CARDIAC NURSES’ KNOWLEDGE, ASSESSMENT PRACTICES AND
MANAGEMENT OF POSTOPERATIVE PAIN

by

Maria Jannette Maglanque

B.S.N., The University of Manitoba, 2002

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN NURSING

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

November 2017

© Maria Jannette Maglanque, 2017
Abstract

**Background:** Pain is an important stressor for postoperative patients and remains an issue this present day. Postoperative patients continue to report moderate to severe postoperative pain following cardiac surgery. Acute postoperative pain that is not treated appropriately could potentially progress into postsurgical chronic pain which would significantly impact an individual’s overall quality of life. Nurses are at the frontlines providing direct patient care and play a major role in pain assessment and pain management, however, barriers exist that prevent postoperative patients from receiving effective pain relief. **Purpose:** To understand cardiac nurse' postoperative pain knowledge, pain assessment practices and pain management in the context of cardiac surgical patients. **Sample/Methods:** This was a mixed methods design that was conducted on two cardiac surgical units in a tertiary hospital located in British Columbia. There were 63 nurses who accessed the online survey. **Results:** The findings revealed nurses have moderate pain knowledge with scores ranging from 56.1% to 91.1%. Nurses education level, experience level and age had no impact on their knowledge scores. **Conclusions:** A majority of nurses reported adequate pain knowledge in assessment and management, however, knowledge gaps exist in terms of pain assessment, neuropathic pain and chronic pain.
Lay Summary

Pain is a common complaint following heart surgery and patients continue to complain of moderate to severe pain in hospital. Pain that is not treated appropriately could lead to further complications, slow down recovery and impact an individual’s overall quality of life. The purpose of this research study was to understand what cardiac nurses know about postoperative pain, pain management and to identify their knowledge deficits. Participants completed an online survey that examined their competence in pain knowledge, knowledge of pain medications; perceptions of pain and support from colleagues about their treatment decisions. The results indicated participants felt competent in their pain knowledge, but knowledge deficits were identified in which further pain education would be beneficial for both nurses and patients.


Preface

This thesis is original, unpublished, independent work by the author, Maria Jannette Maglanque. I conducted this research study, collected and analyzed the data and wrote the entire thesis with the guidance from my supervisor Dr. Jennifer Kryworuchko and thesis committee members Dr. Bernie Garrett and Brenda Poulton. Ethical approval was obtained from The University of British Columbia Behavioral Research Ethics Board Certificate number: H16-00981 also approval from the Fraser Health Research Ethics Board Certificate number: 216-066 to conduct the research.
Table of Contents

Abstract ................................................................................................................................. ii

Lay Summary ...................................................................................................................... iii

Preface ................................................................................................................................ iv

Table of Contents ................................................................................................................ v

List of Tables ........................................................................................................................ ix

Glossary ............................................................................................................................... x

Acknowledgements ............................................................................................................ xii

Dedication ........................................................................................................................... xiii

Chapter 1: Introduction ....................................................................................................... 1
  1.1 Background of Problem ............................................................................................... 2
  1.2 Problem Statement ..................................................................................................... 4
  1.3 Study Purpose ............................................................................................................ 4
  1.4 Research Questions ................................................................................................... 5
  1.6 Significance of Study ............................................................................................... 5

Chapter 2: Literature Review .............................................................................................. 7
  2.1 Introduction ............................................................................................................... 7
  2.2 Pain Defined .............................................................................................................. 7
    2.2.1 Acute Pain ........................................................................................................... 7
    2.2.2 PostSurgical Chronic Pain ................................................................................ 8
    2.2.3 Neuropathic Pain ............................................................................................... 8
| 2.3 | Impact of Unrelieved Pain                                      | 9 |
| 2.4 | Cardiac Surgery and Acute Pain                                | 10 |
| 2.5 | Cardiac Surgery and Postsurgical Chronic Pain                 | 11 |
| 2.6 | Cardiac Surgery and Neuropathic Pain                         | 13 |
| 2.7 | Pain Management Post Cardiac surgery                          | 14 |
| 2.7.1 | Nurse’s Role in Pain Assessment                               | 14 |
| 2.7.2 | Nurses’ Role in Neuropathic Pain Assessment                   | 15 |
| 2.7.3 | Pain Assessment Tools                                         | 17 |
| 2.8 | Barriers in Pain Management                                   | 18 |
| 2.9 | Summary                                                      | 22 |

**Chapter 3: Methods**

| 3.1 | Study Design                                                 | 23 |
| 3.2 | Ethical Considerations                                       | 24 |
| 3.3 | Sampling Plan                                                | 25 |
| 3.4 | Instrumentation                                              | 26 |
| 3.4.1 | Toronto Pain Management Inventory (TPMI)                    | 26 |
| 3.4.2 | Open Ended Questions                                         | 27 |
| 3.5 | Study Procedures                                             | 28 |
| 3.5.1 | Data Collection and Recruitment                              | 28 |
| 3.6 | Data Analysis                                                | 29 |
| 3.7 | Summary                                                      | 31 |

**Chapter 4: Results**

<p>| 4.1 | Sample Characteristics                                       | 32 |</p>
<table>
<thead>
<tr>
<th>4.2</th>
<th>Toronto Pain Management Inventory (TPMI)</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3</td>
<td>Participants Reported Experiences of Pain Management</td>
<td>36</td>
</tr>
<tr>
<td>4.4</td>
<td>Summary</td>
<td>42</td>
</tr>
</tbody>
</table>

