

**Middle-aged patients' experiences of pain
management after cardiac surgery**

A Literature Review

Kosonen Gabriela

Mesiäinen Nita

Pirttimäki Elli

Bachelor's thesis

September 2017

Social services, Health and Sport

Degree Programme in Nursing

Author(s) Kosonen, Gabriela Mesiäinen, Nita Pirttimäki, Elli	Type of publication Bachelor's thesis	Date September 2017
	Number of pages 49	Language of publication: English
		Permission for web publication: x
Title of publication Middle-aged patients' experiences of pain management after cardiac surgery A Literature Review		
Degree programme Degree Programme in Nursing		
Supervisor(s) Holma, Sinikka & Sinivuo, Riikka		
Assigned by -		
Abstract <p>In the year 2010, 2100 coronary artery bypass grafts (CABGs) were performed in Finland. In the United States, thousands of these surgeries are performed every day. The surgeries cause severe pain to the patient, and thus accurate assessment and understanding of pain is integral for providing sufficient pain control and optimising recovery. The importance of the study was to shed light on the gaps of knowledge about how patients experience pain management after cardiac surgery and how it influences overall recovery from the procedure.</p> <p>The aim of the study was to conduct a literature review that reviews how middle-aged patients react to and feel about the different methods pain management commonly used after cardiac surgery. The purpose was to gather the information into a comprehensive whole so that it can be applied to and used to develop clinical nursing work for the patients' benefit.</p> <p>Information was gathered from two different databases (EBSCO & PubMed) by use of deductive methodology. Predetermined categories were opioids and non-opioids under pharmacological pain management, and physical and non-physical treatment under non-pharmacological pain management. Ten relevant articles were chosen for review. The results indicated a need for more studies to further explore the specific interests and experiences of middle-aged cardiac surgery patients concerning their postoperative pain management.</p>		
Keywords (subjects) Pain, pain management, middle-age, patient, cardiac surgery		
Miscellaneous		

Table of contents

1. Introduction	1
2. Cardiac surgery	2
2.1 Defining cardiac surgery	2
2.2 Middle-age and cardiac surgery.....	2
2.3 Recovery from cardiac surgery	3
3. Pain and pain management after cardiac surgery	5
3.1 Definition of pain management.....	7
3.2 Pharmacological pain management	8
3.3 Non-pharmacological pain management	8
4. Aim, purpose and research question	9
5. Methodology	10
5.1 Qualitative research and literature review.....	10
5.2 Literature search.....	12
5.3 Data analysis	14
6. Results	15
6.1 Pharmacological pain management	16
6.2 Non-pharmacological pain management	19
7. Discussion	23
7.1 Discussion of the results	23
7.2 Validity, reliability and ethics.....	31
References.....	33
Appendices	
Appendix.....	41
Tables	
Table 1. Inclusion criteria	11
Table 2. Results of the literature search	13
Table 3. Categories and subcategories	15

1. Introduction

Disorders of the heart and blood vessels are called cardiovascular diseases (WHO, 2017). Globally cardiovascular diseases are the leading cause of death and disability (Sardarina, Akbarpour, Lotfaliany, Bagherzadeh-Khiabani, Bozorgmanesh, Sheikholeslami, Azizi & Hadaegh, 2016). In 2015, an estimated 17,7 million people died due to cardiovascular diseases, representing 31% of all deaths worldwide. It is estimated that 7,4 million of these deaths were caused by coronary heart disease and 6,7 million by stroke. (WHO, 2017) Cardiac surgeries are among the most frequent surgical procedures and therefore managing the pain they cause is critical to prevent negative consequences. Approximately two thirds of adult cardiac surgery patients experience moderate to severe postoperative pain (Martorella, Gélinas & Purden, 2014). Pain after cardiac surgery is due to various reasons. The most important of these include sternotomy, insertion of drains, and saphenous vein harvesting (Jahangiri Fard, Babae, Alavi, Nasiri, Ghoreishi, Noori & Mahjoubifard, 2014).

Cardiac surgery can correct problems with the heart if other treatments have not worked or cannot be used. The most common cardiac surgery for adults is coronary artery bypass grafting (CABG). (National Heart, Lung and Blood Institute, 2013) In the year 2010, 2100 CABGs were performed in Finland (Mäkijärvi, 2014). In the United States, thousands of CABG surgeries are performed every day. Other cardiac surgeries include heart transplants and heart valve repair or replacement. Despite a shortage of donor organs, annually over 2,300 people in the U.S. have heart transplants. (Texas Heart

Institute, 2016).

Persistent pain has been found to occur after cardiac surgery (Bjørnnes, Parry, Lie, Fagerland, Watt-Watson, Rustøen, Stubhaug & Leegaard, 2016). Acute pain is common and may keep patients from participating in activities meant to prevent postoperative complications. Accurate assessment and understanding of pain are integral for providing sufficient pain control and optimizing recovery. (Milgrom, Brooks, Bunnell, Wuestefeld & Beckman, 2004.) Inadequate postoperative pain relief can prolong recovery and reduce patient satisfaction (Allan & Tong, 2003), and pain intensity after cardiac surgery is often underestimated (Murphy, Szokol, Avram, Greenberg, Marymont, Shear, Parikh, Patel & Gupta, 2015).

The aim of the study was to conduct a literature review that reviews how middle-aged patients experience the different methods of pain management commonly used after cardiac surgery. The purpose was to gather the information into a comprehensive whole in order to shed light on the gaps of knowledge about how patients experience pain management after cardiac surgery and how it influences overall recovery from the procedure.

The literature review will be utilised in the health care field for the benefit of both health care professionals and patients. It will give health care workers the opportunity to broaden their expertise concerning pain management of middle-aged patients in postoperative cardiac surgery and apply it to the clinical setting. Patients will become aware of the methods used and can acknowledge how pain management affects recovery. Middle-aged patients were selected for the study to elucidate the effects of pain management on achieving full recovery and the possibility of returning to working life.

2. Cardiac surgery

2.1 Defining cardiac surgery

A surgery of the heart and/or the proximate great vessels is defined as a cardiac surgery (Medical Dictionary, 2009). Cardiac surgery is a procedure that aims at improving functionality and quality of life (HUS, n.d). Cardiac surgery is performed under anesthesia, and it can be performed either laparoscopically or as open heart surgery (Mäkijärvi, 2014).

Alongside conventional open heart surgery, minimally invasive surgical techniques and treatment methods have been developed in recent years. Compared to open heart surgery, endoscopic, endovascular and robot-assisted procedures are less demanding and patients' recovery is usually faster. However, these techniques are not suitable for all patients and the appropriate treatment method and surgical technique is selected case by case. (HUS, n.d.)

2.2 Middle-age and cardiac surgery

The Merriam-Webster Dictionary (2017) defines middle age as the period of life from about 45 to about 64 years of age. Aging increases the risk in multiple cardiac diseases, as aging effects the heart and arterial system (North & Sinclair, 2012). Coronary heart disease has traditionally been viewed as a disease of middle-aged men (Leegaard, Nåden & Fagermoen, 2008).

Comparing men and women, in women cardiovascular disease develops 7 to 10 years later than in men (Maas & Appelman, 2010). Among women, the risk of getting a cardiac disease increases after menopause. (National Heart, Lung, and Blood Institute, 2017). Treatment is usually the same for both sexes (National Heart, Lung and Blood Institute, 2014). The rate of occurrence of postoperative delirium is also most frequent in those who are older (Vaurio, Sands, Wang, Mullen & Leung, 2006).

There are many risk factors that may contribute to the development of cardiac diseases. Smoking, poor diet, high blood pressure, high blood cholesterol levels, diabetes and obesity are common factors behind the development of cardiac disease. (Kilkenny et al., 2017; Sardarinia et al., 2016.)

