitive impairment. It is not a disease in itself, but there are certain groups of symptoms that may accompany certain diseases or conditions (American Psychiatric Association 2004). Cognitive impairment is not caused by any one disease or condition, nor is it limited to a specific age group. Cognitive impairment can be caused by Alzheimer's disease and other dementias in addition to conditions such as stroke, traumatic brain injury, and developmental disabilities. A common form of acute cognitive impairment in the older patient is delirium or confusion.

Hip fractures are common among older persons. Fractured hips account for over 7000 injuries in Finland annually (Sund et al. 2008). Approximately 25% of these patients have at least moderate cognitive impairment (Griffiths et al. 2012). Older persons with dementia are at a high risk of falling and sustaining fractures mainly because of impaired central processing leading to reduced balance and gait (Viramo & Sulkava 2006). Surgery is the best analgesic for hip fractures (Griffiths et al. 2012) and the majority of postsurgical pain can be well-managed with the appropriate use of analgesics (Wells, Pasero & McCaffery 2008). Patients suffering from hip fractures are often in great pain (Handoll et al. 2009; Herrick et al. 2004) and a range of studies have supported the view that acute pain is poorly detected and assessed, and thus inadequately treated in persons with dementia who have difficulties in verbally expressing their pain (Macintyre et al. 2010; AGS 2009). Despite generally successful surgical treatment, hip fractures pose a major threat to life, mobility, and independence (Lönnroos 2009). Effective pain management promotes decreased human suffering; it contributes to shorter stays in hospitals with reduced costs, effective mobilization and functional independence, and results in decreased morbidity (Herrick et al. 2004; Morrison et al 2003b).

Older persons are particularly susceptible to the adverse effects of analgesics due to changes in pharmacokinetics and pharmacodynamics and risk factors such as polypharmacy and co-morbidities (Jahr et al. 2012; Macintyre et al. 2010). Despite a high risk for adverse effects of analgesics in older persons (AGS 2009), these risks need to be carefully assessed in relation to the potential benefits (Barber & Gibson 2009; Burris 2004). Opioids play a key role in pharmacological postoperative pain management, especially for surgical procedures that cause moderate to severe pain.

Although pharmacological pain treatment is the first step for treating postoperative pain in hip fracture patients with dementia, it is advisable to use nonpharmacological pain treatment methods as supplements to effective pharmacological treatment methods (Wells, Pasero & McCaffery 2008). The most frequently used nonpharmacological

intervention used on those hospitalized with hip fractures includes repositioning, followed by the use of pressure relief devices and cold applications (Titler et al. 2003).

Cognitive problems make assessing pain in older people challenging and a large number of nurses cite this as a barrier for optimal assessment and management of pain in acute medical units (Coker et al. 2010). Under-diagnosed and untreated pain may also contribute to increases in distressing behavioral symptoms in patients with dementia (Kovach et al. 2006b; Brown 2004; AGS 2002). System-related barriers included the lack of optimal team work, barriers for communication, and insufficient time. Institutional policies could be put in place in order to prioritize pain management, and help overcome some of these barriers (Fox et al. 2004).

Pain among individuals with dementia has recently become a topic of great interest (Kunz et al. 2009a; Zwakhalen et al. 2006). However, these studies have been widely focused on the assessment of pain in long-term settings (Prowse 2007) and there are very few studies on postoperative pain treatment in older persons (Brown 2004) and especially in persons with dementia (Scherder et al. 2009). The pain management in patients with dementia has also been explored fairly little in Finnish nursing science research. Several doctoral theses have been published about children's pain (Axelin 2010; Hong-Gu 2006; Kankkunen 2003; Pölkki 2002; Halimaa 2001; Salanterä 1999) and one study concerning pain assessment and management during colonoscopy (Ylinen 2010) as well as music intervention in the alleviation of pain in acute care (Vaajoki 2012).

The focus of the National Development Programme for Social Welfare and Health Care (Kaste 2012-2015 programme) and Health 2015 has shifted from the treatment of problems to preventing problems in health, including the early recognition of dementia and effective rehabilitation. This is especially important, because Finnish population is rapidly aging (Health 2015), and, accordingly, the incidence of advanced-age-related diseases, such as cognitive impairment and hip fractures, will increase exponentially in the near future...The viewpoint of nurses is important, as they have an obligation to appropriately treat pain in older patients (Denny & Guido 2012). Their role is essential in treating postoperative pain in frail patients who are unable to express their pain and other needs clearly. Nurses act as advocates for patients, and they must be proactive in ensuring that older people have adequate pain relief (Prowse 2007). The purpose of the study was to describe and explain postoperative pain management in hip fracture patients with dementia as reported by nurses. The study illustrates and clarifies nurses' evaluations of pharmacological and nonpharmacological pain treatment and the practices of treatment as well as presents barriers for optimal pain management. It also explores the knowledge of potentially clinically relevant adverse effects of analgesics. The study is part of a research program on pain management ("Pain Alleviation and its Effectiveness") in the Department of Nursing Science at the University of Eastern Finland (http://www.uef.fi/hoitot/tutkimusohjelma).

2 Literature

2.1 RELATED CONCEPTS

2.1.1 Aging

Currently, the majority of older people are healthy without major functional limitations (Corner, Brittain, & Bond 2004). Life expectancy is increasing nearly linearly in most developed countries, with no sign of deceleration (Christensen et al. 2009; Kirkwood 2008). In addition, the added life years are spent in good health, as the proportion of "years of frailty" has not been increased in Finland (Sihvonen 2003; Martelin 2002). Such terms as "successful aging" (Hochhalter, Smith & Ory 2011; Jopp & Smith 2006). and "third age" (Karisto 2004) represent this phenomenon. Rowe and Kahn (1987) argued that the cognitive and physiological losses documented in the literature as age-related changes are mischaracterizations of the natural aging process. They believe that "the role of aging per se in these losses has often been overstated and that a major component of many age-associated declines can be explained in terms of lifestyle, habits, diet, and an array of psychosocial factors extrinsic to the aging process" (Hochhalter, Smith & Ory 2011).

Aging can be characterized as a physiological, psychological, and social interaction phenomenon (Young, Frick & Phelan 2009). According to Kirkwood (2005) physiological aging is caused by gradual, lifelong accumulation of a wide variety of molecular and cellular damage, which is random in nature. The major organs affected by aging are the kidneys, liver, heart and blood circulation (cardiovascular changes) (Pollock 1998). Psychological aging includes the changes that occur in sensory and perceptual processes, cognitive abilities, adaptive capacity, and personality (Hooyman & Kiyak 2011). The social aging is connected with the person as a member of society (Linjakumpu 2003). It includes changes in social activities, previous roles, or interactions (Lyyra & Tiikkainen 2008).

Aging includes two concurrent processes: physiological changes that are natural consequences of advancing age and an increased risk of comorbidities (Altman 2010), such as cancer, heart disease, arthritis and dementia (Kirkwood 2008). However, these comorbidities are not a natural part of aging, but advanced age is a risk factor for certain age-related diseases. Therefore, the fundamental aging process is not a disease in itself, but increases vulnerability to diseases (Hayflick 2007). Vision and hearing change both structurally and functionally with age (Camacho-Soto, Sowa & Weiner 2011), and impairments in these areas are common with advanced age (Smith & Cotter 2012). Common eye diseases (e.g., cataract, glaucoma, macular degeneration, and diabetic retinopathy) associated with aging may result in moderate to severe vision loss. Presbycusis, defined as the loss of hearing with age, is estimated to affect one third of patients over the age of 65 and half of those over the age of 85. (Camacho-Soto, Sowa & Weiner 2011.) Aging is associated with a number of physical and physiologic changes that can increase the risk of falls (Lönnroos 2009) and the expression and experience of pain as well as its treatment (Camacho-Soto, Sowa & Weiner 2011). Common changes in the musculoskeletal system include sarcopenia (i.e., decline in muscle mass and strength), degenerative arthritis, and decreased bone density (Camacho-Soto, Sowa & Weiner 2011). Muscle strength is required in daily motoric tasks such as walking and in retaining control of postural balance during standing. Postural control abnormalities also become more prevalent, leading to an increased risk of falls (Lönnroos 2009).

A number of physiological changes associated with aging (Table 1) may lead to alterations in the pharmacokinetics and pharmacodynamics of analgesics (Camacho-Soto, Sowa & Weiner 2011; Coldrey, Upton & Macintyre 2011; AGS 2009). The distribution of the drug is altered because an increase in fat to lean body weight ratio and a decrease in intracellular body water causing prolonged half time and accumulation of the lipophilic drugs (Coldrey, Upton & Macintyre 2011; AGS 2009). Due to changes in liver metabolism, there might be prolonged drug half-time (Coldrey, Upton & Macintyre 2011; AGS 2009). Declining renal function, which is a consequence of decreased size and functional capacity of kidneys (decrease in renal blood flow and glomerular infiltration rate), may cause an accumulation of drugs, which are excreted via the kidneys (e.g., certain NSAIDs and morphine) (Coldrey, Upton & Macintyre 2011). These factors contribute to prolonged elimination of half-lives of analgesics in older people compared with younger people.

Table 1. Examples of physiological changes associated with aging which may influence to effects of analgesics (Coldrey et al. 2011; AGS 2009)

Physiological variable	**Change**	**Potential consequence**
Gastrointestinal absorption and function	Slowing gastrointestinal transit	Rate of drug absorbtion may be slowed
Cardiac output	Decreased/unchanged	Increased peak plasma concentration
Hepatic clearance	Decreased liver mass and blood flow	Decreased clearance in first pass metabolism and increased plasma concentrations
Renal clearance	Decreased size and functional capacity of kidneys ↓in renal blood flow and glomerular infiltration rate	↑plasma concentrations of renally cleared drugs
Body composition	↑body fat ↓intracellular body water ↓muscle mass	↑ volume of distribution and half-life of lipophilic drugs
Protein binding	↓ albumin Drug specific binding changes	Volume of distribution changes.

2.1.2 Hip fractures

Hip fractures represent a worldwide major public health burden which is expanding as the population ages (Handoll et al. 2009; Kannus et al. 2002); with hip fracture incidence rates increasing exponentially with age (Cummings & Melton 2002; Gullberg, Johnell & Kanis 1997; Melton et al. 1996). An estimated 1.3 million hip fractures occurred worldwide in adults in 1990 (Johnell & Kanis 2004; Gullberg, Johnell & Kanis 1997), with predictions of the numbers rising to 7.3–21.3 million by the year 2050 (Gullberg, Johnell, & Kanis 1997). The annual number of hip fractures in Finland is approximately 7000 (Sund et al. 2011), of which more than 95% involve patients aged 60 years and over (Kannus et al. 2006). In industrialized countries, the mean age of people sustaining a hip fracture is around 80 years (Handoll et al. 2009). Approximately 25% of patients with hip fractures have at least moderate cognitive impairment, 20% are institutionalised, and 50% require walking aids or are immobile (Griffiths et al. 2012).

The hip fractures occur in the upper end of the femur. According to a standard definition of hip fractures, the patients can be identified using the diagnoses of the fractures of femoral neck (ICD-10: S72.0), trochanteric fractures (S72.1), and subtrochanteric fractures (S72.2) (Sund et al. 2011) (Figure 1).

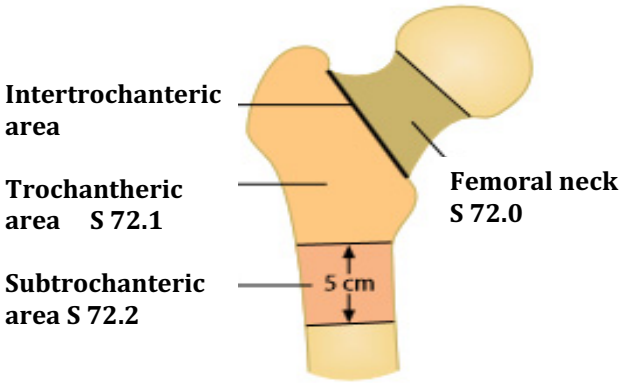

Figure 1. The classification of the upper end of the femur fractures (ICD 10) (Käypä hoito (= Current Care) 2011)

The hip fracture incidence rates are higher among women than men (75%). This discrepancy, however, was largely explained by age; women live longer and are more likely to reach the ''hip fracture age'' (Lönnroos, Kiviranta & Hartikainen 2010). Among the aged people, 90% of hip fractures result from moderate low-energy trauma, occurring after a simple, mechanical fall usually from standing height or lower (Hayes et al. 1996). The people with advanced age are at a high risk for falling and suffering fractures (Cummings & Melton 2002; Gullberg, Johnell & Kanis 1997; Melton et al. 1996), partly because advanced age is related to a reduction in muscle and bone strength as well as gait and balance problems (Lönnroos 2009). Although osteoporosis weakens bone strength among older people, falling rather than osteoporosis is the strongest risk factor for fractures (Järvinen et al. 2008; Kannus et al. 2005; Robinovitch et al. 2003; Kannus et al. 2002). When a person falls, the type and severity of the fall (including fall height, energy, and direction) largely determine whether a fracture appears (Kannus et al. 2005; Robinovitch et al. 2003; Kannus et al. 2002). Reduction in bone mineral density significantly increases the fracture risk. By contrast, a sideways fall increases the risk for a hip fracture six-fold, and when such a fall causes a direct impact to the hip (to the greater trochanter of the proximal femur), hip fracture risk is raised approximately 30-fold (Robinovitch 2003). Such falls that have direct impact to the hip are most common in patients with advanced age due to a prolonged reaction time and reduced autonomic protecting mechanisms. Mobility and postural reactions require cognitive processing and abilities to rapidly reallocate attention. For example, the presence of Alzheimer's disease significantly increases the risk for hip fractures (Tolppanen et al. 2013), because of sideways falls (Jäntti 2008). In Alzheimer's disease, the balance and gait persists for a fairly long time, whereas in vascular dementia and Lewy body dementia, impaired balance and walking are symptoms that occur in the early stage (Jäntti 2011). As a conclusion, dementia is the risk factor for hip fractures (van Doorn et al. 2003; Cummings & Melton 2002). In addition to the cognitive impairment, osteoporosis, balance and gait deficits, the most common risk factors include muscle weakness, history of falls, use of assistive

device, visual deficit, arthritis, impaired activities of daily living (ADLs), depression, and age greater than 80 years old (Corcoran & Kinosian 2011). Other possible risk factors for hip fractures include e.g. low body mass index (Stolee et al. 2009), arrhythmia, postural hypotension, valvular heart disease and polypharmacy (Griffiths et al. 2012). A summary of the risk factors and causes for falling in older adults are presented in Table 2.

Table 2. Risk factors and causes for falling in older adults (Griffiths et al. 2012; Lönnroos, Kiviranta & Hartikainen 2010; Corcoran & Kinosian 2011; Robinowitch 2003)

Intrinsic	**Extrinsic**
Advanced age	Psychotropics
	benzodiazepines
	antidepressants
	antipsychotics
Sideway falls	Physical restraints
Osteoporosis	Poor footwear
	Problem with assistive device
Low body mass index	
Functional and cognitive impairment (including dementia)	Environmental factors:
Postural hypotension	Unsecured area rugs or uneven floors
Valvular heart disease	Poor lighting
Infection	Absent grab bars where needed
Musculoskeletal or neuromotor dysfunction	Poor accessibility to food, phone, etc.
(e.g. neuromuscular pathology	Inappropriate clothing
peripheral neuropathy)	
Chronic medical problems	
Sensory problems	
Visual	
Auditory	
Vestibular	
Neuropathic	

Hip fracture is a severe and often very painful trauma for a frail old person (Björkelund et al. 2010; Handoll et al. 2009; Morrison et al. 2003b; Morrison & Siu 2000; Lynch et al. 1998; Roberts et al. 1994). More than 98% of fractures are repaired surgically, for the purposes of analgesia and early rehabilitation (Griffiths et al. 2012). Hip fracture patients should receive surgery as soon as possible, preferably within the first 24 h after the occurrence of the fracture (Griffiths et al. 2012; Current Care 2011). According to the study of Lönnroos et al. (2010) three percent of hip fracture patients were not operated on. Patients' poor condition was the reason for choosing conservative treatment. For an individual, hip fracture is a serious condition, which is associated with significant morbidity and mortality (Sweitzer et al. 2013; Griffiths 2012; Kuntz et al. 2011; Corcoran & Kinosian 2011; Lönnroos 2009), both of which can be reduced by prompt surgical fixation of the fracture and early, effective rehabilitation (Huusko et al. 2002; 2000). Early mobilization is possible only when pain is properly managed. Hip-fracture-related pain primarily compromises the functional performance upon discharge from hospital (Kristensen 2013). The Finnish guideline for treating hip fractures suggests that the 1-year mortality rate in hip fracture patients is approximately 20% (Current Care 2011), and it is significantly higher than the mortality rate among the same-aged general population (Lönnroos 2009). In addition, according to the recent study with 44,143 fall-related hip fracture patients, the relative mortality rate of those with dementia was greater (OR 2.4, 95% CI 2.3-2.6) than in the cognitively intact group and their hospital length of stay is shorter (40%), particulary if

they are discharged to a residential elderly care facility (Scandol, Toson & Close 2012). After the occurrence of a hip fracture, up to 42% of patients experience pain for up to 4 months and approximately 25% of patients have moderate to severe pain lasting up to 12 months (Dimitriou, Calori & Giannoudis 2012). When interviewing 1541 hip fracture patients, the prevalence of intense fracture-related hip pain was 13% 6-12 months after discharge from stationary treatment (Dasch et al. 2008).

Delirium is common (34-61%) following hip fracture (Holmes & House, 2000; Björkelund et al. 2010), and cognitive impairment is the most important risk factor for delirium (Nie et al. 2012; Lindesay, Rockwood & Rolfson 2002). Delirium is an important cause for perioperative morbidity in patients undergoing hip fracture surgery and it is underdiagnosed, and consequently insufficiently treated in these patients (Johnson 2011). Delirium is a disturbance in consciousness and cognition, with rapid onset, fluctuating course, and underlying causation (Siddiqi et al. 2007). In addition to dementia, severe pain, polypharmacy, and comorbidities include risk factors that are present in developing delirium (Siddiqi et al. 2007). According to the study of Nie and colleagues (2012) with 103 hip fracture patients, the multivariate logistic regression analysis indicated pain intensity (OR: 1.61, 95% CI: 1.06–2.45) and pre surgery cognitive impairment (OR: 3.88, 95% CI: 0.45–33.19) were significant risk factors for delirium. Delirium usually occurs in the 2–5 days post operation in hip fracture patients (Nie et al. 2012). Those affected by delirium have a higher mortality rate and poorer functional capacity (Davis et al. 2012).

According to Sund et al. (2011), in Finland, virtually all suspected hip fracture patients are first referred to examination and treatment in the nearest hospital with orthopaedic services. The diagnosis of a fracture of the hip is straightforward, using X-ray examination. A surgical operation is performed on the majority of patients. The main methods used in treatment are reduction and internal fixation of the fracture or hip replacement arthroplasty. The care pathway for a hip fracture patient is rather complex, involving several phases. Typically, a patient is transferred to rehabilitation to a health centre serving the patient's municipality of residence after a short period of postoperative hospital treatment. The mean length of a perioperative stay in hip fracture patients was 5.8 days in 2009 in Finland (NIHW 2012). Finnish health centres are local primary health care units, which also have inpatient wards. Other institutional environments of care include residential homes and service housing with 24-hour assistance, which both provide a level of care equal to that of a nursing home. Non-institutional services utilised by hip fracture patients include outpatient health services, home nursing, ordinary service housing, home-help services and support for informal care. In this sense, hip fracture treatment can also be viewed as a tracer condition in health systems, testing how well health and social services are integrated in the provision of acute care, rehabilitation and continuing support for a large and vulnerable group of patients. (Sund et al. 2011.)

Promoting regular exercise and activities to improve balance and strength has been shown to reduce fall risks (Benetos et al. 2007). Exercise training after hip fracture is an important strategy with the potential to improve recovery and prevent a decrease in function and subsequent falls (Yu-Yahiro et al. 2009).

2.1.3 Dementia

Dementia is not a disease in itself but rather a group of symptoms that may accompany certain diseases or conditions (American Psychiatric Association 2004). The disorders of dementia are characterized by development of multiple cognitive deficits (including memory impairment), but are differentiated (as in DSM-IV-TR) on the basis of etiology (American Psychiatric Association.2004). Degenerative brain disease causing dementive disorder includes Alzheimer's disease, dementia with Lewy-body, Parkinson's disease,

Huntington's disease and vascular dementia. Other types of dementia include those brought on by HIV, head trauma, or other general medical conditions; substance-induced persisting dementia and dementia due to multiple etiologies.

The prevalence of dementia increases exponentially with age (American Psychiatric Association 2004). Altogether 35.6 million people were estimated to have dementia in 2010, and due to changes in population structure, the numbers will be nearly doubling every 20 years, to 65.7 million in 2030 and 115.4 million in 2050 (Alzheimer's Disease International 2009). The main risk factor for most forms of dementia is advanced age (Alzheimer's disease International 2009). For example, the prevalence of dementia in Western Europe is estimated to be 43 % in people aged 90 years and older (Alzheimer's disease International 2009). Dementia was the third most common cause of death after diseases of the circulatory system and neoplasm's by year 2011 in Finland (OSF 2011). The estimated national increase in incidence (at least advanced dementia) is believed to be growing from the 85, 000 of 2004 (Erkinjuntti 2010) to 115 000 by 2020 (Viramo & Sulkava 2006) due to the aging population (KASTE 2012-2015). The Global Burden of Disease (GBD 1996) indicates that dementia is the leading cause for disability among older people and causes 11.3% of years lived with disability by people aged 60 years and over. Dementia is the most common reason for long term care and, as a consequence, the treatment of dementia is more expensive than that of strokes, heart diseases or cancer in the UK (Alzheimer's Association 2011).

According to the DSM-IV-TR (American Psychiatric Association 1995) and ICD-10, the essential symptoms of dementia include an acquired impairment in short and long-term memory, associated with impairment in abstract thinking, impaired judgment, other disturbances of higher cortical function, or personality changes criteria (WHO 2010). The diagnosis of dementia is not made if these symptoms occur exclusively during the course of delirium (American Psychiatric Association 2004). According to the DSM-IV- TR (American Psychiatric Association 2004) classification of dementia, the condition results from the development of multiple cognitive deficits manifested by both memory impairment and at least one of the following abnormalities of cognition: aphasia, apraxia, agnosia or a disturbance in executive functioning (Table 3).

Table 3. Definition of dementia symptoms according to the DSM-IV-TR classification (American Psychiatric Association 2004)

DEFINITION OF DEMENTIA SYMPTOMS ACCORDING TO THE DSM-IV-TR CLASSIFICATION

A).The development of multiple cognitive deficits manifested by both

1 Memory impairment (impaired ability to learn new information or to recall previously learned information)

AND

2 At least one of the following cognitive disturbances:

a) Aphasia (language disturbance)
b) Apraxia (impaired ability to carry out motor activities despite intact motor function)
c) Agnosia (failure to recognize or identify objects despite intact sensory function)
d) Disturbance in executive functioning (i.e., planning, organizing, sequencing, abstracting)

IN ADDITION

B) In the case of criteria A1 and A2, each causes significant impairment of social and occupational functioning and represents a significant decline from previous level of functioning.

There are a great number of diseases and conditions that may cause dementia (American Psychiatric Association 2004). Alzheimer's disease (AD) is the most common dementia

disorder (Knopman 2011; Cummings & Benson 1992), followed by vascular dementia (10-20%) (Rocca et al. 1991), Lewy body dementia (10-20%) (Ballard & Bannister 2010) and frontotemporal dementia (5-10%) (Alzheimer's Disease International 2009). Up to 70 percent of all people with dementia are suffering from Alzheimer's disease - a degenerative disease, which slowly and progressively destroys brain cells (Alzheimer Europe 2010). The differential diagnosis of AD is a two-stage process; the first stage concerns the determination of whether dementia is present and the second stage concerns the cause or the differential diagnosis of the dementia. AD can be diagnosed clinically with certainty in a patient with gradual and progressive impairment of recent memory and dysfunction in at least one other cognitive or behavioral domain. The term 'Alzheimer's disease dementia' is used as the name of a pathological condition in which neuritic plaque and neurofibrillary tangle pathology occur. In the case of patients with a clinical diagnosis of dementia due to AD, their hippocampal atrophy clearly different from persons of the same age who are not cognitively impaired. Hippocampal atrophy is relatively specific for AD. (Knopman 2011.) Memory impairment is the basic characteristic of Alzheimer's disease, and is particularly manifested as difficulties in delayed recall and recognition, whereas frontotemporal degeneration and Lewy body dementia are characterised by behavioral changes (Jokinen et al. 2012).

Behavioral symptoms in older adults with dementia

The Neuropsychiatric Inventory (NPI) was developed to be applied to patients with Alzheimer's disease and other dementias (Cummings 1997). Twelve neuropsychiatric disturbances common in dementia are included in the NPI: delusions, hallucinations, agitation, dysphoria, anxiety, apathy, irritability, euphoria, disinhibition, aberrant motor behavior, night-time behavior disturbances, and appetite and eating abnormalities (Cummings 1997; Cummings et al. 1994). Challenging behaviors sometimes referred to as behavioral and psychological symptoms of dementia (BPSD) or neuropsychiatric symptoms involve disturbances in person's mood, behaviors, thoughts and perceptions (Finkel et al. 1997). Behavioral symptoms are manifested in up to 90% of persons with dementia (Cohen-Mansfield, Marx & Rosenthal 1989) and account for many poor health outcomes, such as declines in functional status (Harwood et al. 2000), social engagement and physical activity (Wunderlich & Kohler 2000). Behavioral symptoms not only diminish quality of life, they also contribute a major source of caregiver burden (Donaldson, Tarrier & Burns 1997).

The behavioral symptoms can be classified as physically non-aggressive behaviors, physically aggressive behaviors, problematic vocalizations and problematic passivity (Whall & Kolanowski 2004). Behavioral and psychological symptoms of dementia include, e.g., agitation, aberrant motor behavior, anxiety, irritability, apathy, disinhibition, delusions, hallucinations (Cerejeira, Lagarto & Mukaetova-Ladinska 2012) or behavior disturbances such as confusion, shouting, repetitive questioning, toileting difficulties, misidentifications and sexual challenges (Stokes 2000). These behaviors are described as "challenging" because they are perceived to be unreasonable and challenge the norms and rules of the contexts within which they occur (Moniz-Cook et al. 2012). Challenging behavior is a manifestation of distress or suffering in the person, while, on the other hand, also causes distress in the caregiver (Bird M & Moniz-Cook 2008). According to this definition, instead of perceiving challenging behavior merely as disruptive or problematic conduct, it can be viewed as an active attempt by the individual to meet or express physiological or psychological needs (Whall & Kolanowski 2004; Stokes 2000), for example, pain and/or anxiety (Kovach et al. 2006b). According to a study concerned with a large number of cognitively impaired residents (n=2822, 538 with pain), pain was

significantly associated with behavioral and psychiatric symptoms, such as resistance to care, inappropriate behavior and delusions (Tosato et al. 2012). Challenging behaviors and symptoms may be difficult to recognize by nurses (Kovach et al. 2012), and misconceptions in the interpretation of distributive behavior may occur. In such cases, e.g., psychotropic drugs may mask symptoms such as pain (Husebo et al. 2011). American Geriatrics Society (AGS 2002) has determined the behavioral signs of pain in cognitively impaired patients. These behaviors have similarities with challenging behaviors in patients with dementia (See Table 4).

2.1.4 Definitions and characteristics of pain

Pain experience is a complicated, multifactorial issue (Eccleston 2001) influenced, among other things, by culture, previous pain experience, belief, mood and ability to cope. Pain may be an indicator of tissue damage, but may also be experienced in the absence of an identifiable cause (Macintyre et al. 2010).

The most widely adopted definition of pain is by the International Association for the Study of Pain (IASP), which determines the phenomenon as "pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (Merskey & Bogduk 1994). The IASP's definition of pain means that pain is not only a sensory process and a directly observable or measurable phenomenon, but also a subjective experience that is influenced by physiological processes and diverse psychological and emotional progressions (Macintyre et al. 2010; Renn & Dorsey 2005). It recognizes the complex multifaceted nature of pain and encompasses physical, psychological, social, cultural and environmental factors that interconnect and affect how pain is perceived, managed and evaluated.

According to a traditional definition of nursing by McCaffery (1968), pain is defined as "whatever the experiencing person says it is, existing whenever he says it does". As a consequence, the subjectivity of pain experience means that it cannot be accurately and objectively measured, and thus the most reliable method for identifying pain is the patients' self-report, which is widely accepted as the gold standard for identifying and measuring the pain experience (AGS 2002). One limitation of this definition, however, is that it relies solely on self-report and does not take into consideration individuals with cognitive deficits, who may not be able to verbally report their pain (Horgas et al. 2007).

Nociceptive pain can be either s*omatic* or *visceral* (AGS 2002). It is caused by stimulation of peripheral nerve fibers that respond only to stimuli approaching or exceeding harmful intensity (nociceptors). Nociceptive pain typically predominates in acute care settings. (Macintyre et al. 2010.) *Postoperative pain* is caused by inflammatory response at the site of injury, which activates peripheral sensory organs called nociceptors (nociceptive pain), and, to a lesser extent, by damage to nerve fibres innervating the site of the incision (neuropathic pain) (ANZCA 2005). *Somatic pain* is associated with local or surrounding tenderness and may be described as sharp, hot, or stinging, and, as a consequence, is generally well localised (Macintyre et al. 2010). By contrast, *visceral* or internal organ *pain* is difficult to locate, is felt across a larger area, may be described as dull, cramping, or colicky, is often poorly localised and may be associated with tenderness locally or in the area of referred pain, or with symptoms such as nausea, sweating, and cardiovascular changes (Scott & McDonald 2008). Clinical studies of pain states have indicated that older persons exhibit a relative absence of pain in the presentation of certain visceral disease states, such as ischemic heart pain (Mehta et al. 2001) and abdominal pain associated with an acute infection (Helme & Gibson 1999).

Pain can also be classified as acute, recurrent, or chronic pain (Laurence & Bennet 1987). Postoperative pain is a prevalent type of *acute pain*, which is defined as: "pain of recent onset and probable limited duration. Acute pain usually has an identifiable temporal and causal relationship with an injury or a disease, such as trauma, impairment, or surgery" (ASPM 2010). Tissue damage is the the source for acute pain is, and the sensation of pain warns the body that is has been injured (D'Arcy 2011). The duration of acute pain is expected by the patient to be short-term and to resolve as the injury heals (Moore et al. 2011). *Recurrent pain* includes recurrence of a work disability or health care utilization and there is no consensus available about minimum gap between episodes of pain (Wasiak et al. 2003). *Chronic pain* is defined by the International Association for the Study of Pain (IASP) as ''pain that persists beyond normal tissue healing time, which is assumed to be three months'' (IASP 1986). There may be no clearly identifiable cause for chronic pain (Ready & Edwards, 1992). Poorly controlled and acute pain can be severe, which can increase the risk of a chronic state of pain (Bruce et al. 2003).

Pain mechanism

The most dominant and widely accepted theory of pain transmission is the Gate Control Theory developed by Melzack and Wall in 1965 (ASPMN 2010). The theory represents and integrates physiological and psychological aspects of pain transmission within a unified perspective (Asmundson & Wright 2004). A key premise of the theory is the presence of a gating mechanism within the dorsal horn of the spinal cord that is responsible for allowing or disallowing ascending nociceptive information from the periphery to the brain (Melzack 1996). At the same time, the theory recognizes that descending transmissions (i.e., from the brain to the spinal cord) reflecting affective and cognitive processes can affect the gating mechanism and modulate or inhibit nociceptive input (Hadjistavropoulos et al. 2009). This premise of the gate control theory elaborates on the role of psychological, cognitive, social, cultural, and environmental factors in pain (Hadjistavropoulos et al. 2009; Asmundson & Wright, 2004). Therefore, the sensation of pain is influenced by signals from the brain to the dorsal horn and signals from the body periphery to the dorsal horn (Hadjistavropoulos et al. 2009; Melzack 1996).

The gate control theory notes that a pain stimulus can be of significant intensity to "open" a neuronal gate, allowing the pain stimulus to proceed through the nervous system to the brain to create a sensation that can be identified as pain (Melzack 1996). The actual steps in pain transmission using the gate control theory include the following: A pain stimulus from the body periphery is carried by rapid A delta and slow C nerve fibers to the dorsal horn of the spinal cord. If the painful stimulus is of sufficient intensity or persists, the pain is transmitted up through the limbic system to the cerebral cortex. In the cerebral cortex, the stimulus is recognized as pain and the efferent neural path is activated to provide a response to the pain (ASPMN 2010).

Because affective and motivational factors affect the pain sensation, touch, attention and emotion are then capable to increase or decrease pain sensation by descending mechanisms from the brain to the dorsal horn (Good 2009). As a consequence, the efficiency of certain nonpharmacological pain-relieving methods, which influence emotional state, is interpretable as a light of gate control theory; in such case, the brain's signal to the spinal cord closes the gate and blocks or reduces the sensation of pain. The sensation of pain can be also reduced by activating thick and rapid A delta fibers with massage or touch (Bonica & Loeser 2001). In such case, non-nociceptive input (such as massage and touch), conducted by large myelinated, thick and rapid A delta fibers can inhibit or reduce the pain sensation. The more extensive the fiber activity relative to thin fiber activity at the inhibitory cell, the less pain is felt. (Grau et al. 2012.) (See Figure 2).

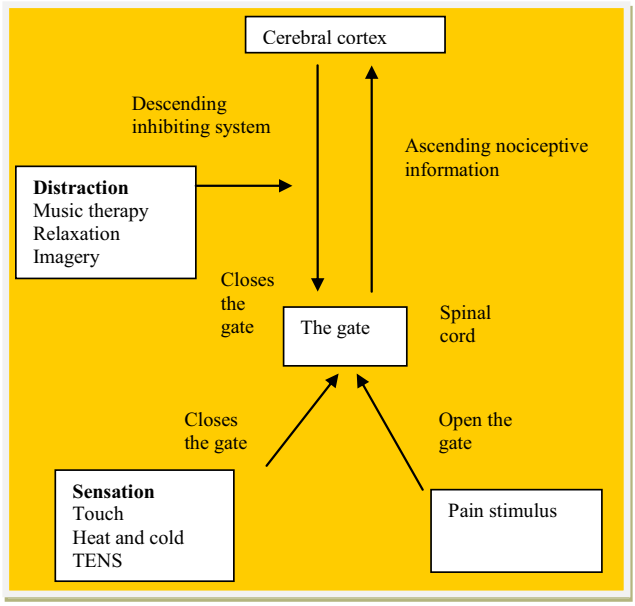

Figure 2. Gate control theory (Adapted from Dunn 2004)

Pain and dementia

Aging results in significant structural, functional and neurochemical changes in both central and peripheral nervous systems, which may alter nociceptive processing, including impairment of descending endogenous pain inhibitory mechanism, and change the way the older person responds to both brief noxious stimuli and pain from tissue injury (Coldrey, Upton & Macintyre 2011; Gibson et al. 2001). The presence of dementia symptoms is likely to add further deficits in central pain processing pathways (Scherder 2009). Because of neuropatological changes, minimal behavioral changes, which can indicate painful conditions, may act as a sign of remarkable pain in older adults with dementia (Scherder 2009; Tilvis 2004).

There is no evidence that older adults experience less pain but rather that there are changes in the way that pain is experienced with advanced age (Hadjistavropoulos 2009). Most studies have found that ratings of stimulus intensities around pain threshold were not changed in patients with dementia, whereas pain tolerance was significantly increased (Gibson et al. 2001; Benedetti et al. 1999). According to one study, in patients with Alzheimer's disease, the lower the cognitive function of the patient, the higher their pain tolerance (Benedetti et al. 1999). Findings from clinical and experimental pain studies do not suggest that pain is less frequent and intense in patients with advanced dementia even if no longer reported. On the contrary, it is likely that any sign of pain (manifested verbally or via behavioural markers) occurring in the presence of marked cognitive impairment requires even greater attention and a more proactive treatment response. (Scherder et al. 2009.)

Autonomic responses, such as increased heart rate, blood pressure, or respiratory rate, are typically associated with severe acute pain but are attenuated in older people (Pasero, Reed & McCaffery 1999). Autonomic responses tended also to be diminished in patients

with dementia (Kunz et al. 2009b; Benedetti et al. 2004; Rainero et al. 2000; Benedetti et al. 1999). For example, in patients with Alzheimer's disease, a lower cognitive function signified lower anticipatory heart rate responses to a noxious event (Benedetti et al. 2004).

Facial responses to noxious stimulations are significantly increased in patients with dementia (Kunz et al. 2009b; Lints-Martindale et al. 2007) and there has been found a higher frequency of observed facial expressions during pain assessments in persons with more severe cognitive impairments who are unable to self-report (Kaasalainen et al. 2012).

2.2 NURSING PRACTICES IN POSTOPERATIVE PAIN MANAGEMENT

Pharmacological pain treatment is the first choice when treating postoperative pain in hip fracture patients. Nurses are the health care professionals responsible for the management of patients' pain (Bell & Duffy 2009) by recognizing it, making pain-relieving decisions, and choosing the administered analgesics. Their role also includes incorporating nonpharmacological interventions in a patient's treatment (Denny & Guido 2012). When asking nurses and physicians about competencies required by nurses for caring for hip fracture patients, the most often mentioned issues were providing comprehensive holistic care, advocacy, collaborating with all members of a multidisciplinary team, and coordinating and improving patient care (Forster 2012). They also acknowledged that nurse's role is well-accepted and utilized in orthopedic teams.