**Chapter 5: Discussion**

<table>
<thead>
<tr>
<th>5.1</th>
<th>Cardiac Nurses’ Postoperative Pain Knowledge</th>
<th>43</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>Postoperative Pain Assessment</td>
<td>46</td>
</tr>
<tr>
<td>5.3</td>
<td>Neuropathic Pain Assessment</td>
<td>48</td>
</tr>
<tr>
<td>5.4</td>
<td>Challenges in Managing Chronic Pain</td>
<td>50</td>
</tr>
<tr>
<td>5.4.1</td>
<td>Pain Medications</td>
<td>50</td>
</tr>
<tr>
<td>5.4.2</td>
<td>Acute Pain versus Chronic Pain</td>
<td>51</td>
</tr>
<tr>
<td>5.5</td>
<td>Limitations</td>
<td>52</td>
</tr>
<tr>
<td>5.6</td>
<td>Summary</td>
<td>53</td>
</tr>
</tbody>
</table>

**Chapter 6: Conclusions and Implications**

<table>
<thead>
<tr>
<th>6.1</th>
<th>Summary</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2</td>
<td>Implications for Nursing</td>
<td>57</td>
</tr>
<tr>
<td>6.2.1</td>
<td>Nursing Practice</td>
<td>57</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Education</td>
<td>59</td>
</tr>
<tr>
<td>6.2.3</td>
<td>Health Policy Recommendations</td>
<td>60</td>
</tr>
<tr>
<td>6.3</td>
<td>Recommendations for Future Research</td>
<td>60</td>
</tr>
<tr>
<td>6.4</td>
<td>Conclusions</td>
<td>61</td>
</tr>
</tbody>
</table>

**References**

**Appendices**

| Appendix A: Introduction Letter to Manager | 75 |
List of Tables

Table 1 Demographic Profile of Participants................................................................. 33
Table 2 Ranking of Scores from Highest to Lowest Percentage for each TPMI item.............. 35
Table 3 Distribution of Participants relating to Painful Sites ............................................ 37
Table 4 Distribution of Participants by Postoperative Pain Assessment Practices............... 39
Table 5 Distribution of Participants by Neuropathic Pain Assessment Practices............... 41
Glossary

Allodynia: Pain as a result of a stimulus that would not normally cause pain (Fear, 2010).

Central Sensitization: “An amplification of neural signaling within the CNS that elicits pain hypersensitivity” (Woolf, 2011, p.4).

Coronary Artery Bypass Grafting (CABG): Heart surgery that involves harvesting a healthy vein or artery from the legs, arms or chest wall, which is then grafted to a blocked coronary artery to improve circulation to the heart (Heart and Stroke Foundation, 2012).

Dysaesthesia: “The experience of pain that is unpleasant atypical sensation that can be spontaneous or evoked such as numbness, burning and cramping” (Fear, 2010, p.36).

Hyperalgesia: The experience of pain that is severe as a result of a painful stimulus (Fear, 2010).

Internal Mammary Artery: This is an artery that branches off the subclavian artery and is the most common artery used for CABG surgery (Otsuka, Yahagi, Sakakura & Virmani, 2013).

Numerical Pain Rating Scale: A measure of pain intensity used in adults rating their pain from 0 (no pain) to 10 (worst pain) (Ferreira-Valente, Pais-Ribeiro & Jensen, 2011).

Open Heart Surgery or Cardiac Surgery: A type of surgery that involves cutting into a chest wall to open the rib cage and operate on the heart (National Heart, Lung & Blood Institute, 2013).

Paraesthesia: “The feeling of painless abnormal skin sensations such as pins and needles or tingling” (Fear, 2010, p.36).

Saphenous Vein graft: The large vein found in the leg that is utilized for grafting in coronary artery bypass surgery (Sabik, 2011).

Somatosensory system: involves communication of sensations from the peripheral system and
transmitting them through the spinal cord, brainstem and thalamic relay nuclei to the sensory cortex of the brain (Martens, 2013).
Acknowledgements

This thesis resulted in many years of hard work, dedication and challenges that came along the way. I would like to offer my sincere gratitude to my advisor Dr. Jennifer Kryworuchko for your guidance and support throughout this entire process. As well, thank you to my committee members Dr. Bernie Garrett for your knowledge and expertise in research and statistics and Brenda Poulton for your contributions and expertise in pain management. I appreciate your time and feedback which have helped me complete my thesis.

My greatest thank you goes to my family and friends for their support in pursuing my studies and their constant words of encouragement. I am extremely grateful to my husband, Jayson for his love, patience and support throughout this journey of mine. I am thankful to my parents for taking the time to care for Adrielle and Eliah and for always supporting me with my choices in life. Special thanks to my nursing colleagues for their support, words of wisdom and for accommodating me with shift trades to complete my studies.
Dedication

This thesis is dedicated to my daughters – Adrielle and Eliah. You have brought me so much love and joy and were my motivation to complete this thesis. I love you forever.
Chapter 1: Introduction

Nurses are essential health professionals providing patients with effective pain assessment and pain management. Pain is one important stressor in patients having to go through cardiac surgery. Pain is a common symptom described by patients after Coronary Artery Bypass Grafting (CABG) surgery in hospital and at home (Parry, Watt-Watson, Hodnett, Tranmer, Dennis & Brooks, 2010). Many studies have investigated the perceptions of pain in both patients and nurses, nurses’ knowledge and beliefs regarding pain management. There is limited research in cardiac nurses’ pain knowledge, assessment practices and postoperative pain management in the context of cardiac surgical patients. The initial postoperative period is a crucial period for this population with the goals to adequately manage their pain and provide postoperative care to a state of recovery. However, studies have reported postoperative pain levels after cardiac surgery ranging from moderate to severe; also, the pain is undertreated and could cause serious affects in the short and long-term outcomes (Cogan, 2010; Parry, Watt-Watson, Hodnett, Tranmer, Dennis & Brooks, 2010; Watt-Watson, Stevens, Garfinkel, Streiner & Gallop, 2001).