2.3 Recovery from cardiac surgery

Recovery from cardiac surgery is affected by patients' age, general condition, other diseases and the surgery in question. The patient is generally hospitalized for 8 days (Exarchopoulos, Charitidou, Dedeilias, Charitos, Routsis, 2015; HUS, n.d). Full recovery is achieved within 3 months, after which it is possible to return to working life (Mäkijärvi, 2014; HUS, n.d). Fast-track or rapid-recovery pathways are becoming more common in cardiac units to maximize the use of scarce resources (Naughton, Cheek & O'Hara 2005).

Approximately half of all cardiovascular surgical patients experience a cardiac-related event or symptom and/or some form of short-term dementia, delirium or memory loss following cardiac surgery (Fredericks & DaSilva, 2010). It has been found that 2,8 percent of patients experienced a major health

care-associated disease, such as pneumonia or sepsis, after cardiac surgery (Greco, Shi, Michler, Meltzer, Ailawadi, Hohmann, Thourani, Argenziano, Alexander, Sankovic, Gupta, Blackstone, Acker, Russo, Lee, Burks, Gelijns, Bagiella, Moskowitz & Gardner, 2015). Depression and anxiety are common after cardiac surgery (Harrison, 2005), however in the case of most patients the depression resolves itself during rehabilitation. Other common symptoms after surgery include mood swings, irritability and insomnia. (Suomen Sydänliitto r.y, 2012.)

Rehabilitation typically lasts 3-6 months and 80% of patients in working life return to work within a year. However, in addition to the operation itself, complete recovery requires appropriate medication, cessation of smoking, a healthy diet and adequate physical activity. The recovery process also includes follow-up check-ups. (Suomen Sydänliitto ry, 2012.)

Ossification of the sternum takes approximately 2-3 months. It is recommended to avoid stress on the sternum for this time. Stressing factors include rapid movements and rotations of the upper body and upper limbs, as well as lifting heavy objects. (Suomen Sydänliitto ry, 2012.) However, upper limb exercises are routinely prescribed both in the acute phase and during rehabilitation, the aim being restoration of range of movement and function. These exercises are significantly associated with pain. (El-Ansary, Waddington & Adams, 2007.)

3. Pain and pain management after cardiac surgery

The International Association for Study of Pain (2011) defines pain as an undesirable sensory and emotional experience that is connected with actual or potential tissue damage, or characterized in terms of such damage. Pain can be categorized based on its duration into acute or chronic pain (WHO, 2012). It has been indicated that pain is the fifth vital sign and should be measured and treated equally to other vital signs, as poorly managed pain leads to negative consequences for the organism (Karabulut, Aktaş, Gürçayır, Yılmaz & Gökmen, 2015).

Pain after cardiac surgery is often experienced as severe, and the majority of patients have reported that the worst pain experiences were while mobilizing (Karabulut et al., 2015). Research shows that the most severe pain following cardiac surgery occurs during the first two days following surgery (Aslan, Badir, Arli & Cakmacki, 2009). Patients may experience pain from several weeks to months (Suomen Sydänliitto ry, 2012). In the intensive care unit (ICU) environmental factors such as constant light and noise, sleeplessness and psychological factors, like anxiety, can intensify the feeling of pain. In addition to this, nursing activities such as repositioning and changing of dressings can have an effect. (Aslan et al., 2009.)

Patients have described their pain as sharp, stabbing burning, and throbbing during activities such as movement and chest tube removal. These different terms used by patients to explain the quality of pain emphasize the fact that pain is a subjective experience and can only be described by the person who is experiencing it. (Aslan et al., 2009.) There are many different causes of post-operative pain after cardiac surgery. A number of sources for pain have been

identified, such as incisions, trauma, immobility, chest tubes left in after surgery, invasive equipment, and nursing and medical interventions. (Karabulut et al., 2015.)

Pain after surgery decreases the quality of life of patients and affects their comfort level. Pain has also been reported to be one of the main sources of concern for cardiac surgery patients, and post-operative pain is still a significant clinical problem although major advances in pain management and treatment have been made. (Karabulut et al., 2015.)

Sex differences in pain can be observed for up to one year following cardiac surgery. 29 percent of patients reported persistent postoperative pain at rest 12 months after surgery, with intensity and interference being worse for women than for men. (Bjørnnes et al., 2016.)

In Canada, it was found that the incidence of chronic pain following cardiac surgery varies between 21% and 55%. Pain syndromes that occur after cardiac surgery can be numerous and of visceral, musculoskeletal, or neurogenic origin (Cogan, 2010). Many postoperative interventions and management strategies are available for reduction and management of postoperative pain (Chou, Gordon, De Leon-Casasola, Rosenberg, Bickler, Brennan, Carter, Cassidy, Chittenden, Degenhardt, Griffith, Manworren, McCarberg, Montgomery, Murphy, Perkal, Suresh, Sluka, Strassels, Thirlby, Viscusi, Walco, Warner, Weisman & Wu, 2016)

The occurrence of pain is common in middle-age. Many conditions characterised by chronic pain become more common as a person ages. These conditions include musculoskeletal diseases, osteoarthritis, diabetes, different cancers and cardiovascular diseases. (Tilvis, 2004.) Other age-related pains are

lower back pain, headaches and carpal tunnel syndrome (Pagán, 2015).

Non-arthritis joint pain is common as, due to aging, tendons lose elasticity and become more prone to injury. The occurrence of muscle strains and pain increases with each passing decade. (Pagán, 2015.) However, it is partially unclear as to what extent the differences in pain between age groups are caused by aging, other diseases and psychosocial factors, such as attitudes towards pain (Tilvis, 2004).

3.1 Definition of pain management

The goal of pain management is to relieve or reduce pain. Pain can be treated pharmacologically or non-pharmacologically. (MedicineNet.com, 2016) The situation where normally painful stimulation causes no pain is called analgesia (International Association for Study of Pain, 2011). A common finding is that patient satisfaction with pain management is high, even though patients have also reported significant intensity of pain, long waiting times for pain medication and ineffective treatment (Karabulut et al., 2015).

Postoperative pain control is a complicated topic involving a cornucopia of treatments and therapies. Early diagnosis of the symptoms, patient education and treatment using an integrative approach combining pharmacological and non-pharmacological techniques serve well in tackling this complex problem. (Allan & Tong, 2003.)

3.2 Pharmacological pain management

Effective pain management after surgery involves a multimodal approach and using various drugs with differing mechanisms of action (Allan & Tong, 2003). Commonly used pharmacological treatment strategies include opioids, paracetamol, NSAIDs, and more recently anticonvulsants (Cogan, 2010). Opioids such as morphine and fentanyl are used to control moderate to severe pain immediately after cardiac surgery. Other drugs such as ibuprofen, paracetamol and oxycodone can be used to treat mild to moderate pain or along with opioids. (Garimella & Cellini, 2013) After hospitalization, the patient gets individual instructions about their medication. The instructions should be obeyed until the first follow-up, unless the doctor orders otherwise. The necessity of the medication is estimated during the follow-up. Appropriate medical treatment improves the benefits of the surgery. (Suomen Sydänliitto ry, 2012.)

3.3 Non-pharmacological pain management

Despite focus on pharmacological intervention, a holistic approach to postoperative pain management is to be encouraged. There are several methods that have been proven to be effective while causing minimal adverse effects. (Allan & Tong, 2003)

Upon arriving home, self-care and pain management are crucial for patients' successful recovery after surgery (Aslan et al., 2009). Clinical guidelines suggest the use of non-pharmacological interventions for pain management of adults receiving care in an intensive care unit (Martorella, Boitor, Michaud &

Gélinas, 2014).

Non-pharmacological pain management methods can reduce pain but are most effective when used together with pharmacological interventions. Non-pharmacological pain management methods can be for example exercise, therapeutic training, cognitive-behavioral therapy, physical treatment including heat and cold therapy, trigeminal nerve stimulation or massage, music therapy and emotional support. (Kipu: Käypä hoito –suositus, 2015; Gélinas, Arbour, Michaud, Robar, Côté, 2013) Acupuncture and hypnosis have also been found to be effective in controlling postoperative pain (Allan & Tong, 2003). Parasternal block and transcutaneous electrical nerve stimulation (TENS) have been proven to produce effective analgesia and reduce the need for the use of opioids in postoperative cardiac surgery patients (Ozturk, Baki, Kavakli, Ayoglu, Karaveli, Emmiler, Inanoglu & Karsli, 2016).