Identification and assessment of pain in patients with dementia

Identification of pain and its assessment is the cornerstone of pain treatment, since pain that is not detected cannot be treated. There are three ways to measure the presence of pain: by direct questioning (self-report), by direct behavioral observation, and by interviews with caregivers or informants (de Andrade et al. 2011.) Because the subjectivity of pain experience, patients' self-reports act as the gold standard for pain assessment and the method has been accepted as the most reliable source of measurement of pain intensity unless the patient has serious limitations in their ability to communicate (de Andrade et al. 2011; AGS 2002). The subjectivity of pain experience complicates assessing pain in individuals with serious deficits in verbal and mental capacities, for example, noncommunitative individuals with advanced dementia (Craig 2006). According to many studies, individuals with mild to moderate dementia are able to provide self-reported pain scores (Pesonen 2011; Mehta et al. 2010; Pesonen et al. 2009; Lints-Martindale et al. 2007; Feldt, Ryden & Miles 1998; Ferrell, Ferrell & Rivera 1995). Even in the presence of severe cognitive impairment, an assessment can be made by using simple questions (Pesonen 2011; AGS 2002) about the presence, intensity and location of pain. An evaluation of the patient's cognitive function is crucial to the identification of an appropriate pain assessment strategy and to the development of an appropriate treatment plan (Hadjistavropoulos et al. 2007). Consistent and appropriate use of validated pain assessment tools provides the essential data based on which pain management decisions can be made (Denny & Guido 2012). Validated pain rating scales allow the nurses to assess and evaluate patients' pain experience in a way that provides a foundation for pain management decisions. In addition, healthcare providers and pain experts recognize that the self-report method alone may be insufficient for some patients with dementia, and additional observational pain assessment strategies are needed (Horgas, Elliott & Marsiske 2009). The American Geriatrics Society (AGS 2002) has also established comprehensive quidelines for assessing behavioral indicators of pain (Table 2).

Patients recovering from surgery and trauma should have the intensity of their pain frequently measured in order to optimise treatment. There are several pain measurement instruments, and these assessment tools should be applied according to the degree of cognitive impairment (McAuliffe et al. 2009). Pain assessment instruments for geriatric patients should be simple, readily available to patients and staff, and use large font when including text (Burris 2004). Reliable and accurate assessment of acute pain is necessary to ensure that patients experience safe, effective, and individualised pain management. Regular assessment of pain leads to improved acute pain management. The assessment and measurement of pain are fundamental steps in the process of assisting in diagnosing the cause of a patient's pain, selecting an appropriate analgesic therapy and evaluating and, subsequently, modifying that therapy according to patient's response. In acute pain management, assessment must be undertaken at appropriately frequent intervals. (Macintyre et al. 2010.)

The intensity of pain can be measured in many ways. Self-report is considered the criterion standard of the diagnosis of pain (Connor 2012; de Andrade et al. 2011; Horgas, Elliott & Marsiske 2009; AGS 2002). Some commonly used tools include Visual Analogue Scale (VAS), Numerical Rating Scale (NRS), Verbal Rating Scale (VRS) and Faces Pain Rating Scale (FSP) (See Figure 3). The VAS is widely used, especially in hospital settings (Pesonen et al. 2009) and it consists of a 100 mm horizontal line with verbal anchors at both ends and no tick marks (Macintyre et al. 2010). The patient is asked to mark the line and the 'score' is the distance in millimeters (0 to 100 mm) from the left side of the scale to the mark. The VAS has a high internal consistency (Cronbach α 0.87-0.88), adequate test-retest reliability (r=0.75-0.83), and strong positive correlation with other pain intensity scales (Hadjistavropoulos et al. 2007). The VAS requires extensive abstract thinking (Hadjistavropoulos et al. 2007) and the ability to discriminate subtle differences in pain intensity and may be difficult for some older persons to complete (Macintyre et al. 2010; Pesonen et al. 2009; Hadjistavropolous & Fine 2006; Horgas 2003). Numerical rating scales (NRS) have both written and verbal forms. Patients rate their pain intensity on the scale of 0 to 10, where 0 represents 'no pain' and 10 represents 'worst pain imaginable'. NRS are, generally, recommended for the assessment of pain intensity among seniors who are cognitively intact and able to self-report (Hadjistavropoulos et al. 2007). Some older adults (with and without cognitive impairment) have difficulty with the NRS scale (Hadjistavropoulos et al. 2007). Faces Pain Scale (FPS) consists of seven faces ranging from a neutral face (no pain) to a grimacing face (worst pain) (Bieri et al. 1990). FSP requires abstract thinking and has been difficult for some older adults with cognitive impairment to use, even though high test-retest correlations in individuals with cognitive impairment have been supported (Hadjistavropoulos et al. 2007). In contrast, according to the study of Pesonen (2011), even slight cognitive impairment (MMSE 17-23) induced difficulties in completing the FSP pain scale. The use of facial pain scale figures may also increase the possibility of the result becoming confounded due to emotional issues, such as depression (Pesonen 2011). The Verbal Descriptor Scale is the tool specifically recommended for use with older adults. The five-point verbal rating scale VRS has been indicated to be applicable to persons with a clear cognitive dysfunction (Camacho-Soto, Sowa & Weiner 2011; Hadjistavropoulos et al. 2007), i.e., those with MMSE of over 17 (Pesonen & Kauppila 2009). According to the study of Feldt, Ryden & Miles (1998), the majority (73%) of hip fracture patients with moderate dementia were able to report pain by using the VRS.

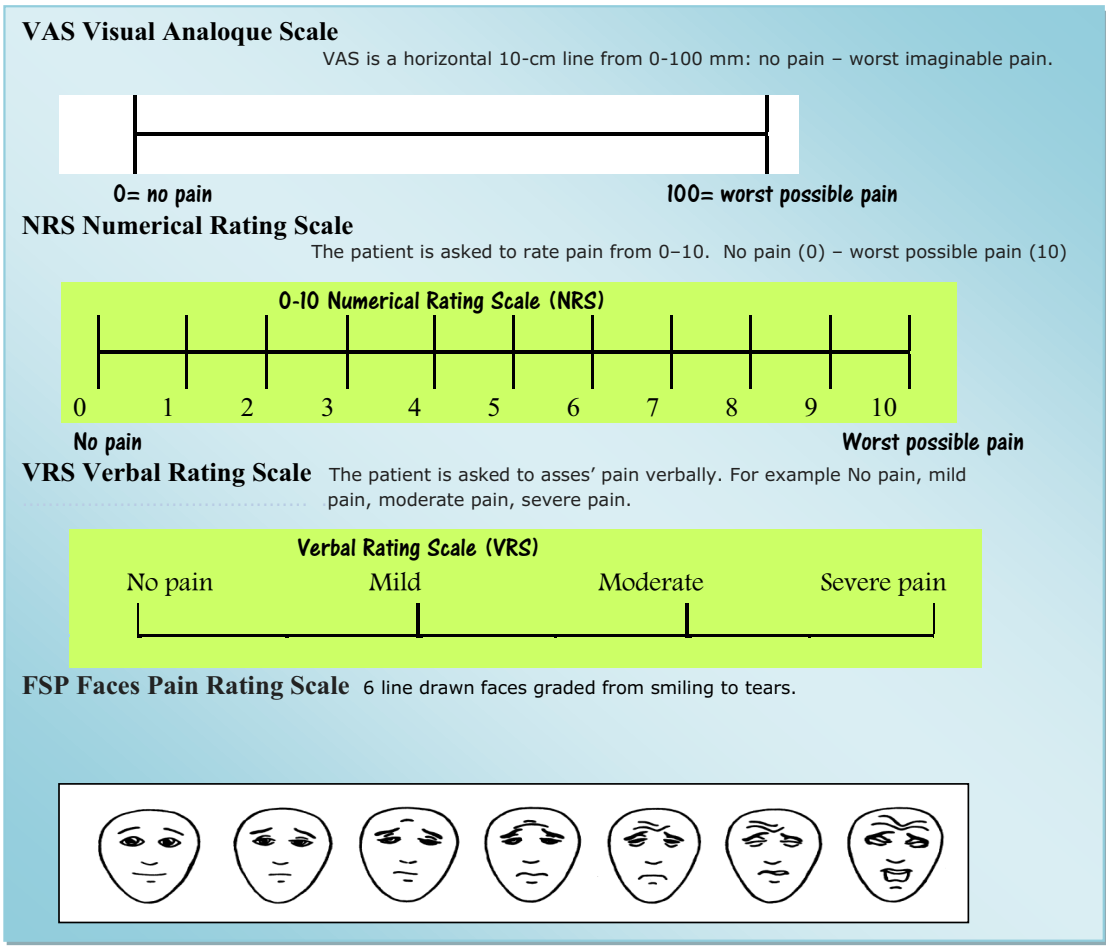

Figure 3. Different self-rating pain scales (FSP: Bieri et al. 1990)

In severely cognitively impaired persons, discomfort, such as pain, is often exhibited non-verbally (AGS 2002). According to the study of Kaasalainen et al. (2012), individuals with more severe limitations in ability to self-report pain display pain behaviors more frequently. For example, facial expression items are observed more frequently among persons who are not able to verbally report their pain. Another study indicated that facial expressions in people with Alzheimer's disease were increased according to the severity of noxious stimulation (Lints-Martindale et al. 2007). In contrast, according to a small-scale study of nine patients with 18 observers (Manfredi et al. 2003), facial expression seemed to be indicative for an existence of pain only, and not for its intensity (interrater reliability for the intensity of pain 0.10). When patients cannot self-report pain, nonverbal pain cues have the most important role and, therefore, pain is often assessed with observational methods (Eritz & Hadjistavropoulos 2011; Hadjistavropoulos et al. 2008; AGS 2002). Language and cognitive skills are required for many pain assessment instruments (Frampton 2003), and there is a number of pain scales developed for noncommunitative patients with advanced dementia (Zwaghalen et al. 2006). The major weakness of pain scales, which are based on observation of behaviours, is that, in spite of pain cues, these

behaviors can also indicate physiologic distress or emotional distress (Pasero & McCaffery 2005), such as thirst, constipation, depression, and frustration (Tilvis 2010). Common pain expressions in cognitively impaired persons in comparison with challenging behaviors or symptoms in patients are presented in Table 4.

Table 4. Common pain expressions in cognitively impaired older persons (AGS 2002) and challenging behavior/symptoms in patients with dementia (Kovach et al. 2006b; Ballard et al. 2010; Stokes 2000)

Pain expressions in cognitively impaired older persons (AGS 2002)		**Challenging behaviors/ symptoms in patients with dementia**
Facial expressions	Slight frown, sad, frightened face grimacing, wrinkled forehead, closed or tightened eyes. Any distorted expression. Rapid blinking.	Facial grimacing
Verbalizations, vocalizations	Sighing, moaning, groaning. Grunting, chanting, calling out. Noisy breathing. Asking for help. Verbally abusive.	Problematic vocalication Noisy breathing Aggression
Body movements	Rigid, tense body posture, guarding. Fidgeting. Increased pacing, rocking. Restricted movement. Gait and mobility changes.	Restless body movement Tense body part Increased physical dependence
Changes in interpersonal interactions	Aggressive, combative, resisting care. Decreased social interactions. Socially inappropriate, disruptive. Withdrawn.	Change in social interaction Aggression Resisting care Apathy
Changes in activity patters or routines	Refusing food, appetite change. Increase in rest periods. Sleep, rest pattern changes. Sudden cessation of common routines. Increased wandering.	Changes in activity Wandering
Mental status changes	Crying or tears. Increased confusion. Irritability or distress.	Confusion Anxiety

In addition, many of these pain scales are unsuitable for acute care setting, because filling them in is time-consuming (partly because of the number of items) and developed for the assessment of persistent pain. The preferred pain scales are valid, reliabile, and easy to use (Määttä & Kankkunen 2009). Tools may be valid and reliable, but if they are time-consuming or difficult to understand, they will not be useful in clinical settings (DeWaters et al. 2008). According to the interdisciplinary expert concensus statement of Hadjistavropoulos and colleques (2007), clinically relevant measures may be categorized into those that are brief (comprising 10 items or less) and those that are extended (comprising of more than 10 items). Measurement scales that comprise 10 items or less include the Discomfort Scale (DS-DAT), Checklist of Nonverbal Pain Indicators (CNPI), Pain Assessment in Advanced Dementia (PAINAD), Abbey Scale, Noncommunicating Patient's Pain Assessment Instrument (NOPPAIN), the DOLOPLUS-2, and the Pain Assessment Tool in Confused Older Adults (PATCOA). These scales can be further categorized in terms of whether they require information from a collaborative informant (e.g., about changes in sleeping and eating patterns) or whether an observer who is unfamiliar with the patient (as the case is often in acute care setting) can administer them. Information from a collaborative informant is required by DOLOPLUS-2 and Abbey Scale. Unfortunately, if persons with dementia do not present these limited behaviors, their pain will not be recognized. As a consequence, the existing evidence of several reviews does not support the use of these instruments due to limited evidence of their validity, reliability, and clinical utility (Zwakhalen et al. 2006) available at this time to recommend

any one tool for broad use in different settings and populations (Hadjistavropoulos et al. 2007). ASPM Board of Directors suggests that the strongest conceptual and psychometric support, as well as clinical utility tools include, e.g., CNPI, Doloplus 2, NOPPAIN, PACSLAC, and PAINAD, all of which have been tested in long term care setting (Herr et al. 2006a).

Table 5. Clinically relevant behavioral pain rating scales for patients with advanced dementia or other cognitive impairment (Hadjistavropoulos et al. 2007)

Scale	Descripiton	Time to complete	Validity and reliability considerations	Limitations
Abbey Scale	6 items, 0-3 scale	< 1 min	Internal consistency: 0.74-0-81 Moderate positive correlation between total score and nurse's pain assessment	Pain intensity tended to be overestimated by the Abbey especially with low MMSE scores[a]
CNPI	6 items, Yes/no	Likely very brief	Interrater reliability: K= 0.62-0.82 Moderate correlations between CNPI scores and verbal report	Low internal consistency may imply that construct other than pain is being measured by some of the items
Discomfort scale (DS-DAT)	Nine items, 0-3 scale	5 minutes	Internal consistency: 0.86-0.89 Interrater reliability: 0.61-0.98 Positive correlations between self-report measures and DS-DAT scores	The pain was not the gold standard but illness involving fever
Doloplus-2	10 items 0-3 scale	< 5 minutes	Significant convergent validity of the VAS and Dolpoplus- 2 scores	English version not sufficiently researched
NOPPAIN	6 pain behaviours Yes/no and 0-5 scale	30s for measure/ 10 min for observation	[b]Interrater reliability: K= 0.70-1.0 for presence of pain behaviour. Interclass correlation for pain intensity: 0.72-1.0	[b]No significant correlations between NOPPAIN and self-reported worst pain among cognitively impaired persons
PACI	7 items yes/no	2 minutes	Interrater reliability: K= 0.74-0.85, ICC =0.82-0.88	Low correlations with self-report measures among one group
PAINAD	5 items 0-2 scale	5 minutes	Internal consistency: 0.50-0.67 Interrater reliability: 0.82-0.97 Concurrent validity: positive correlations with DS-DAT	Low internal consistency in some of the items (breathing, consolability)
PATCOA	9 items	Likely brief	Internal consistency: <0.70 Interrater reliability: 57%-100% agreement	Not investigated among seniors with dementia
PACSLAC	60 items Yes/no	5 minutes	Internal consistency: 0.85 Interrater reliability: 0.92	Moderate correlations with nurses' ratings
PADE	24 items yes/no, open-ended	10 minutes	Internal consistency 0.24-0.88 ICC= 0.54-0.95	PADE may not be pain-specific because verbal agitation is also able to do this

[a]Takai et al. 2012, [b]Horgas et al. 2007

The Pain Assessment in Advanced Dementia Scale (PAINAD) has become particularly popular, as it yields a number on a 0 to 10 scale, has been evaluated in numerous studies in different settings, satisfies credentialing surveyors, and is clinically useable (Herr 2011). PAINAD developed by Warden et al. (2003) assesses five categorical items: breathing, negative vocalization, facial expression, body language and consolability (Figure 4). Items are scored from 0 (no pain) to 10 (most severe pain). Each category is scored between 0 and 2 to indicate the intensity of behavior. PAINAD is a simple, reliable, and validated observational tool (Herr et al. 2010; Leong, Chong & Gibson 2006; Warden et al. 2003). Convergent validity with other pain scales differentiate between painful, calm, and non-pain related distress, moderate to good internal consistency, good interrater reliability, and strong test-retest validity have been supported by numerous of studies (Herr et al. 2010). A study comparing self-reported pain and the PAINAD scale in 13 cognitively impaired and twelve intact older adults after hip fracture surgery found a positive correlation between the PAINAD and a self-report pain scale, providing evidence of concurrent validity (DeWaters et al. 2008). PAINAD scores were higher when patients were likely to experience pain than when this was unlikely, which provided evidence of discriminant validity. According to the systematic review of Määttä & Kankkunen (2009), existing studies about validity and realibility of PAINAD had certain limitations, such as small sample sizes (DeWaters et al. 2008; Costardi et al. 2007; Basler 2006) and deficits in study settings (DeWaters et al. 2008; Costardi et al. 2007; Hutchison et al. 2006). In addition, in some studies, patients were asked to self-report their pain scores (DeWaters et al. 2008; Costardi et al. 2007), despite the fact that the tool is designed for the measurement of pain in persons with advanced dementia. According to the study of Hutchison (2006) et al., the use of PAINAD instrument was associated with significantly higher opioid consumption (11.25mg v.s. 5.75mg, P=0.003) in hip fracture patients with cognitive impairement. There were no differences in opioid-induced adverse effects in either group.

	0	1	2	Score
Breathing Independent of vocalization	Normal	Occasional labored breathing. Short period of hyperventilation	Noisy labored breathing. Long period of hyperventilation. Cheyne-Stokes respirations	
Negative vocalization	None	Occassional moan or groan. Low level speech with a negative or disapproving quality.	Repeated, troubled calling out. Loud moaning or groaning. Crying	
Facial expression	Smiling or inexpressive	Sad. Frightened. Frown.	Facial grimacing	
Body Language	Relaxed	Tense. Distressed pacing. Fidgeting	Rigid. Fists clenched. Knees pulled up, pulling or pushing away. Striking out	
Consolability	No need to console	Distracted or reassured by voice or touch	Unable to console, distract or reassure	
			Total:	

Figure 4. Pain Assessment in Advanced Dementia (PAINAD) scale (Developed by Warden et al. 2003)

Nursing staff provides regular care for older cognitively impaired patients, and can influence regular pain assessments and assisting the primary provider in formulating and adjusting analgesic regimens, but they often fail to make pain assessments into a routine

and to communicate their findings and concerns (Titler et al. 2003). For example, it might be possible to enhance the treatment of pain and associated symptoms in a medical/surgical unit by adding regular pain assessment into daily care, wound care, physical therapy, transfers out of bed, and at rest, along with more direct means of communication between providers and by applying uniform practices (Mehta et al. 2010). In addition to the measurement of pain intensity, the assessment of pain should always include information of patient's history of pain in the patient for determining potential causes of pain, location (Maher et al. 2012; Hadjistavropolous et al. 2007), character and chances in pain experience (Hadjistavropolous et al. 2007), and a report from family members in the case of patients with cognitive impairment (Herr et al. 2010).

Nursing practices in pharmacological pain treatment

Pain treatment is a fundamental aspect for clinicians in patient care (Bucknall, Manias & Botti 2001). The general principles in pharmacological pain treatment include administering analgesics regularly and around the clock (Coker et al. 2010; Macintyre et al. 2010; Mehta et al. 2010; Pasero & McCaffery 2007; Herr et al. 2006b; Gordon et al. 2005; Herr et al. 2004). A study by Mehta and colleagues (2010) found that only 7% of cognitively impaired surgical patients (62% had fractures as an etiology of acute pain) were placed on an around the clock analgesic regimen. Such limited use of around the clock analgesic administration could be explained by a lack of familiarity with, and/or application of existing pain management guidelines. The administration of analgesics is essential prior to physical activity (Srikandarajah & Gilron 2011; Mehta et al. 2010; McLiesh, Mungall & Wiechula 2009; Pasero & McCaffery 2005), because, according to the systematic review of Srikandarajah & Gilron (2011), the intensity of movement-evoked pain is up to 200% more intensive than pain at rest. According to a study of 49 hip fracture patients, the self-reported pain (VRS) occurring the day after surgery was reported as 179% more intense with movement than at rest and, in addition, patients with confusion experienced significantly more intense pain at rest both on admission and on the day before discharge (Johansson et al. 2012). Nursing practices also include medication prior to painful events (such as dressing or wound healing) (Srikandarajah & Gilron 2011; Mehta et al. 2010, McLiesh, Mungall & Wiechula 2009; Kelley, Siegler & Reid 2008) and routine and regular assessment and documentation of the severity of pain (Gordon et al. 2005; Innis et al. 2004), the analgesic response, and the incidence of adverse effects (Coker et al. 2010; Macintyre et al. 2010; Herr & Titler 2009; Herr, Bjoro & Decker 2006).

The regular assessment of pain and its documentation in medical records are important components of high quality pain management (Gordon et al. 2005; Innis et al. 2004; Simpson, Kautaman & Dodd 2002). If the intensity of pain is not documented regularly, it seems that pain management in hip fracture patients with dementia remains insufficient (Current Care 2011). Herr and Titler (2009) assessed 1454 medical records from patients with hip fractures and found that, despite the fact that nearly all medical records included some documentation related to pain (99%), 54% contained pain assessment conducted with a numeric rating scale, 4% with a non-numeric rating scale (such as a verbal descriptor or faces scale), and 7% with nonverbal pain behaviours. Therefore, no assessment of pain had been documented in the case of one third of patients. The documentation of pain is important, because sustaining the continuity of care and information flow among health care clinicans is the basis element for sufficient pain management. Recorded information on pain assessment after the administration of analgesics and documentation of pain both before and after giving analgesics was scarcely available according to a study of Chanvej and colleagues (2004). As a result of this study,

regular pain assessment was found in only 2 (0.5%) of the total 425 medical charts during the first 72 postoperative hours.

Nonpharmacological pain treatment practices

Nonpharmacological pain relieving refers to such methods that do not involve pharmacological pain treatment. These interventions complement pharmacological pain treatment and nurses play a primary role in the incorporation of these methods in a patient's treatment plan (Denny & Guido 2012). However, according to one study, minimal consideration (e.g., for repositioning patient) is given to nonpharmacological pain treatment in acute care of nursing practice (Brown & McCormack 2006). Non-pharmacological methods include such noninvasive measures as massage, distraction (for example, music), pressure application, cold and hot compresses, and repositioning. The frequently used non-pharmacological intervention for those hospitalised with a hip fracture includes repositioning followed by use of pressure relief devices and cold application (Mehta et al. 2010; Titler et al. 2003). Studies from nonpharmacological pain relieving methods are presented in Table 6.

According to the gate control theory, affective and motivational factors affect pain sensation, and thus touch, attention and emotion can be used to increase or decrease pain by a descending mechanism from the brain to the dorsal horn (Good 2009). As a consequence, the effect of many non-pharmacological pain treatment practices can be seen as attempts to influence the patients' emotional state. Because psychological factors are central to the experience of pain, improvements in pain management can often be brought about by simple, if subtle, changes in clinical practice (Eccleston 2001).

Anxiety has been shown to be associated with a higher intensity of postoperative pain (Pinto et al. 2013; Vivian et al. 2009). The relationship between anxiety and pain is reciprocal, so that fear exacerbates pain (Vivian et al. 2009) and pain, in turn, appears to promote fear and anxiety (AGS 2002). Anxiety is thought to have an intensifying effect on experiencing pain, although it remains difficult to establish whether pain causes anxiety or whether anxiety leads to increased pain (Pinto et al. 2013). According to a study of Gittel and colleagues (2000) that involved 878 patients and 338 care providers, relational coordination across health care providers is associated with improved quality of care, reduced postoperative pain, and decreased lengths of hospital stay for patients. Postoperative pain was significantly reduced by several dimensions of relational coordination, including the frequency of communication (P=0.011), and the degree of mutual respect (P=0.013) among care providers. Attempting to alter the patient's emotional state, from stress or fear to comfort or peace, should also be an effective feature of certain pain management practices, such as quieting down patients and consoling or soothing them with a supportive touch and cueing (Kovach et al. 2006a). Individuals with dementia have a decreased threshold for stress caused by the environment, and thus the need for a peaceful and comfortable environment without, e.g., visual, auditory or thermal stress, is highlighted (Kovach et al. 2006b).

The use of particular music to divert patient's attention away from pain and to promote a sense of relaxation and well-being has long been a popular approach. Music effectively reduces anxiety and improves mood for medical and surgical patients (Hadjistavropoulos & Fine 2006). Seeking broad evidence for the effectiveness of music on acute and chronic pain intensity, Cepeda et al. (2006) reviewed fifty-one studies. These studies evaluated pain reduction in over 3600 patients and included both patients experiencing pain from surgical procedures and patients suffering from common medical conditions that produce pain. According to this meta-analysis, participants exposed to music had a 70% greater probability of having pain relief than unexposed subjects in postoperative setting. Patients

exposed to music had pain intensity that was 0.5 units lower on a zero to ten scales than unexposed subjects. Four studies reported the increased number of subjects with at least 50% pain relief. However, the magnitude of these benefits is small and, therefore, the clinical importance of the results remains unclear (Cepeda et al. 2006). This result concurs with a prospective clinical study; listening to music has been shown to alleviate pain intensity and pain distress significantly after abdominal surgery (Vaajoki et al. 2012). According to the systematic review of Engwall and Duppils (2009) music therapy is highly effective for postoperative pain. Fifteen of the altogether eighteen studies found that music had a significant, positive effect on postoperative pain and in four of the eighteen studies the use of analgesics decrease was described. According to the large review of 175 studies, music, especially when performing daily activities, has shown to decrease behavioral symptoms (such as anxiety) in individuals with dementia (Doody et al. 2001). On the other hand, the effect of individual respective music in reducing anxiety among patients with dementia was supported by the study of Guétin 2009. Both anxiety prior to and pain after surgical procedures can be successfully relieved through music, in order to reduce emotional distress that commonly accompany these conditions (Bernatzky et al. 2011). In a small study of 22 hip or knee surgery patients there were findings, that the music-listening group (n=11) had higher levels of cognitive function and less confusion than those who did not listen to music (McCaffery 2009). Listening to music offers potential advantages of low cost, ease of provision (Hadjistavropoulos & Fine 2006), and safety (Cepeda et al. 2006). More work should be done in music research as a treatment for pain (Bernatzky et al. 2011).

There is little consistent evidence of benefit from massage in the treatment of post-operative pain (Macintyre et al. 2010) because of the paucity of high-quality data (Wu & Raja 2011). According to the small studies (Table 6), significant differences between the experimental and the control group were found in postoperative pain intensity in patients with hip or knee artrhroplasty (Büyükyılmaz & Aştı 2011) and with cardiac surgery (Bauer et al. 2010). Transcutaneous electrical nerve stimulation (TENS) improved pain relief after inguinal herniorrhaphy, laparoscopic tubal ligation, thoracotomy and primary dysmenorrhoea (Mcintyre et al. 2010). Evidence of benefits from post-operative local cooling is mixed. Significant reductions in opioid consumption and pain scores after a variety of orthopaedic operations have been reported; other studies have shown no such reductions (Macintyre et al. 2010). Some strategies, such as imagery or relaxation techniques, may not be feasible for cognitively impaired older adults due to communication difficulties (Kankkunen 2009). There are some limitations to the use of nonpharmacological therapies, because the evidence base regarding the use of non-drug therapies to manage acute pain requires further development; current knowledge does not support consistent outcomes from these therapies (Wells, Pasero & McCaffery 2008).

Table 6. Studies about hip fracture specific methods and significant effects of other nonpharmacological postoperative pain relieving methods

Study Country	Sample	Method	Findings
Hip fracture specific methods (repositioning, pressure relief devices and cold application)			
Mehta et al. 2010 USA	n=100 patients, with 56 surgical patients, 47 fracture	Retrospective medical record review	Used by 75% of the surgical patients. (such as repositioning and cold packs)
Titler et al. 2003 USA	n=709 hip fracture patients	Retrospective medical record review	The most frequently used: repositioning, pressure relief devices and cold application.
Other methods			
Music			
Vaajoki 2012 Finland	n=168 abdominal surgery patients	Quasi experimental study	On the second postoperative day the intensity of pain was lower in the music group.
Bernatzky et al. 2011 USA	15 studies on music in pain relief in surgery patients	Literature review	Pain reductions in 13 out of 15 studies. Lower opioid consumption in four studies.
Engwall et al. 2009 Sweden	18 studies	Systematic review of randomized trials or quasi experimental studies	Positive effect on PO[2] pain (in 15 of the 18 studies).
Cepeda et al. 2006 USA Colombia	51 studies with 1867 subjects (PO[2] pain: 14 studies with 1003 subjects)	Cochrane review of the randomized controlled trials	Listening to music reduces pain intensity levels and opioid requirements, but the magnitude of these benefits is small.
Massage			
Büyükyılmaz et al. 2011 Turkey	Experimental group: n=30/ control group: n=30	Randomized clinical trial	Differences in pain intensity in patients with hip or knee arthroplasty between the experimental and the control group.
Bauer et al. 2010 USA	Massage, n=62; control, n=51	Randomized clinical trial	Massage decreased pain in patients with cardiag surgery. They were higly satisfied with the intervention.
TENS[1]			
Macintyre et al. 2010 Newceland	Five studies	Quideline for acute pain management	Improved pain relief after inguinal herniorrhaphy, laparoscopic tubal ligation, thoracotomy and primary dysmenorrhoea.
Walsh et al. 2009 UK, USA	12 studies with 919 participants	Systematic review of Cochrane	No conclusions about effectiness of TENS as an isolated treatment for actute pain in adults.
Lang et al. 2007 Austria	30 patients with TENS and 33 in control group.	Randomized placebo-contolled double blind study	TENS is helpful during emergency transport for severe posttraumatic hip pain.

[1] Transcutaneous electrical nerve stimulation, [2]PO=postoperative

2.3 BARRIERS TO PAIN MANAGEMENT

Pain is consistently underdiagnosed in persons with dementia (Abbey 2004). Managing pain in older hospitalized patients with dementia is challenging for many reasons (Ardery et al. 2003; AGS 2002). Nursing staff have an essential role in the treatment and care of patients who are vulnerable, and therefore unable to advocate for their own pain treatment.

Several barriers to optimal pain management in older adults have been suggested in the literature as being categorized as patient-related, caregiver-related, and system-related barriers to pain management on acute medical care units (Coker et al. 2010) and long term facilities (Fox et al. 2004). In previous literature there have been identified some expectations on behalf of nursing staff, such as enhanced multiprofessional cooperation, updated education and adequate staffing to overcome these barriers (Fox et al. 2004). The employer can facilitate the pain management in patients with dementia by providing working conditions where it is possible to provide qualified pain management (Schafheutle, Cantrill & Noyce 2001).

Cognitive impairment represents a major barrier to pain assessment and management (Stevenson et al. 2006; Ferrell, Ferrell & Rivera 1995). These patients are at high risk for insufficient postoperative pain treatment due to inability to articulate or convey their pain experience (Bjoro & Herr 2008). Older patients with dementia, who are unable to provide a self-report of pain post hip fracture, are at risk for underdetection and insufficient treatment of acute pain (Connor 2012). Pain assessment is the cornerstone of pain treatment, since pain that is not detected cannot be treated (de Andrade et al. 2011). Difficulties assessing pain in older people due to cognitive problems (Cohen- Mansfield 2004; Frampton 2003) were cited by the greatest number of nurses as being a barrier to optimal assessment and management of pain in acute medical units, according to the study by Coker et al. (2010). Other patient related problems included difficulties in pain assessment due to sensory problems (Coker et al. 2010). Because provider–patient communication is an essential component in the treatment of pain, impairments in vision and hearing may alter the efficacy of care and require modified measurement scales (Camacho-Soto, Sowa & Weiner 2011; Burris 2004). One of the common barriers to effective pain management is the belief that pain is a normal part of aging and should thus be expected and is not necessarily required to be reported or treated (Parke 1992). Under-diagnosed and untreated pain may also contribute to increases in distressing behavioral symptoms in patients with dementia (Kovach et al. 2006b; Brown 2004; AGS 2002). The behavioral signs of pain are often misinterpreted; in such cases; psychotropic drug use can mask typical signs of pain and result in the under-treatment of discomfort (Husebo et al. 2011). Additionally, in cases of severe dementia, behavioral signs of pain are not easy to identify, i.e., behavior had to occur several times and be observed in the presence of the same caregiver before it was linked to pain (McAuliffe et al. 2009).

Caregiver-related barriers include lack of knowledge about the use of analgesics (Coker et al 2010; Innis 2004) and caregiver's reluctance to use opioids (Kaasalainen et al. 2007). According to the study of Coker and colleagues (2010), physicians' reluctance to prescribe adequate pain relief for the fear of overmedicating was seen as a frequent barrier by 37 % of the nurses, while only 1% identified their own reluctance to give pain medication to older patients. The fear of overmedicating is understandable, because geriatric patients often have multiple diagnoses, are taking multiple drugs, and are especially susceptible to adverse effects of drugs and drug interactions (Weissman 1999). One of the reasons patients have poorly managed pain is that healthcare professionals often lack the skills

and knowledge to assess and manage pain (Innis et al. 2004). Experiences and expressions of pain in patients with impaired cognition are sometimes ignored by nursing staff due to a belief that their ratings are unreliable (Maher et al. 2012; Camacho-Soto, Sowa & Weiner 2011; Brown 2004; Frampton 2003). Furthermore, nurses reveal difficulties in contacting physicians to find out about patients' pain status when the dose or type of analgesics needs to be re-evaluated or changed (Titler et al. 2003). The importance of careful documentation about pain in the patient by nursing staff is highlighted in order to guarantee effective flow of information and continuity of appropriate pain treatment and analgesic administration. According to the review of nearly two thousand medical records of patients with hip fractures, analgesic administration was seldom followed by reassessment (Titler et al. 2009). Indeed, when asking nurses working in acute medical units for their opinions concerning the statement "documentation on the effects of analgesics in older adults is important", 51% had an opinion of always implementing the task and 47% noted that they occasionally implemented the aforementioned practice, although 92% believed that it was the preferred method (Coker et al. 2010).

Fox et al. (2004) identified several system-related barriers. These included the lack of optimal team functions, barriers in communication, and insufficient time. These barriers pointed out that there is a need for strong administrative support for pain management (Gordon et al. 2005). Leaders of health care institutions need to be united in ensuring that pain management is a high priority (Denny & Guido 2012). The role of administration is to put such institutional policies in place that prioritize pain management and help to overcome some of these barriers (Gordon et al. 2005; Fox et al. 2004). A perceived lack of time for pain assessment and treatment represent typical barriers to effective pain management (Coker et al. 2010; Bell & Duffy 2009; Brown 2004; Fox et al. 2004). Multiprofessional team functions are highlighted (Brown 2004; Fox et al. 2004), because there are challenges to get a more proactive treatment response in this vulnerable group of patients (Scherder 2009). In a study by Titler et al. (2003) that dealt with barriers for the pain treatment of older adults hospitalized with hip fractures, nurses reported difficulties in contacting physicians, and difficulties communicating with them about the type and/or dose of analgesics as the greatest barriers to pain management. Instead, nurses educated as pain experts were sufficiently available for consultation, and knowledge regarding pain medication was acceptable.

2.4 PHARMACOLOGICAL PAIN TREATMENT

The World Health Organization (WHO) (1986) has developed a recommendation in the form of a three-step ladder (Figure 5), for cancer pain relief. The recommendation has been adapted to all kinds of acute pain. This analgesic ladder is widely used and recommends a "step up" approach to pain management. Analgesic treatment is adjusted from one step to the following one according to pain intensity and the presence of severe adverse effects. The administration of analgesics should start with nonopioids (step I), most frequently paracetamol. The second step on the WHO ladder includes ''weak'' opioids, such as bubrenorphine and codeine. Subsequently, strong opioids are used if necessary, and might include, e.g., morphine (step III). To maintain this state, drugs should be given regularly rather than "on demand". All of these drugs and adjuvants form a part of acute pain management. The idea is to start the immediate administration of drugs in the following order: nonopioids (NSAID, paracetamol), weak opioids (codeine, tramadol), and strong

opioids (morphine, oxycodone) until the patient is free from pain. Acute postoperative pain is best treated by a multimodal approach, with drug combinations to enhance analgesia and reduce potential adverse effects (Myles & Power 2007).

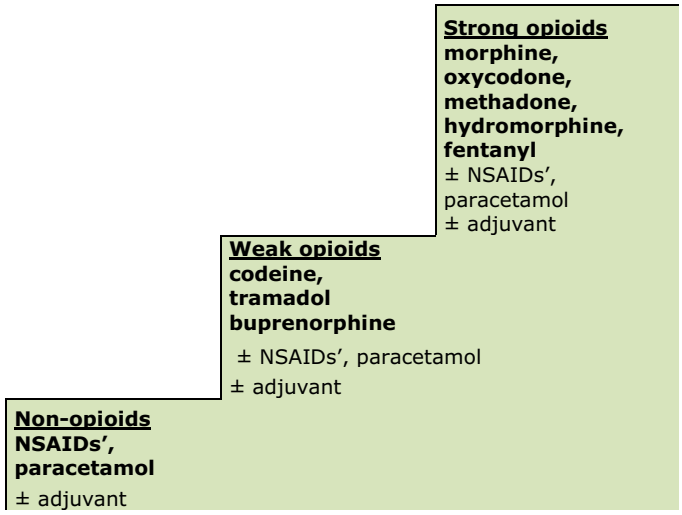

Figure 5. The World Health Organization 3-step analgesic ladder

Postoperative analgesia has often relied on parenteral opioids, but an oral regimen can be effective for nearly all minor, intermediate, and some more extensive (major), surgical procedures (McLachlan et al. 2011). The key issue is whether the patient can swallow or not. The weakness of transdermal opioids administration in acute care includes delayed onset of action (McLachlan et al. 2011; Gupta et al. 1992) and rigidity in dose titration (Bell et al. 2011). On the other hand, transdermal application may generally be in use when there are problems with swallowing, behavioural resistance to swallow, or renal impairment (Bell et al. 2009).

Pharmacological acute pain management

Opioid analgesia is a key component in managing acute hip fracture pain (Maher et al. 2012). The majority of the postsurgical pain can be treated with appropriate and sufficient pharmacological pain management (Wells, Pasero & McCaffery 2008). Factors that can make effective control of acute pain in older persons more difficult than in younger patients include a higher incidence of coexistent diseases and polypharmacy, which increases the risk of drug-drug and disease-drug interactions; age-related changes in physiology, pharmacodynamics, and pharmacokinetics (Coldrey, Upton & Macintyre 2011; de Andrade et al. 2011; Macintyre et al. 2010; AGS 2009; Mäntyselkä 2008). However, with aging, there is increased individual variability in the physiological responses of patients (Coldrey, Upton & Macintyre 2011; Taipale 2011).