Unrelieved pain could make a significant impact on the recovery of a postoperative cardiac patient and could lead to detrimental effects physiologically and psychologically. Unrelieved pain could further progress to postsurgical chronic pain which would lead to an increase in morbidity and mortality, longer hospital stays and an increase use of healthcare resources (Alston & Pechon, 2005; Cogan, 2010; Eisenberg, Pultzok, Pud & Bar-El, 2001; Reimer-Kent, 2004; 2012). Postsurgical chronic pain, defined as pain that develops after a surgical procedure and persists at least three months after surgery (Treede et al., 2013); is an undertreated problem and a common form of morbidity following heart surgery. Studies have
reported prevalence rates of postsurgical chronic pain post cardiac surgery ranging from 10% to 56% (Bruce, Drury, Pooblan, Jeffrey, Smith & Chambers 2003; Choiniere, Watt-Watson, Victor, Baskett, Bussiere, Carrier et al., 2014; Eisenberg, Pultorak, Pud & Bar-El, 2001; Gjeilo, Klepstad, Wahba, Lydersen & Stenseth, 2010; Meyerson, Thelin, Gordh & Karlsten, 2001; Taillefer, Carrier, Belisle, Levesque, Lanctot, Boisvert & Choiniere, 2006). Chronic postsurgical pain is often neuropathic in nature and attributed to nerve damage and/or changes within the somatosensory nervous system, including central sensitization. Research studies indicate that patients frequently report some form of neuropathic pain symptoms following cardiac surgery which includes dysesthesia, hypoesthesia, hypalgesia, allodynia and hyperalgesia (Alston & Pechon, 2005; Einsenberg et al., 2001; Mailis, Umana & Feindel, 2000; Rowe & King; 1998). These types of pain are important health issues affecting the patient’s life and focusing on proper pain management and addressing pain issues sooner will help improve their recovery time.

1.1 Background of Problem

Nurses are one of the first health professionals that patients encounter upon admission to the hospital. Nurses provide care to patients and are responsible in pain assessment and pain management (Watt-Watson & Stevens, 1998). This includes ongoing pain assessment, initiation of treatments and medications as well as ongoing evaluation to ensure effectiveness (Wood, 2010). Individual’s experiencing unrelieved pain suffer physically such as the inability to perform daily activities, reducing physical activities and independence; psychological effects such as anxiety, depression and sleep disturbances; loss of employment and income and losing their relationships with family and friends (Duenas, Ojeda, Salazar, Mico & Falide, 2016). Therefore, it is important for health professionals to recognize and treat acute pain in the early
postoperative period. Unrelieved pain could later progress into chronic pain making it more difficult to treat and can significantly impact an individual’s overall quality of life.

Effective postoperative pain management relieves the patient’s discomfort and allows for early mobilization, decreases length of hospital stays and utilization of health care resources and increases patient satisfaction. Despite new advancements in pain management and pain management guidelines; the control of postoperative pain continues to be a challenge and issues of postoperative pain levels remain high, inadequate or under administered medication dosages, poor patient compliance and issues of postsurgical chronic pain demonstrate an increase risk in this population (Chapman, Zaslansky, Donaldson & Shinfeld, 2011; Kehlet, Jensen & Woolf, 2006; Leegaard, Watt-Watson, McGillion, Costello, Watson & Partridge, 2011).

As studies have focused on pain management in critical care and surgical areas (Dihle, Bjolseth & Helseth; 2006; Manias, Bucknall & Botti, 2004; Rose et al., 2012), there is still limited evidence on the understanding of cardiac nurses’ knowledge on pain management following cardiac surgery. Cardiac surgical patients suffering from postoperative pain is associated with nurses and patients lack of pain knowledge. Leegaard et al. (2011) studied nurses’ pain knowledge and identified common pain challenges and issues with pain management in cardiac surgery patients. The most common pain challenges identified include patients’ hesitation to take any opioids and fears of adverse effects or addiction as a result of lack of understanding about pain medications. It was also noted that nurses lacked education about pain management, did not trust the patients’ personal report of pain and disagreed with their patient’s pain level (Leegaard et al., 2011). There is the expectation from patients to self-report their pain to the nurse and patients expect the nurse to provide them with effective pain relief, however this did not often occur and led to poor pain management. Other research studies have
shown that nurses’ attitudes, poor knowledge and poor communication with patients affect pain management (Dihle et al., 2006; Leegaard et al., 2011; Manias et al., 2004; Watt-Watson & Stevens, 1998; Watt-Watson et al., 2001).