4. Aim, purpose and research question

The aim of the study was to conduct a literature review that reviews how middle-aged patients react to and feel about the different methods of pain management commonly used after cardiac surgery. The purpose was to gather the information into a comprehensive whole so that it can be applied to and used to develop clinical nursing work for the patients' benefit.

Research question:

- What kind of experiences have middle-aged patients had of post-cardiac surgery pain management methods?

5. Methodology

5.1 Qualitative research and literature review

The aim of qualitative research is to find solutions to the research question using words and sentences, instead of quantitative methods such as statistics. Qualitative research studies individual phenomena. Outcome of the study can only be related to the specific subject and it cannot be generalized. (Kananen, 2014.)

A literature review aims at answering a clearly targeted research question and allows for replication. Evidence is searched for and critically analysed from published (and sometimes unpublished) sources. (Rew, 2010.) Rew (2010) defines a systematic review as providing the reader with an efficient compilation of the findings on the desired topic. The specific purpose or aim is to describe, summarize, and compile findings about a specific phenomenon or problem in practice, and present these findings in a way that not only answers the research question, but also saves other practitioners the time to find and evaluate these studies themselves. By clearly delineating each step in the review process, another reviewer can easily replicate and verify the findings. (Rew, 2010.)

Before starting the literature review, specific research question(s) that the finished review answers must be identified (Rew, 2010). The purpose of the literature review in question was to form a single review that was based on multiple scientific reviews that answered the research question: "What kind of experiences have middle-aged patients had of post-surgery pain management

methods?". While conducting the research it was important to evaluate what to include and exclude and why to make sure the text focused entirely on the research question. Also, it was decided which search terms to use and the appropriate databases to search from identified. Then the electronic search was conducted. (Rew, 2010.)

The outcome of the search was reviewed and matched with the inclusion criteria. Inclusion criteria are demonstrated in Table 1. After this each paper was systematically gone through and the quality of the reviewed studies determined. Any limitations and biases inherent in the process were acknowledged. (Rew, 2010.)

Table 1. Inclusion criteria.

- Publication language English or Finnish
- Scientific publication
- Published after the year 2010
- Free access to full text for JAMK students
- Studies dealing with cardiac surgery

The method of literature review was used in the study as limited resources meant that a qualitative, empirical based study could not be conducted. Including all the literature from previous studies into one comprehensive whole was most beneficial for all parties when conducted by literature review.

5.2 Literature search

The evidence-based databases used for the compilation of the literature review were EBSCO (CINAHL), EBSCO (Academic search elite) and PubMed. The keywords used in the research were: pain, pain management, middle-age, patient and cardiac surgery. These keywords were the terms used for the literature search because they appropriately summarized the research question. After defining the research question and inclusion and exclusion criteria, the scientific article selection process was done in May 2017.

Advanced search was utilised to narrow down the results to better fit the inclusion criteria presented in Table 1. When conducting literature search with PubMed, advanced search was used to limit results to those with free full text availability and a publication date within the last 10 years. Literature search with EBSCO (CINAHL) using keywords ""cardiac surgery" AND pain" was modified with advanced search by limiting the results to those including only middle-aged individuals and accessibility to full text.

The optimal results were obtained by using the keywords pain, pain management, middle-age, patient and cardiac surgery, and combinations of them, in the literature search. Table 2 demonstrates the search databases, keywords and the results of the search. Duplicates were automatically excluded from the final number of selected studies.

Table 2. Results of the literature search

Database	Key terms	Results	Chosen on the basis of title	Chosen on the basis of abstract	Chosen on the basis of full text	Relevant studies
CINAHL	"pain" AND "pain management*" AND "Cardiac surgery"	2	1	1	1	1
CINAHL	"cardiac surgery" AND pain	4	2	1	1	1
Academic search elite	"pain management*" AND "Cardiac surgery"	22	12	4	0	0
Academic search elite	"pain" AND "pain management*" AND "Cardiac surgery"	23	7	2	1	1
PubMed	*cardiac surgery* AND *pain management* AND *middle-age*	19	8	8	0	0
PubMed	*cardiac surgery* AND *pain management*	44	19	14	7	5
PubMed	*cardiac surgery* AND *pain* and *middle-age*	159	11	7	4	2

First the results were browsed through based on title and articles not related to the study were excluded. The abstracts of the processed articles were read through and appraised, and irrelevant articles excluded. The final selection for the literature review was done by reading the full texts and selecting all relevant studies for analysis. A total of 10 articles were chosen for review. A table listing all chosen and reviewed articles can be found in Appendix 1. The article appraisal was done by carefully reviewing the quality and validity of the articles, their compatibility with the research question and aims and how they are based on current, up-to-date research.

5.3 Data analysis

The purpose of data analysis is to find a solution to the problem that the study presents and is based on (Kananen, 2014). The purpose in the literature review in question was to gather information from different sources into one comprehensive whole.

A deductive content analysis is based on a theoretical concept or concepts which are now being examined from a practical point of view. Based on previous knowledge and research, the analysis frame and the data classification are determined in advance. (Kankkunen & Vehviläinen-Julkunen, 2009.) When conducting the data reduction, the researcher finds and highlights the expressions which answer the research questions (Tuomi & Sarajärvi 2009).

Deductive methodology was chosen for the literature review because the literature search was conducted based on predetermined categories. In addition, no comprehensive whole that encompasses the research question yet exists, and deductive methodology was decided to be the best method for gathering the desired information.

6. Results

The results are presented in two main categories and five sub-categories, which are illustrated in Table 3. Other factors concerning pharmacological pain management were added as a subcategory due to obscurity on whether results of one study dealt with opioids or non-opioids.

Table 3. Categories and subcategories

Main category	Sub-category
Pharmacological	<ul style="list-style-type: none"> • Opioids • Non-opioids • Other factors
Non-pharmacological	<ul style="list-style-type: none"> • Physical treatment • Non-physical treatment

6.1 Pharmacological pain management

Opioids

The extent of the side-effects from an analgesic regimen are considered equally as important as the pain relief itself (Rafiq, Steinbrüchel, Wanscher, Andersen, Navne, Lilleoer & Olsen, 2014). Traditionally pain management after cardiac surgery has been based on opioid analgesic drugs. However, opiates can have undesirable dose-related side-effects such as nausea, constipation, vomiting, dizziness, mental confusion and respiratory depression, which influence recovery and may even delay discharge after surgery (Rafiq et al, 2015.) In the study conducted by Rafiq et al. (2015) some patients undergoing a traditional opioid-based analgesic regime using morphine and paracetamol had to discontinue their regime due to the degree of nausea and vomiting.

Jahangiri Fard et al. (2014) found in their study that the opioid remifentanil reduced pain after cardiac surgery effectively. Nowadays, the patient controlled analgesia (PCA) method results in better postoperative pain management. Remifentanil is used with the method of PCA. (Jahangiri Fard et al., 2014.)

Imantalab, Mirmansouri, Sedighinejad, Naderi, Farzi, Atamanesh & Nassiri (2014) compared the use of morphine sulphate, a narcotic analgesic used to control moderate to severe pain, and diclofenac suppositories in their study. Mean Visual analogue scale (VAS) scores measured at extubation and 24 hours later were lowered. Based on the results, morphine sulphate suppository can relieve pain after CABG and be effective in pain control. It

was found that morphine sulfate can reduce postoperative pain effectively regardless of route of administration. However, no meaningful difference was found by Imantalab et al. (2014) between use of the two drugs, morphine sulphate and diclofenac, as suppositories.