Although older patients are generally at a high risk for adverse effects of analgesics (Karttunen et al. 2012; AGS 2009), analgesic and pain-modulating medicines can still be safe and effective when comorbidities and other risk factors are carefully considered (AGS 2009). It should be assumed that sensitivity of the central nervous system to active analgesics, including opioid analgesics, increases with age. Age-related changes in efficacy, sensitivity and toxicity should also be expected (AGS 2002). For example, in an analysis of 1511 older patients with a fractured femur, approximately one third of patients

had at least moderate renal dysfunction on admission to hospital, which placed them at a higher preoperative risk for opioid-induced respiratory depression (White, Rashid & Chakladar 2009). Concerns about adverse effects and interactions in older subjects may contribute to low rates of analgesic use (Shega et al. 2006). Delirium is common (34-61%) following a hip fracture (Björkelund et al. 2010; Holmes and House, 2000), especially in cognitively impaired patients (Sieber et al. 2011), and severe pain is one of its risk factors (Björkelund et al. 2010; Siddiqi et al. 2007; Fong, Sands & Leung 2006). Dementia is also a risk factor for developing postoperative delirium. However, the incidence can be reduced with sufficient pain management (Björkelund et al. 2010; Siddiqi et al. 2007; Fong, Sands & Leung 2006; Lindesay, Rockwood & Rolfson 2002). A range of studies have supported the idea that postoperative pain is inadequately treated in hip fracture patients (Johansson et al. 2012) with cognitive impairment (Sieber et al. 2011; Titler et al. 2003; Forster, Pardiwala & Calthorpe 2000; Morrison & Siu 2000; Feldt, Ryden & Miles 1998) (Table 7).

Table 7. Studies of differences in pharmacological postoperative pain treatment in hip fracture patients with cognitive impairment as compared with cognitive intact persons

Study Country	Sample	Method	Findings
Sieber et al. 2011 USA	236 patients, of whom 28% (n=66) had dementia	Clinical study	The mean single dose of administered opioids was half of the dose given for cognitively intact persons
Titler et al. 2003 USA	701 patients (n= 185 with dementia, n=524 without dementia)	Review of the medical records	Dementia patients received 25% less PME* of opioids than those without dementia ($p<0.0001$)
Forster et al. 2000 UK	100 patients	Review of the medical records	Patients with cognitive impairment received 74% of the amount of paracetamol and 64% of the amount of morphine that was administered to cognitively intact patients
Morrison & Siu 2000 USA	92 patients	Prospective cohort study	Patients with advanced dementia received one third of the amount of PME* opioids that was administered to cognitively intact patients
Feldt et al. 1998 USA	88 patients (53 cognitively impaired, 35 cognitively intact)	Prospective comparative survey	Cognitively impaired subjects received significantly less opioids than cognitively intact subjects. Pain intensity did not vary between groups

**PME= Mean Parenteral Morphine Equivalent of Opioids.*

Pharmacological pain treatment in hip fracture patients is based on the administration of strong opioids. According to the medical records of several studies, 93-99% of the hip fracture patients received opioids (Mehta et al. 2010; Herr & Titler 2009; Titler et al. 2003). According to the review of 1748 medical records of hip fracture patients, only 39% of the patients received the total dose of ≥16.8 mg of parenteral morphine equivalent milligrams during the first postoperative 24 hours (Titler et al. 2009). Low doses of opioids or the avoidance of opioids increase the risk for delirium (Morrison et al. 2003a). The study of 190 patients from orthopaedic, oncological and acute geriatric wards indicated that older

patients received lower doses of opioids in comparison with middle-aged patients. Pain intensity did not vary across the age group (Gnijidic et al. 2008). According to the studies, administration of paracetamol in hip fracture patients (which is usually used with a combination in opioids), varies between 0% and 87% (Herr & Titler 2009; Eid & Bucknall 2008; Titler 2003). The summary of pharmacological postoperative pain treatment is presented in Table 8.

Table 8. Studies of pharmacological postoperative pain treatment in hip fracture and other surgical patients.

Study Country	Sample	Method/data source	Findings
Kondo et al. 2012 Japan USA	492 hip fracture patients (Japan n=216, USA n=276)	Retrospective survey	Days of morphine use: Japan mean 0.53 (SD:2.0); USA mean 5.2 (SD: 3.5), P<0.001
Mehta et al. 2010 USA	100 patients with dementia, cognitive impairment or memory loss. Fracture: 62%	Retrospective medical record review	93% of surgical patients received opioids, NSAIDs 2%, paracetamol 46%
Titler et al. 2009 USA	1748 medical records of hip fracture patients.	Medical records	Administered analgesics: 39% ≥16.8 mg of parenteral opioids[1] during the first postoperative day (24h)
Herr & Titler 2009 USA	285 medical records of hip fracture patients	Medical records	Administered analgesics: opioids 98%, paracetamol 0%. Mean total dose of opioids prescribed and administered: 6.1 mg (SD 21.0) vs. 4.0 mg (SD 3.8)
Eid & Bucknall 2008 Australia	43 hip fracture patients	Medical records	Administered doses: paracetamol (61%), codeine (14%), morphine (8%), oxycodone (8%)
Gnjidic et al. 2008 Australia	190 patients from orthopaedic, oncological and acute geriatric wards	Cross-sectional survey	Older patients received lower doses of opioids than middle-aged patients. Pain intensity did not vary across the age groups
Morrison et al. 2003a USA	541 hip fracture patients without delirium	Prospective cohort study	Avoiding opioids or very low doses of opioids increase the risk of delirium
Titler et al. 2003 USA	709 medical records of hip fracture patients	Medical records	Administered analgesics: opioids in 99% of the patients (morphine 52%, oxycodone 14%, codeine 14%), paracetamol 87%

[1]morphine equivalent

Strong opioids

Opioid therapy may be considered for patients with moderate to severe pain (Abdulla et al. 2013). Analgesics, particularly opioids, are used as the primary treatment for acute pain (Current Care 2011; Wells, Pasero & McCaffery 2008). Strong opioids that are available in Finland include morphine, hydromorphone, oxycodone, oxycodone combination, and fentanyl. Opioids bind to specific receptors in the central nervous system (CNS), causing reduced pain perception and reaction to pain and increased pain tolerance. In addition to

these desirable analgesic effects, binding to receptors in the CNS may cause adverse events, such as drowsiness and respiratory depression. In addition, binding to receptors elsewhere in the body (for example the gastrointestinal and urinary tract) commonly causes nausea, vomiting, and constipation. Adverse effects of opioids, including nausea and vomiting, should be expected and the use of a suitable prophylaxis should be considered (Abdulla et al. 2013). Appropriate laxative therapy should be prescribed throughout the treatment for all older people who are prescribed opioid therapy (Abdulla et al. 2013). In an effort to reduce the amount of opioids required for pain relief, and thus reduce problematic adverse effects, opioids are commonly combined with non-opioid analgesics, such as paracetamol (Moore et al. 2011).

As a class, opioids have long been used to treat moderate to severe pain during and immediately after surgery (Pasero & McCaffery 2007), because they are effective and can be given parenterally and as doses can be titrated to bring about immediate pain relief (Moore et al. 2011). Oral opioids are less frequently used alone, but are instead administered in fixed-dose combinations with other drugs, such as paracetamol or ibuprofen (McQuay 1997).

Morphine is effective in the treatment of acute pain. Morphine remains the most widely used opioid for the management of pain and the standard against which other opioids are compared. In the management of acute pain, one opioid is not superior over others, but certain opioids are better with some patients. (Macintyre et al. 2010.) Oxycodone is the most used strong opioid for relieving postoperative pain in hip fracture patients in Finland (Current Care 2011), whereas in the USA (Kondo et al. 2012; Titler et al. 2003) and Australia (Eid & Buchnall 2008), morphine may be more commonly used. According to the study of Kondo et al. (2012), in the USA, opioids, primarily morphine and nonsteroidal anti-inflammatory drugs (NSAIDs), were used as analgesics. A combination with oxycodone and naloxone formulation results in similar analgesic efficacy, but causes less bowel dysfunction (Vondrakova et al. 2008). Fentanyl is s short-acting opioid and has been used, e.g., in the case of renal impairment, in pre-hospital settings and in treating breakthrough pain (Macintyre et al. 2010). Instead, transdermal patches (such as fentanyl patches) are not recommended for acute pain management because of a delayed onset of action (McLachlan et al. 2011; Gupta et al. 1992) and rigidity in dose titration (Bell et al. 2011).

The incidence of clinically meaningful adverse effects of opioids is dose-related (Harris 2008). Common adverse effects of opioids include sedation, itching, nausea, vomiting, slowing of GI function, and urinary retention (Table 9) (Macintyre et al. 2010; Hudcova et al. 2005). Sedation is defined as subjective feelings of drowsiness and sleepiness, and also as objectively measured slowing down of psychomotor functioning (Bourin & Briley 2004). Postoperative sedation can be measured, e.g., with the Richmond Agitation Sedation Score (RASS) and includes drowsiness (Sessler et al. 2002). Nausea and vomiting have the consequence of lack of appetite. Other opioid-related adverse effects include, e.g., dependence (Webster et al. 2006), addiction (Fishbain et al. 2008), and increase in tolerance (Mao 2008), nightmares (Vella-Brincat & Macleod 2007) and euphoria (Plante & Vanitallie 2010). Opioid-related constipation can be efficiently prevented through premedication with laxatives (Ishihara et al. 2012).

Strong opioid-related adverse effects in postoperative patients with advanced age also include confusion (Narayanaswamy, Smith & Spralja 2006). There is notable consideration of the medical treatment of pain in patients with dementia due to a higher risk for postoperative delirium as compared to cognitively intact older adults (Sieber et al. 2011; Lindesay, Rockwood & Rolfson 2002). This risk can be reduced by administering

appropriate and sufficient analgesic drugs, including strong opioids, so that severe pain can be avoided (Morrison et al. 2003a; Lindesay, Rockwood & Rolfson 2002).

Table 9. Studies of clinically relevant adverse effects of strong opioids

Study Country	Sample	Method	Adverse effects of strong opioids
Bounes et al. 2011 France	277 patients receiving opioids in prehospital settings	Prospective, observational clinical study	Nausea, dizziness, emesis, drowsiness, pruritus
Li et al. 2010 Taiwan	150 cancer patients receiving palliative care	Retrospective review	Sedation (1%), constipation (57%), drowsiness (5%), and dryness of mouth (4%)
Fishbain et al. 2008 USA	67 studies from chronic opioid analgesics therapy	Literature review	Total abuse/addiction rate was 3.27%, with 0.19% without a history of abuse/addiction
Gnijidic et al. 2008 Australia	463 patients from orthopaedic, oncological and acute geriatric wards	Cross-sectional survey	Nausea, dizziness, vomiting, sweating, constipation
Avouac et al. 2007 France	18 trials with 3,244 patients with osteoarthritis received opioids and 1,612 were administered placebo	Meta-analysis of RCTs	Nausea, somnolence, dizziness, vomiting, and constipation
Villars et al. 2007 USA	174 cancer patients with bone metastasis	Clinical study	Prevalence rates of ≥24.5%* for AEs: difficulty concentrating, nausea,vomiting, lack of energy, nightmares , difficulty sleeping, light-headedness, constipation, feeling drowsy, poor coordination
Hudcova et al. 2005 USA	52 studies out of 3462 papers	Systematic review	Nausea, vomiting, sedation, itching, slowing of GI function, urinary retention
Marcou et al. 2005 France	90 patients (tramadol n=30, morphine n=30, tramadol + morphine n=30)	Double-blind prospective RCT	Morphine-associated AEs include (median): dry mouth 13%, dizziness 3%, nausea, vomiting 10%, sedation 30%, respiratory depression 10%
Marret et al. 2005 France	22 randomized controlled trials in postoperative setting	Meta-analysis	Increased risk of 0.9% for nausea and 0.3% for vomiting for every 1 mg increase in PCA morphine consumption after surgery

AE= Adverse effect, PCA=Patient-controlled anaesthesia, GI=gastrointestinal, * around-the-clock (ATC) opioid, or an ATC + opioids as needed, RCT=randomized controlled trial

Weak opioids

Weak opioids include codeine, tramadol and buprenorphine. The potential adverse effects of weak opioids are presented in Table 10. *Tramadol* is a typical centrally acting analgesic (Coldrey, Upton & Macintyre 2011). Administering lower daily doses to older patients is suggested (Macintyre et al. 2010). Even though these are effective analgesics, they may not provide adequate pain relief if used as the sole agents for the management of moderate to

severe acute pain in the currently recommended doses (Thevenin et al. 2008). Tramadol causes less respiratory depression and constipation than other opioids (Macintyre et al. 2010); however, its use is associated with postoperative delirium (Table 10), (Brouquet et al. 2010). Significant respiratory depression has only been described in patients with severe renal failure (Barnung SK, Treschow M & Borgbjerg 1997).

Perceived advantages of *codeine* include reduced nausea and vomiting compared with morphine (Williams et al. 2002), but may be associated with reduced efficacy (Williams et al. 2001). There are conflicting reports of efficacy for postoperative pain. The combination of codeine and paracetamol has been reported to improve analgesia (Pappas et al. 2003) or to have no effect (Moir et al. 2000). As with other opioids, repeated administration of codeine without pain may cause dependence and tolerance. Long term use of pain relief, or use of high doses, tends to result in adverse effects, in particular constipation and drowsiness. Respiratory depression is dose-related and may have serious consequences in people with advanced age with reduced renal function (Derry et al. 2010.) According to the guideline of Griffiths et al. (2012), codeine should not be administered for hip fracture patients, as it is constipating, emetic, and associated with peri-operative cognitive dysfunction.

Buprenorphine appears to be effective and well-tolerated in long term opioid treatment (Camacho-Soto, Sowa & Weiner 2011). It shows a distinct benefit in improving neuropathic pain symptoms, which is considered a result of its specific pharmacological profile (Pergolizzi et al. 2008). Buprenorphine-related adverse effects (Table 10) include, e.g., constipation, nausea, vomiting, allergic reactions (to transdermal patch), drowsiness, confusion, and respiratory effects (Naing, Aung & Yeoh 2012). In the case of all opioids apart from *buprenorphine*, the half-life of the active drug and metabolites is increased with advanced age and in patients with renal dysfunction (Pergolizzi et al. 2008). It is, therefore, recommended that, with exception for buprenorphine, opioid doses be reduced. Buprenorphine is administered intravenously, orally or transdermally (WHO 2010). Transdermal analgesics may not be the ideal option for acute pain management due to delayed onset of action (McLachlan et al. 2011; Gupta et al. 1992) and rigidity in dose titration (Bell et al. 2011).

Table 10. Studies from clinically relevant adverse effects of weak opioids

Study Country	Sample	Method	Findings
Gatoulis et al. 2012 New Jersey Germany	Dental pain study vs. headache study: placebo n=61 vs. n=103, paracetamol with codeine n=121 vs. n=233	Double blind placebo controlled RCT	The most common AEs of paracetamol with *codeine*: nausea, vomiting, dry socket, dizziness, and somnolence
Jalili et al. 2012 Iran	89 patients (n=44 in buprenorphine group, n=45 in morphine group)	Double blind RCT	Sublingual buprenorphine in acute bone fractures: nausea 14% vs. 12%, dizziness 14% vs. 22%
Kapil et al. 2012 (in press) USA	37 subjects treated with bubrenorphine patches	Randomized open-label study.	*Buprenorphine*-related adverse effects include, e.g., constipation, nausea, vomiting, and somnolence
Skurtveit et al. 2011 Norway	245006 new users of weak opioids	Register-based study	Apparent problematic *weak opioid* use (abuse or addiction) was found in n=191 (0.08%) of subjects
Derry et al. 2010 UK	35 clinical trials in postoperative setting with n=1223 adults receiving codeine	Cochrane systematic review of RCTs	Nausea, vomiting and sedation may be associated with the AE of high single doses of *codeine*
Brouquet et al. 2010 France	118 surgical patients aged ≥75 without severe cognitive dysfunction	Prospective study	*Tramadol* seems to be an independent risk factor for postoperative delirium (OR: 7.1 (95% CI 2.2–22.5, P=0.0009)
Gordon et al. 2010 Canada	78 patients completing treatment of at least two consecutive weeks	Double-blind crossover RCT	AEs of [1]transdermal *buprenorphine*: nausea, dizziness, vomiting, somnolence, dry mouth
Marcou et al. 2005 France	90 patients (groups tramadol n=30, morphine n=30, tramadol + morphine n=30)	Double-blind RCT prospective study	*Tramadol*-associated AEs include (median): dry mouth 17%, dizziness 3%, nausea and vomiting 13%, sedation 17%
Eckhardt et al. 1998 Germany	18 volunteers taking 170mg codeine	Double-blind placebo controlled RCT	Most commonly reported AEs of *codeine:* sedation, relaxation, euphoria, pruritus

AE= Adverse effect, RCT=randomized controlled trial

Paracetamol and Non-Steroidal Anti-Inflammatory Analgesics (NSAIDs)

While opioids are the preferred form of analgesics for moderate to severe acute pain, non-opioid analgesic drugs produce an opioid-sparing effect, thereby allowing a reduction in the dose of opioids, which is required for effective pain management (Myles & Power 2007). The analgesic effects of paracetamol (Gaskell et al. 2009) and nonsteroidal anti-inflammatory drugs (NSAIDs) supplement the analgesic effects of opioids (Myles & Power 2007).

Paracetamol is a widely used analgesic for relieving postoperative pain in combination with opioids. Paracetamol should be considered a first-line treatment in the management of both acute and persistent pain (Abdulla et al. 2013). It is considered to be effective and well-tolerated for management of mild and moderate pain. A Systematic review of 51 studies (n=5762 participants) by Toms and colleagues (2008) suggested that a single dose of paracetamol for relieving postoperative pain was not associated with any serious

adverse effects. Paracetamol is recommended as a first-line analgesic for treatment of pain in older people because it is safe in doses smaller than 4g per day (Abdulla et al. 2013; AGS 2009; 2002). Paracetamol can be routinely used on a regular basis for relieving postoperative pain (Griffiths et al. 2012; Jahr et al. 2012; Björkelund et al. 2010; Macintyre et al. 2010; Cuvillon et al. 2007; Myles & Power 2007) during the first postoperative days in combination with strong opioids or other multiform analgesia. Paracetamol has oral, rectal and intravenous formulations. The intravenous routes are used after surgery when administering drugs orally is not possible. The adverse effect associated with the use of paracetamol is hepatotoxity (Craig et al. 2011; Mort et al 2011; Macintyre et al. 2010; Watkins et al. 2006) (Table 11). However, in geriatric care, this adverse effect can be avoided, when administering drugs in therapeutic doses (≤4g/24 hours) (Abdulla et al. 2013; AGS 2009).

Table 11. Hepatotoxity associated to the use of paracetamol

Study Country	**Sample**	**Method**	**Adverse effect**
Mort et al. 2011 USA	4.8 million beneficiaries	Retrospective cohort study	Liver dysfunction was diagnosed in 3818 cases, of which 23% had opioid-paracetamol prescription
Watkins et al. 2006 USA	145 healthy adults, 4g paracetamol daily (up to two weeks), alone, in a combination, or as a placebo	Randomized, parallel-group placebo controlled longitudinal study	Some of the liver tests (ALT and peak alpha-GST) were highly correlated and suggestive of hepatocellular injury
Moling et al. 2006 Italy	45 year-old man with HIV, hepatitis A and B who had taken 1g paracetamol for the previous 4 days	Single case study	The patient with multiple risk factors suffered severe hepatoxity after having taken paracetamol

Adverse effects of NSAIDs are significant and may limit their use (Table 12). NSAIDs should be used with caution in older people and lowest doses should be provided for the shortest duration (Abdulla et al. 2013). NSAIDs are associated with a number of adverse effects, which include gastrointestinal, cardiovascular and renal complications (Barkin et al. 2010; Vonkeman & van de Laar 2010; Ong et al. 2007; Ofman et al. 2002). These also include alterations in renal function, effects on blood pressure and hepatic injury (Ong et al. 2007). The most important adverse effects of NSAIDs, including COX-2 inhibitors, are gastrointestinal and cardiovascular adverse effects, respectively (Lo, Meadows & Saseen 2006). Medical professionals have identified GI ulceration as the most common adverse effect of NSAIDs (Cullen, Kelly & Murray 2006). On the contrary, patients clearly lacked of knowledge about the adverse effects of NSAIDs (Bongard et al. 2002), particularly in relation to gastrointestinal adverse effects (Cullen, Kelly & Murray 2006).

The use of *NSAIDs* in older people requires extreme caution (Macintyre et al. 2010), although the risks of postoperative administration are limited (Coldrey, Upton & Macintyre 2011). The incidence of NSAIDs-related adverse effects, such as GI ulcers and bleeding, increases in frequency and severity with advanced age (Barkin et al. 2010; Boers et al 2007). According to previous studies, a five to seven day use of certain classical NSAIDs in older people may result in gastroduodenal ulceration rates in the range of 20-40% (Shug & Manopas 2007). However, these adverse effects are more common in long-

term use (Macintyre et al. 2010). In medical inpatients over 65 years of age, the use of NSAIDs was a significant risk factor for renal functioning (Burkhardt, Bruckner & Gladisch 2005). In general, all older people taking NSAIDs should be routinely monitored for gastrointestinal, renal, and cardiovascular adverse effects, and drug-drug and drug-disease interactions (Abdulla et al. 2013).

Table12. Clinically relevant adverse effects of NSAIDs

Study Country	Sample	Method	Adverse effects of NSAIDs
Renal and cardiac adverse effects			
Barkin et al. 2010 USA	124 references on NSAIDs' safety and adverse effects	Review of clinical trials of high quality	Renal, cardiovascular, and gastrointestinal adverse effects are common in older populations
Mamdani et al. 2004 Canada	138882 patients aged >66 years (rofecoxib n=14,583, celecoxib n= 18,908, non-selective NSAIDs n= 5,391, control group of 100,000 non-users)	Population based retrospective cohort study	Risk for heart failure relative to control group for non-selective NSAIDs users and rofecoxib users: (adjusted rate ratio 1.4, 95% CI 1.0–1.9 vs. 1.8, 95% CI 1.5–2.2)
Feenstra et al. 2002	7277 subjects over 55 years of age	Clinical follow-up study	NSAIDs users with prevalent heart failure the relative risk of relapse: adjusted OR 9.9 (95% CI 1.7-57)
Page et al. 2000	365 patients admitted to hospital with heart failure, controls n=658 admitted without heart failure	Case-contol study with structured interviews	Use of NSAIDs on the previous week in patients with hospital admission with heart failure: adjusted OR 2.1, 95% CI 1.2-3.3). 10.5 fold increased risk of exacerebating heart failure in older patients with recent NSAIDs use
Puopolo et al. 2007 USA, Peru, Chile	548 patients with osteoarthiritis (placebo n=111, etoricoxib n=224, ibuprofen n=213)	RCT	Edema-related AE: placebo 1.8%, etoricoxib 3.6%, ibuprofen 3.3%
Juhlin et al. 2005 Sweden	14 65-80 year-old subjects who received diclofenac and a placebo	Double-blind cross-over fashion	Diclofenac significantly decreased glomerular infiltration rate and urine flow
Gastrointestinal irritability and gastric ulcer			
Lanas et al. 2006 Spain, Canada	Clinical trials and epidemiological studies published in 2002-2006	Systematic review	The estimated incidence of upper GI complications and ulcers in certain risk users in 14 cases in 100 patient years
Boers et al. 2007 Netherlands, Switzerland, USA	12 RCTs	A pooled analysis of RCT	Increasing age is associated with more frequent and serious NSAID gastropathy (inc. ulcers)
Bleeding			
Barthélémy et al. 2013 France, Germany, Switzerland	23,728 European patients with risk factors (83% atherothrombotic disease)	Register-based study	Trends toward increased bleeding[1] rate (OR 1.554; CI 95% 0.960-2.51, P=0.07)

AE= Adverse effect, [1] Bleeding was defined as any bleeding leading to both hospitalisation and transfusion.
RCT=randomized controlled trial

Multimodal analgesia

Multimodal analgesia, which is combination of non-opioid analgesics such as NSAIDs and paracetamol, has been proposed to decrease opioid consumption in order to avoid the adverse effects of strong opioids (Maher et al. 2012). For example, postoperative sedation and nausea and vomiting can be prevented by combining opioids with NSAIDs (Macintyre et al. 2010; Elia et al. 2005; Marret et al. 2005). Opioid-sparing with no decrease in postoperative nausea and vomiting was reported in paracetamol (Elia et al. 2005). Instead, according to a meta-analysis with 30 studies and 2634 participants, i.v. paracetamol reduced nausea when given prophylactically either before surgery, 0.54 (0.40–0.74), or before arrival in the postanesthesia care unit, 0.67 (0.55–0.83); but not when administered after the onset of pain, 1.12 (0.85–1.48) (Apfel et al. 2013). Paracetamol is considered to be quite safe in doses smaller than 4g/day and it is recommended to be used routinely in older patients (AGS 2002; 2009). However, postoperative pain after hip fracture surgery is often severe (Handoll et al. 2009; Morrison et al. 2003b; Morrison & Siu 2000; Lynch et al. 1998), and as a consequence, the non-opioid analgesia produce insufficient pain relief during the first postoperative days. According to a Cochrane database review of Gaskell et al. (2009) with 20 studies and 2641 participants, a single dose of 5 mg of oxycodone shows no benefit over a placebo for the treatment of moderate to severe acute pain; doses of 15 mg alone, 10 mg with paracetamol and 5 mg with paracetamol, are effective for adults.

Epidural analgesia, spinal analgesia and femoral nerve block

Epidural analgesia can provide the most effective pain relief of all analgesic therapies used in the postoperative setting (Macintyre et al. 2010). PCA and epidural analgesia are more effective in older people than conventional opioid regimens. After hip fracture surgery, epidural analgesia with bupivacaine and morphine also provided better pain relief both at rest and with movement, but this did not lead to improved rehabilitation (Foss et al. 2005). According to a small study (n=54), older patients with hip fracture who had received epidural bupivacaine/fentanyl analgesia, experienced significantly better pain relief than those who were given IM oxycodone (Scheinin et al. 2000).

Femoral nerve blocks in combination with intravenous opioids are much more effective than intravenous opioids alone in the treatment of pain caused by a fractured neck of femur (Macintyre et al. 2010), and s femoral nerve block has been suggested to lower the incidence of post-operative delirium and improving the quality of analgesia after a hip fracture surgery (Rosario et al. 2008). However according to the Cochrane review, evidence of the drugs' clinical benefits remain unclear, even though they seemed to reduce pain after hip fracture surgery (Parker, Griffiths & Appadu 2002).

2.5 SUMMARY OF THE STUDY BACKGROUND

Hip fracture patients with dementia are currently a remarkable patient group in acute care setting and their number is expotentially expanding in the near future as the population ages. The previous studies have been widely focused on pain management in long term settings (Prowse 2007) and there is limited evidence of pain management in patients with dementia in acute care settings (Scherder 2009).

Effective postoperative pain management is an essential component for the quality of care (Abdalrahim et al. 2011). Proper pain management includes the basic rights of humans in addition to a decrease in the morbidity and mortality associated with insufficient pain treatment (Prowse 2007). A range of studies suggest that postoperative pain is inadequately treated (Gnijic, Murnion & Hilmer 2008) in hip fracture patients with cognitive impairment. According to previous studies, hip fracture patients with cognitive impairment receive significantly lower doses of opioids in acute care setting than cognitively intact persons (Sieber et al. 2011; Titler et al. 2003; Forster, Pardiwala & Calthorpe 2000; Morrison & Siu 2000; Feldt, Ryden & Miles 1998). The role of nurses is essential for guaranteeing qualified pain treatment in this vulnerable patient group. Nurses are the professional group mainly responsible for assessing pain, administering and at present also prescribing analgesia and evaluating the quality of pain relief in older people (Prowse 2007). Based on this, they are the group most likely to affect improved patient outcomes. Nurses' competence in pain management in hip fracture patients requires providing comprehensive holistic care, advocacy, collaborating with all members of multidisciplinary teams, coordinating patient care, and improving care (Forster 2012).

Older adults are susceptible for hip fractures for many reasons (Griffiths et al. 2012; Corcoran & Kinosian 2011; Stolee et al. 2009). Older people with dementia symptoms are at a high risk of falling and getting fractures, especially because of a decreased balance and gait (Lönnroos 2009; Viramo & Sulkava 2006). On the other hand mobility and postural reactions require cognitive processing and rapidly allocating attention in order to avoid sideway walls (=direct impact to hips), which increase the fracture risk approximately 30 times (Robinovitch et al. 2003).

Pain management in hip fracture patients with dementia is widely considered insufficient because of difficulties in the identification of pain (Coker et al. 2010; Cohen-Mansfield 2004; Frampton 2003) and because older people are particularly susceptible to the adverse effects of analgesics because of a high risk for the presence of many co-morbidities and polypharmacy (Weissman & Matson 1999), age-related changes in physiology, pharmacodymanics and pharmacokinetics (Coldrey, Upton & Macintyre 2011; de Andrade et al. 2011; Macintyre et al. 2010; AGS 2009; Mäntyselkä 2008). In addition, the risk for the development of postoperative delirium in patients with dementia (Björkelund et al. 2010; Holmes & House 2000) highlights the need for sufficient pain relieving (Björkelund et al. 2010; Siddiqi et al. 2007; Fong, Sands & Leung 2006; Lindesay, Rockwood & Rolfson 2002).

A wide range of pain assessment scales have been designed and studied in nonverbal cognitively impaired older people in care settings (Hadjistavropoulos et al. 2007). However, the transferability of these tools to acute care contexts and their sustainability to use has not been widely reported (Prowse 2007). The gold standard in pain assessment is self-reporting (AGS 2002) and simple tools, such as verbal pain rating scale can be successfully implemented in the pain measurement of patients with mild to moderate dementia (Pesonen 2011; Mehta et al. 2010; Pesonen & Kauppila et al. 2009; Lints-Martindale et al. 2007; Feldt, Ryden & Miles 1998; Ferrell, Ferrell & Rivera 1995).

From the viewpoint of nurses, postoperative pain management includes both pharmacological and supplementary nonpharmacological pain relieving (Figure 6). Opioid analgesia is a key component in managing acute hip fracture pain (Maher et al. 2012). The general principles of analgesic administration have already been previously described well (e.g., Coker et al. 2010; Macintyre et al. 2010; Mehta et al. 2010; Pasero & McCaffery 2007; Herr et al. 2006b; Gordon et al. 2005; Herr et al. 2004). However, for example, the procedure of around-the-clock administration of analgesics fails to be in clinical practice (Mehta et al. 2010), using pain rating scales is not a very common practice,

and the assessment of pain is insufficiently documented (Herr & Titler 2009; Chanvej et al. 2004). Although there is limited knowledge about using many of the nonpharmacological pain relieving methods in acute care settings, it is advisable to use them as a supplement to pharmacological methods. The most frequently used nonpharmacological pain management method in hip fracture patients includes repositioning, pressure relieving devices, and cold application (Mehta et al. 2010; Titler et al. 2003). Because affective and motivational factors affect pain sensation, touch, attention and emotion can influence feelings of pain (Good 2009). On the other hand, as anxiety increases the intensity of pain (Vivian et al. 2009) and patients with dementia are at a high risk for stress or fear (Kovach et al. 2006b). Various methods can be used to influence the patient's emotional state such as quieting and consoling and applying a soothing supportive touch (Kovach et al. 2006a), that might be able to relieve pain.

3 Purpose of the study

The purpose of the study was to describe and explain postoperative pain management in hip fracture patients with dementia as reported by nurses. The specific purposes were:

1. To examine postoperative pain management practices in hip fracture patients with dementia as evaluated by nurses.

2. To describe the perceptions of nurses regarding the barriers for postoperative pain management in hip fracture patients with dementia, their expectations, and facilities offered by their employers to overcome these obstacles.

3. To describe the analgesic use in hip fracture patients with dementia during the first two post-operative days as reported by nurses.

4. To investigate the registered nurses' knowledge of potentially clinically relevant adverse effects of analgesics in persons with dementia.

5. To find out which model predicts the factors associated to nurses' opinion of sufficient pain management.

4 Materials and methods

4.1 STUDY DESIGN

This descriptive, cross-sectional study was conducted in seven universities (including three Helsinki University Hospitals (HUCH)) and ten central hospitals between March and May 2011. The questionnaire with structured and open-ended questions was sent to a total of 634 nurses working in orthopaedic units. The exclusion criteria were hospitals that had less than one hundred first hip fractures by the year 2009. All the university hospitals and ten out of eleven central hospitals were included in the study. These hospitals admitted approximately 68% of the total number of first hip fracture patients in Finland by the year 2009.

The study consisted of five substudies (Table 14). In papers I and II the study population consisted of all the respondents. In papers III and IV the study population consisted of RNs. Article I focused the pharmacological and non-pharmacological nursing practices (n=333), Article II focused on barriers to pain management and expectations and facilitators offered by employer for overcoming the barriers in hip fracture patients with dementia (n=331) and Article III focused on analgesic use during two initial postoperative days in hip fracture patients with dementia as reported by nurses (n=269) and Article IV focused on knowledge of potentially clinically relevant adverse-effects in patients with dementia (n=267). In addition, in summary of this thesis there were the variables reported which were associated to the opinion of sufficient postoperative pain management. All the nurses were informed about the purpose of study before participating in the study. In this study all the participants were nurses: head nurses, staff nurses, registered nurses (RNs) and practice nurses. In addition three students and one physiotherapist were included in the study.

4.2 METHODS

Nursing practices and barriers to pain management (Article I- II)

Nurses were asked about pain management practices (Article I) in two separate structured questions, including the analgesic treatment practices in use in their unit (seven variables), and by 11 variables of nonpharmacological pain treatment methods used in their unit. In addition, one variable, "giving analgesics", was excluded from analysis because of the item-total correlation was below 0.2 and nearly all of the nurses agreed (agreed in some extent 12%, n=39 and completely agreed 87%, n=328) that it was in use in their unit (99%, n=328, SD 0.48). An item-total correlation test was performed to check if any item in the set of tests was inconsistent with the averaged behavior of the others, and could thus be discarded (Metsämuuronen 2006). Item-total correlation for variable TENS was 0.2 and 0.4 for massage. Further literature search provided no evidence about the effectiveness of these methods in relieving postoperative pain in hip fracture patients with dementia. As a result of an explanatory factor analysis (see Article I) (altogether 16 variables), a four-factor solution was found. The first factor related to the analgesic treatment practices (seven variables), the second to the emotional support (three variables), third to the physical methods (three variables) and the fourth to the hip fracture specific methods

(three variables). The detailed information from the factor analysis is presented in Article I.

Barriers to pain management were divided into those related to patients (eight variables), formal caregivers (eight variables) and the system (seven variables). The variables were categorized into different groups based on content analysis performed by the principal researcher.

Pain management practices (Article 1), barriers to postoperative pain management (Article II), expectations of nurses for the enhancement the pain management (Article II), and facilities offered by the employer to overcome the barriers in postoperative pain management (Article II) were asked in a five-point Likert scale (1= completely disagree, 2= disagree to some extent, 3= neither agree or disagree, 4= agree in some extent, 5= completely agree). Individual items were interpreted so that Likert number one and two indicated disagreement, number three stood for neither agree or disagree, and numbers four and five signalled agreement (1= disagree, 2= neither disagree nor agree, 3= agree). When analyzing agreement of nursing practices (Article 1) the mean sum variables, which were derived from factors, were classified into two classes in which the value < 3,5 indicated disagreement and value ≥ 3,5 showed agreement (See Table 5, Article I). When analyzing predictors for opinions of sufficient pain management, the mean sum variables were classified to three classes (1= <2.5, 2= 2.5-3.5, 3= >3.5). This three-class classification of mean sum variables of the nursing practices (i.e., analgesic treatment practices, emotional methods, physical methods and hip fracture specific methods) was also applied when analyzing the predictors for opinions of sufficient pain management.

Analgesic use (Article III)

Analgesics were classified and their daily doses (DDD) were defined by the Anatomical Therapeutic Chemical Classification (ATC) recommended by the World Health Organization (WHO 2010) (Article III). Accordingly**,** analgesic drugs (Article III) were defined as 1) paracetamol, (ATC-code N02BE), 2) Non-steroidal anti-inflammatory analgesics (NSAID) (M01A) included 2a) coxibs (M01AH) included celecoxib, parecoxib, etoricoxib, and 2b) other NSAIDs, diclofenac, etodolac, ketorolac (M01AB), meloxicam (M01AC), ibuprofen, naproxen, ketoprofen, dexketoprofen (M01AE), mefenamic acid, tolfenaci acid (M01AG), and 3) weak opioids included buprenorphine (N02AE01), codeine combination (N02AA59), tramadol (N02AX02) and 4) strong opioids included morphine (N02AA01), oxycodone (N02AA05) and oxycodone combination (N02AA55), fentanyl (N02AB03).

Open-ended questions in Article III (analgesics use) concerned a) typical doses of each defined analgesic, other analgesic treatments (generic names, trade names, typical doses, and routes), b) typical combinations of analgesics, and c) other pharmacological methods (e.g., spinal or epidural analgesia) in postoperative pain management. The use of adjuvants in pain treatment was not asked. The daily doses of analgesics reported by RNs were converted to their equivalent dose of Defined Daily Doses (DDD) (e.g., 1DDD for oxycodone inj. /inf. solution is 30mg). DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults (WHO 2010).

Adverse effects of analgesics (Article IV)

In a study of RNs' knowledge of the potentially clinically relevant adverse effects of analgesics (Article IV), the analgesics were defined as strong opioids (N02AA01-55, N02AB), weak opioids (N02AA59, N02AE, and N02AX), NSAIDs (M01AB-AH) and paracetamol (N02BE01). The questionnaire consisted of a table of 21 adverse effects concerning four different types of analgesics. The types of analgesics were categorized

according to the Anatomical Therapeutic Chemical Classification System recommended by The World Health Organization (WHO, 2010).