1.2 Problem Statement

Pain has been a topic of interest in the clinical setting and in research; the literature suggests patients continue to report pain while in hospital and at home which impacts an individual’s overall quality of life. The question that arises; do cardiac surgical nurses require additional training or regular educational sessions regarding postoperative pain management to provide adequate pain control in their postoperative open heart patients? If so, what areas of pain management do cardiac nurses believe they require further training?

1.3 Study Purpose

Nurses have an important role when caring for postoperative patients and nurses pain knowledge, pain assessment and reassessment are significant in effective pain management. This research study proposes:

1.) To describe cardiac nurses’ knowledge about postoperative pain;

2.) To describe areas of strengths and gaps in cardiac nurses’ knowledge about postoperative pain;

3.) To describe postoperative pain assessment practices of nurses that are currently used in cardiac patients;

4.) To describe neuropathic pain assessment practices of nurses in cardiac patients;

5.) To describe the nurses’ challenges in managing the postoperative cardiac patient with chronic pain;
6.) To explore the impact of age, education level and years of experience on the nurses’ pain knowledge based on the Toronto Pain Management Inventory (TPMI) scores

1.4 Research Questions

The questions I seek to address in this study are:

1) What knowledge do cardiac nurses have regarding postoperative pain after open heart surgery?

2) What pain assessment practices are utilized in postoperative cardiac patients in their first week of post recovery?

3) Does cardiac nurses’ knowledge of pain management vary with their age, education and experience?

1.6 Significance of Study

This research study was designed to examine nurses’ understanding of pain and current assessment practices of postoperative pain in the context of the cardiac patient and identify nurses’ knowledge deficits in postoperative pain assessment and pain management. Exploring these research questions may be beneficial for cardiac nurses and their postoperative cardiac patients which may help improve their knowledge on postoperative pain management and educating their postoperative patients that may lead to patient satisfaction, decrease the patient’s length of hospital stays and improve patient care outcomes.

1.7 Organization of Thesis

This research study will examine cardiac nurses’ knowledge, assessment practices and management of postoperative pain in the cardiac surgical population. The thesis is organized into six chapters. Chapter One introduces the concept of pain, the background of the problem and its significance to nursing. Also, this chapter describes the purpose of the study and
identifies the research questions. Chapter Two discusses the issues of postoperative pain and pain management. It further describes the various type of pain that can occur after cardiac surgery, the nurse’s role in pain assessment, pain management, nurses’ knowledge regarding postoperative pain and the barriers to poor pain management. Chapter Three discusses the overall plan of the research study that includes the research design and methodology, obtaining ethical consideration, the study procedures, the data collection and data analysis procedure. Chapter Four provides a detailed data analysis and presents the results and findings of this study. Chapter Five provides the discussion of the results and limitations of the study design. Chapter Six summarizes the research study, discusses the implications for nursing practice, education, health policy and recommendations for future research studies.
Chapter 2: Literature Review

2.1 Introduction

In this chapter, pain is defined and the types of pain discussed within the context of post cardiac surgery. Also, the impact of unrelieved pain, the nurses’ role with pain assessment, pain assessment tools and the barriers of pain management are explored.

2.2 Pain Defined

Pain can be challenging to define since pain is complex; it is both a highly subjective and objective individual experience. Pain affects people of varying ages and individuals experience pain in different ways. Pain is often mismanaged or misunderstood among nurses and patients within the hospital setting. The International Association for the Study of Pain (IASP) defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (IASP, 2012). Another definition of pain is “whatever the experiencing person says it is, existing whenever he says it does” (McCaffery and Pasero, 1999, p.17).

Acute and chronic pain differ from another in many ways in terms of the cause, the duration and the type of treatment used; one similarity between them is they both require adequate pain relief. When patients with pre-existing chronic pain are admitted into hospital for other reasons, the chronic pain often becomes forgotten because the focus becomes the acute pain (Siedlecki, Modic, Bernhofer, Sorrell, Strumble & Kato, 2014).

2.2.1 Acute Pain

Individuals undergoing surgery are usually prepared for some pain and discomfort with the expectation that it will eventually go away as they recover from surgery (Bruce & Quinlan, 2011). The IASP defines acute pain as an “awareness of noxious signalling from recently
damaged tissue complicated by sensitization in the periphery and within the central nervous system” (Merskey et al., 1994). Pain following cardiac surgery represents acute pain, and is a major postoperative issue for cardiac surgical patients. Sources of acute pain and discomfort that are problematic for postoperative cardiac patients include intravenous and central line sites, urinary catheters, nasogastric tubes, endotracheal tubes, chest tube insertion or removal, chest drains, incisional or surgical site pain, dressing changes, deep breathing and coughing, back pain as a result of positioning and duration in surgery, patient repositioning and mobilization (Gelinas, 2007; Martin & Turkelson, 2006; Sethares, Chin & Costa, 2013; Wood, 2010).

2.2.2 PostSurgical Chronic Pain

A precise definition of chronic pain after surgery is difficult to find in the literature. Bruce and Quinlan (2011) stated, “there is no standardized definition of chronic pain after surgery; most epidemiological studies use the IASP definition for chronic pain.” Treede et al. (2015) defined chronic pain after surgery as “pain that develops after a surgical procedure or a tissue injury (involving trauma) and persists at least 3 months after surgery or tissue trauma.” It has been reported the prevalence rates of chronic pain after surgery is between 10 to 30% at one year postoperatively and higher rates after coronary artery bypass grafting surgery and thoracic surgery (Bruce et al., 2011; Kehlet, Jensen & Woolf, 2006). Risk factors of developing chronic pain after surgery include pain that exists preoperatively, younger patients, psychological factors such as fear of the surgery, emotional distress (anxiety, depression), nerve injury during the operation and genetics (Bruce et al., 2011; Kehlet et al., 2006).