Non-opioids

Non-steroidal anti-inflammatory drugs (NSAIDs) are used as alternative therapy in postcardiac surgery pain management. However, NSAIDs are related to a variety of complications such as increased post-operative bleeding and renal dysfunction (Jahangiri Fard et al., 2014.) The use of NSAIDs instead of opiates after cardiac surgery has been demonstrated to significantly reduce occurrence of nausea and vomiting (Rafiq et al., 2015).

Paracetamol, a non-opioid analgesic drug used to control postoperative pain, is reported to have none of the adverse effects associated with the use of opioids and NSAIDs. Adequate pain relief can be achieved with intravenous paracetamol. (Jahangiri Fard et al., 2014.) It was concluded by Jahangiri Fard et al. (2014) that paracetamol had better pain relief effect and outcomes than remifentanyl, an opioid analgesic, as patients receiving paracetamol had lower postoperative VAS scores when compared to those receiving remifentanyl. However, this difference was only significant in a minority evaluation times during the study and in addition, there were no significant differences concerning adverse effects after surgery. Paracetamol, like the opioid remifentanyl, can also be used via PCA, resulting in better postoperative pain management. (Jahangiri Fard et al., 2014.)

Imantalab et al. (2014) state that the NSAID diclofenac sodium can alleviate moderate to severe pain caused by surgical manipulation. When measured after extubation and at 24 hours, the mean value of VAS scores went down when using diclofenac suppository. No adverse effects were reported during this time.

Significant pain reduction was noted by Rafiq et al. (2014) when using a multimodal analgesic regime and consisting of dexamethasone, gabapentin, ibuprofen and paracetamol after cardiac surgery. When comparing a multimodal to a traditional opioid regimen consisting of morphine and paracetamol, none of the patients on the multimodal regime had as extensive nausea and vomiting as those undertaking the opioid regime. Patients had significantly lower average pain scores from the day of the operation throughout the first three days postoperatively. In addition, small doses of dexamethasone on its own have been demonstrated to improve the quality of postoperative recovery especially by reducing patients' complaints of fatigue, nausea and vomiting. (Rafiq et al., 2014.)

Other factors

Effective pain management is influential in increasing comfort levels. As the pain experienced by patients affects the comfort level, assessment of pain and comfort level can increase patient satisfaction in the presence of pain. Comfort scores upon discharge are found to be high. However, some patients have mentioned the need for better pain management. (Karabulut et al, 2015.)

Karabulut et al. (2015) examined waiting time for pain medication as one component of patient satisfaction concerning postoperative pain medication after open heart surgery. Most patients in the study reported that 15 minutes was the longest time they needed to wait for pain medication. Most patients reported nurses and doctors taking them into consideration by asking them when they experienced pain. No patients received written material about the importance of their pain management. Using a scale of “very dissatisfied” and “very satisfied” the majority of the subjects reported being very satisfied with the pain treatment implemented by nurses.

Karabulut et al. (2015) found previous research indicating that certain beliefs about pain management have a negative impact on effective pain control. According to this research, patients believe they become addicted to pain medication easily and pain medication should be saved for cases where pain gets worse. However, the research conducted by Karabulut et al. (2015) found that only a minor sample of patients are worried about becoming addicted to the analgesic medication used for their pain relief.

6.2 Non-pharmacological pain management

Physical treatment

Massage is a safe, noninvasive therapy that has found to have a significant effect in reducing pain, anxiety, heart rate and blood pressure upon investigation in different populations (Braun, Stanguts, Casanelia, Spitzer, Paul, Vardaxis & Rosenfeldt, 2012.) It is stated by Braun et al. (2012) that five

clinical studies investigating the use of massage therapy have been conducted with cardiac surgery patients, three of which used massage as the sole treatment, but the results have been conflicting and left many unanswered questions. Najafi, Rast, Momennasab, Ghazinoor, Dehghanrad & Mousavizadeh (2014) also found previous results regarding the effect of massage therapy on pain to be contradictory.

Braun et al. (2012) found that there was a significant increase in patient satisfaction with their hospital stay after massage therapy delivered on postoperative days 3 and 4. In the study conducted by Najafi et al. (2014) all patients in an intervention group where massage was provided by the patients' companions were satisfied with the massage therapy.

Massage given on postoperative days 3 and 4 reduced patients' average pain by over half when measuring with the VAS scale. Comparatively, an equivalent period of rest time only reduced pain insignificantly (Braun, 2012). The results presented by Najafi et al. (2014) prove that offering patients' companions to participate in taking care of the patient after being trained in the application of massage therapy is effective in reducing the severity of postoperative pain in CABG patients, with the highest reduction in pain being observed 60 minutes after intervention. Previous studies have found that massage therapy delivered before day 3 after cardiac surgery is ineffective in reducing pain (Braun et al., 2012).

Massage therapy was also found to reduce anxiety scores by over half and significantly improve relaxation (Braun et al., 2012). In addition, improvement in quality of sleep, tranquility, recovery time and overall healing process were noted when massage was delivered by a companion (Najafi et al., 2014).

According to nurse reports, patients were excited about the offered treatments, and often more relaxed and less anxious after receiving massage. Massage therapists also reported excellent general feedback from patients. Patient acceptance of massage therapy in a hospital setting was confirmed (Braun et al., 2012.) Participation of the patients' relatives in the process eliminates pain, eventually increasing both patients' and companions' satisfaction with care (Najafi et al., 2014).

A number of studies have demonstrated that low-level laser therapy can affect pain in many ways (Fernandes, Araújo Júnior, Lima, Gonzaga, de Oliveira, Nicolau, 2017). According to the McGill questionnaire used by Fernandes et al. (2017) when studying pain after CABG, a group of patients receiving low-level laser therapy experienced less pain when compared to control and placebo groups. Pain scores measured with VAS were comparable as pain reduction was statistically greater on postoperative days 6 through 8 when patients received laser therapy. There was no significant difference between groups regarding pain before the 6th postoperative day. It may be assumed from the data that low-level laser therapy is effective in controlling CABG patients' pain mainly after the 6th day postoperatively. (Fernandes et al., 2017.)

Non-physical treatment

The impact of a virtual reality simulation designed for pain management on post cardiac surgery patients was studied by Mosso-Vázquez, Gao, Wiederhold & Wiederhold (2014). Virtual reality was shown to be a non-invasive and safe procedure to improve postoperative distress in the intensive care unit, as most of the subjects reported a decrease in pain level experienced

after the virtual reality therapy. When comparing physiological measurements and Likert survey scale ratings, all results indicate lower pain and stress of patients. Virtual reality acts as an additional support method to avoid and reduce postsurgical distress. (Mosso-Vázquez et al., 2014.)

Jose, Verma & Arora (2012) found music therapy to be effective in reducing pain, as well as physiological variables related to pain such as blood pressure and pulse, in postoperative cardiac surgery patients. The decrease in mean scores was significant. All patients receiving music therapy felt relaxed and believed music to be an effective method in reducing their pain. In addition, all subjects reported experiencing a change of mood from unpleasant to pleasant, and feeling better after administration of music therapy.

Most of the patients did not agree with the fact that music helped them to sleep gradually, though all believed it to have a soothing effect. (Jose et al., 2012.) The findings by Bauer, Cutshall, Anderson, Prinsen, Wentworth, Olney, Messner, Brekke, Li, Sundt, Kelly & Bauer (2011) on significant reduction of pain scores and improvement of relaxation scores with postoperative cardiovascular surgery patients receiving a combination of music and nature sounds support those of Jose et al. (2012) concerning music therapy. In addition, a combination of music and nature sounds was discovered to result in lower anxiety and increased satisfaction. Patients and families were generally very receptive to listening to music. (Bauer et al., 2011.)

The effect of a period of rest time on pain after cardiac surgery was studied, and the results compared to those of massage therapy, by Braun et al. (2012). Though the rest period caused significant improvement in relaxation scores

reported by patients, it had no significant effect on pain scores or patient satisfaction (Braun et al., 2012).