The number of respondents were divided into two groups in order to find out how many correct answers were found in the group with the best overall knowledge (approximately 20% of the nurses) of potentially clinically relevant adverse effects of analgesics (Figure 7). Accordingly, the RNs' group of "the best knowledge of adverse effects of analgesics" included: 1) "All analgesics": 18% (n=49) of RNs with ≥29 correct answers (range 0-32), 2) strong opioids: 19% (n=51) of RNs with 15 correct answers (range 0-15), 3) weak opioids: 22% (n=51) of RNs with ≥10 correct answers (range 0-11), 4) NSAIDs: 26% (n=69) of RNs with 5 correct answers (range 0-5), 5) "paracetamol": 91% (n=243) of RNs with one correct answer (range 0-1).

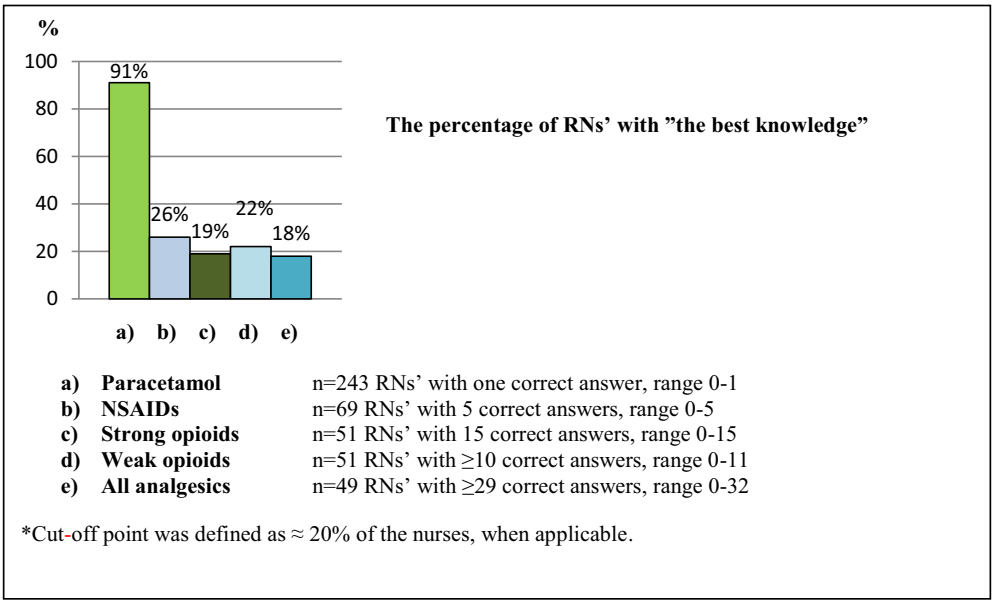

Figure 6. The proportion of RNs' defined to be in the group with the best knowledge.

Classification of the variables when analyzing predictors of sufficient pain management

Reasonable painlessness with slight discomfort or pain relief only at peak periods were combined in the same class in order to perform logistical regression analysis concerning the factors associated with the opinion of sufficient pain management.

4.3 SAMPLES

There are five university hospital districts in Finland. Out of the five districts, four include one hospital and the Helsinki university district (HUCH) includes three hospitals in total. All orthopaedic units in seven university hospitals and ten central hospitals out of fifteen hospitals were included in the study. These included the hospitals of Peijas, Töölö, and Jorvi (HUCH), the university hospitals of Kuopio, Oulu, Tampere, and Turku, and the central hospitals of South Karelia, Tavastia Proper, Central Finland, Kymenlaakso, Lapland, Mikkeli, North Karelia, Päijänne Tavastia, Satakunta, and Vaasa (N=634).

Four central hospitals that had less than one hundred first hip fractures per year in 2009 (National Institute for Health and Welfare, NIHW 2012) were excluded, and one central hospital refused to participate. First hip fractures were used as the inclusion criteria, because it was the only data available on the incidence of hip fractures per hospital and, on the other hand, it was assumed that it would satisfactorly reflect the overall incidences of hip fractures. A hip fracture is classified as first when it is the first hip fracture occurring within the previous ten years (Sund 2007). There were altogether 6126 first hip fractures in the year 2009 (NIHW 2012), which means approximately 88% of total annual number of 7000 hip fractures. The incidence of first hip fracture in hospitals eligible in this study was 4167 (in university hospitals n= 2206 vs. in central hospitals n=1961) in the year 2009. Finally, the 17 hospitals included in this study treated approximately 68% of all of the patients admitted to hospital for first hip fractures in the year 2009 in Finland (NIHW 2012). The mean number of patients' first hip fractures in each hospital included in this study was 315 (Range: 277-918[1]) in university hospitals and 196 (Range: 101-284) in central hospitals accordingly by year 2009 (NIHW 2012). [1]=HUCH (including Töölö, Peijas and Jorvi hospitals).

Contact persons, one head nurse from each orthopaedic unit, distributed the questionnaires and informed the participants. A cover information letter detailing the procedure was attached to the questionnaire to which participants were asked to respond. In April 2011, participants were reminded by the contact persons about filling in the questionnaire. Questionnaire forms were returned to the researcher by prepaid envelopes.

Initially, the questionnaire forms were also sent to the doctors (N=145) in the units, but their response rate was approximately 12% (n=17), and they were thus excluded from the study. Altogether 634 questionnaires were sent to the nurses, including 476 RNs. Nurses' response rates varied significantly between hospitals, ranging from 21% to 88%. The sample of RNS was representative; proportion of RNs respondents was 77% from initial 75% (n=476 RNs; proportion of RNs of the total sample). The response rates were 53% (Article I), 52% (Article II), and 54% (Article III and IV). The response rates per each hospital are presented in Table 13.

Table 13. Response rates of the nurses (N=634)

Hospital	Nursing practices Article I N	n (%)	Barriers Article II N	n (%)	Analgesics use Article III N	n (%)	Adverse effects Article IV N	n (%)
University hospitals	274	159 (59%)	274	158 (59%)	222	127 (57%)	222	127 (57%)
HUCH[1], Jorvi hospital	24	21 (88%)	24	21 (88%)	19	15 (79%)	19	15 (79%)
Oulu	64	44 (69%)	64	44 (69%)	51	36 (71%)	51	36 (71%)
Tampere	32	20 (63%)	32	20 (63%)	25	15 (60%)	25	15 (60%)
Turku	43	27 (63%)	43	26 (60%)	36	23 (64%)	36	23 (64%)
HUCH[1], Peijas hospital	29	14 (48%)	29	14 (48%)	23	12 (52%)	23	12 (52%)
Kuopio	30	12 (40%)	30	12 (40%)	24	11 (46%)	24	11 (46%)
HUCH[1], Töölö hospital	52	21 (40%)	52	21 (40%)	44	15 (34%)	44	15 (34%)
Central hospitals	360	174 (48%)	360	173 (48%)	272	142 (52%)	272	142 (52%)
Vaasa	32	24 (75%)	32	24 (75%)	27	20 (74%)	27	20 (74%)
Lapland	35	24 (69%)	35	24 (67%)	24	21 (88%)	24	21 (88%)
Satakunta	30	20 (67%)	30	20 (67%)	23	17 (74%)	23	17 (74%)
North Karelia	51	27 (53%)	51	27 (53%)	36	21 (58%)	36	21 (58%)
Kymenlaakso	24	12 (50%)	24	11 (46%)	20	8 (40%)	20	8 (40%)
Päijät- Häme	43	20 (47%)	43	20 (47%)	34	15 (44%)	34	15 (44%)
South Karelia	39	16 (41%)	39	16 (33%)	31	13 (42%)	31	13 (42%)
Central Finland	50	19 (38%)	50	19 (36%)	37	18 (49%)	37	18 (49%)
Mikkeli	23	5 (22%)	23	5 (22%)	17	4 (24%)	17	4 (24%)
Tavastia Proper	33	7 (21%)	33	7 (23%)	23	5 (22%)	23	5 (22%)
TOTAL	634	333 (53%)	634	331 (52%)	494	269(54%)	494	267 (54%)

[1]HUCH= Helsinki University Hospital

There was little missing data in this study. When background items were considered, there were only three to five missing values among the characteristics. Three respondents did not mention their occupation, while two answered that they administer medicines. Generally, administration of medicines is mainly RNs' responsibility in specialized health care. The five missing values pertained to contracts, employment arrangement, and work shifts. Work experience in health care and in current units included four missing values from eight separate respondents. When analyzing other background variables, there were between two and eight missing values. The primary aim of pain management had eight missing values and the sufficiency of pain management had seven. These missing values were nearly solely "double answers". For example, when asked about the sufficiency of pain management, one respondent had picked choices of both "pain management is insufficient" and "pain management is sufficient", and had written on the form that the choice depends on the situation and the anesthetic on duty. Nursing practices had approximately 9.89 (mean) missing values (Range 4-17) and barriers to postoperative pain management produced approximately 2.17 (mean) missing values (Range 0-10). Accordingly, the expectations for the enhancement the pain management were as follows: 8.80, range 7-10 and facilitators offered by the employer to overcome barriers in postoperative pain management precautions: 6.75, range 5-9). When transferring the part of qualitative data (i.e., pain scales, analgesics administration route and their daily doses)

to the SPSS, it became apparent that there were much more missing data, because many of the respondents did not answer the open-ended questions at all. For example, in the case of the open-ended question about pain scales in use, there were 231 answers out of the total number of 333 responses.

4.4 THE INSTRUMENT

Because no questionnaire was found to assess postoperative pain management in people with dementia in acute care setting from the viewpoint of nurses, a new questionnaire was developed. The Postoperative Pain Management in Hip Fracture Patients with Dementia scale was developed on the basis of previous studies. The development of the scale was stimulated by a literature review (Appendix 2). The target was to identify what measurements had been used in studies which focused on the postoperative acute pain management in patients with dementia. The review of the nursing practices and barriers to postoperative pain management in hip fracture patients with dementia was conducted during autumn 2010 via the Medline, Cinahl and Cochrane databases. The search terms used to find literature concerning nursing practices in postoperative pain management were combinations of the following search terms: pain management, postoperative, dementia, hip fracture, nurses, pharmacological, and nonpharmacological. Barriers to postoperative pain management were sought via different combinations of the following search terms: barriers, pain management, postoperative, acute, dementia, and older adults (See Appendix 2). Abstracts of articles were found in English, Finnish or Swedish, and the articles were read if they were available in full and had been published in journals with the search terms in the title or in the abstract.

The analgesics groups and their defined daily doses (DDD) reported in Article III were defined by the Anatomical Therapeutic Chemical Classification (ATC) recommended by the World Health Organization (WHO 2010). Potentially clinically relevant adverse effects of analgesics (Article IV) were defined on the basis of existing guidelines, published journals and expert panel of authors. The s Medline, Cochrane, Cinahl and Science Direct databases were used to find articles published between 2005 and 2011. Additional references were identified from the bibliographies of retrieved reports.

The scale contained pharmacological and nonpharmacological pain management practices, pharmacological pain treatment, RNs' knowledge of the adverse effects of analgesics, and the barriers to pain management. In addition, there were questions concerned with the operational prerequisites offered by employers and expectations of nurses to overcome the barriers to postoperative pain management in hip fracture patients with dementia. The first part of the questionnaire focused on demographic information (For detailed information, see Table 15 and Appendix 1), including hospital, gender, age, occupation, work experience in current unit and work experience in health care, contract, employment arrangements and work shifts. Other background information included participation in update training, opinions regarding the primary aim of pain management and the sufficiency of postoperative pain management (See Table 16). In addition, respondents were asked about participation in the administration of analgesics (Appendix 1). Only those who were participating analgesic administration were asked to answer questions about the kinds of analgesics administered and adverse effects of types of analgesics.

4.5 DATA ANALYSIS

The quantitative data were analyzed using SPSS 17.0 (Article I - II) and SPSS 19.0 (Articles III-IV) for Windows®, SPSS Inc., Chicago, IL, USA, and the qualitative data were analyzed using the qualitative data analysis and research software ATLAS.ti 6.2.25. Descriptive statistics were generated about the demographics of the nurses. The normality of distributions was analyzed by the means of a histogram. P-value of < 0.05 was considered to be statistically significant.The structure validity of the subscale "nursing practices in postoperative pain management in hip fracture patients with dementia" (Article I) was evaluated by explorative factor analysis and reliability by the means of Spearman correlation coefficients for both total scale and subscales (Article I and II). The specific research themes, data, analysis and reporting of this study are indicated in Table 14.

Table 14. The research questions, data, analyses and reporting by phases

POSTOPERATIVE PAIN MANAGEMENT PRACTICES			
Research themes	Data	Analysis	Reporting
Nursing practices Relation of the background variables of nurses to the pain management practices	Questionnaire study with open-ended questions to nurses[1] (n=333)	T-test, Analysis of Variance, explanatory factor analysis, Spearman's correlation, qualitative content analysis	Article I
BARRIERS TO POSTOPERATIVE PAIN MANAGEMENT			
Research themes	Data	Analysis	Reporting
Barriers to postoperative pain management Relation of background variables to the identified barriers Expectations on behalf of nurses and facilitators offered by employer as overcoming the barriers	Questionnaire study with open-ended questions to nurses[1] (n=331)	T-test, Analysis of Variance, Spearman's correlation, qualitative content analysis	Article II
ANALGESICS IN POSTOPERATIVE CARE			
Research themes	Data	Analysis	Reporting
Analgesic use during first two postoperative days The main goal in postoperative pain management	Questionnaire study with open-ended questions to RNs (n=269)	χ^2-test, Mann-Whitney U-test, Kruskal-Wallis-test, qualitative content analysis	Article III
NURSES' KNOWLEDGE OF ADVERSE EFFECTS OF ANALGESICS			
Research themes	Data	Analysis	Reporting
Nurses' knowledge of adverse effects of analgesics Predictors of the best knowledge of adverse effects of analgesics	Questionnaire study to RNs (n=267)	Logistic regression analysis	Article IV
PREDICTORS OF THE OPINION OF SUFFICIENT PAIN MANAGEMENT			
Research theme	Data	Analysis	Reporting
Factors that predicts the opinion of sufficient postoperative pain management	Questionnaire study to nurses[1] (n=333)	Logistic regression analysis	Thesis

[1]nurses= head nurses, staff nurses, registered nurses and practice nurses

Postoperative pain management practices in patients with dementia (Article I)

The Two Independent Samples T-test and Analysis of Variance were used to investigate whether there were significant differences in the responses of the nurses based on background variables. The pain management practices among 333 nurses were

investigated by calculating the percentages of the extent of opinions. The two open-ended questions (other non-pharmacological pain management practices and use of pain scales) were analyzed and the qualitative content analysis was performed by categorizing the data to different subcategories. Subsequently, another open-ended question "which pain scales do you use when assessing postoperative pain in patients with a hip fracture and dementia?" was quantified by modifying it to SPSS-data. Although qualitative researchers have tended to avoid any use of numbers (Burns & Grove 2009), comparing insights with numbers can be a good method of verification (Miles & Huberman 1994). Factor analysis was performed to refine the subscales (as a part of the scale development) and to investigate underlying factor structure in each subscale (Burns & Grove 2009). The Explanatory Factor analysis was conducted with Varimax rotation. Kaiser-Meyer-Olkin measure of sampling adequacy was 0,760, and thus items were retained. One item ("giving pain medication") was deleted before performing the factor analysis, because item-total correlation was below 0.2. The four-factor solution explained 53.8% of the total variance. The first factor explained 23.4%, the second factor 11.6%, the third factor 10.6% and the fourth factor 8.2% of the total variance. The findings indicated that the first factor related to analgesic treatment practices in pain relieving, the second to emotional pain relieving methods, the third to the different physical manners in pain management, and the fourth to specific postoperative pain management practices in patients with dementia.

Barriers to postoperative pain management in hip fracture patients with dementia (Article II)
Percentages were used to report the respondents' demographics. Since the data was normally distributed, and comparisons were being performed between two or more independent samples, the two independent samples T-test (for dichotomous variables), and analyses of variance, for analyzing differences between more than two samples, were applied. The open-ended questions were analyzed with qualitative content analysis by a principal researcher. The goal of the qualitative analysis was to allow a comprehensive description of perceived barriers, expectations, and facilities offered by employers from the viewpoint of nurses. The analysis focused both on visible, obvious components, referred to as manifest content, and latent content, which meant dealing with relationship aspects, and involved interpretation of the underlying meaning of the text (Garneheim & Lundman, 2004).

Analgesics in postoperative care among hip fracture patients with dementia (Article III)
Data analyses were primarily descriptive. Differences in the use of analgesic types and their proportions of DDDs between university and central hospitals were analyzed by using the χ^2-test if the expected count was over 5 in at least 20% of cells, and, otherwise, by using the Mann-Whitney U-test. Differences between nurses' characteristics and the primary aim and sufficiency of pain management were analyzed by Mann-Whitney U-test or Kruskal-Wallis test. The qualitative content analysis was performed by ATLAS.ti 6.2.25 software by grouping responses of open-ended questions under common categories. After content analysis, the qualitative data concerning "daily doses of analgesics" and "other pharmacological pain treatment" were entered into the SPSS data file to aid quantitative analysis. The goal of the qualitative analysis of open-ended questions concerning "primary aim of pain management" and "challenges in postoperative pharmacological pain relief" in hip fracture patients with dementia was to allow a comprehensive description from the viewpoint of nurses. Different issues were grouped under each category (Graneheim & Lundman 2004).

Nurses' knowledge of the adverse effects of analgesics (Article IV)

Logistic regression analysis with the Wald-forward method was used to determine which variables predicted the best knowledge of potentially clinically relevant adverse effects of all adverse effects, strong opioids, weak opioids, NSAIDs and paracetamol. Logistic regression is based on the assumption that a logistic relationship (i.e., a sigmoidal dependency) exists between the probability of group membership and one or more predictor variables (Worth & Cronin 2003). Odds ratio (OR, 95% confidence interval) was used to analyze deviations in knowledge of clinically significant adverse effects of analgesics. The variables included type of hospital (university hospital vs. central hospital), contract (permanent vs. deputy), employment arrangements (full time vs. part time), work shifts (daytime or two shift work vs. three shift work or night work), age, work experience in health care and work experience in current unit.

Predictors of the opinion of sufficient pain management

The logistic regression analysis Wald-forward method was applied in order to analyze which variables predict the opinion that postoperative pain management is sufficient in hip fracture patients with dementia during initial two postoperative days. The variables included type of hospital (university hospital vs. central hospital), contract (permanent vs. deputy), employment arrangements (full time vs. part time), work shifts (daytime or two shift work vs. three shift work or night work), age, work experience in health care, work experience in current unit, the primary aim of postoperative pain management in hip fracture patients with dementia (complete pain relief/ slight pain, which does not prevent normal functioning/ Reasonable painlessness with slight discomfort or pain relief only at peak periods), participating in update training (yes/no), status (nurse manager vs. other nurses). Other variables included barriers to pain management (including 23 variables) and expectations on behalf of nurses (five variables), facilitators offered by employer (four variables) to overcome barriers in postoperative pain management in hip fracture patients with dementia. In addition, nursing practices in pain management (analgesic treatment practices (seven variables), emotional support (three variables), physical methods (three variables) and hip fracture specific methods (three variables) were included.

The significant variables associated with the opinion of the sufficiency of pain management

Differences in individual variables (altogether 48 variables) and between opinions that pain management is insufficient and pain management is sufficient were analyzed by means of χ^2-test if expected count was over 5 in at least 20% of cells, and otherwise by using the Mann-Whitney U-test.

Qualitative content analyses

Initially, when creating visible content, inductive content analysis was performed in first (nursing practices) and second part (barriers to pain management) of the study, in order to achieve clear interpretation, without previous theoretical expectations. Similar categories were classified together. Typically, related sentences were used as the unit of analysis. In the second phase of the analysis, when creating the latent content to the analysis, deductive interpretation was performed based on previous knowledge and literature about the content. When searching latent meaning within text, it cannot be analyzed by directly identifying specific terms (Burns & Grove 2009). The open-ended question regarding the pain scales used in the unit was transferred to the SPSS for Windows in order to conduct quantitative analyses. When analysing the unit of meaning was pain scale(s) mentioned in quotation. When analysing open-ended question about defined daily doses (DDD) of analgesics, the unit of meaning was the total dose administered to the

patient within 24 hours. These doses were converted to DDDs' in order to achieve comparable data for daily doses before transferring it to SPSS data. All the qualitative analyses were performed using ATLAS.ti 6.2.25.

4.6 ETHICAL CONSIDERATIONS

Conducting research ethically starts with the identification of the study topic and continues throughout the process up to the publication of the study (Burns & Grove 2009). The principles of research ethics were followed at every phase of this study (World Medical Association 2008; European Commission 2007). This study is ethically legitimate, as proper pain management includes subjects' rights and patients with dementia belong to a vulnerable patients group. When patients are particularly vulnerable, as is with patients with dementia, the viewpoint of nurses is highlighted in guaranteeing the quality of pain management and advocating proper pain treatment. On the other hand, it has been proved that there are many deficits in the pain treatment of this patient group. The study can also be justified because there are no previous studies of this topic in Finland.

This study was approved by the hospital district of Northern Savonia's Committee on Research Ethics (permission number 83/2010), and permission to conduct the study was obtained separately from each hospital according to their individual procedures.

The cover letter included information about the aim of the study, research problems and participatory volunteering and how the anonymity was guaranteed (Burns & Grove 2009). When analyzing data, no such information was given through which respondents could be identified. In addition, the hospital that refused to participate was not named in this thesis.

The study was financially supported by non-commercial funding sources. There were no conflicts of interest of the author in interpreting and reporting the findings.

5 Results

5.1 CHARACTERISTICS OF THE STUDY PARTICIPANTS

The majority of the participants (Articles I-IV; n=267-333), were female registered nurses working with permanent full time contract of employment in three-shifts having over five years work experience in health care. Approximately one third of the nurses had work experience of less than five years in their current unit. The detailed characteristics of the study (I-IV) participants are presented in Table 15

Table 15. Characteristics of the respondents in articles I-IV (n, %).

Characteristics		**Nursing practices** Article I **n= 333** n (%)	**Barriers** Article II **n= 331** n (%)	**Analgesic use** Article III **n= 269** n (%)	**Knowledge of Adverse Effects** Article IV **n=267** n (%)
Type of hospital					
	University hospital	159 (48)	157 (47)	127 (47)	126 (47)
	Central hospital	174 (52)	174 (53)	142 (53)	141 (53)
Occupation					
	Head nurse	7 (2)	7 (2)	na	na
	Staff nurse	16 (5)	16 (5)	15 (6)	15 (6)
	Registered nurse	253 (77)	253 (77)	254 (94)	252 (94)
	Practice nurse	50 (15)	50 (15)	na	na
	Other[1]	4 (1)	4 (1)	na	na
Gender	Female	317 (95)	316 (95)	258 (96)	257 (96)
	Male	16 (5)	15 (4)	11 (4)	10 (4)
Age					
	< 36 years	118 (36)	118 (36)	103 (38)	103 (39)
	36-50 years	123 (37)	122 (37)	104 (39)	102 (38)
	51-65 years	89 (27)	88 (27)	61 (23)	61 (23)
Work experience in current unit					
	< five years	113 (34)	113 (35)	94 (36)	93 (35)
	5-15 years	124 (38)	123 (38)	110 (41)	109 (41)
	> 15 years	92 (28)	91 (28)	61 (23)	61 (23)
Work experience in health care					
	< five years	46 (14)	46 (14)	37 (14)	37 (14)
	5-15 years	131 (40)	131 (40)	118 (44)	117 (44)
	> 15 years	152 (46)	151 (46)	111 (42)	111 (42)
Contract	Permanent	268 (82)	266 (82)	217 (82)	215 (82)
	Deputy	60 (18)	60 (18)	47 (18)	47 (18)
Employment arrangement					
	Fully time	290 (88)	289 (88)	217 (82)	234 (88)
	Part time	40 (12)	39 (12)	47 (18)	31 (12)
Work Shifts					
	Daytime work	18 (6)	18 (6)	5 (2)	5 (2)
	Two-shift work	38 (12)	37 (11)	33 (13)	32 (12)
	Three-shift work	267 (80)	266 (82)	223 (84)	223 (85)
	Night work	5 (2)	5 (2)	3 (1)	3 (1)

[1]Other: three students and a physiotherapist

Over half of the participants were of the opinion that postoperative pain management is sufficient in hip fracture patients with dementia (Table 16). The majority of the nurses also

agreed that slight pain that does not prevent normal functioning, is the primary aim of postoperative pain management. The majority of the nurses also agreed that slight pain that does not prevent normal functioning, is the primary aim of postoperative pain management. 6% of the nurses had participated in update training.

Table 16. Sufficiency, primary aim of pain management and participating in update training (Articles I-IV).

Background variable	**Nursing practices** Article I n= 333 n (%)	**Barriers** Article II n= 331 n (%)	**Analgesic use** Article III n= 269 n (%)	**Knowledge of Adverse Effects** Article IV n=267 n (%)
Sufficiency of postoperative pain management in hip fracture patients with dementia				
Pain management is sufficient	172 (53)	172 (53)	138 (53)	138 (53)
Pain management is insufficient	154 (47)	152 (47)	123 (47)	123 (47)
The primary aim of postoperative pain management in hip fracture patients with dementia				
Complete pain relief	84 (26)	84 (26)	59 (22)	59 (23)
Slight pain which does not prevent normal functioning	222 (68)	220 (68)	189 (72)	187 (71)
Reasonable painless with slight discomfort	11 (3)	11 (3)	10 (4)	10 (4)
Pain relief only at peak periods	8 (3)	8 (3)	5 (2)	5 (2)
Participating in update training	20 (6)	20 (6)	17 (6)	17 (6)

In the open-ended question concerning the primary aim of postoperative pain management in hip fracture patients with dementia, the reasons nurses gave for choosing either "complete pain relief" or "slight pain which does not prevent normal functioning" were quite similar. Both groups stated that, in practice, a completely painless state is unrealistic to achieve. They justified this point with a view that a completely painless situation means that a patient with dementia has received such an amount of analgesia that functional recovery is not achieved due to the inability to walk, which is a consequence of the adverse effects of analgesics. Some of the nurses also noted that although a completely painless state is a preferred goal, some pain, caused by movement, occurs nearly without exception. Nurses stated in the open-ended question that pain functions as a warning signal by preventing the complications from inappropriate stress injury in the operated leg. They also argued that patients with dementia have the same rights for pain treatment as cognitively intact patients. The opinion for the first or second choice seemed to depend on whether the nurse made a distinction between the idealistic goal and what was realistic to achieve in practice. According to the open-ended question, the reasons nurses gave for choosing either "complete pain relief" or "slight pain which does not prevent normal functioning" for primary aim of pain management were quite similar.

When comparing characteristics in nurses between sufficiency of pain management (pain management is insufficient vs. pain management is sufficient) there were no significant differences in opinions between type of hospital, occupation, genders, contracts or work shifts. Significant differences were found in age groups, work experience in health care and in current unit. Nurses younger than 36 years, and those with less than five years of work experience in their current unit or in health care, stated significantly more often that pain management is sufficient in hip fracture patients with dementia as compared with other groups (See Table 17).

Table 17. Significant differences between characteristics and opinions of the sufficiency of pain management. n=333 (n, %)

Characteristic	**Pain management**		P-Value[2]
	insufficient	**sufficient**	
	n (%)	n (%)	
	154 (47)	172 (53)	
Age n=323			0.046
< 36 years	44 (38)	72 (62)	
36-50 years	61 (51)	58 (49)	
>50 years	47 (53)	41 (47)	
Work experience in current unit n=322			0.010
< five years	41 (37)	69 (63)	
5-15 years	58 (48)	62 (52)	
> 15 years	54 (59)	38 (41)	
Work experience in health care n=322			0.001
< five years	14 (30)	32 (70)	
5-15 years	51 (40)	76 (60)	
> 15 years	87 (58)	62 (42)	

5.2 POSTOPERATIVE PAIN MANAGEMENT PRACTICES (ARTICLE I)

Data concerning current pain management practices was collected from 333 nurses via questionnaire. The response rate to the questionnaire was 53%.

As a result of explanatory factor analysis, a four-factor solution was found (For detailed information see Article I). The first factor was related to analgesic treatment practices in pain relieving, the second to emotional pain relieving methods, the third to different physical means in pain management, and the fourth to specific post-operative pain management practices in patients with dementia.

The results (Table 18) indicate that preferred methods in pain management among nurses in their units were "hip-fracture specific pain management practices", i.e., repositioning, helping with daily activities and cold applications. The most common analgesic administration practices included providing pain medication prior to painful events, before physical activity and regularly. The agreement of opinion on the idea that the effects of analgesic were assessed and documented was 73%. Quieting and consoling (85%) was the most popular method among "Emotional support" and presence when the patient seemed to be in pain (42%) was the least common practice. "Physical methods" including music (6%) and heat therapy (17%) were not preferred as pain relieving methods.

Table 18. Nursing practices in postoperative pain management in hip fracture patients with dementia (n=333)

Variable	Disagree %	NAND[1] %	Agree %	Factor loading[2]
Analgesic treatment practices (Factor 1)				
Providing pain medication prior to painful events (n=323)	2	2	96	0.711
Providing pain medication regularly (n=323)	2	2	96	0.472
Providing pain medication prior to physical activity (n=322)	3	3	94	0.659
Administering analgesics around the clock (n=321)	4	3	93	0.416
Assessment and documentation of effects of analgesics (n=320)	12	15	73	0.559
Assessment for pain at least every four hours (n=316)	18	13	69	0.353
Assessing pain by means of pain scales (n=312)	51	18	31	0.374
Emotional support (Factor 2)				
Quieting and consoling (n=323)	4	11	85	0.745
Soothing, supportive touch (n=327)	16	13	71	0.688
Presence when patient seems to be in pain (n=329)	31	27	42	0.551
Physical methods (Factor 3)				
Peaceful and comfortable environment (n=324)	35	27	38	0.552
Heat therapy (*e.g.*, heat patches) (n=318)	69	14	17	0.613
Music (n=326)	88	6	6	0.680
Hip-fracture specific methods (Factor 4)				
Repositioning (n=325)	0	0	100	0.602
Helping with daily activities (n=327)	1	2	97	0.773
Using cold therapy for pain relief (n=326)	3	4	93	0.328

[1]NAND= Neither disagree nor agree, [2]derived from five point Likert-scale

Permanent staff considered that the use of "physical methods" was more uncommon among them than with deputy personnel (p=0.043). Those who were employed full time (p=0.006) agreed that "hip fracture specific methods" were used more often when compared with those working part time. The largest number of differences regarding pain management practices could be seen between those working in different hospitals.

When analyzing the open-ended questions, a clear pattern of meaningful communication in pain management practices emerged. The nurses highlighted that patients with dementia need specifically peaceful work approaches in order to create feelings of comfort and peace. Appropriate information about what is going to happen next and informing about the cause of pain were also seen as a part of pain management. Positive interaction included humor and trying to get the patient to move by singing together. The presence of relatives was also highlighted as aiding in getting the patient feel more peaceful. The nurses mentioned that patients with dementia need a particularly peaceful environment with small patient rooms. Moreover, some respondents named concrete suggestions, such as a proper lifting technique, mobilization and, in case of problems with swallowing, using an appropriate method for giving analgesics to enhance pain management. Different problems in nonpharmacologic pain management were often mentioned. Lack of resources and time to use nonpharmacological pain relieving methods and insufficient staffing were among problems related to pain management, and the absence of means emerged in some comments. Some of the nurses mentioned that nonpharmacological methods are ineffective in postoperative pain management and there is no evidence of the effectiveness of certain therapies, such as TENS or heat therapy.

When analyzing the open-ended question: "What kind of pain scales do you use in pain assessment in patients with hip fracture and dementia?" the most often mentioned pain scale was VAS (75 related quotations). VRS (0-4 verbal rating scale) was mentioned in 66 quotations, general behavioral assessment in 83 quotations and common verbal assessment in 60 quotations. There were altogether 348 quotations in 231 comments.

5.3 BARRIERS TO POSTOPERATIVE PAIN MANAGEMENT (ARTICLE II)

According to nurses, the biggest barrier in pain management was the difficulty in assessing pain owing to a patient's cognitive impairment (86%). Other barriers were patients not wanting to bother nurses or doctors and their willingness to put up with pain. There were statistically significant differences between the sufficiency of pain management and barriers. Those who expected pain management to be insufficient identified more barriers than those who expected pain management to be sufficient ($p<.001$).

Insufficient documentation of the effects of analgesics (48%), difficulties assessing pain owing to a hearing deficit (45%), and not knowing pain levels owing to inadequate time spent with patients with dementia (52%) were among the most often identified barriers to pain management (Figure 7).

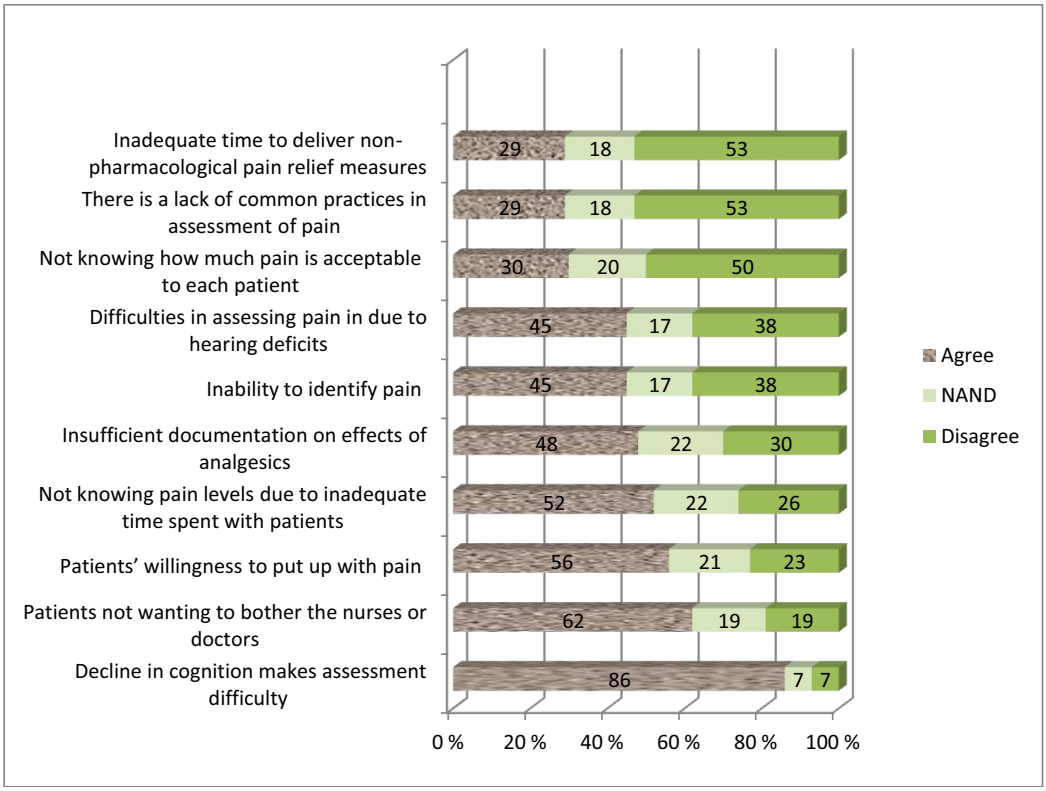

Figure 7. The most commonly identified barriers to pain management (%)

Availability of pain experts, nonpharmacologic pain relief measures unavailable as supplements to analgesics and difficulties in assessing pain due to visual deficits were among the most seldom identified barriers (Figure 8). Nurses' reluctance to give patients sufficient pain medication (23%) and physicians' reluctance to prescribe adequate pain relief (22%) were also among most seldom identified barriers to pain management. Instead the patients' reluctance to take pain medication (30%) owing to a fear of overmedication was more often reported as a barrier to pain management.

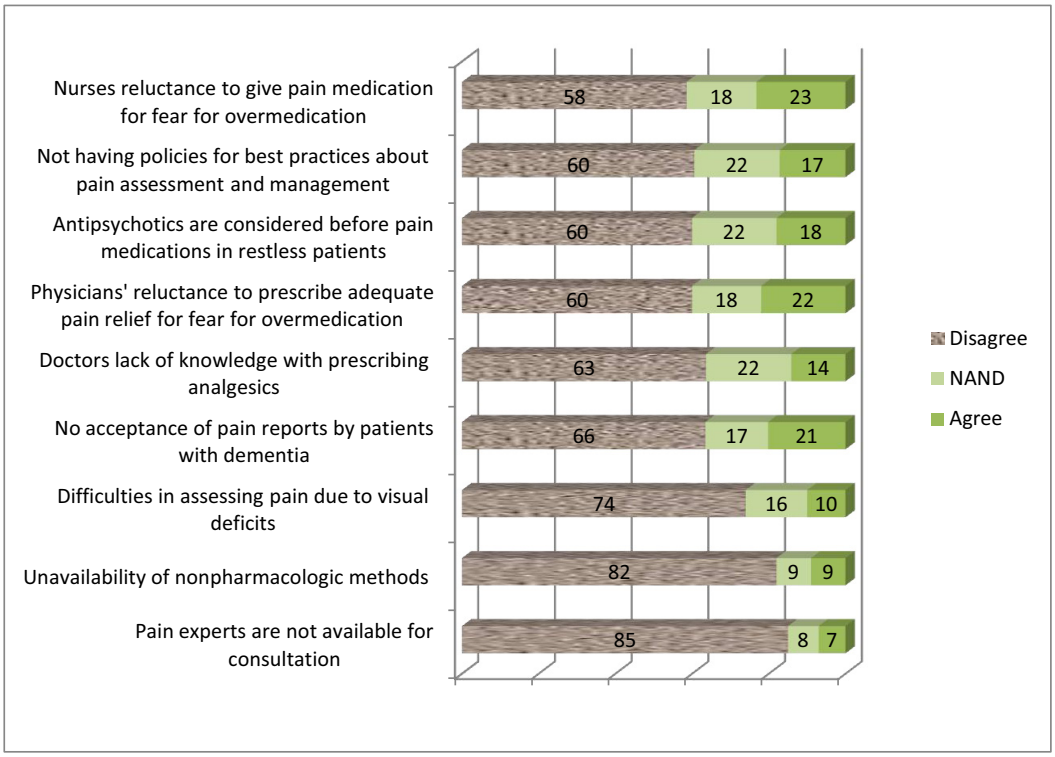

Figure 8. The most seldom identified barriers to pain management (%)

Nurses also reported their expectations regarding improving pain management. They expected adequate staffing, updating education, consistent practices, guidelines, and enhanced multiprofessional cooperation. The facilitators offered by employers were mostly related to the availability of updating education (46%) and implementation of new directions concerning pain management (54%). Nearly one half (47%) of the respondents had the opinion that lack of resources is the challenge in developing pain management.