2.2.3 Neuropathic Pain

Neuropathic pain “is caused by a lesion or disease of the somatosensory nervous system” (Treede et al., 2015, p.1004). Neuropathic pain is usually difficult to diagnose and cannot be
treated with simple analgesics (Callin & Bennett, 2008). Neuropathic pain is usually a chronic condition, however, it may occur as acute pain in terms of the surgery or trauma related to nerve damage. Examples of neuropathic pain associated with peripheral and central nerve damage include diabetic neuropathy, chemotherapy induced neuropathy, spinal cord injury, nerve compression and phantom limb pain (Baker, 2009; Fear, 2010). Neuropathic pain is considered more severe than any other types of chronic pain and affects approximately 8% of the population (Fear, 2010). The literature discusses central sensitization as a common pathophysiological mechanism related to neuropathic pain. Central sensitization occurs with amplification of neural signaling and processing within the peripheral and central nervous system causing pain hypersensitivity (Gudin, 2004; Latremoliere & Woolf, 2009; Woolf, 2011). These changes in the somatosensory nervous system are referred to as neuroplasticity which is associated with chronic pain. Neuropathic pain is characterized as pain that radiates or spreads, burning pain, shooting or stabbing pain and an increased sensitivity to normal stimulus such as light touch (Barker, 2008). Also, paresthesia and allodynia are common characteristics of neuropathic pain.

2.3 Impact of Unrelieved Pain

Unrelieved pain can cause serious negative consequences in the short and long term and these outcomes would be harmful for the patients with regards to morbidity and mortality. Postoperative pain that is not relieved may lead to slower recovery time, limitations with mobility, restrictions of deep breathing and coughing exercises leading to pulmonary complications and the development of postsurgical chronic pain (Cogan, 2010; Parry, Watt-Watson, Hodnett, Tranmer, Dennis & Brooks, 2010; Reimer-Kent, 2003; Watt-Watson et al., 1998). Yorke et al. (2004) reported patients describing their pain as tiring and exhausting and physical activities such as coughing, physical therapy and movement had the greatest effects on
pain. Unrelieved pain not only impacts the individuals physically but also emotionally and mentally. Individuals experiencing unrelieved pain may be anxious, fearful, become depressed, angry and lack of trust from the health care team in terms of pain management (Parizad, Abdolahzahed & Mousavi-Shabestari, 2014). Furthermore, unrelieved pain also increases length of hospital stays and increased utilization of healthcare resources (Reimer-Kent, 2004, 2012). Pain continues to be is an important health issue with some patients report moderate or greater pain while in hospital and at home affecting their overall recovery and daily living. Unrelieved pain can progress into chronic pain impacting an individual’s function and quality of life including: physical capabilities, psychological well-being, employment, finances, relationships, sleep and activities.

2.4 Cardiac Surgery and Acute Pain

Coronary Artery Bypass Grafting (CABG) surgery is undertaken to alleviate symptoms of angina, enhance and improve an individual’s quality of life and increase life expectancy (Hawkes, Nowak, Bidstrup & Speare, 2006; Martin & Turkelson, 2006). CABG surgery involves harvesting a healthy vein or artery from the legs, arms or chest wall, which is then grafted to a blocked coronary artery to enhance circulation of blood flow to the heart (Heart and Stroke Foundation, 2012). CABG surgery also involves multiple surgical wounds that causes pain and discomfort in postoperative patients.

Postoperative pain levels following cardiac surgery has been reported to be moderate to severe and undertreated and the effects strongly prolong an individual’s state of recovery (Cogan, 2010; Watt-Watson, Stevens, Garfinkel, Streiner & Gallop, 2001). Watt-Watson et al. (2001) reported that 57% of postoperative cardiac patients had severe pain and 29% of postoperative cardiac patients had moderate pain in the last 24 hours. Kuperberg & Grubbs
(1997) investigated post CABG patient’s perceptions of pain and reported patients experienced moderate to severe pain and were under medicated. Yorke, Walls & McLean (2004) also investigated patient’s perceptions of pain post cardiac surgery and findings indicated patients received less analgesia and 45% of patients had to wait for analgesia sometime during their critical care admission. Parry, Watt-Watson, Hodnett, Tranmer, Dennis & Brooks (2010) investigated pain experiences in men and women after CABG surgery and found women (27%) reported unrelieved pain that was moderate to severe nine weeks post discharge. Many sources of acute pain occur following cardiac surgery; most commonly following the median sternotomy which damages subcutaneous muscle, bone, tissue and nerves (Reimer-Kent, 2003; Watt-Watson & Stevens., 1998). The internal mammary artery (IMA) and saphenous vein grafts (SVG) are used for CABG surgery which caused moderate to severe acute postoperative pain for most patients (Cogan, 2010; Watt-Watson & Stevens, 1998; Yorke et al., 2004).