In addition to effective pain management, effective communication with the patients and giving information about postoperative pain management are considered influential in increasing comfort levels (Karabulut et al., 2015). It was found by Karabulut et al. (2015) that majority of patients indicated that nurses asked patients to notify them when they experienced pain. However, the subjects of the study reported that they received no written material about the importance of their pain management.

7. Discussion

7.1 Discussion of the results

Pain after surgery decreases quality of life and has an effect on comfort levels. Pain has also been reported as being the main source of concern for cardiac surgery patients. (Karabulut et al., 2015.) Nilsson (2009) stated that patients with higher anxiety and depression levels after operation have higher requirements of analgesics for postoperative pain. Assisting patients in any way and any amount with reduction of pain and anxiety after cardiac surgery is valuable for the healing process and improvement of the overall experience. Pain and stress during hospitalization can interfere with multiple factors influencing the overall experience, such as sleep quality, appetite, digestion, behavior, and wound healing. (Bauer et al., 2011.) Patients may also experience difficulties in reaching the planned goals of care (Fernandes et al., 2017). This in turn hinders the entire chain of care, so it is important for

patients to experience their pain management as useful and effective in order to support the healing process.

Any additional methods capable of providing symptomatic relief and increasing patient satisfaction are a welcome addition to care and provide patients with options for improving their surgical experience (Bauer et al., 2011). Pain after cardiac surgery is often experienced as severe (Karabulut et al, 2015) and thus, based on these statements, it can be concluded that pain management is an integral part of patients' hospital experience. Correct pain management in postoperative phase assists on minimizing risk for secondary morbidity and development of chronic pain (Magidy, Warrén-Stomberg & Bjerså, 2015)

VAS has been proven to be one of the most reliable scales for evaluating intensity of pain. Despite being a subjective method of pain assessment, VAS is among the best options available for pain studies. (Fernandes et al., 2017.) Thus, VAS measurements have been included in the literature review as a method of describing patient experience of pain management, with low pain scores indicating more positive patient experience. Authors assumed that when pain management was effective in lowering pain scores, patients' experience of the pain management method in question was better. The majority of the literature reviewed used VAS, and one of the studies described experiences by using the 11-point numeric rating scale (11-NRS) which is a numeric version of VAS.

Studies included in this review concerning pharmacological pain management were mainly centered on comparison of opioids and non-opioids in prevention of pain after cardiac surgery. Traditionally pain management after

cardiac surgery has been based on the use of opioid analgesics (Rafiq et al., 2015). However, it was noted by Rafiq et al. (2015) when comparing multimodal and opioid-based analgesic regimes following cardiac surgery, average pain scores were lower in patients undergoing the multimodal regime. Findings by Jahangiri Fard et al. (2014) support this, though the difference between opioid and non-opioid medication was not as meaningful.

However, Imantalab et al. (2014) found no significant difference in pain scores when comparing the use of morphine sulphate, an opioid, and diclofenac, a non-opioid, as suppositories. These controversial findings may be explained by differences in route of administration, type of cardiac surgery or physiological factors. Also, the country where each study was conducted and cultural differences in perception of pain must be taken into account. The role of opioids as the traditional method of pain management after surgery may also subjectively affect patients' acceptance and experiences concerning postoperative pain medication. Surprisingly, fear of addiction was noted to be low by Karabulut et al. (2015), and this may indicate patients being readier to accept opioid analgesics. However, it is important for health care professionals to consider dependence as a possible risk of these drugs, as stated in a study by Sattari, Baghdadchi, Kheyri, Khakzadi and Mashayekhi (2013).

Preventing a number of adverse effects with effective pain management results in patient satisfaction (Imantalab et al., 2014). As adverse effects are generally unpleasant for patients, it can be assumed that absence of them reinforces positive experiences. For this reason, patients' reports of occurrence of side-effects following administration of postoperative pain management were also included in the literature review.

Rafiq et al. (2014) found in their study that nausea and vomiting were nonexistent when receiving multimodal pain medication whereas 13 patients receiving opioids had to cease their regime altogether because of these side-effects. It is noteworthy that occurrence of these side effects and low pain scores correlated with each other in the study. When this and the fact that adverse effects negatively affect patient satisfaction are taken into account, the possibility to use alternatives to opioids should be considered to improve patients' experience. On the other hand, NSAIDs, often used as alternatives, have their own array of side-effects (Martínez, Rodríguez, Roca & Ruiz, 2016).

The optimal medication for pain management after cardiac surgery should be considered individually with each case to produce the best possible experience for the patient. Sattari et al. (2013) add that analgesic therapy and especially the need for opioids should be frequently evaluated. Paracetamol, reportedly causing none of the side effects of opioids or NSAIDs (Jahangiri Fard et al., 2014), could especially be researched and developed more as a postoperative analgesic. Based on the findings, authors drew conclusions that generally better patient experiences were yielded when using non-opioid pain management methods. It can be argued that non-opioid analgesics are a more patient-friendly method of pain management than the traditionally used opioids. However, patients may have different individual opinions of side-effects and how much they influence their postoperative experience. More research is needed to confirm the drawn conclusions and illuminate the differences and overall experiences that middle-aged patients have of using opioids and non-opioids.

The effect of massage therapy on post-cardiac surgery pain was measured by VAS, and declared to significantly reduce pain as well as anxiety. Correlating

with the lowered pain scores and indicating good experiences regarding pain medication was a rise in patient satisfaction (Braun et al., 2012.) Massage is non-invasive, safe and causes none of the side effects commonly experienced with pharmacological pain management methods, and thus can be assumed to be enjoyable to patients. However, providing massage therapy immediately after cardiac surgery may not be beneficial, as manual manipulation of tissues especially surrounding the incision sites can be painful. Braun et al. (2012) support this assumption, determining that massage given before postoperative day 3 is not effective in reducing pain. Massage can be considered a viable complementary method in reducing pain after cardiac surgery when used alongside pharmacological methods.

Further study by Najafi et al. (2014) concludes that including companions trained to give the massage therapy results in very high satisfaction rates. The inclusion of family members or friends may have a positive effect on a patient's state of mind, which leads to experiences of better pain management. Just the feeling of safety with companions nearby coupled with the physical closeness of massage can be assumed to contribute to increased comfort and relaxation.

Neither the study by Braun et al. (2012) or Najafi et al. (2014) specified the areas massaged during the interventions, and there were some contradictory results reported by previous studies about how effective massage therapy was considered in managing pain after surgery. Therefore, more specific studies would be beneficial to further determine the effectiveness of massage therapy in patients after cardiac surgery and whether the experiences are positive enough to validate use as a pain management method for middle-aged

patients. A study involving continuation of massage therapy at home after discharge could also be considered.

Another non-invasive form of pain management, low-intensity laser therapy, was studied by Fernandes et al. (2017) and found to be effective in reducing pain after coronary artery bypass graft surgery. Hereby patient experiences of this method of pain management could be considered as good. However, the analgesic effect of laser therapy was only observed on the 6th day postoperatively, notably later than when using other methods. This may make it a less appealing form of pain management compared to traditional interventions, despite reduced pain scores. Also, initially more trust is bound to be placed in conventional therapies, especially among older middle-aged patients. Because of the delayed analgesic effect, authors conclude that laser therapy can only be considered as a complementary pain management method.

As large a portion as 88% of cardiac surgery patients in the study by Mosso-Vázquez et al. (2014) reported virtual reality to decrease pain levels. This pain-reducing effect can be argued to be caused by the distracting nature of a virtual reality simulation, as it momentarily averts patients' attention from the painful physiological stimuli often associated with cardiac surgery. Lower stress observed by Mosso-Vázquez et al. (2014) also indicates good patient experiences regarding virtual reality therapy.