Other barriers to postoperative pain management in hip fracture patients with dementia were asked about with an open-ended question (Table 19).

Table 19. Patient-related barriers to postoperative pain management in hip fracture patients with dementia as a result of an analysis of the open ended-question

Potential patient related barriers to pain management in hip fracture patients with dementia	**Behavior**	**Consequences**
Problems with swallowing	Inability to swallow oral analgesics.	Risk for undertreated pain.
Confusion	Resisting care. Trying to rip out the intravenous cannula or epidural cathethers.	Risk for extra pain or cessation of pain medication. Risk for using physical restraints.
Coexisting diseases	Exposion to polypharmacy.	Challenges in analgesics administration.
Memory loss	Patient does not undertand the meaning of care procedures.	Patient feel anxious→ higher pain intensity Exposion to painful situations, e.g., they may try to walk immediately after operation and are then exposed to falls and painfull situations.

According to the open-ended question, some expectations on the enhancement of postoperative pain management were related to appropriate and sufficient analgesic administration. Nurses mentioned that guaranteeing the continuity of pain management is challenging, because patients' length of stay is short and patients suffer from many comorbidities. There was a desire for more updating education concerning the special characteristics of pain assessment in patients with dementia. Facilitators offered by employers were mostly related to the availability of consultation with anesthetists and nurses in charge of pain management. Other facilitators mentioned included cooperation and dealing with workplace experiences. The availability of updating education was also named, but some nurses mentioned that, in practice, it is not actually available for many reasons, such as that it is mostly intended for pain experts and, on the other hand, there is a lack of time and shortage of deputy personnel.

5.4 PHARMACOLOGICAL PAIN TREATMENT (ARTICLE III)

Paracetamol and strong opioids administered orally or parenterally seemed to be the most typical of postoperatively-used types of analgesics in patients with dementia. NSAIDs and weak opioids were also commonly reported to be in use. There were no statistically significant differences between hospitals regarding typical daily doses.

All nurses reported administration of paracetamol and strong opioids. Altogether 79% of nurses reported administration of NSAIDs and 65% reported weak opioids.

Orally and intravenously administered oxycodone was the most commonly used strong opioid. Using combination tablets containing codeine and paracetamol was reported by over half of the nurses. Fentanyl and buprenorphine patches were also used, but only in a few hospitals. Oral administration was the most commonly reported method.

The most typical daily dose of paracetamol was 1 DDD=3g administered by oral and parenteral route. The typical mean dose of oral Oxycodone was 0.18-0.34 DDDs, which is 14-26 mg. Nurses only reported oxycodone infusion/injection solutions as single doses.

In total, 245 nurses reported use of different combinations of analgesics. Concomitant use of oxycodone and paracetamol (52%, n=127) was most often reported. Concomitant use of a combination of oxycodone, paracetamol, and ibuprofen was reported by nearly one third of the nurses (31%, n=75).

Epidural analgesia was reported to be used by 46% (n=124) of the total number of 269 nurses included in this study. However, 33 of them reported epidural analgesia to be infrequently in use. Instead, spinal analgesia (6%, n=15) and femoral nerve block (5%, n=12) were only rarely reported.

5.5 NURSES' KNOWLEDGE OF ADVERSE EFFECTS OF ANALGESICS (ARTICLE IV)

Registered nurses recognized nausea (99%), confusion (98%), drowsiness (95%), respiratory depression (96%), and constipation (93%) mostly as potential clinically relevant adverse effects of strong opioids (Table 20). Failure of liver function associated with paracetamol was also well known (91%), as well as GI (gastrointestinal) irritability (95%), gastric ulcer (93%) and bleeding (89%) with NSAIDs. Instead, the risk for fluid retention (41%) and cardiac insufficiency (34%) were more seldom identified with NSAIDs. Registered nurses reported the potential adverse effects of weak opioids to be quite similar as those in strong opioids. Median knowledge of potentially clinically relevant adverse effects associated with the analgesic types was one in the group of paracetamol (100%, range 0-1), while there were 13 correct answers in the strong opioid group (87%, range 0-15), eight correct answers regarding weak opioids (73%, range 0-11), and three correct answers regarding NSAIDs (60%, range 0-5). The proportion of registered nurses who knew all of the defined potentially clinically relevant adverse effects was in a group of paracetamol 91%, NSAIDs 26%, strong opioids 19% and weak opioids 13%. The numbers of no correct answers about potentially clinically relevant adverse effects of analgesics were in a group of paracetamol 8.6% (n=23), weak opioids 6.0% (n=16), NSAIDs 2.2% (n=6) and strong opioids 0.4 % (n=1).

Table 20. The number of circulated responses of potential adverse effects of types of analgesics in patients with dementia as identified by nurses (n=267) (Article III)

Adverse effect	Strong opioids		Weak opioids		NSAIDs		Paracetamol	
	n	%	n	%	n	%	n	%
Hyperemesis/nausea	**264**	**99**	**210**	**79**	35	13	11	4
Confusion	**261**	**98**	**204**	**76**	4	2	2	1
Drowsiness	**253**	**95**	**194**	**73**	15	6	11	4
Respiratory depression	**255**	**96**	101	38	1	0	2	1
Constipation	**249**	**93**	**192**	**72**	13	5	9	3
Hallucination	**244**	**91**	**179**	**67**	1	0	2	1
Nightmares	**239**	**90**	**167**	**63**	3	1	5	2
Cognitive disorder	**217**	**81**	**138**	**52**	3	1	2	1
Dependence	**207**	**78**	**137**	**51**	11	4	6	2
Delirium	**203**	**76**	**111**	**42**	0	0	2	1
Lack of appetite	**202**	**76**	**153**	**57**	54	20	14	5
Itching	**196**	**73**	101	38	50	19	26	10
Increase in tolerance	**179**	**67**	**139**	**52**	29	11	24	9
Urinary retention	**168**	**63**	105	39	42	16	3	1
Lifted mood	**133**	**50**	94	35	4	2	8	3
Cardiac insufficiency	42	16	16	6	**91**	**34**	5	2
Gastrointestinal irritability	24	9	19	7	**254**	**95**	15	6
Gastric ulcer	18	7	12	5	**247**	**93**	11	4
Fluid retention	21	8	8	3	**109**	**41**	12	5
Failure of liver function	6	2	7	3	39	15	**244**	**91**
Bleeding	1	0	1	0	**237**	**89**	11	4

The bolded numbers are defined as potentially clinically relevant adverse effects

Certain adverse effects which were not defined in this study as to be associated with weak opioids were identified quite often. These adverse effects included respiratory depression (38%), itching (38%), urinary retention (39%) and lifted mood (35%).

Five separate logistic regression analyses with best knowledge of potentially clinically significant adverse effects of different types of analgesics (all analgesics, strong opioids, weak opioids, NSAIDs, paracetamol) were performed. According to these logistic regression analyses, younger age predicted best knowledge of potentially clinically relevant adverse effects of strong opioids (OR 0.97, 95% CI 0.94–1.00) or weak opioids (OR 0.96, 95% CI 0.93-0.99). When comparing university hospitals and central hospitals, working in a university hospital (OR 2.08, 95% CI 1.16-3.73) predicted the best knowledge of potentially clinically relevant adverse effects of NSAIDs. Work experience in the current unit (OR 1.11, 95% CI 1.02-1.20) was associated with the best knowledge of potentially clinically relevant adverse effect of paracetamol. Contract, employment arrangements, work shifts and work experience in health care were not statistically significant in any logistic regression model.

5.6 THE MODEL OF SUFFICIENT PAIN MANAGEMENT

The model for nurses' opinion that pain management in hip fracture patient is sufficient was created by analyzing the variables associated with this opinion (Table 21). According to the logistic regression analysis, applying "analgesics treatment practices" in the current unit (OR 3.64, 95% CI 2.02-6.55) was most significantly related with the opinion that "pain management is sufficient". The primary aims "Slight pain which does not prevent normal

functioning" and "Reasonable painlessness with slight discomfort or pain relief only at peak periods" were significantly associated with nurses' opinion of sufficient postoperative pain management in hip fracture patients with dementia (OR 2.14, 95% CI 1.16–3.97 vs. OR 2.51, 95% CI 0.75- 8.40) as compared with the opinion of the primary aim of "complete pain relief". Decrease in work experience in the current unit (OR per 1 years decrease) (OR 0.96, 95% CI 0.94-0.99) was significantly associated with the opinion that pain management is sufficient (Table 18). Less often identified barriers (OR 0.43, 95% CI 0.24-0.78) and less expectations on behalf of nurses to overcome barriers to postoperative pain management were also significantly related with the opinion of sufficient pain management (OR 0.96, 95% CI 0.26-0.80). Type of hospital, age, contract, employment arrangements, work shifts and work experience in health care were not statistically significant in the logistic regression model. Accordingly, in addition to the use of pain scales in units, facilitators offered by employer and such nursing practices as emotional support, physical methods and hip fracture specific methods were neither statistically significant in logistic regression model.

Table 21. Variables associated with the opinion of sufficient pain management in hip fracture patients with dementia

Variable	**OR**	**95% CI**	**P- Value**
Primary aim of postoperative pain management			
Complete pain relief	1		0.045
Slight pain which does not prevent normal functioning	2.14	1.16-3.97	0.016
Reasonable painlessness with slight discomfort or pain relief only at peak periods	2.51	0.75-8.40	0.136
Work experience in current unit (OR per 1 years increase)	0.96	0.94-0.99	0.018
Expectations on behalf of nurses	0.46	0.26-0.80	0.006
Barriers to postoperative pain management	0.43	0.24-0.78	0.005
Analgesic treatment practices	3.64	2.02-6.55	<0.001

Complete pain relief was significantly more frequently the primary aim of postoperative pain management in hip fracture patients with dementia, as it was the main goal of the total of 33% of the nurses who reported that pain management was insufficient, whereas total painlessness was reported to be the main goal of 20% of the nurses, who reported that pain management was sufficient (P=0.013). On the other hand, the nurses who reported that pain management was sufficient more frequently had the main goal of attaining a state of "slight pain which does not prevent normal functioning" in comparison with nurses who reported that pain management was insufficient (74% vs. 61%, P=0.012). See Table 22.

Table 22. The primary aim of postoperative pain management and the opinion of sufficiency of pain management (n, %)

Primary aim	**Pain management** **insufficient** n (%)	**sufficient** n (%)	P-Value[1]
Complete pain relief (n=83)	49 (33)	34 (20)	0.013
Slight pain which does not prevent normal functioning (n=217)	92 (61)	125 (74)	0.012
Reasonable painlessness with slight discomfort or pain relief only at peak periods (n=19)	10 (7)	9 (5)	n.a.[2]

[1] χ^2-test, [2] n.a.=not applicable

According to the results of the factor analysis, "analgesic treatment practices" also included variables which related to the assessment of pain, in spite of variables containing certain analgesics treatment practices, such as administering analgesics around the clock and frequently. Those who reported pain management as sufficient were more likely to have the opinion that such "analgesics treatment practices" as assessment for pain at least every four hours (80% vs. 60%, $p < 0.001$), assessment and documentation of effects of analgesics (83% vs. 60%, $P < 0.001$), and assessing pain by means of pain scales (40% vs. 21%, P= 0.001), were applied in their units as compared with those who reported that pain management was insufficient. They were also significantly less likely to share the opinion that there is lack of common practices in the assessment of pain (17% vs. 34%, P<0.001). (Table 23).

Table 23. The significant analgesic treatment practices associated with the opinion of the sufficiency of pain management (n, %)

Analgesics treatment practices	**Pain management** **insufficient**			**sufficient**			
	Disagree n (%)	NAND[1] n (%)	Agree n (%)	Disagree n (%)	NAND[1] n (%)	Agree n (%)	P-Value[2]
Analgesics treatment practices							
Assessment of pain at least every four hours (n=310)	37 (25)	22 (15)	87 (60)	19 (12)	14 (9)	131 (80)	<0.001
Assessment and documentation of the effects of analgesics (n=313)	29 (20)	29 (20)	88 (60)	11 (7)	17 (10)	139 (83)	<0.001
Assessing of pain by means of pain scales (n=310)	85 (59)	28 (20)	30 (21)	74 (44)	26 (16)	67 (40)	0.001

[1] NAND= neither disagree nor agree, [2] χ^2-test

The only found significant patient-related barrier was the inability to identify patients' pain, which was more often related to the opinion of insufficiently treated pain than among nurses who agreed with the view that pain management was sufficient (agree: 54% vs. 39%, P= 0.013). Physicians' reluctance to prescribe adequate pain relief due to a fear of overmedication (31% vs. 15%, P= <0.001) or nurses' (33% vs. 16%, P= 0.001) reluctance to give pain medication due to fear of overmedication were approximately two times more often the identified barrier to pain management among nurses who shared the opinion that pain management was insufficient in comparison with those who felt that pain management was sufficient. Physicians lack of knowledge about prescribing analgesics was significantly more often identified as a barrier to pain management among nurses

with the opinion of insufficient pain management (20% vs. 7%, P=0.001). Inconsistent instructions about the administration of requested analgesics were significantly associated with the opinion of insufficient pain management (22% vs. 13%, P= 0.047). The opinion of insufficient pain management was also significantly associated with the identified barrier of antipsychotic use before pain medication in restless patients (24% vs. 13%, P= 0.020). Lack of documented pain treatment plans for each patient (36% vs. 16%, P<0.001) and insufficient documentation of the effects of analgesics (68% vs. 34%, P<0.001) were also significantly associated with the opinion of insufficiently treated pain. Inadequate time to deliver nonpharmacologic pain relief measures (36% vs. 24%, P=0.010) and not knowing pain levels because of inadequate time spent with patients (41% vs. 20%, P= >0.001) were significantly associated to the opinion of insufficient pain management. Lack of common practices in the assessment of pain was also significantly associated with the opinion of insufficient pain management (34% vs. 17%, P= <0.001). (See Table 24).

Table 24. The significant barriers to postoperative pain management in hip fracture patients with dementia associated to the opinion of sufficiency of pain management (n, (%)

Barriers to pain management	**Pain management insufficient**			**sufficient**			
	Disagree n (%)	NAND[1] n (%)	Agree n (%)	Disagree n (%)	NAND[1] n (%)	Agree n (%)	P-Value[2]
Patient related barriers							
Inability to identify pain due to cognitive impairment (n=322)	46 (30)	24 (16)	82 (54)	77 (45)	27 (16)	66 (39)	0.013
Caregiver related barriers							
Physicians' reluctance to prescribe adequate pain relief for fear of overmedication (n=324)	74 (49)	31 (20)	47 (31)	122 (70)	25 (15)	25 (15)	<0.001
Physicians' lack of knowledge about prescribing analgesics (n=315)	84 (57)	35 (24)	29 (20)	123 (74)	32 (19)	12 (7)	0.001
Nurses' reluctance to give pain medication for fear for overmedication (n=324)	74 (49)	28 (18)	50 (33)	113 (66)	31 (18)	28 (16)	0.001
Antipsychotic are considered before pain medication in restless patients (n=322)	81 (54)	34 (22)	37 (24)	112 (66)	36 (21)	22 (13)	0.020
Lack of documented pain treatment plan for each patient (n=323)	70 (46)	28 (18)	54 (36)	95 (56)	48 (28)	28 (16)	<0.001
Insufficient documentation on effects of analgesics (n=324)	17 (11)	32 (21)	103 (68)	78 (45)	36 (21)	58 (34)	<0.001
Organizational barriers							
Not knowing pain levels because of inadequate time spent with patients (n=324)	20 (13)	30 (20)	102 (67)	61 (36)	40 (23)	71 (41)	<0.001
Inconsistent instructions about the administration of requested analgesics (n=322)	81 (54)	36 (24)	33 (22)	113 (66)	36 (21)	22 (13)	0.047
Inadequate time to deliver nonpharmacologic pain relief measures (n=322)	65 (43)	31 (21)	55 (36)	103 (60)	27 (16)	42 (24)	0.010
There is lack of common practices in assessment of pain(n=322)	66 (43)	35 (23)	51 (34)	114 (67)	27 (16)	29 (17)	<0.001

[1] NAND= neither disagree nor agree, [2] χ^2-test

The nurses with the opinion that pain management was insufficient had significantly more expectations for the enhancement of pain management (i.e., providing consistent practices, guidelines and enhancing multiprofessional cooperation) and less identified facilitators offered by employer to overcome the barriers to postoperative pain management as compared with those who expected pain management to be sufficient. (See Table 25.

Table 25. Expectations of nurses and facilitators offered by employer to overcome barriers associated with the opinion of the sufficiency of pain management (n, (%))

Expectations and facilitators	**Pain management insufficient**			**sufficient**			
	Disagree n (%)	NAND[1] n(%)	Agree n (%)	Disagree n (%)	NAND[1] n (%)	Agree n (%)	P-Value[2]
Expectations of nurses for enhancement the pain management							
Consistent practices (n=317)	2 (1)	4 (3)	141 (96)	2 (1)	15 (9)	153 (90)	0.046[2]
Guidelines for acute pain management (n=317)	0 (0)	3 (2)	145 (98)	2 (1)	16 (10)	151 (89)	0.002[2]
Enhanced multiprofessional cooperation (n=317)	0 (0)	3 (2)	144 (98)	2 (1)	13 (8)	155 (91)	0.009[2]
Facilitators offered by employer to overcome the barriers in postoperative pain management							
Update training is available (n=321)	54 (36)	38 (25)	58 (39)	41 (24)	40 (23)	90 (53)	0.025
New directions are implemented satisfactorily (n=319)	41 (28)	42 (28)	66 (44)	12 (7)	51 (30)	107 (63)	<0.001
Permanent chances are implemented without major difficulties (n=317)	66 (45)	53 (36)	28 (19)	55 (32)	63 (37)	52 (31)	0.024
There are sufficient resources for development of pain management (n=320)	83 (55)	37 (25)	29 (20)	67 (39)	54 (32)	50 (29)	0.011

[1] NAND= neither disagree nor agree, [2]Mann Whitney U-test, otherwise χ^2-test

6 Discussion

6.1 DISCUSSION OF THE RESULTS

As a basis of the findings, managing pain in hip fracture patients with dementia is challenging and there are several areas that need to be developed. Over half of the nurses reported that pain management is sufficient. However, the nurses identified difficulties in assessing pain in hip fracture patients with dementia as a major barrier to postoperative pain management. In addition, applying certain pain assessment-related nursing practices, such as the systematic assessment of pain, the use of pain scales, assessing pain at least every four hours, and assessing and documenting the effects of analgesics during initial two postoperative days were significantly related to the opinion that pain management was sufficient.

The possibility for inadequate and inappropriate use of analgesics cannot be exluded, even though the pharmacological pain management seemed to be based on strong opioids and paracetamol. The reported use of transdermal opioids, tramadol and codeine combination warrants further examination. In addition, regardless of the fact that the overall knowledge of adverse effects of analgesics was satisfactory, the RNs had deficits in their knowledge, especially regarding renal and cardiovascular adverse effects of NSAIDs.

6.1.1 Recognizing and assessing pain

The most often identified barrier to postoperative pain management in hip fracture patients with dementia was difficulty in assessing pain owning to a patients' cognitive impairment. A similar finding was reported by Coker and colleagues (2010). Inability to identify pain in a patient with dementia was identified by less than half of the nurses as a barrier to pain management. Identifying pain is the precaution of its assessment (McAuliffe et al. 2009). For health care providers, a diagnosis of cognitive impairment adds the difficulty of evaluating pain (Mehta et al. 2010). It seems that assessing pain may be a more demanding task for nurses than recognizing pain. Such pain assessment methods as using pain scales, assessing pain for at least every fourth hours and assessing and documenting the effects of analgesics were mainly related to the opinion of sufficient pain management. These findings highlight the comprehensive assessment of pain and put challenges to clinical practice to target the update training to nurses.

Less than one third of respondent nurses reported that pain scales were in use in their unit and the most commonly used scale was the VAS and secondly most frequently used was the VRS. However, VAS requires a great amount of abstract thought (Hadjistavropolous & Fine 2006; Horgas 2003), and older people have difficulties using this scale (Horgas 2003; Pesonen et al. 2009). Therefore, VAS is not suitable pain scale for individuals with dementia (Macintyre et al. 2010; Pesonen et al. 2009). Difficulties in pain assessment can point towards the need for using different kinds of pain scales, which should be applied according to the degree of cognitive impairment. The VRS was the secondly most commonly reported pain scale. Five-point VRS appeared to be applicable in persons with clear cognitive dysfunction (Camacho-Soto, Sowa & Weiner 2011; Pesonen & Kauppila 2009; Hadjistravopoulos et al. 2007). Previous research has indicated that, according to the medical records, over half of hip fracture patients had their pain assessed with numeric rating scale (NRS) and 4% with a non-numeric pain rating scale, such as the VRS or the FSP (Herr & Titler 2009). However, NRS requires some abstract though and,

therefore, is generally, recommended for the assessment of pain intensity among seniors who are cognitively intact and can self-report (Hadjistavropoulos et al. 2007). Assessment of pain occurring every four hours was reported quite often (69%). This result contradicts previous findings, where medical records were assessed after admission for acute hip fracture; assessment every four hours was performed in 37% of cases during the first 24 hours and, in 6% cases, during the first 72 hours (Herr & Titler et al. 2004). The differences in findings can be explained by the method used in this study. The data of previous studies consisted from medical records of surgical patients; in the current study, we asked nurses for their opinions.

When analyzing open-ended questions about barriers to pain management, nurses identified many behavioral signs, such as resisting care, confusion or restlessness, which might also be symptoms of unrelieved pain (AGS 2002). The American Geriatrics Society has classified the behavioral indicators of pain as facial expressions, verbalizations and vocalizations, body movement, changes in interpersonal interactions and mental status changes (AGS 2002). Although the nurses identified several common pain behaviors (e.g., confusion and resisting care) classified by the AGS (2002), it seems that these were actually not always associated with pain in practice. This finding concurs with the result of another study by McAuliffe and colleagues (2009) that behaviors needed to be repeated several times and observed by the same caregiver before they were linked to pain.

According to the findings related to the behavioral signs of pain, physical restraint was reported by nurses to be in use in some cases, although using restraint is an ethical conflict situation. Physical restraints are used to a greater extent than permitted by legislation, and the decision to use such restraints had been made by professional healthcare staff other than physicians (Lejman et al. 2013). However, in Finland, there is no legislation against the use of physical restraint in geriatrics (Saarnio 2009). Instead, there are some national recommendations for preventing the use of restraint in institutionalized care (Valvira 2009; ETENE 2008; TEO 2008). Preventing older people from falling is a high priority in nursing homes (Gulpers et al. 2012), and one preventive measure has been physical restraint (Saarnio 2009; Capezuti 2004). However, a study aimed at reducing the use of physical restraint in nursing homes for dementia care showed no increased incidence of falls despite a reduction of restraint practices (Pellfolk et al. 2010). As a matter of fact, physical restraints include the risk factor of falling (Corcoran-Kinosian 2011). Restraining can be detrimental to individuals' well-being and health (Moore & Haralambou 2007). It is necessary to make sure there is sufficient analgesic administration, because multiple behavioral changes, such as restlessness, aggression, and resisting care (AGS 2002) can be symptoms of pain. An individual with advanced dementia often uses behavior rather than specific verbal complaints to express the presence of symptoms, such as pain (Kovach et al. 2006b). Use of restraint has negative impacts for residents of older care facilities, leading to increased anxiety (Moore & Haralambou 2007). This can lead to a vicious cycle, because the impact between pain and anxiety is two-way. Anxiety is associated with higher postoperative pain intensity (Vivian et al. 2009), and pain is associated with distributive and anxious behavior (AGS 2002). Additionally, physical restraints include the risk factors that are present in developing delirium (Siddiqi et al. 2007). In conclusion, based on the findings there are several areas in pain regonizing and assessment that need to be developed.

6.1.2Analgesic use

According to the RNs' reports, pharmacological pain management seemed to be based on the use of strong opioids and paracetamol during the initial two postoperative days. There

is previous evidence that this combination for managing moderate to severe pain enhanced postoperative pain relief more than oxycodone alone (Gaskell et al. 2009). Hip fracture is a painful trauma and pharmacological pain treatment is a basis for postoperative pain relief. Ensuring good pain control already during the hospital stay is very important for the clinical management of older hip fractured patients following surgery (Shyu et al. 2009).

Oral route in administration was reported to have been most commonly used for all types of analgesics. Oral opioids are generally considered the drug of choice when strong opioids are required for pain (Pergolizzi et al. 2008), as the many strengths and formulations provide flexibility in dose titration (Bell et al. 2011; 2009). However, according to the analyses of the open-ended question, the oral route can be unsuitable to some patients with dementia who have swallowing difficulties or refuse to take oral analgesics, e.g., by trying to spit out tablets.

Oral oxycodone and injection/infusion solution were reported as the most commonly used strong opioids, but morphine was rarely used. The combination of oxycodone and naloxone was seldom reported to be in use, although compared to using oxycodone alone the combination formulation resulted in good analgesic efficacy and a decrease in bowel dysfunction (Schutter & Meyer 2009; Vondrackova et al. 2008). Fentanyl was reported to be in use only in patch form. Transdermal analgesics are not the best option for acute pain management because of delayed onset of action (McLachlan et al. 2011; Gupta et al. 1992) and rigidity in dose titration (Bell et al. 2011).

Reported daily doses of oral oxycodone were 14-26 mg during initial two postoperative days and oxycodone use was often reported by RNs in combination with paracetamol. The combination of oxycodone and paracetamol enhances postoperative pain relief (Gaskell et al. 2009). Previous research indicates that the total dose of administered morphine is the equivalent of ≥16.8 mg in 39% of hip fracture patients during the first postoperative day (Titler et al. 2009). The analgesic requirements vary considerably after fracture fixation, particularly during mobilization (Griffiths 2012), and recommendations for age-adjusted dosing are not available for most analgesics (AGS 2009). A previous study reported mean single dose of morphine equivalent to be approximately half of the dose (0.71 vs. 0.36 mg/kg) administered postoperatively to a cognitively impaired hip fracture patients than to cognitively intact patients (Sieber et al. 2011) and another study (Morrison & Siu 2000) indicated that hip fracture patients with advanced dementia received one third of the amount of the opioid doses of cognitively intact subjects. However, there were methodological limitations in both studies. First, either pain intensity in cognitively impaired persons was not studied (Morrison et al. 2000) or the patients self-reported their pain scores with the 0-10 NRS pain scale (Sieber et al. 2011), even though some older adults (with and without cognitive impairment) have difficulty with the NRS scale (Hadjistavropoulos et al. 2007). Impaired memory and language capabilities hinder the ability to recall and report the pain experience (Horgas et al. 2007). In a study of Sieber et al. (2011), the self-reported pain intensity and administered total doses of morphine equivalents were significantly higher in cognitively intact persons than with cognitively impaired patients. Second, there is an age-related decrease in opioids requirements; i.e., older patients require a smaller dose of opioids than younger patients to achieve the same degree of pain relief, but significant interpatient variability persists (Liukas 2011; Macintyre et al. 2010; Barber & Gibson 2009).

This study indicates that the use of NSAIDs and weak opioids can be common in postoperative pain treatment in hip fracture patients with dementia. NSAIDs should be used with caution in older patients, and only for short periods of time (Griffiths et al. 2012; White et al. 2009). More than half of the RNs reported that postoperative pain in patients

with dementia is treated with codeine combination during the initial two days. In general, weak opioids may not produce the sufficient pain relief during the first postoperative days. In addition, the guideline by Griffiths and colleagues (2012) suggests that codeine should not be administered for hip fracture patients, because of potential adverse effects (constipation, hyperemesis, and risk of perioperative cognitive dysfunction).

The use of epidural analgesia was reported by approximately half of the RNs and spinal analgesia or femoral nerve block by only few of the nurses. Epidural analgesia can provide effective pain relief used in the postoperative setting (Macintyre et al. 2010; Foss et al. 2005; Scheinin et al. 2000). However, according to the RNs answers to the open-ended question, epidural/spinal analgesia seems to have major difficulties in a cases where the patients resisting care and trying to rip off the epidural catheters. RNs stated that a femoral nerve block seems to be an effective way to relieve postoperative pain, but, in practice, the difficulties exists when patient does not remember that the hip has been operated and tries to walk although it may be forbidden immediately after operation. The Australian quideline of Macintyre and colleagues (2010) suggest that, in combination with intravenous opioids, the femoral nerve block can be more effective as intravenous opioids alone in the treatment of pain from a fractured neck of femur. In addition, femoral nerve block has been suggested to lower the incidence of post-operative delirium and improving the quality of analgesia after hip fracture surgery (Rosario et al. 2008). In contrast, according to the Cochrane review, their clinical benefit remains unclear although it seemed to reduce pain after hip fracture surgery (Parker et al. 2009).

Careful management of pain is essential because it reduces the risk of mortality and morbidity after surgery (Prowse 2006) and promotes functional recovery and mobility in older age (Karttunen et al. 2012). There is also notable consideration in medical treatment of pain in patients with dementia due to a higher risk for post-operative delirium than in the case of cognitively intact older adults (Sieber et al. 2011; Lindesay et al. 2002). This risk can be reduced by administering appropriate and sufficient analgesic drugs so that the severe pain can be avoided (Lindesay et al. 2002).

6.1.3 RNs' knowledge of the adverse effects of analgesics

Older people are susceptible to the adverse effects of analgesics (Karttunen et al. 2012; AGS 2009) because they have limited reserves and less effective compensatory mechanisms for dealing with unwanted adverse effects than younger people (Prowse 2007). Careful monitoring of the efficacy and adverse effects of analgesics on behalf of nurses is highlighted in patients with dementia who may be unable to report their pain level and symptoms clearly.

The majority of the RNs knew the main potentially clinically relevant adverse effect of paracetamol. The median percentage of correct answers was 87% in a group of strong opioids, 73% in weak opioids, and 60% in NSAIDs. Younger RNs' age predicted better knowledge of potentially clinically relevant adverse effects of strong opioids or weak opioids. RNs had shortcomings in their knowledge of adverse effects of analgesics especially regarding renal and cardiovascular adverse effects of NSAIDs.

Some potentially clinically relevant adverse effects associated with strong opioids - such as nausea, constipation, urinary retention and itching - were well known by RNs. More than a third of the registered nurses responded that urinary retention, lifted mood, and respiratory depression are clinically relevant adverse effects of weak opioids. However, in this study, these adverse effects were not defined as to be among potentially clinically relevant adverse effects associated with the use of weak opioids, although

codeine can cause urinary retention (Galbraith et al. 2011) and, in some cases, lifted mood is associated with the use of tramadol (Mishra & Khan 2012). Instead, respiratory depression is mainly included in the adverse effects of strong opioids (Macintyre et al. 2010).

Nearly all of the RNs identified GI irritability, gastric ulcer, and the risk of bleeding as the most common adverse effects of NSAIDs. Gastric ulcer is the most commonly reported adverse effect (Cullen, Kelly & Murray 2006). Effects on kidneys causing fluid retention and cardiac insufficiency were less known risks. Both the gastrointestinal and the cardiovascular risks of individual patients when taking NSAIDs must be taken into account (Barkin et al. 2010; Vonkeman & van de Laar, 2010). Patients taking NSAIDs have an increased risk for congestive heart failure (Mamdani et al. 2004; Feenstra et al. 2002; Page & Henry 2000). Therefore, there is a need for careful monitoring of cardiovascular effects in patients receiving NSAIDs. NSAIDs should be used with great caution in patients with a history of cardiovascular disease.

The risk for developing delirium was associated with strong opioids by the majority of the RNs, while the risk with weak opioids was noted by less than half of them. Dementia poses an extra challenge for such fears of analgesics-related adverse effects that impact mental capacity, e.g., by developing delirium, which is common in acute care settings, especially in older patients with dementia (Sieber et al. 2011; Lindesay 2002). However the risk for delirium can be also reduced by appropriate and sufficient analgesia, so that severe pain can be avoided (Lindesay et al. 2002; Lynch et al. 1998). Nearly all of the registered nurses associated respiratory depression to strong opioids. The fear of respiratory depression in older people often leads to inadequate and low doses of opioids. However, significant respiratory depression can generally be avoided by appropriate monitoring (Macintyre et al. 2010).

In acute pain management, frequent assessment of patients' opinions and responses to pain treatment must be undertaken (Herr& Titler, 2009; Gordon et al. 2005). This assessment definitely should include monitoring of the potential adverse effects (Scott & McDonald 2008; Myles & Power, 2007; Gordon et al. 2005), such as level of consciousness especially when administering (additional) opioids (van Dijik et al. 2012). This is only possible, when nurses have enough knowledge of potential adverse effects of analgesics. Nurses are the cornerstone of the team approach, and they have direct responsibilities related to the tailoring of analgesics (McCaffery & Ferrel, 1997). They act as coordinators between doctor and patient, and play a main role in recognizing pain and discomfort in the patient, and therefore the knowledge of adverse effects of analgesic is highlighted. Lack of knowledge is a challenge in training nurses because of the risk for inappropriate and unsafe pain treatment, especially in vulnerable patients with dementia. There is a need for update training for RNs, especially concerning cardiovascular and renal adverse effects of NSAIDs. When planning update training, older RNs' weaker knowledge about adverse effects of opioids should be taken into account.

The nurses who reported that pain management was insufficient identified significantly more often physicians' fears related to prescribing adequate pain relief due to a fear of overmedication and nurses' reluctance to give pain medication for fear of overmedicating as compared with those nurses who reported that pain management was sufficient. Nurses' fear of overmedication was the reason for their reluctance to give pain medication in nearly one in four nurses. Physicians' reluctance to prescribe adequate pain relief out of fear for overmedication was reported by approximately one fifth of the nurses, and patient reluctance owing to the fear of overmedication was named by nearly one third of the nurses. Doctors' lack of knowledge about prescribing analgesics was identified by 14% of the nurses. A previous study identified physicians' reluctance to prescribe adequate pain

relief for fear of overmedicating in 37% of the nurses, and due to nurses' own reluctance in 1% of the nurses (Coker et al. 2010). Previous studies indicate that health care professionals have inaccurate and exaggerated concerns about opioids' adverse effects, especially regarding addiction, tolerance, and respiratory depression (Abdalrahim et al. 2011; McCaffery & Ferrel 1997; von Roenn et al. 1993).

In the open-ended question, RNs mentioned certain pharmacological pain treatment principles, such as analgesic administration without delays, regularity, and continuity, to be among expectations for sufficient pain management among patients with dementia.

RNs suggested an improvement of pain management in hip fracture patients with dementia in the form of specialised orthogeriatric units in acute care settings tailored to patients with dementia, so that their special characteristics could be better taken into account. Patients with hip fractures require multidisciplinary care led by orthogeriatricians due to the complexity of pain management in postoperative pharmacologic pain treatment, resulting from, for example, coexisting diseases and polypharmacy (Griffiths et al. 2012).

6.1.4 Pain management practices and barriers to pain management

According to the explanatory factor analysis of current data, the pain management practices can be divided into analgesic treatment practices, hip fracture specific methods, emotional methods and physical methods. Hip fracture specific postoperative pain management practices in patients with dementia, such as repositioning, cold therapy and helping with daily activities, were among most preferred pain management practices. This finding confirms the study of Titler et al. 2003, with the exception of helping with daily activities, which was not studied.

Most commonly reported analgesic treatment practices were providing pain medication prior to movement or painful events and administering analgesic regularly and around the clock. This confirms the finding that the lack of clear instructions of requested analgesic administration was not commonly reported to be a barrier to pain management. In contrast, the study of Mehta and colleagues (2010) found that only 7% of the cognitively impaired surgical patients were postoperatively put to an around-the-clock analgesic regimen. Other analgesic treatment practices included regular assessment of pain, assessment and documentation of the effects of analgesics, and the use of pain scales in units. Agreement with the opinion that the effects of analgesics were assessed and documented was 73% and with the assessment for pain at least every four hours was 69%. Conversely, agreement with the assessment of pain with pain scales was only 31%. Surprisingly, although the majority of the nurses reported that effects of analgesics were assessed and documented, nearly half of them reported that insufficient documentation of the effects of analgesics is one of the barriers to pain managmenent. Insufficient documentation on the effects of analgesics and lack of documented pain treatment plans were reported approximately two times more often by nurses who considered that pain was undertreated than nurses who reported that pain management was sufficient. Carefull documentation is necessary in order to guarantee a continuous information flow and high-quality pain management. Poor documentation is alarming and possibly indicates a lack of understanding of pain assessment and management practices (Eid & Bucknall 2008). One of the potential barriers to appropriate monitoring and treatment of pain is the lack of documentation that would prompt health care advocates to administer effective analgesics (Jackson 2010).