2.5 Cardiac Surgery and Postsurgical Chronic Pain

Cardiac surgery is performed to help improve a patient’s quality of life. However, unrelieved pain in the early postoperative period can contribute to postsurgical chronic pain that will in turn interfere with daily living, affect an individual’s quality of life and psychological well-being (Gjeilo, Stenseth, & Klepstad, 2014; Taillefer, Carrier, Belisle, Levesque, Lanctot, Boisvert & Choiniere, 2006). Several studies have been undertaken to determine the prevalence rates of postsurgical chronic pain in patients following cardiac surgery. Reports have shown that higher pain intensity levels in patients that require large amounts of analgesic early on have been linked with developing postsurgical chronic pain (Bigeleisen & Goehner, 2015; Choiniere et al., 2014). Cogan, 2010; Kaslo, Mennander, Tasmuth & Nilsson, 2001; Lahinten, Kokki & Hynynen, 2006; Meyerson et al., 2001). Taillefer et al. (2006) conducted a study of 736 patients
after cardiac surgery and found that 23% of patients reported postsurgical chronic pain one or more years after the operation. Choiniere et al. (2014) reported 10% of patients experienced chronic postoperative pain two years after cardiac surgery and found the level of pain intensity postoperatively predicted the presence of postsurgical chronic pain. Lee et al. (2010) studied postoperative cardiac patients’ pattern and predictors of chronic pain and found patients who reported chronic pain three months following cardiac surgery had abnormal patterns of increasing pain within the first month of their recovery. Patients reported high pain intensity ratings and those who were reluctant about using opioids had a greater risk of developing postsurgical chronic pain.

The mechanisms and etiology of postsurgical chronic pain remains unclear with further research needed due to its complex pathophysiology. Research studies have proposed various theories relating to a neuropathic pain component, for example neuropathy entrapment, musculoskeletal trauma during the operation, wound dehiscence, rib fracture, sternal wires and postoperative infection or lack of adequate analgesia (Bruce et al., 2003; Cogan, 2010; Eisenberg et al., 2001; Gjeilo et al., 2014; Meyerson et al., 2001; Tailler et al., 2006). A more recent article (Pozek, Beausang, Baratta & Viscusi, 2016) proposed that postsurgical chronic pain involves the transition from acute pain to chronic pain in which an inflammatory response related to the surgical incision or trauma promotes the neuroplasticity process and central sensitization. The literature reported a number of risk factors related to developing postsurgical chronic pain which include younger patients (under 60 years old), patients who reported preoperative pain, female gender, obesity, repeat surgery, emergency surgery, acute postoperative pain and genetic predisposition (Bruce et al., 2003; Choiniere et al., 2014; Gjeilo et al., 2014). As well, patients
who are anxious preoperatively or have a history of depression are at higher risk of developing postsurgical chronic pain (Choiniere et al., 2014; Gjeilo et al., 2014).

2.6 Cardiac Surgery and Neuropathic Pain

Patients undergoing cardiac surgery are also at risk of developing neuropathic pain as a result of nerve damage caused by the sternal retraction, sternal wires becoming misplaced and when intercostal drains are inserted (Alston & Pechon, 2005; Conacher, Doig, Rivas & Pridie, 1993; Eisenberg et al., 2001; Mountney & Wilkinson, 1999; Sharma, Sreeram & Grocott, 2000). Potential nerve damage involves the dissection of the IMA or SVG grafts affecting nearby nerves such as the intercostal nerves, brachial plexus, phrenic nerve and saphenous nerve (Sharma et al., 2000).

Research studies indicate that patients have reported some form of neuropathic pain symptoms following cardiac surgery containing sensory changes. These sensory changes may include dysaesthesia (numbness, burning, cramping), paraesthesia (pins and needles, tingling), hyperalgesia (heightened painful experience) and allodynia (pain caused by light touch) (Alston & Pechon, 2005; Callin et al., 2008; Eisenberg et al., 2001; Fear, 2010; Mailis, Umana & Feindel, 2000; Rowe & King; 1998). Also, the process of central sensitization is associated with neuropathic pain and is characterized by allodynia and hyperalgesia (Institute for Chronic Pain, 2017).

Alston and Pechon (2005) investigated whether dysaesthesia occurs after CABG surgery and findings indicated 54% of patients experience some form of dysaesthesia on their sternal incision. The harvesting of the right or left IMA may have damaged the intercostal nerves during the surgery which potentially contributed to the dysaesthesia. Mailis et al. (2000) investigated the prevalence of intercostal nerve damage after CABG surgery and a total of 37
patients were seen 15 months postoperatively and 15% of patients had persistent pain with
definite nerve damage after cardiac surgery.

Eisenberg et al. (2001) investigated the characteristics of postsurgical chronic pain in 540
post CABG patients; the findings of the study indicated 73% of patients had sensory
abnormalities as a result of the surgical operation. The researchers also identified three
subcategories of postsurgical chronic pain all of which indicated that the chronic chest wall pain
had a neuropathic pain component with specific symptoms of alldynia and hyperalgesia. Bruce
et al. (2003) conducted a study of post CABG patients that studied both chronic chest and leg
pain post CABG surgery. Symptoms of neuropathic pain were much more evident in patients
with chronic leg pain than patients with chronic chest pain following CABG surgery.