In addition to reduced pain scores, music therapy was reported by cardiac surgery patients to have a soothing effect in the study by Jose et al. (2012). Simply this calming effect of music can be assumed to increase patients' satisfaction, as found by Bauer et al. (2011), and provide a good experience by

decreasing anxiety. It is subjective how each person experiences listening to music, but the finding by Jose et al. (2012) that all patients felt better and more relaxed after a session of music therapy is strong evidence that experiences regarding music therapy were good. This is supported by the discovery made by Bauer et al. (2011) that patients and families found listening to music very acceptable. In addition to being effective in reducing pain scores, positive experiences could have been influenced by the ease, cost-efficiency and non-invasiveness of this form of pain management. In the study by Bauer et al. (2011) the possibility for patients to choose their own preference of music probably effected the positive experiences of listening to a combination of music and nature sounds.

Pre-existing beliefs can have an impact on how patients experience their pain management (Karabulut et al.,2015). Ethical questions are raised if a patient refuses medication deemed best for them, for example because of fear of addiction or own personal values. In these cases, effective communication between the patient and health care professional is integral to reaching a solution. Providing patients with adequate information about their pain medication can reinforce positive thinking and increases comfort levels, as found by Karabulut et al. (2015). Offering official written material to get acquainted with could enhance good experiences of pain management. Leegaard and Fagermoen (2008) state that patients need more specific information about taking scheduled pain medication.

On the other hand, comfort levels and satisfaction with management of pain medication were still found to be high after cardiac surgery despite lack of offered written material (Karabulut et al. 2015). This indicates that patients had generally experienced their pharmacological pain management as good.

Sattari et al. (2013) suggest that despite moderate levels of pain after cardiac surgery, satisfaction with pain management may be high because patients expect postoperative pain to be inevitable.

With 15 minutes being reported as the longest waiting time for pain medication in the same study by Karabulut et al. (2015), it can be stated that 15 minutes following the patient's complaint of pain and/or request for pain relief could be asserted as a general upper limit for providing postoperative analgesics. This rule could be useful in upholding patient satisfaction and reinforcing good experiences of pain medication. Problems concerning waiting time in wards can be caused by rush or understaffing, which must be combatted to achieve the abovementioned goals.

It may be assumed that managing pain after discharge from hospital is an integral part of care, especially concerning middle-aged patients who may be returning to working life. Early discharge from hospital setting means patients have more responsibility of themselves, as stated by Leegaard and Fagermoen (2008). Thus it was surprising that no information regarding self-management was found in the literature reviewed even though self-management is a major component of the post-cardiac surgery care chain. Especially nurses and other health care professionals could benefit from further research on the subject of patient experiences regarding self-management of pain. Counseling patients may be easier if there were knowledge of how self-management has previously been experienced and what problems may possibly have arisen with it. To maintain a comprehensive pain management, an individualized assessment of pain is necessary to patient satisfaction (Kianfar, Shadvar, Mahoori & Azarfarin, 2007).

It must be taken into consideration that pain scores and occurrence of side effects are a roundabout way of measuring patient experiences of pain management, used in the literature review only because of the surprisingly limited amount of direct experiences from patients themselves. Qualitative, questionnaire- or interview-based study is needed to accurately answer the research question, as statistical measurements do not tell the researcher specifics about the patients' experiences. There is a clear need for studies involving middle-aged patients' experiences of pain management after cardiac surgery in order to develop this area of health care accordingly. Thus, authors suggest qualitative study based on patient interviewing to be conducted, to further explore the specific interests and experiences of middle-aged cardiac surgery patients.

7.2 Validity, reliability and ethics

The literature review was conducted according to the principles of reliability, honesty and open discussion. The involvement of three authors offered the opportunity for critical reflection and comparison of opinions, giving the work more depth. All literature reviewed was up-to-date and evidence-based, as all articles chosen for the process were scientific publications published after the year 2010. Providers of data in the literature review were informed according to the JAMK project reporting instructions. This way it can be certified that all data used was theoretically based and had a proper reference to its respective author. No plagiarism or fabrication was practiced during the conduction of the literature review.

The study had a number of limitations. Mean age of subjects in the reviewed studies was used as a reference for middle-age, as none of the relevant studies

were definitively focused on middle-aged patients. This being the case, some of the patients taking part in the studies were inevitably younger or older than the definition of middle-aged used in the literature review. In addition, one of the studies had no mention of patients' age. Thus, results cannot be directly used to describe the experiences of specifically middle-aged patients. However, the age spectrum being wide allows results to be applied to other age groups than the one specified in the study.

Lack of relevant literature dealing with direct patient experiences caused the authors to partly rely on statistical pain scores and occurrence of side effects to evaluate patient experience of pain management. While use of these has been justified, the produced results are not as reliable to indicate experiences as those yielded by patient interviewing, for example. In addition, all literature reviewed focused on pain management in hospital setting. Self-management after discharge was not mentioned at all, despite authors believing it to be an integral part of postoperative pain management after cardiac surgery.

Sample sizes in the relevant studies were small and focused in one country or a specific ward, preventing their application to the general population worldwide. Cultural differences in pain perception were not taken into consideration. The wide range of different cardiac surgeries undergone by patients in the studies may also have had an effect on patients' experiences of their pain management.

The literature review in question utilised the Guidelines of the Finnish Advisory Board on Research Integrity 2012. To maintain ethical acceptability, reliability and credibility of results, research must be conducted following responsible conduct. Applying the guidelines for the responsible conduct of

research constitutes a form of legislation-bound self-regulation. The responsible conduct of research is also an integral part of the quality assurance of research organizations. (Finnish Advisory Board on Research Integrity, 2012).

References

- Allan, B.S. & Tong, J.G. 2003. *Optimising postoperative pain management in the ambulatory patient*. *Drugs*. 2003, Vol. 63 Issue 9, p855-867. 13p.
- Aslan, F.E., Badir, A., Arli, S.K. & Cakmakci, H. 2009. *Patients' experience of pain after cardiac surgery*. *Contemporary Nurse: A Journal for the Australian Nursing Profession*. 2009, Vol. 34 Issue 1, p48-54. 7p. 3
- Bjørnnes, A.K., Parry, M., Lie, I., Fagerland, M.W., Watt-Watson, J., Rustøen, T., Stubhaug, T. & Leegaard, M. 2016. *Pain experiences of men and women after cardiac surgery*. *Journal of Clinical Nursing* vol. 25, p3058-3068
- Braun, L., Stanguts, C., Casanelia, L., Spitzer, O., Paul, E., Vardaxis, N.J. & Rosenfeldt, F., 2012 *Massage therapy for cardiac surgery patients—a randomized trial*. *The Journal of Thoracic and Cardiovascular Surgery*, Volume 144, Number 6
- Chou R., Gordon, D., De Leon-Casasola, O., Rosenberg, J., Bickler, S., Brennan, T., Carter, T., Cassidy C., Chittenden, E., Degenhardt, E., Griffith, S., Manworren, R., McCarberg, B., Montgomery, R., Murphy, J., Perkal, M., Suresh, S., Sluka, K., Strassels, S., Thirlby, R., Viscusi, E., Walco, G., Warner, L., Weisman, S. & Wu, C. 2016. *Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council*. *The Journal of Pain*, Vol 17, No 2 (February), 2016: pp 131-157
- Cogan, J. 2010. *Pain Management After Cardiac Surgery*. *Semin Cardiothorac Vasc Anesth*. 2010 Sep;14(3):201-4.
- El-Ansary, D., Waddington, G. & Adams, R. 2007. *Relationship between pain and upper limb movement in patients with chronic sternal instability following cardiac surgery*. *Physiotherapy Theory & Practice*. September 2007, Vol. 23 Issue 5, p273-280. 8p.
- Exarchopoulos, T., Charitidou, E., Dedeilias, P., Charitos, C. & Routsis, C., 2015. *Scoring Systems for Outcome Prediction in a Cardiac Surgical Intensive Care*

Unit: A Comparative Study. American Journal Of Citical Care, July 2015, Volume 24, No. 4

Fredericks, S. & DaSilva, M., 2010. *An examination of the post discharge recovery experience of patients who have had heart surgery.* Journal of nursing and healthcare of chronic illness 2, 281-291

Garimella, V. & Callini, C., 2013. *Postoperative Pain Control.* Clin Colon Rectal Surg. 2013 Sep; 26(3): 191–196.