The findings of this study pointed out that certain emotional pain relieving methods, such as quieting and consoling patients and applying soothing, supportive touch were commonly reported by nurses to be in use on units. In contrast, nurses' presence when patient appeared to be in pain was more seldom reported, although the precaution of quieting and consoling patiens and using a soothing supportive tough are a manifestation of the presence of a nursing staff member. The findings may indicate that applying emotional pain relieving methods is insufficient and occasional. On the other hand, according to the open-ended question, nurses reported willingness to apply these methods, but insufficient time and staffing gave reasons for rejecting these methods. The effectiveness of emotional pain relieving methods may be considered to be based on decreasing negative emotions, such as anxiety, because, according to a systematic review, it was found that anxiety is one of the most significant predictive factors for the intensity of postoperative pain (Vivian et al. 2009). Psychological distress can increase postoperative analgesic consumption. In open-ended questions, the nurses suggested further emotional pain relieving methods, such as the presence of persons close to the patient and ways of meaningful communication. The nurses have an important role in allowing the presence of relatives or close friends who know the treated person and can effectively relieve distress and are familiar with the individual's ways of expressing pain. Knowing individual ways to express pain is highlighted when trying to discover the ways that cognitively impaired individuals express their pain, because the ability to express pain is often decreased in people with dementia (Macintyre et al. 2010; AGS 2002). Moreover, nurses reported that meaningful communication of staff and relatives, such as peaceful, emphatic interaction and providing appropriate information to patients by keeping them updated (e.g., about what is going to happen and the cause of their pain) is important. In a cross-sectional study of nine hospitals, Gittell and colleagues (2000) found that the better the communication, the more succesfull the postsurgical pain relief. Individuals with dementia have a decreased threshold for stress from the environment, so a peaceful and comfortable environment without, for example, visual, auditory or thermal stress, is highlighted (Kovach et al. 2006a). A focus on "organizing a peaceful and comfortable environment" was not common practice (38 % agreement) in units. On the other hand, the nurses also suggested that their means for organizing a comfortable environment are limited by small and noisy rooms with multible beds, and lack of time. There was also a suggestion for separate orthopedic units for geriatric patients, where the needs of patients with dementia could also be better taken into account.

Only 6% of the nurses reported that music was used as a nonpharmacological pain relieving method. However, music may be effective for treating postoperative pain (Vaajoki 2012; Engwall & Duppils 2009). Listening to music has not been used widely although it offers potential advantages of low cost, ease provision and safety. In addition, music has been proved to effectively reduce anxiety and improve mood for medical and surgical patients (Vaajoki 2012; Salimpoor et al. 2011; Hadjistavropoulos & Fine 2006). Listening to music has also shown a decrease of behavioral symptoms in individuals with dementia (Doody et al. 2001). One reason for not applying music as a pain relief may be the challenges in clinical environment, such as units with multiple beds, high level of noise and restlessness.

6.1.5 Developing postoperative pain management

The need for update training and consistent pain management practices were both among the major expectations of nurses. Only 6 % of the nurses had participated in update training concerning pain management in hip fracture patients and this training was

mainly directed to pain experts. The nurses who reported pain management to be sufficient shared the opinion that update training was available significantly more often than nurses who considered that pain management was insufficient. Instead, there were no significant differences between the opinion of sufficiency and in actual participation in update training. There are many innovative ways to organize such kind of training, e.g., web-based collaborative learning, video-materials and simulation training supplementary to traditional update training. It has been suggested that interactive, multiple methods using update training have positive outcomes (O'Brien et al. 2001). For example, educational outreach visits (O'Brien et al. 2007) and educational meetings (Forsetlund et al. 2009) appear to improve the care delivered to patients. Educational meetings include courses, conferences, lectures, workshops, seminars, and symposia. In addition, audit and feedback generally lead to small but potentially important improvements in professional practice (Ivers et al. 2012). The effectiveness of audits and feedback seem to depend on baseline performance and how feedback is provided. Strategies to increase attendance at educational meetings, using mixed interactive and didactic formats, and focusing on outcomes that are likely to be perceived as serious may increase the effectiveness of educational meetings (Forsetlund et al. 2009).

Although a large number of international guidelines are available, nurses had the expectation for consistent guidelines for acute pain management in patients with dementia (93%), because there are no such guidelines for nurses in Finnish. However, the existence of guidelines does not mean that they are implemented in practice, because according to international studies, pain remains insufficiently treated, and evidence-based guidelines are rarely followed (Coker et al. 2010; Morrison et al. 2003b; Titler et al. 2003). This finding concurs with a previous Cochrane review, which showed that printed materials may have a small beneficial effect on professional practice outcomes (Giguère et al. 2012). One option is to organize such a type of update training, where these guidelines are implemented in practice. However, pain management in this patient group is a demanding task and, according to the findings, there are several areas, including pain assessment, which need to be developed. Because a majority of the nurses stated that pain management was sufficient in this patient group, the development of pain management may be a demanding task.

The availability of pain experts' consultation was not among the commonly reported barriers to pain management. Nurses reported opportunities to consult doctors or other pain experts 24/7 in pain treatment decisions, although, according to the previous study (Titler et al. 2003), nurses reported a lot of difficulties in contacting and communicating with physicians concerning pharmacological pain treatment decisions, such as difficulties with contacting physicians, and problems with communicating with them about the types and/or doses of analgesics, as the greatest barriers. Nearly all of the nurses had the expectation of enhanced multi-professional co-operation (94%). This warrants further examination, because it contradicts the nurses' opinion that pain experts are available for pain consultation. Maybe this cooperation was seen more extensively by nurses, because acute pain management for older people is an area where sharing knowledge and resources between pharmacists, doctors, nurses, researchers and the wider multidisciplinary team is essential, as no one discipline can achieve good pain management outcomes alone (Prowse 2007). Because of the complexity of pain management in patients with dementia, a program of proactive geriatric co-operation may also reduce the incidence of delirium and its severity (Siddiqi et al. 2007), and, as a consequence, insufficient pain treatment in patients undergoing surgery for hip fractures.

6.2 VALIDITY, RELIABILITY AND TRUSTHWORTHINESS OF THE STUDY

Systematic searches from the MEDLINE, CINAHL, and Cochrane databases were conducted in order to find out if there was a previously validated instrument for postoperative pain management in hip fracture patients with dementia or some part of an instrument that could be applied in this study. According to Burns and Grove (2009), the use of evidence-based literature supports content validity when developing a new scale. Because there was no validated instrument, the new instrument was developed. This may weaken the validity of the study and, therefore, the criterion validity could not be measured.

Validity indicates how well the instrument reflects the abstract constructs of the investigated topic (Burns & Grove 2009). Face validity was tested by the panel of the pain experts. Construct validity determines whether the instrument actually measures the theoretical construct that it is intended to measure (Burns & Grove 2009). The construct validity of "Nursing practices in postoperative pain management" (Article I) was tested by explanatory factor analysis. Loadings of >0.3 were treated as sufficient. The results of the factor analysis provided good support for the nursing practice scale, no items had high loadings on other factors.The structure of the instrument can be seen supporting by the high loadings of items under each sum variable on the same factor. In addition, the *construct validity* of the scale (article I and II) supported by predictors of opinion that pain management is sufficient, more frequent reported use of analgesics treatment practices, fewer expectations for enhancing pain management and less identified barriers to pain management.

Internal consistency was evaluated by Spearman's correlation coefficient (Article I-II) (Burns & Grove 2009). The instrument was pretested in one surgical unit before use (N=28, n=19), because it is newly developed. The instrument is based on systematic review (Article I- II), and the assessment of experts (e.g., nursing scientists and nurses in an orthopaedic unit). The analgesics classification (Article III-IV) and their defined daily doses were based on the Anatomical Therapeutic Chemical Classification (ATC) recommended by World Health Organization (WHO 2010). Potentially clinically relevant adverse effects of analgesics (Article IV) were defined based on the literature and consencus of an expert panel.

Face validity was established by asking two pain experts (one a docent in nursing science and one professor of geriatric pharmacotherapy), one professor of nursing science and eight doctorial students to review the questionnaire. During the next phase, the scale was evaluated by eight doctoral students and one professor in nursing science. The researcher met the nurses who participated in the pretest in the Töölö hospital three times. A pretest was conducted in order to avoid any misconceptions, such as missing responses or unclear questions regarding the newly developed instrument. The nurses stated on a separate form that the items were clearly expressed and easy to complete. No one suggested additional questions or topics. A couple of nurses stated that it is not relevant to ask about analgesic use and adverse effects of analgesics, because this kind of information does not include the area of nursing science. However, nurses' competence includes all the aspects of pain management, i.e., also their knowledge about the analgesics they administer and, accordingly, recognizing and preventing the adverse effects. When asking about individual analgesics use, there was a separate yes/no choice for each analgesic. However, because of major missing values, this item was deleted from the final questionnaire. The majority of the participants (n=13) noted that there were too many questions, but, on the other hand, there were also statements that structured questions are

quite easy to answer. Some comments were related to difficulties in interpreting the questions; the respondents had to read the questions carefully before understanding their meaning. After pre-testing, the questionnaire was simplified so that an individual question asked about one topic only. Additionally, the scale was made easier to use by modifying its visual presentation.

Reliability indicates the consistency of the results. The consistencies of individual items to total scale and subscales (Article I and II) were supported by Spearman's correlation coefficients, in exception with three items in patient-related barriers to postoperative pain management. The lowest correlation coefficients were found in "patient with dementia do not want to bother the nurses or doctors" (0.190), "patient's willingness to put up with pain" (0.255) and "decline in cognition make assessment difficult" (0.236). Correlation coefficients for associated individual items to three subscales (barriers associated with patients, formal caregivers, and system) varied from 0.474 to 0.709. Coefficients for expectations were all >0.626 and for facilitators offered by employers >0.701. Correlation coefficients of over 0.3 have been regarded as being acceptable (Burns & Grove 2009).

The data collection was conducted between March and May of 2011. This period was suitable because of the probability that the permanent staff was at work was high. The author phoned and/or discussed with contact persons in each unit via e-mail in order to ensure that the guides were understood. The nurses were informed by an information letter about the aim of the study, confidentiality, and they were provided with the contact information of the researcher in order to get advice in case of potential problems. However, no one contacted this number.

In the preliminary model of the predictors of sufficient pain management in hip fracture patients with dementia, out of the three intercorrelating characterististics of age, work experience in health care and work experience in current unit, only work experience in current unit was in the final model. All of the associated correlation coefficients (Pearsson correlation) were high; between age and work experience in current unit 0.675 ($P<0.001$), between age and work experience in health care 0.866 ($P<0.001$) and between work experience in health care and in current unit 0.776 ($P<0.001$). One alternative option could be the choice of only one of the three intercorrelated characteristics.

An analysis of missing data showed that there were three to five missing values among characteristics. The primary aim of pain management had eight missing values and sufficiency of pain management had seven. These missing values were nearly solely "double answers". Nursing practices had approximately 9.89 (mean) missing values (Range 4-17) and barriers to postoperative pain management produced approximately 2.17 (mean) missing values (Range 0-10). Accordingly, the expectations for the enhancement the pain management: 8.80, range 7-10 and facilitators offered by the employer to overcome barriers in postoperative pain management precautions: 6.75, range 5-9). When transferring part of the qualitative data (i.e., pain scales, analgesics administration route and their daily doses) to the SPSS, there was much more missing data, because many of the respondents did not fill in the-open ended questions at all. For example, for the open-ended question about pain scales in use, there were 231 answers.

The response rate may bias the fact that the questionnaire was quite time consuming to fill, as it included multiple questions. This problem can threaten the validity of the instrument (Burns & Grove 2009). Nurses had no time to fill in the electronical questionnaire, so in order to achieve sufficient response rate, the questionnaire was printed as a paper version and returned via a prepaid envelopement to the researcher. The concistent ways in administering the questionnaire support the validity (Burns & Grove 2009). The response rates for posted questionnaires are usually small (25% to 30%) (Burns & Grove 2009).

It is possible that nurses with high motivation in developing pain management were the ones to return the questionnaire and, accordingly, they might be more proactive in treating postoperative pain in hip fracture patients with dementia compared with those who refused to participate. The study was conducted in Finland and, therefore, the findings can be generalized in Finland but cannot be generalized directly in other countries. The sample was extensive, including nurses treating approximately 68% of all hip fracture patients in Finland. This increased the study findings' generalibility beyond the sample used in this study (external validity) (Burns & Grove 2009).

The open-ended questions were analysed by qualitative content analysis but it is important to be aware that text always involves multiple meanings and there is always some degree of interpretation. This is an important issue when discussing the trustworthiness of findings in qualitative content analysis (Graneheim & Lundmann 2004). The primary documents were read carefully several times and the statements given under each code were checked afterwards in order to obtain objective interpretation.

In qualitative research, the concepts credibility, dependability and transferability have been used to describe various aspects of trustworthiness (Lincoln & Guba 1985; Polit & Hungler 1991). Credibility deals with the focus of research. Choosing participants with various experiences (head and staff nurses, registered nurses and practice nurses) increases the possibility of shedding light on the research question from a variety of aspects. In this study, the participants were also of various ages and work experience. The credibility of this study limits the fact that participants were only nurses. The most suitable meaning units were selected and did not include several paragraphs in order to avoid ambiguity. Dependability means the degree to which data changes over time and alterations made by researcher's decisions (Graneheim & Lundman 2004). The questionnaire was used as the collection method and there were not risks for inconsistency during the data collection as can be when performing interviews during a long data collection period. The questions were similar to all participants. Transferability refers to the extent to which findings can be transferred to other settings or groups (Polit & Hungler 1991). Transferability of this study is increased by the fact that the clear description of content, selection and characteristics of participants, data collection and process of analysis was given. Appropriate quotations were also widely presented in publications. Transferability is also supported so that there is also a possibility for readers to look for alternative interpretations of findings when analysing the direct quotations in published articles.

6.3 STRENGHTS AND LIMITATIONS OF THE STUDY

Strengths of the study

The present study provided information about the current situation of the pain management in hip fracture patients with dementia as evaluated by nurses. The sample was wide and representative, covering the majority of the hip fracture population treated in Finland in the data collection phase. Pain management in hip fracture patients with dementia is a fairly little-studied topic in nursing science, as main focuses are in the assessment of pain in long term settings. The study provided new information about the situation of pain management, by pointing out the areas which have to be developed (e.g., identification of the pain and pain documentation). The viewpoint of nurses is important

because they are the group of professionals most closely in contact with patients with dementia and they have many direct responsibilities in managing patient's pain.

Limitations of the study

The current study described and explained pain management in hip fracture patients as reported by nurses. The viewpoint of patients with dementia is also an important aspect, but data collection could be challenging due to deficits in verbal and cognitive capacities. The findings from the use of analgesics cannot be generalized, because reports of nurses cannot provide accurate information of the current situation of analgesics use.

The response rates of the study varied between 52% and 54%. This may lower the representativeness of the sample. In general, the response rate in questionnaires are lower than with other forms of self-reporting, and if the response rate is under 50%, the representativeness of the sample is seriously in question (Burns & Grove 2009). Nurses' response rates varied significantly between hospitals, ranging from 21% to 88%. This may also harm the representativeness of the sample. Systematic drop weakens the validity (Barriball & While 1999). On the other hand, the representativeness of the sample according to occupation was satisfactory. For example, the proportion of RNs respondents was 77% from initial 75% (proportion of RNs in sample).

Analgesic treatment practices were the main predictor of sufficient pain management. Further analysis showed, that significant differences related to the opinion of sufficiency of the pain management were related as a matter of fact to the assessment of pain (regulary, by means of pain scales and after analgesics administration). These variables were defined as a basis of explanatory factor analysis to the factor "analgesics treatment practices".

One limitation was the use of a questionnaire to collect nurses' opinions. There was doubt that some responses (e.g., assessment of pain every four hours) was overestimated in comparison to the real situation of pain management.

Finally, a limitation to this study is caused by the complicated and multidimensional nature of the topic of "pain management in hip fracture patients with dementia" and that there is no validated questionnaire. The questionnaire developed for this study was pretested (n=19) before use and face validity was also supported by the expert panel (n=11). In addition, the internal consistency and validity were supported by the findings of this study with the exception of three patient-related barriers in pain management.

6.4 IMPLICATIONS FOR NURSING PRACTICE AND RESEARCH

Several areas of improvement are indicated:

1) The most frequently identified barrier was the inability to assess pain due to cognitive impairment. The use of pain scales according to the degree of cognitive impairment and regonizing the behavioral signs of pain in order to avoid insufficient pain management and, as a consequence, symtoms of delirium and use of physical restraints.

2) Monitoring and documentation of pain treatment should also be enhanced because insufficient documentation on the effects of analgesics and lack of documented pain treatment plans pose a risk for insufficient pain management.

3) Update training to nurses about analgesics and their adverse effects.

4) There is a need to enhance the use of nonpharmacological interventions, such as music and emotional methods supplementary to pharmacological pain treatment.

5) The employer can facilitate the pain management by providing consistent instructions for the assessment and administration of requested analgesics and offering updating education for enhancing pain management and overcoming barriers, such as nurses and physicians' fears of overmedication as a reason for insufficient analgesic administration.

6) Because of the complexity of pain management there is need for orthogeriatric units with trained nurses and orthogeriatrics. In addition, restless, noisy and busy departments with rooms with multiple beds are not suitable for the care of vulnerable patients with dementia.

6.5 SUGGESTIONS FOR FURTHER RESEARCH

Because postoperative pain management in patients with dementia is a relatively unstudied topic in nursing science, there is shortage of knowledge about clinical practice. There are many important suggestions for further research.

1) There is need for an educational intervention in acute care settings about regonizing pain and implementation of different pain assessment methods and different pain scales in clinical practice according to the degree of cognitive impairment.

2) Studies as a viewpoint of patients can be made by intervention studies. This can be done by examining how the use of pain scales influences the postoperative pain management, e.g., analgesic use and pain intensity in patients with dementia and if there is differences in pain management in patients with dementia as compared to cognitively intact patients.

3) Further research of current pharmacological pain treatment and its effectiveness in hip fracture patients with dementia.

4) Qualitative observational studies about patients' pain experience and treatment as a viewpoint of patients with dementia.

5) More comprehensive knowledge of nurses about the adverse effects of analgesics in patients with dementia, e.g., knowledge about preventing and managing the adverse effects and attitudes and knowledge in the light of fears of adverse effectd to opioids administration in geriatric patients with dementia.

6) Intervention studies for searching evidence about certain nonpharmacological pain relieving methods, such as music and emotional pain relieving methods.

7) Intervention studies about enhancing documentation of pain management are also suggested for future research, as insufficient documentation was significantly

related to the opinion that pain management was insufficient and, on the other hand, inappropriate documentation was a reason for discontinuing and causing misconceptions in pain treatment.

7 Conclusions

In practice, total painlessness seems to be an idealistic goal for postoperative pain management in hip fracture patients with dementia. Therefore, we have to balance between sufficient pain relief and the adverse effects of analgesics to allow early mobilization and functional recovery. The following conclusions can be made based on this study:

1. Difficulty in assessing pain due to patients' cognitive impairment was most commonly identified as a barrier to postoperative pain management.

2. Pharmacological pain treatment is the primary postoperative pain treatment in hip fracture patients with dementia. Pharmacological postoperative pain treatment in acute care was based on strong opioids and paracetamol.

3. As a basis of findings there were deficits especially in the knowledge of cardiovascular and renal adverse effects of NSAIDs. The update training concerning adverse effects of opioids should target especially for RNs' of older age.

4. The preferred supplementary nonpharmacological methods in hip fracture patients with dementia were repositioning, cold therapy and helping with daily activities. It is advisable to pay more attention to applying emotional nonpharmacological pain relieving methods.

5. The opinion of sufficient pain management was mainly associated with applying certain nursing practices related to the assessment of pain and having other than total painlessness as the goal of pain management.

6. Nurses are in a pivotal role in advocating qualified pain management to this vulnerable patient group. This study makes visible the multiple skills and competence needed from nurses to produce this high quality pain treatment in acute care settings.

7. There is need for updating the training of pain management in hip fracture patients with dementia.

References

Abbey J. 2004. The Abbey pain scale: a 1-minute numerical indicator for people with end-stage dementia. International Journal of Palliative Nursing 10(1), 6-13.

Abdalrahim MS, Majali SA, Stomberg MW & Bergbom I. 2011. The effect of postoperative pain management program on improving nurses' knowledge and attitudes toward pain. Nurse Education in Practice 11, 250- 255.

Abdulla A, Adams N, Bone M, Elliott AM, Gaffin J, Jones D, Knaggs R, Martin D, Sampson I, Schofield P, British Geriatric Society. 2013. Guidance on the management of pain in older people. Age and Ageing 42, i1-57.

Alzheimer's Association, Thies W & Bleiler L. 2011. Alzheimer's disease facts and figures. Alzheimers Dementia 7, 208-244.

Alzheimer Europe. 2010. Dementia. Definition. Available at: http://www.alzheimer-europe.org/EN/Glossary/dementia. Accessed February 5, 2013.

Alzheimer's Disease International. 2009. World Alzheimer Report 2009. Alzheimer's Disease International. London.

Altman RD. 2010. Pharmacological therapies for osteoarthritis of the hand: a review of the evidence. Drugs & Aging 27, 729-745.

American Geriatrics Society Panel on Persistent Pain in Older Persons (AGS). 2002. The management of persistent pain in older persons. Journal of the American Geriatrics Society 50(6), 205–224.

American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older People. 2009. Pharmacological Management of Persistent Pain in Older People. Journal of the American Geriatrics Society 57, 1331-1346.

American Psychiatric Association. 1995. Diagnostic and statistical manual of mental disorders, fourth edition. Washington, DC.

American Psychiatric Association. 2004. First MB & Tasman A (Eds.). DSM-IV-TR mental disorders: Diagnosis, etiology, and treatment. J. Wiley. 275-276.

American Society for Pain Management Nursing (ASPMN). 2010. Core curriculum for pain management nursing (2nd ed.). Dubuque, IA: Kendall Hunt Publishing Company.

de Andrade DC, de Faria JW, Caramelli P, Alvarenga L, Galhardoni R, Siqueira SR, Yeng LT & Teixeira MJ. 2011. The assessment and management of pain in the demented and non-demented elderly patient. Arquivos de Neuro-Psiquiatria 69(2B), 387-394.

Apfel CC, Turan A, Souza K, Pergolizzi J & Hornuss C. 2013. Intravenous acetaminophen reduces postoperative nausea and vomiting: a systematic review and meta-analysis. PAIN. In press. Accepted 31.12. 2012.

Ardery G, Herr KA, Hannon BJ, & Titler, MG. 2003. Lack of opioid administration in older hip fracture patients (CE). Geriatric Nursing 24(6), 353-359.

Asmundson GJG & Wright K. 2004. Biopsychosocial approaches to pain. In Hadjistavropoulos T & Craig KD (Eds.), Pain: Psychological perspectives. Mahwah, NJ: Erlbaum. 35-87.

Avouac J, Gossec L & Dougados M. 2007. Efficacy and safety of opioids for osteoarthritis: A meta-analysis of randomized controlled trials. Osteoarthritis Cartilage 15, 957–965.

Axelin A. 2010. Parents as pain killers in the pain management of preterm infants. Doctoral dissertation. Univeristy of Turku. Department of Nursing Science.

Ballard C & Bannister C. 2010. Criteria for the Diagnosis of Dementia. In: Ames D, Burns A & O'Brien J. Dementia, 4th Edition, Copyright (c) CRC Press. P 39.

Barber JB & Gibson SJ. 2009. Treatment of chronic non-malignant pain in elderly: safety considerations. Drug Safety 32, 457-474.

Barkin RL, Beckerman M, Blum SL, Clark FM, Koh EK & Wu DS. 2010. Should nonsteroidal anti-inflammatory drugs (NSAIDs) be prescribed to the older adult? Drugs & Aging 27(10), 775-789.

Barnung SK, Treschow M & Borgbjerg FM. 1997. Respiratory depression following oral tramadol in a patient with impaired renal function. Pain 71(1), 111–112.

Barriball KI & While AE. 1999. Non-response in survey research: a methodological discussion and development of an explanatory model. Journal of Advanced Nursing 30(3), 677-686.

Barthélémy O, Limbourg T, Collet JP, Beygui F, Silvain J, Bellemain-Appaix A, Cayla G, Chastre T, Baumgartner I, Röther J, Zeymer U, Deepak L. Bhatt DL, Steg G & Montalescot G. 2013. Impact of non-steroidal anti-inflammatory drugs (NSAIDs) on cardiovascular outcomes in patients with stable atherothrombosis or multiple risk factors. International Journal of Cardiology 163, 266–271.

Basler HD, Hueger D, Kunz R, Luckmann J, Lukas A, Nikolaus T & Schuler MS. 2006. Assessment of pain in advanced dementia. Construct validity of the German PAINAD]. Schmerz (Berlin, Germany) 20(6), 519.

Bauer BA, Cutshall SM, Wentworth LJ, Engen D, Messner PK, Wood CM, Brekke KM, Kelly RF & Sundt TM. 2010. Effect of massage therapy on pain, anxiety, and tension after cardiac surgery: a randomized study. Complementary Therapies in Clinical Practice 16(2), 70-75.

Bell L & Duffy A. 2009. Pain assessment and management in surgical nursing: a literature review. British Journal of Nursing 18(3), 153–156.

Bell JS, Klaukka T, Ahonen J & Hartikainen S. 2009. National Utilization of Transdermal Fentanyl Among Community-Dwelling Older People in Finland. American Journal of Geriatric Pharmacotherapy 7(6), 355-61.

Bell JS, Laitinen ML, Lavikainen P, Lönnroos E, Uosukainen H & Hartikainen S. 2011. Use of strong opioids among community-dwelling persons with and without Alzheimer's disease in Finland. Pain 152, 543-547.

Benedetti F, Arduino C, Vighetti S, Asteggiano G, Tarenzi L & Rainero I. 2004. Pain reactivity in Alzheimer patients with different degrees of cognitive impairment and brain electrical activity deterioration. Pain 111, 22–29.

Benedetti F, Vighetti S, Ricco C, Lagna E, Bergamasco B, Pinessi, L & Rainero L. 1999. Pain threshold and tolerance in Alzheimer's disease. Pain 80, 377–382.

Benetos IS, Babis GC, Zoubos AB, Benetou V & Soucacos PN. 2007. Factors affecting the risk of hip fractures. Injury 38(7), 735–744.

Bernatzky G, Presch M, Anderson M & Panksepp J. 2011. Emotional foundations of music as a non-pharmacological pain management tool in modern medicine. Neuroscience and Biobehavioral Reviews 35, 1989–1999.

Bieri D, Reeve RA, Champion GD, Addicoat L & Ziegler JB. 1990. The Faces Pain Scale for the self-assessment of the severity of pain experienced by children: development, initial validation, and preliminary investigation for ratio scale properties. Pain 41(2), 139-150.

Bird M & Moniz-Cook ED. 2008. Challenging behaviour in dementia: a psychosocial approach to intervention. In: Woods B, Clare L. Handbook of the Clinical Psychology of Ageing. 1st Edition. Chichester, UK: John Wiley and Sons.

Bjoro K & Herr K. 2008. Assessment of Pain in the Nonverbal or Cognitively Impaired Older Adult. Clinics in Geriatric Medicine 24(2), 237-262.

Björkelund KB, Hommel A, Thorngren KG, Gustafson L, Larsson S & Lundberg D. 2010. Reducing delirium in elderly patients with hip fracture: a multi-factorial intervention study. Acta Anaesthesiologica Scandinavica 54, 678–688.

Boers M, Tangelder MJ, Van Ingen H, Fort JG & Goldstein JL. 2007. The rate of NSAID-induced endoscopic ulcers increases linearly but not exponentially with age: A pooled analysis of 12 randomised trials. Annals of the Rheumatic Diseases 66(3), 417– 418.

Bongard V, Ménard-Taché S, Bagheri H, Kabiri K, Lapeyre-Mestre M & Montastruc J L. 2002. Perception of the risk of adverse drug reactions: differences between health professionals and non health professionals. British Journal of Clinical Pharmacology 54(4), 433-436.

Bonica JJ & Loeser JD. 2001. History of pain concepts and therapies'. In Bonica's management of pain, (third edition), Lippincott Williams and Wilkins, pp. 3-16.

Bounes V, Barniol C, Minville V, Houze-Cerfon CH & Ducassé JL. 2011. Predictors of pain relief and adverse events in patients receiving opioids in a prehospital setting. The American Journal of Emergency Medicine 29(5), 512-517.

Bourin M & Briley M. 2004. Sedation, an unpleasant, undesirable and potentially dangerous side effect of many psychotropic drugs. Human Psychopharmacology 19, 135–139.

Brouquet A, Cudennec T, Benoist S, Moulias S, Beauchet A, Penna C, Teillet L & Nordlinger B. 2010. Impaired mobility, ASA status and administration of tramadol are risk factors for postoperative delirium in patients aged 75 years or more after major abdominal surgery. Annals of Surgery 251(4), 759-765.

Brown D. 2004. A literature review exploring how healthcare professionals contribute to the assessment and control of postoperative pain in older people. Journal of Clinical Nursing 13(6B), 74-90.

Brown D & McCormack B. 2006. Determining factors that have an impact upon effective evidence-based pain management with older people, following colorectal surgery: an ethnographic study. Journal of Clinical Nursing 15(10), 1287-1298.

Bruce J, Drury N, Poobalan AS, Jeffrey RR, Smith WC & Chambers WA. 2003. The prevalence of chronic chest and leg pain following cardiac surgery: a historical cohort study. Pain 104, 265-273.

Bucknall T, Manias E & Botti M. 2001. Acute pain management: Implications of scientific evidence for nursing practice in the postoperative context. International Journal of the Nursing Practice 7, 266-273.

Burkhardt H, Bruckner D & Gladisch R. 2005. Risk factors of worsening renal function in hospitalized elderly patients. Journal of Nephrology 18(2), 166–73.

Burns N & Grove SK. 2009. The practice of nursing research. Appraisal, synthesis and generation of evidence. 6th ed. USA: Elsevier/ Saunders.

Burns N & Grove SK. 2003. Understanding nursing research. Third edition. Saunders. Philadelphia.

Burris JE. 2004. Pharmacologic approaches to geriatric pain management. Archieves of Physical Medicine and Rehabillitation 85, (Suppl 3), 45-49.

Büyükyılmaz F & Aştı T. 2011. The effect of relaxation techniques and back massage on pain and anxiety in Turkish total hip or knee arthroplasty patients. Pain Management Nursing. Article in press. Accepted November 9, 2010.

Camacho-Soto A, Sowa G & Weiner DK. 2011. Chapter 58. Geriatric pain. In: Essentials of Pain Medicine. Benzon H, Raja SN, Fishman SM, Liu S & Cohen SP. Saunders Elsewier. ISBN 978-1-4377-2242-0, 409-421.

Capezuti E. 2004. Minimizing the use of restrictive devices in dementia patients at risk for falling. Nursing Clinics of North America 39 (3), 625–647.

Cepeda MS, Carr DB, Lau J & Alvarez H. 2006. Music for pain relief. Cochrane Database of Systematic Reviews. Issue 2. Art. No.: CD004843. DOI: 10.1002/14651858.CD004843.pub2.

Cerejeira J, Lagarto, L & Mukaetova-Ladinska EB. 2012. Behavioral and psychological symptoms of dementia. Frontiers in Neurology 3, 1-21.

Chanvej L, Petpichetchian W, Kovitwanawong N, Chaibandit C, Vorakul C & Khunthong T. 2004. A Chart Audit of Postoperative Pain Assessment and Documentation: The First Step to Implement Pain Assessment as the Fifth Vital Sign in a University Hospital in Thailand. Journal of Medical Association Thailand 87(12), 1447-1453.

Cho MS, Kim MS, Kim SW & Kim SH. 2007. Opioids in non-cancer chronic pain. European Journal of Pain Supplements 1(1), 53-56.

Christensen K, Doblhammer G, Rau R & Vaupel J. 2009. Ageing populations: the challenge ahead. Lancet 374(3), 1196-1208).

Cohen-Mansfield J. 2004. The adequacy of the minimum data set assessment of pain in cognitively impaired nursing home residents. Journal of Pain and Symptom Management 27(4), 343–51.

Cohen-Mansfield J, Marx M & Rosenthal A. 1989. A description of agitation in a nursing home. Journal of Gerontology 44, M77–M84.

Coker E, Papanaioannou A, Kaassalainen S, Dolovich L, Turpie I & Taniguchi A. 2010. Nurses' perceived barriers to optimal pain management in older adults on acute medical units. Applied Nursing Research 23(3), 139-146.

Coldrey JC, Upton RN, & Macintyre PE. 2011. Advances in analgesia in the older patient. Best Practice & Research Clinical Anaesthesiology 25, 367-378.

Connor LO. 2012. Case report: A patient with dementia presenting with hip fracture in the emergency department – Challenges of acute pain assessment. International Emergency Nursing 20, 255– 260.

Corcoran AM & Kinosian B. 2011. Falls. In: Pignolo, R J, Keenan M & Hebela, NM. Fractures in the Elderly: A Guide to Practical Management. Humana Press. Springer Science+ Business Media. 55-68.

Corner L, Brittain K, & Bond J. 2004. Social aspects of ageing. Psychiatry 3(12), 5-7.

Costardi D, Rozzini L, Costanzi C, Ghianda D, Franzoni S, Padovani A & Trabucchi M. 2007. The Italian version of the pain assessment in advanced dementia (PAINAD) scale. Archives of Gerontology and Geriatrics 44(2), 175-180.

Craig D, Bates C, Davidson J, Kirsty M, Hayes P & Simpson K. 2011. Overdose pattern and outcome in paracetamol-induced acute severe hepatotoxicity. British Journal of Clinical Pharmacology 71(2), 273-282.

Craig KD. 2006. The construct and definition of pain in developmental disability. In: Pain in individuals with developmental disabilities. Symons FJ and Oberlander, TF (eds). Brookes, Baltimore.

Cullen G, Kelly E & Murray FE. 2006. Patients' knowledge of adverse reactions to current medications. British Journal of Clinical Pharmacology 62(2), 232–236.

Cummings JL. 1997. The Neuropsychiatric Inventory Assessing psychopathology in dementia patients. Neurology 48(5 Suppl 6), 10S-16S.

Cummings JL & Benson DF. 1992. Dementia: definition, prevalence, classification and approach to diagnosis. In: Cummings JL, Benson DF (eds). Dementia: A clinical approach. Boston: Butterworth-Heineman.

Cummings JL, Mega M, Gray K, Rosenberg-Thompson S, Carusi DA & Gornbein J. 1994. The Neuropsychiatric Inventory: comprehensive assessment of psychopathology in dementia. Neurology 44, 2308-2314.

Cummings SR & Melton LJ. 2002. Epidemiology and outcomes of osteoporotic fractures. Lancet 359, 1761-1767.

Current Care (Käypä hoito). 2011. Lonkkamurtuma. Suomalaisen Lääkäriseuran Duodecimin ja Suomen Ortopediyhdistyksen asettama työryhmä. Helsinki Duodecim.

Cuvillon P, Ripart J, Debureaux S, Boisson C, Veyrat E, Mahamat A, Bruelle P, Viel E & Eledjam JJ. 2007. Analgesia after hip fracture repair in elderly patients: the effect of a continuous femoral nerve block: a prospective and randomised study. Annales Françaises d'Anesthésie et de Réanimation 26, 2–9.

D'Arcy Y. 2011. Compact Clinical Guide to Acute Pain Management: An Evidence-based Approach for Nurses. Springer Publishing Company.

Dasch B, Endres HG, Maier C, Lungenhausen M, Smektala R, Trampisch HJ & Pientka L. 2008. Fracture-related hip pain in elderly patients with proximal femoral fracture after discharge from stationary treatment. European Journal of Pain 12(2), 149-156.

Davis DH, Terrera GM, Keage H, Rahkonen T, Oinas M, Matthews FE, Cunningham C, Polvikoski T,Sulkava R, Alasdair MJ, MacLullich AMJ & Brayne, C. 2012. Delirium is a strong risk factor for dementia in the oldest-old: a population-based cohort study. Brain 135(9), 2809-2816.

DeWaters T, Faut-Callahan M, McCann J, Paice J, Fogg L, Hollinger- Smith L, Sikorski K & Stanaitis H. 2008. Comparison of self-reported pain and the PAINAD scale in hospitalized cognitively impaired and intact older adults after hip fracture surgery. Orthopaedic Nursing 27, 21–28.

Denny DL & Guido GW. 2012. Undertreatment of pain in older adults: An application of beneficence. Nursing Ethics 19 (6), 800-809.

Derry S, Moore RA & McQuay HJ. 2010. Single dose oral codeine, as a single agent, for acute postoperative pain in adults. Cochrane Database of Systematic Reviews 4. Art. No.: CD008099. DOI: 10.1002/14651858.CD008099.pub2.

Dimitriou R, Calori GM & Giannoudis PV. 2012. Improving patients' outcomes after osteoporotic fractures. International Journal of Clinical Rheumatology 7(1), 109-124.

Dixon RA. 2011. Enduring theoretical themes in psychological aging: Derivation, functions, perspectives, and opportunities. Handbook of the Psychology of Aging 7e, 2.

Donaldson C, Tarrier, N & Burns A. 1997. The impact of the symptoms of dementia on caregivers. British Journal of Psychiatry 170, 62–68.

Doody RS, Stevens JC, Beck C, Dubinsky RM, Kaye JA, Gwyther L, Mohs RC,Thal LJ, Whitehouse PJ, DeKosky ST & Gummins JL. 2001. Practice Parameter: Management of Dementia. Neurology 56(9), 1154-1166.

Dunn K. 2004. Music and the reduction of post-operative pain. Nursing standard (Royal College of Nursing (Great Britain): 1987) 18(36), 33-39.

Eccleston C. 2001 . Role of psychology in pain management. British Journal of Anaesthesia 87(1), 144–152.

Eckhardt K , Li S, Ammon S, Schänzle G, Mikus G & Eichelbaum M. 1998. Same incidence of adverse drug events after codeine administration irrespective of the genetically determined differences in morphine formation. Pain 76(1-2), 27.

Eid T & Bucknall T. 2008. Documenting and implementing evidence-based postoperative pain management in older patients with hip fracture. Journal of Orthopaedic Nursing 12, 90-98.

Elia N, Lysakowski C & Tramer MR. 2005. Does multimodal analgesia with acetaminophen, nonsteroidal antiinflammatory drugs, or selective cyclooxygenase-2 inhibitors and patient-controlled analgesia morphine offer advantages over morphine alone? Meta-analyses of randomized trials. Anesthesiology 103, 1296–1304.

Engwall M & Duppils GS, 2009. Music as a nursing intervention for postoperative pain: a systematic review. Journal of Perianesthesia Nursing 24, 370–383.

Eritz H & Hadjistavropoulos T. 2011. Do informal caregivers consider nonverbal behavior when they assess pain in people with severe dementia? The Journal of Pain 12(3), 331-339.

Erkinjuntti T. 2010. Lääkärin käsikirja. Muistioireet, lievä kognitiivinen heikentymä ja dementia. http://www.terveysportti.fi.ezproxy.uef.fi:2048/dtk/ltk/koti?