2.7 Pain Management Post Cardiac surgery

2.7.1 Nurse’s Role in Pain Assessment

Nurses are at the clinical frontline providing direct patient care and have the
responsibility to provide patients with effective pain assessment and intervening with the
appropriate treatment (Watt-Watson & Stevens, 1998). However, studies have indicated that
patients’ postoperative pain remains to be moderate to severe following cardiac surgery (Aslan,
Badir, Airli & Cakmakci, 2009; Kuperberg & Grubbs, 1997; Watt-Watson et al., 1998; Watt-
Watson et al., 2001). Pain is an individual experience and their personal report of pain indicates
the presence and acuteness of their pain (Devine, Bevsek, Brubakken, Johnson, Ryan, Sliefert &
Rodgers, 1999). Pain assessment involves identifying the location, the duration, the intensity of
pain, description, contributing and alleviating factors, assessing pain at rest and on movement
and has been suggested to include pain as a “fifth” vital sign (Parry et al., 2010; Woods, 2010).
A comprehensive postoperative pain assessment includes determining physical, psychological
and environmental factors that the patient experiences which ensures for early detection, evaluation and appropriate pain management (Wood, 2010).

Pain assessment and management practices have shown to differ widely amongst nurses and have been shown to be influenced by the nurse’s individual pain experiences and beliefs. This may influence their perceptions of the patients’ pain experience, and may even prevent their patients from receiving the adequate treatment (Watt-Watson & Stevens, 1998). Watt-Watson et al. (2001) investigated the association between nurses’ knowledge and beliefs about postoperative pain and their patient’s self-report of pain post cardiac surgery. Data was collected from 94 nurses and 225 patients over a five-month period from four cardiovascular surgical units. Findings indicated nurses felt competent with regards to their knowledge and management of pain but 86% of patients reported moderate to severe pain and were given less analgesia on day one and day two after cardiac surgery. In this study, nurses also believed that the patients would voluntarily request for analgesia and two-thirds of nurses disagreed with their patient’s level of pain postoperatively. Dihle, Bjolseth & Helseth (2006) conducted a descriptive, observational study with in depth interviews of nine nurses to understand their postoperative pain management practices in surgical wards. Findings have shown nurses are knowledgeable about postoperative pain assessment and management. However, this knowledge was not always used to good effect in clinical practice which presents a barrier to optimal pain management.

2.7.2 Nurses’ Role in Neuropathic Pain Assessment

In the early postoperative stages, pain assessment usually focuses on using a simple numerical scale to rate their pain intensity, responding with the appropriate analgesic and re-evaluating the effects. Neuropathic pain may not be familiar to many nurses and may not be aware or have neuropathic pain assessment tools available within their clinical settings. These
Assessment tools include the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS), Neuropathic pain questionnaire (NPQ) and Douleur Neuropathique 4 questions (DN4) which are useful when screening for neuropathic pain (Bennett et al., 2007). However, awareness about neuropathic pain and the lack of appropriate assessment tools are barriers in detecting and managing neuropathic pain. Nurses require the knowledge and skills to perform neuropathic pain assessment and realize the potential long term impact it can have for patients. A comprehensive assessment including a detailed pain history and pain assessment are required (Fear, 2010). The assessment should include the patient’s description of their pain such as the quality of pain, duration of the pain, aggravating and alleviating factors and response to prior treatment. (Barker, 2009; Callin et al., 2008; Herr, 2004; Johnson, 2008). Chronic neuropathic pain which is more difficult to treat than nociceptive or acute pain could have negative effects physically and psychologically and therefore, it is crucial to determine how pain affects their emotions, normal living, sleeping habits, personal relationships, social activities and work (Fear, 2010).

Recent studies have identified the potential for neuropathic pain in the immediate postoperative period and estimates 2-10% of severe postoperative chronic pain is associated with neuropathic pain (Kehlet et al., 2006, Searle et al., 2009). Searle et al. (2009) studied the incidence of acute neuropathic pain immediately after thoracic surgery and found 8% of patients developed acute neuropathic pain postoperatively and 22% developed chronic neuropathic pain three months after surgery. The findings of this study indicate the importance of identifying neuropathic pain symptoms early and treating the pain appropriately. It is important for nurses to screen pre-operative patients, identify patients at risk for developing neuropathic pain and assess these patients for neuropathic pain in the early postoperative period.
It appears there are minimal studies regarding nurse’s knowledge base regarding neuropathic pain assessment and management. Taverner and Prince (2014) conducted a chart audit of nurse assessment and documentation of neuropathic pain in surgical patients in three surgical units. The researchers educated the nurses on how to screen for neuropathic pain signs using a validated screening tool the 7-item DN4 and incorporated this tool into their regular pain chart. Results reported 94% of charts audited had neuropathic pain screening documentation and incorporating this tool into the nurse’s pain assessment record allowed to detect signs of neuropathic pain in 24% of patients three days postoperatively after surgery. Educating nurses to screen for neuropathic pain enabled them to regularly assess for neuropathic pain, which then allowed for early detection and assessment; potentially decreasing the incidence of chronic pain and providing more effective pain management (Taverner & Prince, 2014). Also, Lavoie-Smith et al. (2009) indicated that nurse’s knowledge of neuropathic pain, screening and assessment improved after educational sessions and these changes will likely improve neuropathic assessment and overall pain management.