Gélinas, C., Arbour, C., Michaud, C., Robar, L. & Côté, J., 2013. *Patients and ICU nurses' perspectives of non-pharmacological interventions for pain management.* Nursing in Critical Care, Nov/Dec2013; 18(6): 307-318.

Greco, G., Shi, W., Michler, R. E., Meltzer, D. O., Ailawadi, G., Hohmann, S. F., Thourani, V. H., Argenziano, M., Alexander, J. H., Sankovic, K., Gupta, L., Blackstone, E. H., Acker, M. A., Russo, M. J., Lee, A., Burks, S. G., Gelijns, A. C., Bagiella, E., Moskowitz, A. J. & Gardner, T. J., 2015. *HAIs after cardiac surgery linked to high costs.* AORN Journal. 2015, Volume 101, Issue 2, Pages P5–P6

Harrison, R. 2005. *Psychological assessment during cardiac rehabilitation.* Nursing Standard. 3/16/2005, Vol. 19 Issue 27, p33-36. 4p

HUS, n.d. *Heart diseases.* Accessed 21 May 2017. Retrieved from <http://www.hus.fi/en/medical-care/medical-services/heart-diseases/Pages/default.aspx>

HUS, n.d. *Sydänleikkauspotilaan hoitoketju sairaalassa.* Accessed 25 May 2017. Retrieved from

<http://www.hus.fi/sairaanhoito/sairaanhoitopalvelut/sydansairaudet/sydankirurgia/sydanleikkauspotilaan-hoitoketju/Sivut/default.aspx>

International Association for the Study of Pain, *Classification of Chronic Pain, Second Edition (Revised)*, 2011. Accessed 25 May 2017. Retrieved from <https://www.iasp-pain.org/PublicationsNews/Content.aspx?ItemNumber=1673>

Jahangiri Fard, A., Babae, T., Alavi, S.M., Nasiri, A.A., Ghoreishi, S.M., Noori, N.M. & Mahjoubifard M. 2014. *Intravenous patient-controlled remifentanil versus paracetamol in post-operative pain management in patients undergoing coronary artery bypass graft surgery*. *Anesth Pain Med*. 2014 Sep 16;4(5):e19862

Kananen, J. 2014. *Laadullinen tutkimus opinnäytetyönä. Miten kirjoitan kvalitatiivisen opinnäytetyön vaihe vaiheelta*. Jyväskylän University of Applied Sciences

Kankkunen, P. & Vehviläinen-Julkunen, K. 2009. *Tutkimus hoitotieteessä*. Helsinki: WSOYpro Oy (135)

Karabulut, N., Aktaş, Y., Gürçayır, D., Yılmaz, D. & Gökmen, V. 2011. *Patient satisfaction with their pain management and comfort level after open heart surgery*. *Australian journal of advanced nursing*, volume 32, number 3, March - May 2015

Kianfar, A., Shadvar, K., Mahoori, A. & Azarfarin, R. 2007. *Pain after cardiac surgery*. *BioMed Central* (11)Suppl 2):P429

Kilkenny, M.F., Dunstan, L., Busingye, D., Purvis, T., Reyneke, M., Orgill, M. & Cadilhac, D. A., 2017. Knowledge of risk factors for diabetes or cardiovascular disease (CVD) is poor among individuals with risk factors for CVD. *PLoS ONE*. 2/28/2017, Vol. 12 Issue 2, p1-11. 11p

Kipu (online). Käypä hoito –suositus. Suomalaisen Lääkäriseuran Duodecimin, Suomen Anestesiologiyhdistyksen ja Suomen Yleislääketieteen yhdistyksen asettama työryhmä. Helsinki: Suomalainen Lääkäriseura Duodecim, 2015 (Referred to 13.06.2017). Available online: www.kaypahoito.fi

Leegaard, M. & Fagermoen, M.S. 2008. *Women's descriptions of postoperative pain and pain management after discharge from cardiac surgery*. Journal of Clinical Nursing. August 2008, Vol. 17 Issue 15, p2051-2060. 10p.

Leegaard, M., Nåden, D. & Fagermoen M.S., 2008. *Postoperative pain and self-management: Women's experiences after cardiac surgery*. Journal of Advanced Nursing. September 2008, Vol. 63 Issue 5, p 476-485. 10p.

Maas A.H.E.M. & Appelman, Y.E.A., 2010. *Gender differences in coronary heart disease*. Neth Heart J. December 2010; 18(12): 598-602.

Magidy, Warrén-Stomberg & Bjerså, 2015. *Assesment of post-operative pain management among acutely and electively admitted patients – A Swedish ward perspective*. Journal of Evaluation in Clinical Practice. Apr2016, Vol. 22 Issue 2, p283-289. 7p

Martínez, Rodriguez, Roca & Ruiz, 2016. *Intravenous Ibuprofen for Treatment of Post-Operative Pain: A Multicenter, Double Blind, Placebo-Controlled, Randomized Clinical Trial*. PLoS ONE. 5/6/2016, Vol. 11 Issue 5, p1-16. 16p.

Martorella, G., Gélinas, C. & Purden, M. 2014. *Acceptability of a web-based and tailored intervention for the self-management of pain after cardiac surgery: the perception of women and men*. JMIR Publications, Vol 3, No 4 (2014): Oct-Dec

Martorella, G., Boitor, M., Michaud, C. & Gélinas, C. 2014. *Feasibility and acceptability of hand massage therapy for pain management of postoperative cardiac surgery patients in the intensive care unit*. Heart Lung. 2014 Sep-Oct;43(5):437-44

MedicineNet.com, 2016. *Medical Definition of Pain management*. Accessed 22 August 2017. Retrieved from <http://www.medicinenet.com/script/main/art.asp?articlekey=10513>

Merriam-Webster, 2017. *Middle Age*. Accessed 22 August 2017. Retrieved from <https://www.merriam-webster.com/dictionary/middle%20age>

Milgrom, L.B., Brooks, J.A., Qi, R., Bunnell, K., Wuestefeld, S. & Beckman, D. 2004. *Pain levels experienced with activities after cardiac surgery*. Am J Crit Care. 2004 Mar;13(2):116-25.

Murphy, G.S., Szokol, J.W., Avram, M.J., Greenberg, S.B., Marymont, J.H., Shear, T., Parikh, K.N., Patel, S.S. & Gupta, D.K. 2015. *Intraoperative methadone for the prevention of postoperative pain: A randomized, double-blinded clinical trial in cardiac surgical patients*. Anesthesiology. 2015 May;122(5):1112-22.

Mäkijärvi, 2014. *Sydänsairauksien katetri- ja leikkaushoito*. Accessed 18 June 2017. Retrieved from http://www.ebm-guidelines.com/dtk/syd/avaa?p_artikkeli=syd00407

National Heart, Lung and Blood Institute. 2014. *How is heart disease treated?* Accessed 18 July 2017. Retrieved from <https://www.nhlbi.nih.gov/health/health-topics/topics/hdw/treatment>

National Heart, Lung and Blood Institute. 2017. *What Are the Risk Factors for Heart Disease?* Accessed 18 July 2017. Retrieved from <https://www.nhlbi.nih.gov/health/educational/hearttruth/lower-risk/risk-factors.htm>

National Heart, Lung and Blood Institute. 2013. *What is heart surgery?*
Accessed 18 July 2017. Retrieved from
<https://www.nhlbi.nih.gov/health/health-topics/topics/hs/>

Naughton, C., Cheek, L. & O'Hara, K. 2005. *Rapid recovery following cardiac surgery: a nursing perspective*. British Journal of Nursing. 2/24/2005, Vol. 14 Issue 4, p214-219.