European Commission. 2007. Ethics for researchers. ftp://ftp.cordis.europa.eu/pub/fp7/docs/ethics-forresearchers. pdf (27.6.2013).

Farmer AP, Légaré F, Turcot L, Grimshaw J, Harvey E, McGowan JL & Wolf F. 2008. Printed educational materials: effects on professional practice and health care outcomes (Review). Cochrane Database of Systematic Reviews. Issue 3.

Feeney SL. 2004. The relationship between pain and negative affect in older adults: anxiety as a predictor of pain. Journal of Anxiety Disorders 18, 733-744.

Feenstra J, Heerdink ER, Grobbee DE & Stricker BH. 2002. Association of nonsteroidal anti-inflammatory drugs with first occurrence of heart failure and with relapsing heart failure: the Rotterdam Study. Archives of Internal Medicine 162, 265-270.

Feldt KS. 2000. The checklist of nonverbal pain indicators (CNPI). Pain Management Nursing 1, 13–21.

Feldt KS, Ryden MB & Miles S. 1998. Treatment of pain in cognitively impaired compared with cognitively intact older patients with hip-fracture. Journal of American Geriatrics Society 46(9), 1079–85.

Ferrell BA, Ferrell BR & Rivera L. 1995. Pain in cognitively impaired nursing home patients, Journal of Pain and Symptom Management 10, 591–598.

Finkel S, Silva JC, Cohen G, Miller S & Sartorius N. 1997. Behavioral and psychological signs and symptoms of dementia: a consensus statement on current knowledge and implications for research and treatment. International Journal of Geriatric Psychiatry 12, 1060–1061.

Fishbain DA, Cole B, Lewis J, Rosomoff HL & Rosomoff RS. 2008. What percentage of chronic non-malignant pain patients exposed to chronic opioid analgesic therapy develop abuse/addiction and/or aberrant drug related behaviors? A structured evidence-based review. Pain Medicine 9(4), 444–459.

Fox P, Solomon P, Raina P & Jadad A. 2004. Barriers and facilitators in pain management in long-term care institutions: A qualitative study. Canadian Journal on Aging 23, 269–280.

Fong HK, Sands LP & Leung M. 2006. The role of postoperative analgesia in delirium and cognitive decline in elderly patients: A Systematic Review. Anesthesia Analgesia 102, 1255–1266.

Forster MC, Pardiwala A & Calthorpe D. 2000. Analgesia requirements following hip fracture in the cognitively impaired. Injury 31(6), 435–436.

Forster FJ. 2012. Developing a nurse practitioner role for hip fracture care: A journey of challenges. International Journal of Orthopaedic and Trauma Nursing 16, 214–221.

Foss NB, Kristensen MT, Kristensen BB, Jensen PS & Kehlet H. 2005. Effect of postoperative epidural analgesia on rehabilitation and pain after hip fracture surgery: a randomized, double-blind, placebo-controlled trial. Anesthesiology 102(6), 1197–1204.

Frampton M. 2003. Experience assessment and management of pain in people with dementia. Age and Ageing 32(3), 248-251.

Galbraith JG, Butler JS & McGreal GT. 2011. Opioids toxicity as a cause of spontaneous urinary bladder rupture. The American Journal of Emergency Medicine 29(2), 239. e1-239.e3.

Gaskell H, Derry S, Moore RA & McQuay HJ. 2009. Single dose oral oxycodone and oxycodone plus paracetamol (acetaminophen) for acute postoperative pain in adults. Cochrane Database of Systematic Reviews, Issue 3. Art. No.: CD002763. DOI: 10.1002/14651858.CD002763.pub2

Gatoulis SC, Voelker M & Fisher M. 2012. Assessment of the efficacy and safety profiles of aspirin and acetaminophen with codeine: Results from 2 randomized, controlled trials in individuals with tension-type headache and postoperative dental pain. Clinical Therapeutics 34(1), 138-148.

Gibson SJ, Voukelatos X, Ames D, Flicker L & Helme RD. 2001. An examination of pain perception and cerebral event-related potentials following carbon dioxide laser stimulation in patients with Alzheimer's disease and age-matched control volunteers. Pain Research and Management 6, 126–132.

Giguère A, Légaré F, Grimshaw J, Turcotte S, Fiander M, Grudniewicz A,Makosso-Kallyth S,Wolf FM, Farmer AP & Gagnon MP. 2012. Printed educational materials: effects on professional practice and healthcare outcomes. Cochrane Database of Systematic Reviews, Issue 10. Art. No.: CD004398. DOI: 10.1002/14651858.CD004398.pub3.

Gittell JH, Fairfield K, Bierbaum B, Head W, Jackson R, Kelly M, Laskin R, Lipson S, Siliski J,Thornhill T & Zuckerman J. 2000. Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: A nine-hospital study of surgical patients. Medical Care 38(8), 807-819.

Gnjidic D, Murnion BP & Hilmer SN. 2008. Age and opioid analgesia in an acute hospital population. Age & Ageing 37, 699–702.

Good M. 2009. Pain: A Balance Between Analgesia and Side Effects. In: Peterson, SJ & Bredow TS. 2009. Middle Range Theories. Application to nursing research. Williams & Wilkins, Lipincott. 63- 81.

Gordon A, Callaghan D, Spink D, Cloutier C, Dzongowski P, O'Mahony W, Sinclair D, Rashiq S, Buckley N, Cohen G, Kim J, Boulanger A, Piraino PS, Eisenhoffer J, Harsanyi Z, Darke AC & Michalko KJ. 2010. Buprenorphine transdermal system in adults with chronic low back pain: a randomized, double-blind, placebo-controlled crossover study, followed by an open-label extension phase. Clinical Therapeutics 32(5), 844-860.

Gordon DB, Dahl JL, Miaskowski C, McCarberg B, Todd KH, Paice JA, Lipman AG, Bookbinder M, Sanders SH, Turk DC & Carr DB. 2005. American pain society recommendations for improving the quality of acute and cancer pain management: American Pain Society Quality of Care Task Force. Archives of Internal Medicine 165(14), 1574–1580.

Graneheim UH & Lundman B. 2004. Qualitative Content Analysis in Nursing Research: Concepts, Procedures and Measures to Achieve Trustworthiness. Department of Nursing, Umeå University. Umeå Nurse Education Today 24, 105–112.

Grau JW, Huie JR, Garraway SM, Hook MA, Crown ED, Baumbauer KM, Lee KH, Hoy KC & Ferguson AR. 2012. Impact of behavioral control on the processing of nociceptive stimulation. Frontiers in Physiology 3(262), 1-21. www.frontiersin.org

Griffiths R, Alper J, Beckingsale A, Goldhill D, Heyburn G, Holloway J, Leaper E, Parker, M, Ridgway S, White S, Wiese M, Wilson I. 2012. Association of Anaesthetists of Great Britain and Ireland. Management of proximal femoral fractures 2011. Anaesthesia 67, 85–98.

Guétin S, Portet F, Picot MC, Pommie C, Messaoudi M, Djabelkir L, Olsen AL, Cano MM, Lecourt E & Touchon J. 2009. Effect of music therapy on anxiety and depression in patients with Alzheimer's type dementia: Randomised, controlled study. Dementia and Geriatric Cognitive Disorders 28(1):36–46.

Gulpers MJ, Bleijlevens MH, Capezuti E, van Rossum E, Ambergen T & Hamers JP. 2012. Preventing belt restraint use in newly admitted residents in nursing homes: A quasi-experimental study. International Journal of Nursing Studies 49, 1473-1479.

Gullberg B, Johnell O & Kanis JA. 1997. World-wide projections for hip fracture. Osteoporosis International 7(5), 407–413.

Gupta SK, Southam M, Gale R & Hwang SS. 1992. System functionality and physicochemical model of fentanyl transdermal system. Journal of Pain and Symptom Management 7, 17–26.

Hadjistavropoulos T & Fine PG. 2006. Chronic pain in older persons: prevalence, assessment and management. Reviews in Clinical Gerontology 16, 231-241.

Hadjistavropoulos T, Herr K, Turk DC, Fine PG, Dworkin RH, Helme R, Jackson K, Parmelee PA, Rudy TE, Lynn B, Chibnall JT, Craig KD, Ferrell B, Fillingim RB, Gagliese L, Gallagher R, Gibson SJ, Harrison EL, Katz B, Keefe FJ, Lieber SJ, Lussier D, Schmader KE, Tait RC, Weiner DK & Williams J. 2007. An interdisciplinary expert consensus statement on assessment of pain in older persons. The Clinical Journal of Pain 23, S1-S43.

Hadjistavropoulos T, Hunter P & Fitzgerald TD. 2009. Pain assessment and management in older adults: Conceptual issues and clinical challenges. Canadian Psychology/Psychologie canadienne 50(4), 241-254.

Hadjistavropoulos T, Voyer P, Sharpe D, Verreault R & Aubin M. 2008. Assessing pain in dementia patients with comorbid delirium and/or depression. Pain Management Nursing 9, 48-54.

Halimaa SL. 2001. Hoidetaanko keskoslapsen kipua? Tutkimus hoitajien valmiuksista arvioida ja hoitaa keskoslapsen kipua. Doctoral dissertation. Kuopion yliopiston julkaisuja E. Yhteiskuntatieteet 91.

Handoll HHG, Cameron ID, Mak JCS & Finnegan TP. 2009. Multidisciplinary rehabilitation for older people with hip fractures. Cochrane Database of Systematic Reviews 2009, Issue 4. Art. No.: CD007125. DOI: 10.1002/14651858.CD007125.pub2.

Harris JD. 2008. Management of expected and unexpected opioid-related side effects. Clinical Journal of Pain 24(Suppl 10): S8–S13.

Harwood D, Barker W, Ownby R & Ducra R. 2000. Relationship of behavioral and psychological symptoms to cognitive impairment and functional status in Alzheimer's disease. International Journal of Geriatric Psychiatry 15 (5), 393–400.

Hayes WC, Myers ER, Robinovitch SN, Van Den Kroonenberg A,Courtney AC & McMahon TA. 1996. Etiology and prevention of age-related hip fractures. Bone 18, S77–86.

Hayflick L. 2007. Biological aging is no longer an unsolved problem. Annals of the New York Academy of Sciences 1100(1), 1-13.

Health 2015 (Terveys 2015). Terveys 2015 –kansanterveysohjelman väliarviointi. Sosiaali- ja terveysministeriön raportteja ja muistiota 2012:4.

Helme RD & Gibson SJ. 1999. Pain in older people. Epidemiology of Pain, 103-112.

Helmrich S, Yates P, Nash R, Hobman A, Poulton V & Berggren L. 2001. Factors influencing nurses' decisions to use non-pharmacological therapies to manage patients' pain. Australian Journal of Advanced Nursing 19 (1), 27–35.

Herr K. 2011. Pain assessment strategies in older patients. The Journal of Pain 12(3), S3-S13.

Herr K, Bjoro K & Decker S. 2006. Tools for Assessment of Pain in Nonverbal Older Adults with Dementia: A State-of-the-Science Review. Journal of Pain and Symptom Management 31 (2): 170- 192.

Herr K, Bursch H, Ersek M, Miller L & Swafford K. 2010. Use of Pain-behavioral Assessment Tools in the Nursing Home. Expert Consensus Recommendations for Practice. Journal of Gerontological Nursing 36(3):18-28.

Herr K, Coyne PJ, Key T, Manworren R, McCaffery M, Merkel S, Pelosi-Kelly J & Wild, L. 2006a. Pain assessment in the nonverbal patient: Position statement with clinical practice recommendations. Pain Management Nursing 7(2), 44-52.

Herr K & Titler M. 2009. Acute pain assessment and pharmacological management practices for the older adult with a hip fracture: review of ED trends. Journal of Emergency Nursing 35(3), 12-20.

Herr K, Titler MG, Schilling ML, Marsh JL, Ardery G, Clarke WR & Everett LQ. 2004. Evidence-based Assessment of Acute Pain in Older Adults. Current Nursing Practices and perceived Barriers. Clinical Journal of Pain 20(5), 331-340.

Herr K, Titler MG, Schilling ML, Marsh JL, Jin Xie X, Clarke WR. & Everett LQ. 2006b. Acute Pain Treatment for Older Adults Hospitalized With Hip Fracture: Current Nursing Practices and Perceived Barriers. Applied Nursing Research 16(4), 211-227

Herrick C, Steger-May K, Sinacore DR, Brown M, Schechtman KB & Binder EF. 2004. Persistent Pain in Frail Older Adults After Hip Fracture Repair. Journal of the American Geriatrics Society 52(12), 2062-2068.

Hochhalter AK, Smith ML & Ory MG. 2011. Successful aging and resilience: Applications for public health and health care. In: Resnick B, Gwyther LP, & Roberto KA. Resilience in aging: concepts, research, and outcomes. Springer New York. Springer Science+ Business Media. 15-29.

Hong-Gu H. 2006. Non-Pharmacological Methods in Children's Postoperative Pain Relief in China. Kuopio University Publications. Social Sciences 133.

Holmes JD & House, AO. 2000. Psychiatric illness in hip fracture. Age & Ageing 29(6), 537–546.

Horgas AL. 2003. Pain management in Elderly Adults. Journal of Infusion Nursing 26(3),161-165.

Horgas AL, Elliott AF & Marsiske M. 2009. Pain Assessment in Persons with Dementia: Relationship Between Self-Report and Behavioral Observation. Journal of the American Geriatrics Society 57(1), 126-132.

Horgas AL, Nichols AL, Schapson CA & Vietes K. 2007. Assessing pain in persons with dementia: relationships among the non-communicative patient's pain assessment instrument, self-report, and behavioral observations. Pain Management Nursing 8(2), 77-85.

Hooyman NR & Kiyak HA. 2011. Social gerontology: A multidisciplinary perspective (9th ed.). Boston: Pearson Education. ISBN 0205763138.

Hudcova J, McNicol E, Quah C, Lau J & Carr DB. 2005. Patient controlled intravenous opioid analgesia versus conventional opioid analgesia for postoperative pain control: A quantitative systematic review. Acute Pain 7(3), 115–132.

Husebo BS, Ballard C. & Aarsland D. 2011. Pain treatment of agitation in patients with dementia:a systematic review. International Journal of Geriatric Psychiatry 26, 1012–1018.

Hutchison, Rob W, Kim S & Gilder R. 2006. Evaluation of a behavioral assessment tool for the individual unable to self-report pain. American Journal of Hospice and Palliative Medicine 23(4)328-331.

Huusko TM, Karppi P, Avikainen V, Kautiainen H & Sulkava R. 2002. Intensive geriatric rehabilitation of hip fracture patients: A randomized, controlled trial. Acta Orthopaedica Scandinavica 73, 425–431.

Huusko TM, Karppi P, Avikainen V, Kautiainen H & Sulkava R. 2000. Randomised, clinically controlled trial of intensive geriatric rehabilitation in patients with hip fracture: Subgroup analysis of patients with dementia. British Medical Journal 321, 1107–1111.

Hwang U, Richardson LD, Sonuyi TO, & Morrison RS. 2006. The effect of emergency department crowding on the management of pain in older adults with hip fracture. Journal of the American Geriatrics Society 54(2), 270-275.

Innis J, Bikaunieks N, Petryshen P, Zellermeyer V & Ciccarelli L. 2004. Patient's satisfaction and pain management: an educational approach. Journal of Nursing Care Quality 19(4), 322-327.

International Association for the Study of Pain (IASP). 1986. Classification of chronic pain: Descriptions of chronic pain syndromes and definitions of pain terms. Prepared by the International Association for the Study of Pain, Subcommittee on Taxonomy. Pain Supplement S1–S226.

Ishihara M, Ikesue H, Matsunaga H, Katsuya S, Kiyoyuki K, Kimitaka S, Ryozo O, Toshiaki S, Hiroaki A & Yoshinori I. 2012. A Multi-institutional Study Analyzing Effect of Prophylactic Medication for Prevention of Opioid-induced Gastrointestinal Dysfunction. Clinical Journal of Pain 28(5), 373-381.

Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'BrienMA, JohansenM, Grimshaw J & Oxman AD. 2012. Audit and feedback: effects on professional practice and healthcare outcomes. Cochrane Database of Systematic Reviews, Issue 6, Art. No.: CD000259. DOI: 10.1002/14651858.CD000259.pub3.

Jackson SE. 2010. The efficacy of an educational intervention on documentation of pain management for the elderly patient with a hip fracture in the emergency department. Journal of Emergency Nursing 36(1), 10-15.

Jahr JS, Breitmeyer JB, Pan C, Royal MA & Ang RY. 2012. Safety and efficacy of intravenous acetaminophen in the elderly after major orthopedic surgery: subset data analysis from 3, randomized, placebo-controlled trials. American Journal of Therapeutics 19(2), 66-75.

Jalili M, Fathi M, Moradi-Lakeh M & Zehtabchi S. 2012. Sublingual Buprenorphine in Acute Pain Management: A Double-Blind Randomized Clinical Trial. Annals of Emergency Medicine 59(4), 276-280.

Johansson I, Bååth C, Wilde-Larsson B & Hall-Lord ML. 2012. Acute confusion states, pain, health, functional status and quality of care among patients with hip fracture during hospital stay. International Journal of Orthopaedic and Trauma Nursing. In press

Johnell O & Kanis JA. 2004. An estimate of the worldwide prevalence, mortality and disability associated with hip fracture. Osteoporosis International, 15, 897–902.

Johnson JC. 2011. Prevention and Management of Perioperative Delirium. In: Pignolo RJ et al. (eds.), Fractures in the Elderly. Humana Press. pp. 101-114.

Jokinen H, Hänninen T, Ylikoski R, Karrasch M, Pulliainen V, Hokkanen L, Poutiainen E, Erkinjuntti T & Hietanen M. 2012. Etenevien muistisairauksien varhainen tunnistaminen – neuropsykologinen näkökulma. Suomen Lääkärilehti 23, 1816-1822.

Jopp D & Smith J. 2006. Resources and life-management strategies as determinants of successful aging: On the protective effect of selection, optimization and compensation. Psychology and Aging 21(2), 253–265.

Juhlin T, Björkman S & Höglund P. 2005. Cyclooxygenase inhibition causes marked impairment of renal function in elderly subjects treated with diuretics and ACE-inhibitors. European Journal of Heart Failure 7(6), 1049–1056.

Jäntti P. 2008. Kaatumiset ja niiden ehkäisy. In: Hartikainen S & Lönnroos E. Geriatria. Arvioinnista kuntoutukseen. Edita Helsinki. PP 290.

Jäntti P. 2011. Muistisairauksien merkitys lonkkamurtuman riskitekijänä. Käypä hoito. Näytönastekatsaukset. http://kaupahoito.fi/khhaku/PrintArticle?tunnus=nak04978. Accessed 15th February 2013.

Järvinen TL, Harri Sievänen H, Khan KM, Heinonen A & Kannus P. 2008. Shifting the focus in hip fracture prevention from oseoporosis to falls. British Medical Journal 336 (7636), 124-126.

Kaasalainen S, Akhtar-Danesh N, Hadjistavropoulos T, Zwakhalen S & Verreault R. 2012. A Comparison Between Behavioral and Verbal Report Pain Assessment Tools for Use with Residents in Long Term Care. Pain Management Nursing. In press.

Kaasalainen S. Coker E. Dolovich L. Papaioannou A. Hadjistavropoulos T. Emili A & Ploeg J. 2007. Pain management decision making among long-term care physicians and nurses. Western Journal of Nursing Research 29(5), 561-588.

Kankkunen P. Dementiaoireisen ihmisen kivun hoidon hyvät käytännöt [Good practices in pain management among people with dementia]. In: Voutilainen P & Tiikkainen P. Gerontologinen hoitotyö [Gerontological nursing]. WSOY. Oppimateriaalit Oy, Helsinki. 2009; 247-265.

Kankkunen P. 2003. Parents' Perceptions and Alleviation of Children's Postoperative Pain at Home after Day Surgery. Kuopio University publications E. Social Sciences 100.

Kannus P, Niemi S, Parkkari J, Palvanen M, Heinonen A, Sievanen H, Järvinen T, Khan K & Järvinen M. 2002. Why is the age-standardized incidence of low-trauma fractures rising in many elderly populations? Journal of Bone and Mineral Research 17, 1363-1367.

Kannus P, Niemi S, Parkkari J, Palvanen M, Vuori I & Järvinen M. 2006. Nationwide decline in incidence of hip fracture. Journal of Bone and Mineral Research 21, 1836–1838.

Kannus P, Sievänen H, Palvanen M, Järvinen T & Parkkari J. 2005. Prevention of falls and consequent injuries in elderly people. Lancet 366, 1885-1893.

Kapil RP, Cipriano A, Friedman K, Michels G, Shet MS, Colucci SV, Apselhoff G, Kitzmiller J & Harris SC. 2012. Once-Weekly Transdermal Buprenorphine Application Results in Sustained and Consistent Steady-State Plasma Levels. Journal of Pain and Symptom Management. Accepted for publication: July 1, 2012.

Karisto A. 2004. Kolmas ikä: Uusi näkökulma vanhenemiseen. Ikääntyminen voimavarana. Tulevaisuusselonteon liiteraportti. HELDA- The digital Repository of University of Helsinki. http://hdl.handle.net/10224/4042.

Karttunen N, Lihavainen K, Sipilä S, Rantanen T, Sulkava R & Hartikainen S. 2012. Musculoskeletal pain and use of analgesics in relation to mobility limitation among community-dwelling persons aged 75 years and older. European Journal of Pain 16(1), 140-149.

Kelley AS, Siegler EL & Reid MC. 2008. Pitfalls and recommendations regarding the management of acute pain among hospitalized patients with dementia. Pain Medicine 9(5), 581-586.

Kirkwood TBL. 2008. A systematic look at an old problem. Nature 451(7), 644-647.

Kirkwood TBL. 2005. Understanding the odd science of aging. Cell 120, 437–447.

Knopman D. 2011. Alzheimer's Disease. In: Agronin ME & Maletta, Gabe J. Principles and Practice of Geriatric Psychiatry, 2nd Edition, Copyright (c) 2011 Lippincott Williams & Wilkins. PP 302-315.

Kondo A, Zierler BK & Hagino H. 2012. Comparison of care process and patient outcomes after hip-fracture surgery in acute-care hospitals in Japan and the United States. International Journal of Orthopaedic and Trauma Nursing 16, 195–205.

Kovach CR, Logan BR, Joosse L & Noonan PE. 2012. Failure to identify behavioral symptoms of people with dementia and the need for follow-up physical assessment. Research in Gerontological Nursing 5(2), 89-93.

Kovach CR, Logan BR, Noonan PE, Schlidt AM, Smerz J, Simpson M, & Well, T. 2006a. Effects of the Serial Trial Intervention on Discomfort and Behavior of Nursing Home Residents with Dementia. American Journal of Alzheimer's Disease & Other Dementias 21(3), 147-155.

Kovach CR, Noonan PE, Schildt AM, Reynolds S & Wells T. 2006b. Dementia intervention an approach to treating unmet needs. Journal of Gerontological Nursing 32(4), 17-27.

Kristensen MT. 2013. Hip Fracture− Related Pain Strongly Influences Functional Performance of Patients With an Intertrochanteric Fracture Upon Discharge From the Hospital. The American Academy of Physical Medicine and Rehabilitation 5, 135-141.

Kuntz AF, Gee AO, Ahn J & Mehta S. 2011. Hip Fractures. In: Fractures in the Elderly Humana Press, 239-256.

Kunz M, Mylius, Scharmann S, Schepelman K & Lautenbacher S. 2009a. Influence of dementia on multiple components of pain. European Journal of Pain 13, 317–325.

Kunz M, Scharmann S, Schepelmann K, Hemmeter U & Lautenbacher S. 2009b. The facial expression of pain in dementia. Pain 13(3), 317-325.

Lanas A & Hunt R. 2006. Prevention of anti-inflammatory drug induced gastrointestinal damage: benefits and risks of therapeutic strategies. Annals of Medicine 38, 415–428.

Lang T, Barker R, Steinlechner B, Gustorff B, Puskas T, Gore O & Kober A. 2007. TENS relieves acute posttraumatic hip pain during emergency transport. Journal of Trauma 62(1), 184–188.

Laurence DR & Bennett PN. 1987. Clinical Pharmacology, 6th Edition, Churchill Livingston, Edinburgh, 101.

Lautenbacher S, Kunz M, Mylius V, Sharmann S, Hemmeter U & Scheplemann K. 2007. Multidimensional pain assessment in patients with dementia. Schmerz 21, 529–538.

Lejman E, Westerbotn M, Pöder U & Wadensten B. 2013. The ethics of coercive treatment of people with dementia. Nursing Ethics 20(3), 248–262.

Leong IY, Chong MS & Gibson SJ. 2006. The use of a self-reported pain measure, a nurse-reported pain measure and the PAINAD in nursing home residents with moderate and severe dementia: a validation study. Age & Ageing 35(3), 252–256.

Li MH, Yeh ET, Huang SC, Wang HM, Su WR, & Lai YL. 2010. Clinical Experience With Strong Opioids in Pain Control of Terminally ill Cancer Patients in Palliative Care Settings in Taiwan. Journal of Experimental & Clinical Medicine 2(6), 292-296.

Lindesay J, Rockwood K & Rolfson D. 2002. The epidemiology of delirium. In: Delirium in old age, J. Lindesay, K. Rockwood, A. Macdonald, eds. (New York: Oxford University Press), pp. 27–50.

Lincoln YS & Guba EG. 1985. Naturalistic Inquiry. Sage Publications Inc., Newbury Park; London, New Delhi.

Linjakumpu T. 2003. Drug use among the home-dwelling elderly. Trends, polypharmacy, and sedation. Faculty of Medicine, University of Oulu, (Doctoral thesis).

Lints-Martindale AC, Hadjistavropoulos T, Barber B & Gibson SJ. 2007. A psychophysical investigation of the facial action coding system as an index of pain variability among older adults with and without Alzheimer's disease. Pain Medicine 8, 678–89.

Liukas A. 2011. Pharmacokinetics of oxycodone and paracetamol in the elderly a clinical pharmacokinetic study on orthopaedic surgical patients and Healthy Volunteers. Dissertation University of Turku. Annales Universitatis Turkuensis ser. d osa - tom. 985 medica – odontologica.

Lo V, Meadows SE & Saseen J. 2006. When should COX-2 selective NSAIDs be used for osteoarthritis and rheumatoid arthritis? Journal of Family Practice 55, 260-262.

Lynch EP, Lazor AM, Gellis JE, Orav J, Goldman L & Marcantonio ER. 1998. The impact of postoperative pain on the development of postoperative delirium. Anesthesia & Analgesia 86(4), 781–785.

Lyyra TM & Tiikkainen P. 2008. Terveys ja toimintakyky. In: Voutilainen P & Tiikkainen P. 2008. Gerontologinen hoitotyö. WSOY Oppimateriaalit Oy. PP 58-74.

Lönnroos E. 2009. Hip fractures and medication-related falls in older people. Kuopio University Publications D. Medical Sciences 467. 1-125.

Lönnroos E, Kiviranta I & S. Hartikainen S. 2010. Hip fracture management and outcomes in Finland. European Geriatric Medicine 1,101–103.

Macintyre PE, Schug SA, Scott DA, Visser EJ & Walker M. 2010. APM: SE Working Group of the Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine. Acute Pain Management: Scientific Evidence (3rd edition). ANZCA & FPM, Melbourne.

Maher AB, Meehan AJ, Hertz K, Hommel A, MacDonald V, O'Sullivan M. Kirsten P & Taylor A. 2012. Acute nursing care of the older adult with fragility hip fracture: An international perspective (Part 1). International Journal of Orthopaedic and Trauma Nursing 16, 177-194.

Mamdani M, Juurlink DN, Lee DS, Rochon PA, Kopp A, Naglie G, Austin PC, Laupacis A & Stukel TA. 2004. Cyclo-oxygenase-2 inhibitors versus non-selective non-steroidal anti-inflammatory drugs and congestive heart failure outcomes in elderly patients: a population-based cohort study. Lancet 363, 1751-1756.

Manfredi PL, Breuer B, Meier D E & Libow L. 2003. Pain assessment in elderly patients with severe dementia. Journal of Pain and Symptom Management 25(1), 48-52.

Mao J. 2008. Opioid-induced hyperalgesia. Pain: Clinical Updates (IASP) 16(2).

Marcou TA, Marque S, Mazoit JX & Benhamou D. 2005. The median effective dose of tramadol and morphine for postoperative patients: a study of interactions. Anesthesia & Analgesia 100(2), 469-474.

Marret E, Kurdi O, Zufferey P & Bonnet F. 2005. Effects of nonsteroidal antiinflammatory drugs on patient- controlled analgesia morphine side effects: meta-analysis of randomized controlled trials. Anesthesiology 102(6), 1249–1260.

Martelin T. 2002. Elinajan ja toimintakyvyn muutokset hyvin iäkkäillä. Lecture in course: ”Myöhäisvanhuus tutkittavana”, Univeristy of Helsinki, Department of Social Policy. 26.3.2002.

McAuliffe L, Nay R, O'Donnell M & Fetherstonhaugh D. 2009. Pain assessment in older people with dementia: literature review. Journal of Advanced Nursing 65(1), 2–10.

McCaffery M. 1968. Nursing practice theories related to cognition, bodily pain, and man-environment interactions. Los Angeles: University of California at Los Angeles Students' Store.

McCaffery R. 2009. The effect of music on acute confusion in older adults after hip or knee surgery. Applied Nursing Research, 22(2), 107-112.

McCaffery M & Ferrell BR. 1997. Nurses knowledge of pain assessment and management: How much progress have we made? Journal of Pain and Symptom Management 14(3), 175-188.

McCaffery M, Ferrell B, O'Neil-Page E, Lester M & Ferrell B. 1990. Nurses' knowledge of opioid analgesic drugs and psychological dependence. Cancer Nursing 13, 21--27.

McGuire DB. 1992. Comprehensive and Multidimensional Assessment and Measurement of Pain. Journal of Pain and Symptom Management 7 (5), 312–319.

McQuay H, Moore A & Justins D. 1997. Treating acute pain in hospital. British Medical Journal 314(7093), 531–535.

McLachlan AJ, Bath S, Naganathan V, Hilmer SN, Le Couteur DG, Gibson SJ & Blyth FM. 2011. Clinical pharmacology of analgesic medicines in older people: impact of frailty and cognitive impairment. British Journal of Clinical Pharmacology 71(3), 351-364.

McLiesh P, Mungall D & Wiechula R. 2009. Are we providing the best possible pain management for our elderly patients in the acute-care setting? Journal of Evidence Based Healthcare 7, 173–180.

Mehta RH, Rathore SS, Radford MJ, Wang Y & Krumholz HM. 2001. Acute myocardial infarction in the elderly: Differences by age. Journal of the American College of Cardiology 38(3), 736-741.

Mehta SS, Siegler EL, Henderson CR & Reid MC. 2010. Acute Pain Management in Hospitalized Patients with Cognitive Impairment: A Study of Provider Practices and Treatment Outcomes. Pain Medicine 11, 1516–1524

Melton LJ. 1996. 3rd: Epidemiology of hip fractures: implications of the exponential increase with age. Bone 18, 121S-125S.

Melzack R. 1996. Gate Control Theory. On the Evolution of Pain Concepts. Pain Forum 5(1), 128-138.

Melzack R, & Wall P. 1965. Pain mechanisms: A new theory. Science 150 (699), 971–979.

Mercadante S & Arcuri E. 2005. Hyperalgesia and opioid switching. American Journal of Hospice & Palliative Medicine 22(4), 291–294.

Merskey H & Bogduk N. 1994. Classification of Chronic Pain, IASP Task Force on Taxonomy. Seattle, IASP Press.

Metsämuuronen J. 2006. Tutkimuksen tekemisen perusteet ihmistieteissä: tutkijalaitos. International Methelp.

Miles MB & Huberman AM. 1994. Qualitative data analysis: A sourcebook of new methods (2nd ed.). Beverly Hills, CA: Sage.

Milisen, K, Abraham IL & Broos PL. 1998. Postoperative variation in neurocognitive and functional status in elderly hip fracture patients. Journal of Advanced Nursing 27 (1), 59–67.

Mishra H & Khan FA. 2012. A double-blind, placebo-controlled randomized comparison of pre and postoperative administration of ketorolac and tramadol for dental extraction pain. Journal of Anaesthesiology, Clinical Pharmacology 28, 221-225.

Moir MS, Bair E, Shinnick P & Messner A. 2000. Acetaminophen versus acetaminophen with codeine after pediatric tonsillectomy. The Laryngoscope 110(11), 1824–1827.

Moling O, Cairon E, Rimenti G, Rizza F, Pristerá R & Mian P. 2006. Severe hepatotoxicity after therapeutic doses of acetaminophen. Clinical Therapeutics, 28(5), 755-760.

Moniz-Cook ED, Swift K, James I, Malouf R, De Vugt M & Verhey F. 2012. Functional analysis-based interventions for challenging behaviour in dementia. Cochrane Database of Systematic Reviews, Issue 2. Art. No.: CD006929. DOI: 10.1002/14651858.CD006929.pub2.

Moore RA, Derry S, McQuay HJ & Wiffen PJ. 2011. Single dose oral analgesics for acute postoperative pain in adults. Cochrane Database of Systematic Review. Issue 9. Art. No.: CD008659. DOI: 10.1002/14651858.CD008659.pub2.

Moore K & Haralambou B. 2007. Barriers to reducing the use of restraints in residential elder care facilities. Journal of Advanced Nursing 58(6), 532–540.

Morrison RS, Magaziner J, Gilbert M, Koval KJ, McLaughlin MA, Orosz G, Strauss E & Siu AL. 2003a. Relationship between Pain and Opioid Analgesics on the Development of Delirium Following Hip Fracture. Journal of Gerontology Medical Sciences 58A (1), 76–81.

Morrison RS, Magaziner MA, McLaughlin G, Orosz SB, Silberweig KJ, Koval & Siu AL. 2003b. The Impact of Post-Operative Pain on Outcomes Following Hip Fracture. Pain 103 (3), 303–11.

Morrison RS & Siu AL. 2000. A comparison of pain and its treatment in advanced dementia and cognitively intact patients with hip fracture. Journal of Pain and Symptom Management 19(4), 240–248.

Mort JR, Shiyanbola OO, Ndehi LN, Xu Y, & Stacy JN. 2011. Opioid-paracetamol prescription patterns and liver dysfunction: a retrospective cohort study in a population served by a US health benefits organization. Drug Safety 34(11), 1079-1088.

Myles PS & Power I. 2007. Clinical update: postoperative analgesia. Lancet 369, 810-812.

Mäntyselkä P. 2008. Balancing act with geriatric pain treatment. Pain 138(1), 1-2.

Määttä M & Kankkunen P. 2009. Kansainväliset kipumittarit vaikeaa dementiaa sairastavien kivun arvioinnissa. Hoitotiede 21(4), 282-293.

Naing CM, Aung K & Yeoh PN. 2012. Buprenorphine for treating cancer pain. Cochrane Database of Systematic Reviews 1. Art. No.: CD009596. DOI: 10.1002/14651858.CD009596.

Narayanaswamy M, Smith J & Spralja A. 2006. Choice of opiate and incidence of confusion in elderly postoperative patients. Annual Scientific Meeting of the Australian and New Zealand Society of Anaesthetists. Adelaide, Australia.

National Health and Medical Research Council. 1999. Acute pain management: scientific evidence. Commonwealth of Australia, Canberra.

National institute for health and welfare (NIHW). 2012. http://www.thl.fi/fi_FI/web/fi/tutkimus/hankkeet/perfect/lonkkamurtuma/perusraportit

Nie H, Zhao B, Zhang YQ, Jiang YH & Yang YX. 2012. Pain and cognitive dysfunction are the risk factors of delirium in elderly hip fracture Chinese patients. Archives of Gerontology and Geriatrics 54(2), e172-e174.

Noble M, Treadwell JR, Tregear SJ, Coates VH, Wiffen PJ, Akafomo C & Schoelles KM. 2010. Long-term opioid management for chronic noncancer pain. Cochrane Database of Syst Rev, Issue 1. Art. No.: CD006605. DOI: 10.1002/14651858.CD006605.pub2.

O'Brien MA, Freemantle N, Oxman AD, Wolfe F, Davis D & Herrin J. 2001.Continuing education meetings and workshops: effects on professional practice and health care outcomes. Cochrane Database of Systematic Reviews. Issue 1.

O'Brien MA,Rogers S, Jamtvedt G, OxmanAD,Odgaard-Jensen J, Kristoffersen DT, Forsetlund L, Bainbridge D, Freemantle N, Davis D, Haynes RB, Harvey E. 2007. Educational outreach visits: effects on professional practice and health care outcomes. Cochrane Database of Systematic Reviews 2007, Issue 4. Art. No.: CD000409. DOI: 10.1002/14651858.CD000409.pub2.

Official Statistics of Finland (OSF): Causes of death [e-publication]. ISSN=1799-5078. 2011. Helsinki: Statistics Finland [referred: 12.3.2013]. Access method: http://www.stat.fi/til/ksyyt/2011/ksyyt_2011_2012-12-21_tie_001_en.html.

Ofman JJ, MacLean CH, Straus WL, Morton SC, Berger ML, Roth EA & Shekelle P. 2002. A meta-analysis of severe upper gastrointestinal complications of nonsteroidal anti-inflammatory drugs. Journal of Rheumatology 29, 804–812.

Onder G, Cesari M, Russo A, Zamboni V, Bernabei R & Landi F. 2006. Association between daily pain and physician function among old adults living in the community: results from the ilSIRENTE Study. Pain 121, 53–59.

Ong CK, Lirk P, Tan CH & Seymour RA. 2007. An evidence-based update on nonsteroidal anti-inflammatory drugs. Clinical Medicine & Research 5(1), 19–34.

Page J & Henry D. 2000. Consumption of NSAIDs and the development of congestive heart failure in elderly patients: an underrecognized public health problem. Archives of Internal Medicine 160(6), 777.

Pappas AL, Fluder EM, Creech S, Hotaling A & Park A. 2003. Postoperative analgesia in children undergoing myringotomy and placement equalization tubes in ambulatory surgery. Anesthesia & Analgesia 96(6), 1621–1624.

Parke B. 1992. Pain in the cognitively impaired elderly. The Canadian Nurse 88, 17–20.