Nilsson, U., 2009. *Soothing music can increase oxytocin levels during bed rest after open-heart surgery: a randomised trial control trial*. Wiley Online Library. Volume 18, Issue 15, August 2009, p2153-2161.

North, B. & Sinclair, D., 2012. *The Intersection Between Aging and Cardiovascular Disease*. Circulation Research. 2012; 110: 1097-1108.

Ozturk, N.K., Baki, E.D., Kavakli, A.S., Ayoglu, R.U., Karaveli, A., Emmiler, M., Inanoglu, K. & Karsli, B. 2016. *Comparison of transcutaneous electrical nerve stimulation and parasternal block for postoperative pain management after cardiac surgery*. Thoracic & Cardiovascular Surgeon. 2015, Vol. 63 Issue 6, p514-518. 5p.

Pagán, C.N. 2015. *7 age-related pains and how to ease them*. WebMD. Accessed 18 June 2017. Retrieved from <http://www.webmd.com/pain-management/features/common-pains-of-age#1>

Responsible conduct of research and procedures for handling allegations of misconduct in Finland, 2012. Finnish Advisory Board on Research Integrity. Accessed 20.5.2015. Retrieved from
http://www.tenk.fi/sites/tenk.fi/files/HTK_ohje_2012.pdf

Rew, L., 2010. *The systematic review of literature: Synthesizing evidence for practice*. Journal for Specialists in Pediatric Nursing. Jan2011, Vol. 16 Issue 1, p64-69. 6p.

Sardarinia M., Akbarpour, S., Lotfaliany, M., Bagherzadeh-Khiabani, Bozorgmanesh, M., Sheikholeslami, F., Azizi, F. & Hadaegh, F. 2016. *Risk Factors for Incidence of Cardiovascular Diseases and All-Cause Mortality in a Middle Eastern Population over a decade Follow-up: Tehran Lipid and Glucose Study*. 1-16. PLoS One. 2016; 11(12): e0167623

Sattari, M., Baghdadchi, M.E., Kheyri, M., Khakzadi, H. & Mashayekhi, S.O. 2013. *Study of patient pain management after cardiac surgery*. Advanced Pharmaceutical Bulletin, August 2013, 3(2), 373-377

Suomen Sydänliitto ry. 2012. *Kuntoutuminen sydänleikkauksen jälkeen. Omaterveyteni, 1-48*. Accessed 19 May 2017. Retrieved from http://www.omaterveyteni.fi/sites/www.omaterveyteni.fi/files/Pdf/kuntoutuminen_sydanleikkauksen_jalkeen.pdf

Texas Heart Institute. 2016. *A heart surgery overview*. Accessed 11 June 2017. Retrieved from <http://www.texasheart.org/HIC/Topics/Proced/>

Tilvis, R. 2004. *Vanhusten kivut*. Duodecim 2004;120:223–7

Tuomi, J. & Sarajärvi, A. 2009. *Laadullinen tutkimus ja sisällönanalyysi*. Kustannusosakeyhtiö Tammi.

Vaurio, L.E., Sands, L.P., Wang, Y.Mullen, E.A. & Leung, J.M. 2006. *Postoperative delirium: the importance of pain and pain management*. Anesth Analg. 2006 Apr;102(4):1267-73.

WHO, 2012. *WHO Guidelines on the Pharmacological Treatment of Persisting Pain in Children with Medical Illnesses*. Accessed 10 May 2017. Retrieved from http://apps.who.int/iris/bitstream/10665/44540/1/9789241548120_Guidelines.pdf

WHO, 2017 *Cardiovascular diseases (CVDs)*. World health organization. Accessed 22 August 2017. Retrieved from <http://www.who.int/mediacentre/factsheets/fs317/en/>

Appendices

Appendix 1. Reviewed articles in alphabetical order

Author(s)	Publishing year and country	Title	Research method	Main findings
Bauer, B., Cutshall S., Anderson, P., Prinsen S., Wentworth L., Olney T., Messner P., Brekke K., Li, Z., Sundt, T.M. 3rd. & Kelly R.	2011, Minnesota	Effect of the Combination of Music and Nature Sounds on Pain and Anxiety in Cardiac Surgical Patients: A Randomized Study Alternative Therapies	Quantitative research	Postoperative mean pain and relaxation scores improved after listening to music. Lower anxiety and increased satisfaction overall.
Braun, L., Stanguts, C., Casanelia, L., Spitzer, O., Paul, E., Vardaxis, N.J. & Rosenfeldt, F.,	2012, Australia	Massage therapy for cardiac surgery patients – a randomized trial	Quantitative and qualitative research	Postoperative massage therapy relieves patient discomfort and has both physical and psychological benefits.
Fernandes, G.A., Araújo Júnior, R.B., Lima, A.C., Gonzaga, I.C., de Oliveira, R.A. & Nicolau, R.A	2017 Brazil	Low-intensity Laser (660 NM) has Analgesic Effects on Sternotomy of Patients Who Underwent Coronary Artery Bypass Grafts.	Quantitative research	Laser group had a greater decrease in pain compared to placebo and control groups.
Imantalab,V.,	2014, Iran	Comparing the	Quantitative	No

Mirmansouri, A., Sedighinejad, A., Naderi, N. B., Farzi, F., Atamanesh, H. & Nassiri, N.		effects of morphine sulfate and diclofenac suppositories on postoperative pain in coronary artery bypass graft patients	ve research	significant statistical differences were found when comparing two test groups.
Jahangiri Fard, A., Babae, T., Alavi, S.M., Nasiri, A.A., Ghoreishi, S.M., Noori, N.M. & Mahjoubi-fard, M.	2014, Iran	Intravenous patient- controlled remifentanil versus paracetamol in post-operative pain management in patients undergoing coronary artery bypass graft surgery	Quantitati- ve research	No significant differences were found between the two groups. However, respiratory rate was found to be lower in group R that used remifentanil infusion.
Jose, J., Verma, M. & Arora, S.,	2012, India	An Experimental Study to assess the Effectiveness of Music Therapy on the Post Operative Pain Perception of Patients Following Cardiac Surgery in a Selected Hospital of New Delhi	Quantitati- ve research	Postoperative music therapy had significant, positive effect on pain, blood pressure and pulse.
Karabulut,	2011,	Patient	Quantitati-	Pain

N.,Aktaş, Y., Gürçayır, D., Yılmaz, D. & Gökmen, V.	Turkey	satisfaction with their pain management and comfort level after open heart surgery	ve research	intensity decreased as patients neared discharge from the hospital. Patients were highly satisfied with nurses' pain management.
Mosso-Vázquez, J.L., Gao, K., Wiederhold, B.K. & Wiederhold, M.D.	2014, Mexico	Virtual reality for pain management in cardiac surgery	Qualitative research	Majority of the patients reported a decreased pain level. Treatment had positive effects on heart rates, mean arterial pressure and respiratory rate.
Najafi, SS., Rast, F., Momennasab,M., Ghazinoor, M., Dehghanrad, F. & Mousaviza-deh SA.	2014, Iran	The effect of massage therapy by patients' companions on severity of pain in the patients undergoing post coronary artery bypass graft surgery: a single-blind randomized clinical trial	Qualitative research	Massage therapy was found to be effective strategy for pain management. Massage therapy gives patients family a possibility to participate in taking care of their family member.
Rafiq, S.,	2014,	Multimodal	Qualitative	Multimodal

<p>Steinbrüchel, D.A., Wanscher, M.J., Andersen, L.W., Navne, A., Lilleoer, N.B. & Olsen, P.S.</p>	<p>Denmark</p>	<p>analgesia versus traditional opiate based analgesia after cardiac surgery, a randomized controlled trial</p>	<p>research</p>	<p>regimen offered significantly better analgesia when compared to opiate regimen. Postoperative nausea and vomiting was reduced.</p>
--	----------------	---	-----------------	---