Parker MJ, Griffiths R & Appadu B. 2009. Nerve blocks (subcostal, lateral cutaneous, femoral, triple, psoas) for hip fractures. Cochrane Database of Systematic Reviews, Issue 1. Art. No.: CD001159. DOI: 10.1002/14651858.CD001159.

Parmelee PA, Smith B & Katz IR. 1993. Pain complaints and cognitive status among elderly institution residents. Journal of American Geriatrics Society 41 (5), 517- 522.

Pasero C & McCaffery M. 2005. No self-report means no pain-intensity rating. American Journal of Nursing 105(10), 50-53.

Pasero C & McCaffery M. 2007. Orthopedic Postoperative Pain Management. Journal of PeriAnesthesia Nursing 22(3), 160-174.

Pasero C, Reed B, McCaffery M. 1999. Pain in the elderly. In: McCaffery M, Pasero C, eds. Pain: Clinical manual. 2nd ed. St. Louis, Mo: Mosby, 674-710.

Pautex S, Herrmann F, Le Lous P, Fabjan M, Michel JP & Gold G. 2005. Feasibility and reliability of four pain self-assessment scales and correlation with an observational rating scale in hospitalized elderly demented patients. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences 60(4), 524-529.

Pellfolk TJ-E, Gustafson Y, Bucht G & Karllson S. 2010. Effects of a restraint minimization program on staff knowledge, attitude, and practice: a cluster randomized trial. Journal of American Geriatrics Society 58, 62–69.

Pergolizzi J, Böger RH, Budd K, Dahan A, Erdine S, Hans G, Kress HG, Langford R, Likar R, Raffa RB & Sacerdote P. 2008. Opioids and the management of chronic severe pain in the elderly. Pain Practice 8, 287–313.

Pesonen A. 2011. Pain measurement and management in elderly patients. Clinical studies in long term hospital care after cardiac surgery. Academic dissertation. Medical faculty of the University of Helsinki.

Pesonen A, Kauppila T, Tarkkila P, Sutela A, Niinistö L & Rosenberg PH. 2009. Evaluation of easily applicable pain measurement tools for the assessment of pain in demented patients. Acta Anaesthesiologica Scandinavica 53, 657–664.

Pinto PR, McIntyre T, Ferrero R, Almeida A & Araújo-Soares V. 2013. Predictors of Acute Postsurgical Pain and Anxiety Following Primary Total Hip and Knee Arthroplasty. The Journal of Pain. Article in press.

Plante GE & VanItallie TB. 2010. Opioids for cancer pain: the challenge of optimizing treatment. Metabolism - Clinical and Experimental 59 (Suppl 1), S47–S52.

Polit D & Beck C. 2006. Essentials of nursing research. Methods, appraisal and utilization. Lippincott Williams & Wilkins.

Polit D & Hungler BP. 1991. Nursing research. Principles and methods, fourth ed. J.B. Lippincott company, Philadelphia, New York, Hagestown.

Pollock BG. 1998. Psychotropic drugs and the aging patient. Geriatrics 53 (suppl 1): S20-S24.

Prowse M. 2007. Postoperative pain in older people: a review of the literature. Journal of Clinical Nursing 16, 84–97.

Puopolo A, Boice JA, Fidelholtz JL, Littlejohn TW, Miranda P, Berrocal A, Cichanowitz MSJ & Reicin AS. 2007. A randomized placebo-controlled trial comparing the efficacy of etoricoxib 30 mg and ibuprofen 2400 mg for the treatment of patients with osteoarthritis. Osteoarthritis and cartilage/OARS, Osteoarthritis Research Society, 15(12), 1348-1356.

Pölkki T. 2002. Postoperative pain management in hospitalized children- focus on non-pharmacological pain relieving methods from the viewpoints of nurses, parents and children. Kuopion yliopiston julkaisuja E. Yhteiskuntatieteet 97. Doctoral dissertation. Kuopio.

Rainero I, Vighetti S, Bergamasco B, Pinessi L & Benedetti F. 2000. Autonomic responses and pain perception in Alzheimers's disease. European Journal of Pain 4, 267–274.

Ready LB & Edwards WT. 1992. Management of Acute Pain: a Practical Guide. Taskforce on Acute Pain. Seattle, IASP Publications.

Registered Nurses Association of Ontario (RNAO). 2002. Toolkit: Implementation of clinical practice guidelines. Toronto, ON, Registered Nurses Association of Ontario.

Renn CL & Dorsey SG. 2005. The physiology and processing of pain: a review. AACN Advanced Critical Care 16(3), 277-290.

Roberts HC & Eastwood H. 1994. Pain and its control in patients with fractures of the femoral neck while awaiting surgery. Injury 25, 237- 239.

Robinovitch SN, Inkster L, Maurer J & Warnick B. 2003. Strategies for avoiding hip impact during sideways falls. Journal of Bone and Mineral Research 18, 1267-1273.

Rocca WA, Hofman A, Brayne C, Bretele MMB, Clarke M, Copeland JRM, Dartiques JF, Engedal K, Hagnell O, Heeren TJ, Jonker C, Lindesay J, Lobo A, Mann AH, Mölsä PK, Morgan K, O'Connor DW, Droux AdS, Sulkava R, Kay DWK & Amaducci L. 1991. The prevalence of vascular dementia in Europe: facts and fragments from 1980-90 studies. EURODERM - Annals of Neurology 30, 817-824.

Rogers E. 1995. Diffusion of innovations. New York, NY. The Free Press.

Rosario ED, Esteve N, Sernandez MJ, Batet C & Aguilar JL. 2008. Does femoral nerve analgesia impact the development of postoperative delirium in the elderly? A retrospective investigation. Acute Pain 10, 59—64.

Rossi S. 2004. Australian medicines handbook (Ed.), Australian Medicines Handbook, Adelaide.

Rowe JW & Kahn RL. 1987. Human aging: Usual and successful. Science 237(4811), 143–149.

Saarnio R. 2009. The use of physical restraints in institutional elderly care. Faculty of Medicine, Institute of Health Sciences, Nursing Science, University of Oulu, Acta Uni. Oul. D 1024, 2009.

Salanterä S.1999. Caring for children in pain – Nursing knowledge activities and outcomes. Turun yliopiston julkaisuja. Annales Universitas Turkuensis ser. D Tom. 345. Medica-Odontologica. Painosalama Oy, Turku.

Salanterä S, Hagelberg N, Kauppila M & Närhi M. 2006. Kivun hoitotyö. WSOY Oppimateriaalit OY.

Salimpoor VN, Benovoy M, Larcher K, Dagher A & Zatorre J. 2011. Anatomically distinct dopamine release during anticipation and experience of peak emotion to music. Nature Neuroscience 14, 257–262.

Schafheutle EI, Cantrill JA & Noyce PR. 2001. Why is pain management suboptimal on surgical wards? Journal of Advanced Nursing 33(6), 728-737.

Scandol JP, Toson B & Close JC. 2012. Fall-related hip fracture hospitalisations and the prevalence of dementia within older people in New South Wales, Australia: An analysis of linked data. Injury. Article in Press.

Scheinin H, Virtanen T, Kentala E, Uotila P, Laitio T, Hartiala J, Heikkilä H, Sariola-Heinonen K, Pullisaar O, Yli-Mäyry S & Jalonen J. 2000. Epidural infusion of bupivacaine and fentanyl reduces perioperative myocardial ischaemia in elderly patients with hip fracture–a randomized controlled trial. Acta Anaesthesiologica Scandinavica 44(9), 1061–1070.

Scherder E, Herr K, Pickering G, Gibson S, Benedetti & Lautenbacher S. 2009. Pain in dementia. PAIN 145, 276–278.

Schutter U & Meyer C. 2009. Efficacy and tolerability of prolonged release oxycodone/naloxone. Poster Sessions / European Journal of Pain 13, 208.

Schofield P. 2008. Assessment and management of pain in older adults with dementia; a review of current practice and future directions. Current Opinion in Supportive and Palliative Care 2(2), 128-132.

Scott DA & McDonald WM. 2008. Assessment, Measurement and History. In: Textbook of Clinical Pain Management. 2E edn. Macintyre PE, Rowbotham D and Walker S (eds). Acute Pain.

Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, Tesoro EP & Elswick RK. 2002. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. American Journal of Respiratory and Critical Care Medicine 166, 1338-1344.

Shega JW, Hougham GW, Stocking CB, Cox-Hayley D & Sachs GA. 2006. Management of noncancer pain in community-dwelling persons with dementia. Journal of the American Geriatric Society 54, 1892–1897.

Shug SA & Manopas A. 2007. Update on the role of non-opioids for postoperative pain treatment. Best Practice & Research Clinical Anaesthesiology 21(1), 15-30.

Shyu YEL, Chen ME, Chen MC, Wu C-C & Su JY. 2009. Postoperative pain and its impact on quality of life for hip-fractured older people over 12 months after hospital discharge. Journal of Clinical Nursing 18, 755–764.

Siddiqi N, Holt R, Britton AM & Holmes J. 2007. Interventions for preventing delirium in hospitalised patients. Cochrane Database Systematic Review; Issue 2. Art. No.: CD005563. DOI: 10.1002/14651858.CD005563.pub2.

Sieber FE, Mears S, Lee H & Gottschalk A. 2011. Postoperative opioid consumption and its relationship to cognitive function in older adults with hip fracture. Journal of the American Geriatrics Society 59(12), 2256-2262.

Sihvonen AP. 2003. Sairastuvuus ja toimintakykyinen elinaika. In: Heikkinen E & Rantanen T. Gerontologia. Duodecim, Helsinki, 34-38.

Simpson K, Kautaman L & Dodd S. 2002. The effects of a pain management education program on the knowledge level and attitudes of clinical staff. Pain Management Nursing 3, 87–93.

Skurtveit S, Furu K, Borchgrevink P, Handal M & Fredheim O. 2011. To what extent does a cohort of new users of weak opioids develop persistent or probable problematic opioid use? Pain 152(7), 1555-1561.

Smith CM & Cotter VT. 2012. Age related changes in health. Nursing Standard of Practice Protocol: Age-Related Changes in Health. Evidence-Based Content - Updated July 2012. http://consultgerirn.org/topics/normal_aging_changes/want_to_know_more. Accessed February 2013.

Soldato M, Liperoti R, Landi F, Finne-Sovery H, Carpenter I, Fialova D & Onder G. 2007. Non malignant daily pain and risk of disability among older adults in home care in Europe. Pain 129, 304–10.

Sosiaali- ja terveydenhuollon kansallinen kehittämisohjelma KASTE 2012-2015. (2012). The National Development Programme for Social Welfare and Health Care THE KASTE PROGRAMME 2012–2015. Sosiaali- ja terveysministeriön julkaisuja 2012:1 ISBN 978-952-00-3327-9.

Srikandarajah S, Gilron I. 2011. Systematic review of movement-evoked pain versus pain at rest in postsurgical clinical trials and metaanalyses: a fundamental distinction requiring standardized measurement. Pain 2011; 152: 1734-1739.

Staus R. 2011. Delirium in the older adult orthopaedic patinent. Predisposing, precipitating and organic factors. Orthopaedic Nursing 30(4), 231- 238.

Stevenson K, Berry P, Beck S & Griffie G. 2006. Institutionalizing effective pain management practices: practice change programs to improve the quality of pain management in small health care organization. Journal of Pain and Symptom Management 31 (3), 248-261.

Stokes G. 2000. Challenging behaviour in dementia: A person centred approach. Bicester: Winslow Press.

Stolee P, Poss J, Cook RJ, Byrne K & Hirdes JP. 2009. Risk factors for hip fracture in older home care clients. The Journals of Gerontology series A: Biological Sciences and Medical Sciences 64, 403–410.

Sudo EC, Watanabe LM & Saconato H. 2010. Single dose tramadol for acute postoperative pain in adults. Cochrane Database of Systematic Reviews, Issue 9. Art. No.: CD008660. DOI: 10.1002/14651858.CD008660.

Sund R. 2007. Utilization of routinely collected administrative data in monitoring the incidence of aging dependent hip fracture. Epidemiologic Perspectives & Innovations 4:2 doi:10.1186/1742-5573-4-2. Available from: http://www.epi-perspectives.com/content/4/1/2

Sund R, Juntunen J, Lüthje P, Huusko T & Häkkinen U. 2011. Monitoring the performance of hip fracture treatment in Finland. Annals of Medicine, 43(suppl 1): s39–s46.

Sund, R, Juntunen, M, Lüthje P, Huusko T, Mäkelä M, Linna M, Liski A & Häkkinen U. 2008. Perfect-Lonkkamurtuma. Hoitoketjujen toimivuus, vaikuttavuus ja kustannukset lonkkamurtumapotilailla. [Performance, Effectiveness and Cost of Treatment of hip fracture care episodes] STAKES 18/2008.

Sweitzer V, Rondeau D, Guido V & Rasmor M. 2013. Interventions to Improve Outcomes in the Elderly After Hip Fracture. The Journal for Nurse Practitioners 9(4), 238-242.

Taipale H. 2011. Sedative Load and Adverse Events Among Community-Dwelling Older People. Publications of the University of Eastern Finland. Dissertations in Health Sciences 112.

Takai Y, Yamamoto-Mitani N, Ko A & Heilemann MV. 2012. Differences in Pain Measures by Mini-Mental State Examination Scores of Residents in Aged Care Facilities: Examining the Usability of the Abbey Pain Scale–Japanese Version. Pain Management Nursing. In press.

The Global Burden of Disease. 1996. A comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. The Harvard School of Public Health, Harvard University Press.

Thévenin A, Beloeil H, Blanie, A, Benhamou D & Mazoit JX. 2008. The limited efficacy of tramadol in postoperative patients: a study of ED80 using the continual reassessment method. Anesthesia & Analgesia 106(2), 622-627.

Tilvis R. 2010. Vanhuksen kipu. In: Tilvis R, Pitkälä K, Strandberg T, Sulkava R & Viitanen M. 2010. Geriatria. 2. uudistettu painos. Duodecim. Porvoo: WS Bookwell Oy. 335-340.

Tilvis R. 2004. Vanhusten kivut. Duodecim 120(2), 223-228.

Titler MG, Herr K, Schilling ML, Marsh JL, Xie X, Ardery G, Clarke WR & Everett LQ. 2003. Acute Pain Treatment for Older Adults Hospitalized with Hip Fracture: Current Nursing Practices and Perceived Barriers. Applied Nursing Research 16 (4), 211–27.

Titler MG, Herr K, Xian-Jin Xie, Brooks JM, Schilling ML & Marsh JL. 2009. Acute pain management in older adults. Applied Nursing research 22, 264-273.

Tolppanen A-M, Lavikainen P, Soininen H & Hartikainen S. 2013. Incident Hip Fractures among Community Dwelling Persons with Alzheimer's Disease in a Finnish Nationwide Register-Based Cohort. PLoS ONE 8(3): e59124. doi:10.1371/journal.pone.0059124

Toms L, McQuay HJ, Derry S & Moore RA. 2008. Single dose oral paracetamol (acetaminophen) for postoperative pain in adults. Cochrane Database of Systematic Reviews 4. Art. No.: CD004602. DOI: 10.1002/14651858.CD004602.pub2

Tosato M, Lukas A, van der Roest HG, Danese P, Antocicco M, Finne-Soveri H & Onder G. 2012. Association of pain with behavioral and psychiatric symptoms among nursing home

residents with cognitive impairment: Results from the SHELTER study. Pain 153(2), 305-310.

Vaajoki A. 2012. Postoperative Pain in Adult Gastroenterological Patients–Music Intervention in Pain Alleviation. Publications of the University of Eastern Finland Dissertations in Health Sciences 138.

Vaajoki A, Pietilä AM, Kankkunen P & Vehvilänen-Julkunen K. 2012. Effects of listening to music on pain intensity and pain distress after surgery: an intervention. Journal of Clinical Nursing 21(5-6), 708-717.

van Dijk JF, van Wijck AJ, Kappen TH, Peelen LM, Kalkman CJ & Schuurmans MJ. 2012. Postoperative pain assessment based on numeric ratings is not the same for patients and professionals: A cross-sectional study. International Journal of Nursing Studies 49(1), 65-71.

van Doorn C, Gruber-Baldini AL, Zimmerman S, Hebel JR, Port CL, Baumgarten M, Quinn CC, Taler G, May C & Magaziner J. 2003. Dementia as a risk factor for falls and fall injuries among nursing home residents. Journal of the American Geriatrics Society 51(9), 1213-1218.

Vella-Brincat J & Macleod AD. 2007. Adverse effects of opioids on the central nervous systems of palliative care patients. Journal of Pain and Palliative Care Pharmacotherapy 21(1), 15-25.

Villars P, Dodd M, West C, Koetters T, Paul S M, Schumacher K & Miaskowski C. 2007. Differences in the prevalence and severity of side effects based on type of analgesic prescription in patients with chronic cancer pain. Journal of Pain and Symptom Management 33(1), 67-77.

Viramo P & Sulkava R. 2006. Muistihäiriöiden ja dementian epidemiologia (The epidemiology of memory disorders and dementia). In: Dementia. Erkinjuntti T, Rinne J, Alhainen K, Soininen H. Duodecim, 16-17.

Vivian HY, Abrishami, Peng PW, Wong J & Chung F. 2009. Predictors of postoperative pain and analgesic consumption: A qualitative systematic review. Anesthesiology 111, 657–77.

Vondrackova D, Leyendecker P, Meissner W, Hopp M, Szombati I, Hermanns K, Ruckes C, Weber S, Grothe B, Fleischer W & Reimer K. 2008. Analgesic efficacy and safety of oxycodone in combination with naloxone as prolonged release tablets in patients with moderate to severe chronic pain. Journal of Pain 9(12), 1144–1154.

Vonkeman HE, van de Laar MAFJ. 2010. Nonsteroidal Anti-Inflammatory Drugs: Adverse Effects and Their Prevention Review Article. Seminars in Arthritis and Rheumatism 39(4); 294-312.

von Roenn JH, Cleeland CS, Gonin R, Hatfield AK & Pandya KJ. 1993. Physician attitudes and practice in cancer pain management. Annals of Internal Medicine 119, 121-126.

Walsh DM, Howe TE, Johnson MI, Moran F & Sluka KA. 2009. Transcutaneous electrical nerve stimulation for acute pain. Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD006142. DOI: 10.1002/14651858.CD006142.pub2.

Warden V. Hurley A & Volicer L. 2003. Development and psychometric evaluation of the pain assessment in advanced dementia (PAINAD) scale. Journal of the American Medical Director Association (1), 9-15.

Wasiak R, Pransky G, Verma S & Webster B. 2003. Recurrence of low back pain: definition-sensitivity analysis using administrative data. Spine 28(19), 2283-2291.

Weissman DE & Matson S. 1999. Pain assessment and management in the long-term care setting. Theoretical Medicine 20, 31–43.

Wells N, Pasero C & McCaffery M. 2008. Chapter 17. Improving the quality of care through pain assessment and management. In: Patient safety and quality: An evidence-based handbook for nurses (1), pp. 470-497. http://www.ahrq.gov/qual/nurseshdbk/docs/WellsN_SMTEP.pdf

Watkins PB, Kaplowitz N, Slattery JT, Colonese CR, Colucci SV, Stewart PW & Harris SC. 2006. Therapeutic doses of acetaminophen frequently cause elevated aminotransferases in healthy volunteers: is it significant? Aminotransferase elevations in healthy adults receiving 4 grams of acetaminophen daily: a randomized controlled trial. JAMA 296, 87–93.

Webster LR, Butera PG, Moran LV, Wu N, Burns LH & Friedmann N. 2006. Oxytrex minimizes physical dependence while providing effective analgesia: a randomized controlled trial in low back pain. Journal of Pain 7(12), 937–946.

Whall AL & Kolanowski AM. 2004. Editorial: The need-driven dementia compromised behavior model - A framework for understanding the behavioural symptoms of dementia. Aging and Mental Health 8(2), 106-108.

White SM, Rashid N & Chakladar A. 2009. An analysis of renal dysfunction in 1511 patients with fractured neck of femur: the implications for perioperative analgesia. Anaesthesia 64, 1061–1065.

Williams DG, Hatch DJ & Howard RF. 2001. Codeine phosphate in paediatric medicine. British Journal of Anaesthesia 86(3), 413–421.

Williams DG, Patel A & Howard RF. 2002. Pharmacogenetics of codeine metabolism in an urban population of children and its implications for analgesic reliability. British Journal of Anaesthesia 89(6), 839–845.

World Health Organization and Alzheimer's Disease International. 2012. Dementia: a public health priority
. Neurology 939-944.

World Health Organisation. 2010. International statistical classification of diseases and related health problems, 10 th revision, version for 2010. Available at: http://apps.who.int/classifications/apps/icd/icd10online/. Accessed February 5, 2013.

World Health Organization. 1986. Cancer Pain Relief. WHO, Geneva. http://www.who.int/cancer/palliative/painladder/en/).

World Medical Association. 2008. Declaration of Helsinki - Ethical Principles for Medical ResearchInvolving Human Subjects. http://www.wma.net/en/30publications/10policies/b3/ (24.6.2013).

Worth AP & Cronin MT. 2003. The use of discriminant analysis, logistic regression and classification tree analysis in the development of classification models for human health effects. Journal of Molecular Structure: THEOCHEM, 622(1), 97-111.

WHO Collaborating Centre for Drug Statistics Methodology. 2010. WHO Guidelines for ATC classification and DDD assignment 2010. <http://www.whocc.no/atcddd/> [accessed March 2010].

Wunderlich G & Kohler P. 2000. Improving the quality of long-term care. Washington, DC: National Academy Press.

Wu CL & Raja SN. 2011. Treatment of acute postoperative pain. The Lancet 377(9784), 2215-2225.

Yu-Yahiro JA, Resnick B, Orwig D, Hicks G & Magaziner J. 2009. Design and implementation of a home-based exercise program post-hip fracture: the Baltimore hip studies experience. Physical Medicine and Rehabilitation 1(4), 308-318.

Ylinen ER. 2010. Patients' Pain Assessment and Management during Medication-free Colonoscopy. Doctoral dissertation. Univeristy of Eastern Finland. Department of Nursing Science.

Young Y, Frick KD, & Phelan EA. 2009. Can successful aging and chronic illness coexist in the same individual? A multidimensional concept of successful aging. Journal of the American Medical Directors Association 10(2), 87–92.

Zwakhalen SMG, Hamers JPH, Abu-Saad HH & Berger MPF. 2006. Pain in elderly people with dementia: A systematic review of behavioral pain assessment tools. BMC Geriatrics 6(3), 1471-2318.

Please circle the choice that best describes your situation or write down your answer to the corresponding space!

Background information

1. Hospital:

_____

2. Gender:

1. Female
2. Male

3. Age: _____ years

4. Occupation:

1. Doctor
   speciality _____
2. Head nurse
3. Staff nurse
4. Registered nurse
5. Practice nurse
6. Other _____

5. Work experience in current unit:

_____ years

6. Total work experience in health care:

_____ years

7. Contract:

1. Permanent
2. Substitute or terminable
3. Deputy

8. Employment arrangement:

1. Full time
2. Part time

9. Primary work shifts:

1. Daytime job
2. Two-shift work
3. Three-shift work
4. Night work
5. Other _____

10. I have participated in updating training on the treatment of pain in patients with memory disorders

1. yes 2. No

11. What do you consider to be the primary aim of postoperative pain management in hip fracture patients with dementia? (circle your choice)

1. Complete pain relief
2. Slight pain, which does not prevent normal functioning
3. Reasonable painlessness with slight discomfort
4. Pain relief only at peak periods of pain

Please give an explanation for your choice: _____

---

12. In your opinion, is the postoperative pain management of hip fracture patients with dementia sufficient?

1. Pain is undertreated
2. Pain management is sufficient
3. Pain is overtreated

13. Do you participate in administering or prescribing analgesics to patients? (Please choose one alternative)

1. I participate in administering analgesics
2. I prescribe analgesics
3. I am involved in neither administering nor prescribing analgesics*

**If your do not participate in administering or prescribing analgesics, you may move directly to question number 16.*

14. What are the analgesics used in relieving pain in hip fracture patients with dementia during the initial 48 postoperative hours?

(circle the correct alternative and write down the typical daily dose by each choice)

Paracetamol (e.g. Panadol, Paramax, Perfalgan) *typical daily dose*

1. Infusion solution _____
2. Oral solution _____
3. Suppository _____
4. Tablet

NSAIDs

Ibuprofen (e.g. Burana, Ibumetin) *typical daily dose*

1. Suppository _____
2. Tablet

Naproxen (e.g. Naprometin, Miranax) *typical daily dose*

1. Oral solution _____
2. Suppository _____
3. Tablet

Ketoprofen (e.g. Ketorin, Orudis) *typical daily dose*

1. Injection solution _____
2. Oral solution _____
3. Suppository _____
4. Tablet a) short-acting _____
   b) long-acting

Indometacin (e.g. Indometin) *typical daily dose*

1. Capsule (short-acting) _____
2. Tablet (long-acting)

Indometacin combinations (Indalgin) *typical daily dose*

1. Capsule

Diclofenac (e.g. Voltaren, Diclofenac) *typical daily dose*

1. Inj. Sol./inf.concentr. _____
2. Oral solution _____
3. Suppository _____
4. Tablet a) short-acting _____
   b) long-acting _____

NSAIDs continued

Diclofenac combinations (Arthrotec) *typical daily dose*

1. Tablet a) short-acting _____
   b) long-acting

Etodolac (Lodine) *typical daily dose*

1. Tablet a) short-acting _____
   b) long-acting _____

Ketorolac (Toradol) *typical daily dose*

1. Injection solution _____
2. Solution

Mefenamic acid (Ponstan forte) *typical daily dose*

1. Tablet

Tolfenaci acid (Clotam) *typical daily dose*

1. Tablet

Celecoxib (Celebra) *typical daily dose*

1. Capsule

Parecoxib (Dynastat) *typical daily dose*

1. Injection solution

Etoricoxib(Arcoxia,Turox) *typical daily dose*

1. Tablet

WEAK OPIOIDS

Buprenorphine (e.g. Norspan)

typical daily dose

1. Injection solution(Temgesic) _____
2. Transdermal patch (Norspan) _____
3. Tablet (Temgesic) _____

Tramadol (e.g. Tramadol)

typical daily dose

1. Injection solution _____
2. Oral solution _____
3. Suppository _____
4. Tbl/caps a)short-acting _____

b) long-acting

Codeine, combination *typical daily dose*
(e.g. Panacod, Ardinex, Codaxol)

1. Tablet

STRONG OPIOIDS

Morphine (e.g. Morphin, Dolcontin)

typical daily dose

1. Injection _____
2. Oral solution _____
3. Tablet a) short-acting _____
   b) long-acting _____

STRONG OPIOIDS continued

Oxycodone (e.g. Oxanest, Oxycodone, Oxynorm)

typical daily dose

1. Inj. / inf.solution _____
2. Injection solution _____
3. Depottablet _____
4. Oral solution _____
5. Tablet / capsule _____

Fentanyl *typical daily dose*
(e.g. Durogesic, Fentanyl)

1. Depot patch _____
2. Tablet _____
3. Sublinqual tablet

Please name other medication used for pain relief. (active agent, trade name, route of administration, typical daily dose)

_____

_____

What is the typical combination of analgesics used for pain relief in hip fracture patients with dementia during their 48 postoperative hours in the ward?

_____

_____

What other kinds of pharmacological pain treatment are used in the unit during the first 48 hours of postoperative pain treatment in hip fracture patients with dementia (e.g. spinal or epidural anaesthesia)?

_____

_____

15. What are the potentially clinically relevant adverse effects of analgesics when caring for patients with dementia? (Circle the correct choice(s))

	Strong opioids	Weak opioids	NSAIDs	Paracetamol
Failure in liver function	1	2	3	4
Bleeding	1	2	3	4
Constipation	1	2	3	4
Disorientation	1	2	3	4
Nausea	1	2	3	4
Cardiac insufficiency	1	2	3	4
Increase in tolerance to medicine	1	2	3	4
Delirium	1	2	3	4
Addiction to medicine	1	2	3	4
Gastrointestinal irritability	1	2	3	4
Hallucinations	1	2	3	4
Fluid retention	1	2	3	4
Drowsiness	1	2	3	4
Respiratory depression	1	2	3	4
Cognitive disorder	1	2	3	4
Gastric ulcer	1	2	3	4
Lack of appetite	1	2	3	4
Nightmares	1	2	3	4
Itching	1	2	3	4
Urinary retention	1	2	3	4
Lifted mood	1	2	3	4

16. Which pain management practices apply to your unit regarding the treatment of postoperative pain in hip fracture patients with dementia?
(Circle the choice best depicting your opinion)

	Completely disagree	Disagree to some extent	Neither agree nor disagree	Agree in some extent	Completely agree
1. Assessment for pain at least every four hours	1	2	3	4	5
2. Giving pain medication prior to physical movement	1	2	3	4	5
3. Administering analgesics around the clock	1	2	3	4	5
4. Providing pain medication regularly	1	2	3	4	5
5. Assessment and documentation of effects of analgesics	1	2	3	4	5
6. Providing pain medication prior to painful events	1	2	3	4	5
7. Assessing pain by means of pain scales	1	2	3	4	5

What kind of pain scales do you use in assessing pain in patients with dementia?
(If necessary, you can continue writing on the other side of the sheet)

17. What kind of barriers do you identify for postoperative pain management in hip fracture patients with dementia? (circle the option best describing your opinion)

	Completely disagree	Disagree to some extent	Neither agree nor disagree	Agree in some extent	Completely agree
1. Decline in cognition makes assessment difficulty	1	2	3	4	5
2. Patients not wanting to bother the nurses or doctors	1	2	3	4	5
3. Patients' willingness to put up with pain	1	2	3	4	5
4. Nonacceptance of pain reports by patients with dementia	1	2	3	4	5
5. Not knowing how much pain is acceptable to each patient	1	2	3	4	5
6. Difficulties in assessing pain because of hearing deficits	1	2	3	4	5
7. Difficulties in assessing pain because of visual deficits	1	2	3	4	5
8. Antipsychotics are considered before pain medications in restless patients	1	2	3	4	5
9. Unavailability of non-pharmacological methods (e.g. cold compress)	1	2	3	4	5
10. Difficulties in assessing pain due to cultural differences	1	2	3	4	5
11. Difficulty to identify pain in patients with dementia	1	2	3	4	5
12. Insufficient documentation of the effects of analgesics	1	2	3	4	5
13. Not knowing the pain levels of patients with dementia due to inadequate time spent with them	1	2	3	4	5
14. Unclear instructions about the administration of requested analgesics	1	2	3	4	5
15. Lack of a documented pain treatment plan for each patient	1	2	3	4	5
16. Inadequate time to deliver non-pharmacological pain relief measures	1	2	3	4	5
17. There is a lack of uniform practices for the assessment of pain	1	2	3	4	5
18. Lack of knowledge about prescribing analgesics	1	2	3	4	5
19. Pain experts are not available for consultation	1	2	3	4	5
20. Physicians' reluctance to prescribe adequate pain relief for fear for overmedication	1	2	3	4	5
21. Nurses' reluctance to give pain medication for fear for overmedication	1	2	3	4	5
22. Patients' reluctance to take pain medications because of fear of overdosage	1	2	3	4	5
23. Not having policies for best practices about pain assessment and management	1	2	3	4	5

Please name other possible barriers for pain management in hip fracture patients with dementia if available.

_____

_____

_____

18. How do you assess postoperative pain in nonverbal hip fracture patients with dementia?

(circle the correct alternative and write down your answer to the open-ended question in the space reserved for it)

I assess pain and experiencing pain in patients with dementia with the following criteria:

	Not at all	Very seldom	Seldom	Often	Frequently
1.Knitting brows, sad, frightened facial expression	1	2	3	4	5
2. Grimace, wrinkled forehead,eyes tightly closed or clenched	1	2	3	4	5
3. Any distorted facial expression	1	2	3	4	5
4. Rapid blinking	1	2	3	4	5
5. Sighing, moaning, wailing	1	2	3	4	5
6. Grunting, hollering, screaming	1	2	3	4	5
7. Noisy, laborous breathing	1	2	3	4	5
8. Asking for help	1	2	3	4	5
9. Verbally abusive behavior	1	2	3	4	5
10. Rigid, tense body posture, quarding painful body part	1	2	3	4	5
11. Fidgeting	1	2	3	4	5
12. Pacing and rocking	1	2	3	4	5
13. Impaired walking and/or mobility	1	2	3	4	5
14. Agressive, combative, resisting care	1	2	3	4	5
15. Decreased social interactions	1	2	3	4	5
16. Inappropriate (disruptive or verbally abusive) behaviour	1	2	3	4	5
17. Being withdrawn	1	2	3	4	5
18. Refusing food, change in appetite	1	2	3	4	5
19. Increase in resting periods	1	2	3	4	5
20. Changes in rest and/or sleep rhythm	1	2	3	4	5
21. Sudden cessation of common routines	1	2	3	4	5
22. Crying or tearing up	1	2	3	4	5
23. Increased confusion	1	2	3	4	5
24. Irritability or distress	1	2	3	4	5

Please name any other behavioral changes. _____

_____

_____

_____

19. How is postoperative pain in hip fracture patients with dementia treated in your work unit? (circle the correct alternative and write down your answer to the open-ended question in the space reserved for it)

	Completely disagree	Disagree to some extent	Neither agree nor disagree	Agree in some extent	Completely agree
1. Administering analgesics	1	2	3	4	5
2. Massaging	1	2	3	4	5
3. Soothing and consoling	1	2	3	4	5
4. Using touch for pain relief (e.g. by holding patient's hand, stroking their head)	1	2	3	4	5
5. TENS (transcutaneous electrical nerve stimulation)	1	2	3	4	5
6. Being present with the patient when they are in pain	1	2	3	4	5
7. Good postural care	1	2	3	4	5
8. Helping with daily care activities (e.g. washing, dressing up)	1	2	3	4	5
9. Playing soothing music	1	2	3	4	5
10. Cold therapy (e.g. cold compress)	1	2	3	4	5
11. Warm therapy (e.g. warm compress)	1	2	3	4	5
12. Peaceful and comfortable environment (e.g. quiet sounds, lights, organization, air conditioning)	1	2	3	4	5

What other methods are used? _____

---

20. The most effective nonpharmacological pain relieving methods include:
(circle the correct alternative and write down your answer to the open-ended question in the space reserved for it)

	Completely disagree	Disagree to some extent	Neither agree nor disagree	Agree in some extent	Completely agree
1. Massaging	1	2	3	4	5
2. Soothing or consoling	1	2	3	4	5
3. Using touch for pain relief (e.g. by holding patient's hand, stroking their head)	1	2	3	4	5
4. TENS (transcutaneous electrical nerve stimulation)	1	2	3	4	5
5. Being present with the patient when they are in pain	1	2	3	4	5
6. Good postural care	1	2	3	4	5
7. Helping with daily care activities (e.g. washing, dressing up)	1	2	3	4	5
8. Playing soothing music	1	2	3	4	5
9. Cold therapy (e.g. cold compress)	1	2	3	4	5
10. Warm therapy (e.g. warm compress)	1	2	3	4	5
11. Peaceful and comfortable environment (e.g. quiet sounds, lights, organization, air conditioning)	1	2	3	4	5

Which kind of other methods? _____

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21. What kind of issues do you document concerning postoperative pain in hip fracture patients with dementia? (fill in the open-ended question)

22. What expectations do you have for improving the quality of postoperative pain management in hip fracture patients with dementia?

(circle the correct alternative and write down your answer to the open-ended question in the space reserved for it)

	Completely disagree	Disagree to some extent	Neither agree nor disagree	Agree in some extent	Completely agree
1. Adequate staffing	1	2	3	4	5
2. More updating education	1	2	3	4	5
3. Consistent operational practices	1	2	3	4	5
4. Guidelines for the acute pain management	1	2	3	4	5
5. Enhancing multiprofessional cooperation	1	2	3	4	5

What are your other expectations?

23. What facilitator are offered by your employer to improve the quality of postoperative pain management among hip fracture patients with dementia?

(circle the correct alternative and write down your answer to the open-ended question in the space reserved for it)

	Completely disagree	Disagree to some extent	Neither agree nor disagree	Agree in some extent	Completely agree
1. Updating education is available	1	2	3	4	5
2. New directions are implemented satisfactorily	1	2	3	4	5
3. Permanent changes are implemented without major difficulties	1	2	3	4	5
4. There are sufficient resources for development of pain management	1	2	3	4	5

What are the other facilitators offered by your employer?

Thank you for your response!

Appendix 2. Literature search for pain management practices, barriers to postoperative pain management, analgesics use and potentially clinically relevant adverse effects of analgesics

Databases and Inclusion/exlusion criteria	**Number of studies**
Article I 2002-2010	
Search terms: *pain management, postoperative, dementia, hip fracture, nurses, pharmacological, nonpharmacological*	
Citations found in MEDLINE (PubMed), Cochrane, Cinahl +manual search	246
Dublicates	7
Exluded on the basis of title	203
Exluded on the basis of abstracts	16
Exluded on the basis of full text	7
Articles included	13
Article II 2002-2010	
Search terms: *barriers, pain management, postoperative, acute, dementia, older adults*	
Citations found in MEDLINE (PubMed), Cochrane, Cinahl +manual search	82
Duplicates	1
Excluded on the basis of title	73
Excluded on the basis of abstracts	1
Excluded on the basis of full text	2
Articles included	5
Article III	
Classification of the analgesics and their Defined Daily Doses (DDD): Anatomical Therapeutic Chemical Classification (ATC) recommended by the World Health Organization (WHO 2010).	
Article IV 2005-2011	
Search terms: *adverse effects, side effects, adverse drug reactions, adverse events, analgesics*	
Medline (PubMed), Cochrane, Cinahl databases	

Maija Rantala

Nurses' Evaluations of Postoperative Pain Management in Patients with Dementia

The purpose of the study was to describe and explain postoperative pain management in hip fracture patients with dementia as evaluated by nurses. Data were collected in seventeen hospitals in Finland. The use of pain scales was significantly related to the respondents' opinion that pain was sufficiently treated. The pharmacological pain treatment seemed to be based on the use of strong opioids and paracetamol. This study shows a deficiency in RNs' knowledge of certain adverse effects of NSAIDs.

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