2.7.3 Pain Assessment Tools

A number of pain assessment tools are available for nurses to utilize and incorporate into their daily assessment practices, however these tools frequently do not include neuropathic pain assessment tools. The literature indicates nurses frequently do not utilize these tools when assessing postoperative pain (Dihle et al., 2006; Manias, Bucknall & Botti, 2004; Rose et al., 2012). Manias et al. (2004) studied 52 nurses who provide care to postoperative patients and a total of 316 pain activities were observed. Findings indicate that 43.7% of observed cases, there was no pain assessment done by nurses and 9% of observed cases nurses utilized a pain assessment tool. In this study, the barriers for not utilizing a pain assessment tool is when nurses
believe their patients could not express their pain appropriately (i.e. those with dementia or confusion), when medications were given regularly, when pain was chronic or when pain was incidental (i.e. nurses repositioning a patient in bed) (Manias et al., 2004). This study demonstrated pain assessment tools were available for the nurses to utilize but were not always used in everyday practice. Simple questioning was observed as the common method for nurses to assess for postoperative pain although this form of questioning was observed to be relatively brief; conversations were vague and misinterpreted which caused poor pain management outcomes. Dihle et al. (2006) also observed that nurses assessed pain by asking their patients and observing for nonverbal signs of pain such as clammy skin, feeling ill, pale skin color, body gestures and activity levels. Nurses were aware of pain assessment tools but were seldom used and such tools were not regularly used on the surgical wards. Ene, Nordberg, Bergh, Johansson & Sjostrom (2008) reported 40% of nurses were not using a pain assessment tool and were not assessing for pain with movement.

The most common pain assessment tools used by nurses at the bedside include verbal rating scores (VAS), visual analogue scale (VAS), numerical pain rating scale (NPRS) and Wong-Baker FACES ® rating scale. Also, the Behavioral Pain scale (BPS) and the Critical-Care pain observation tool (CCPOT) are tools used for nonverbal patients in the critical care setting. While these standardized tools are useful in pain assessment they lack the ability to identify neuropathic pain without further inquiry or specialized screening. Potentially leaving nurses unable to offer appropriate or effective pain management.

2.8 Barriers in Pain Management

Pain management is a serious issue when caring for postoperative patients and the goal is to provide effective pain relief (Reimer-Kent, 2004). It is evident in the literature that barriers in
pain management exist among nurses and patients which affects patient care and patient care outcomes. One major barrier that has been reported is the insufficient amount of pain management education that includes inaccurate knowledge of pharmacology, individual’s perceptions about pain management, ineffective assessment practices and ineffective communication between nurses and patients (Manias et al., 2002; Matthews & Malcom, 2007). Leegaard et al. (2011) identified that patients were hesitant to take medications, lacked understanding of the medications and showed concerns about the reactions to the medications such as constipation, feeling nauseous and vomiting. Also, the nurses identified their own knowledge deficits of pain management which includes the misbelief that older patients have less pain, opioids have a ceiling dose, belief that pain management involves one strategy at a time and expressed concerns of respiratory depression. There is also the belief among nurses and patients that moderate pain is acceptable during the postoperative period (Mackintosh-Franklin, 2012; Manias, Bucknall & Botti, 2005; Watt-Watson et al., 2001). These misbeliefs and knowledge gaps about pain among nurses leads to inaccurate patient teaching and ineffective pain relief. Patients are not receiving the appropriate information regarding pain management and therefore patients remain to experience moderate to severe pain following surgery.

Research studies have also reported that nurses are not providing patients with appropriate amounts of analgesia regardless of the patient’s pain (Taylor & Stanbury, 2005; Watt-Watson et al., 2001). Watt-Watson et al. (2001) reported majority of patients received less than 16 mg of analgesics in the previous 24 hours, 47% of patients received the ordered dosage of analgesics, approximately half the patients had severe pain prior to the following dosage and patients did not understand the need for regular dosing of medications. Ineffective pain assessment practices and communication between nurses and patients often leads to ineffective
pain relief. A thorough pain assessment is important for nurses to perform and patients need to understand what is being asked of them and the reasons for the intervention i.e. regular dosing of analgesia. Other research studies have reported nurses underestimated their patient’s pain level, didn’t trust the patient’s self-report of pain, or did not ask about pain (Manias, 2005; Taylor & Stanbury, 2005). Manias et al. (2005) studied 52 nurses who were observed during their shift with their postoperative patients. It was noted when pain cues are unclear, nurses will miss these cues and other nursing activities such as dressing changes or completing rounds become more priority. Nurses frequently provided analgesia in a reactive manner rather than a preventive manner tending to administer analgesia after completing a wound dressing change or after performing deep breathing and coughing exercises. Patients in Manias et al. (2005) study were kept waiting in pain until the pain medication were due and another study (Yorke et al., 2004), also reported 45% of patient had to wait for pain medications.

Pain medications given as pro re nata (PRN) is another barrier in pain management because these medications are administered when requested by the patient or the discretion of the nurse. The PRN medications pose challenges for nurses as these medications are prescribed as a range making it difficult to titrate and provide effective pain relief. McCaffery, Pasero & Ferrell (2007) conducted a study over a 16-year period examining nurses’ responses to a vignette survey regarding documentation of patient’s pain rating and the nurses’ decision about opioid dose. The researchers found nurses chose not to increase the opioid dose even when it was indicated by the patients’ intensity of pain. Gordon, Pellino, Higgins, Pasero & Murphy-Ende (2008) also used a vignette survey to investigate nurses’ views about appropriate PRN opioid dosages and identified about one-third to one-half of nurses chose to be conservative in terms of PRN opioid administration and chose responses that would under medicate the patient.
Another barrier in pain management is both nurses and patients have shown a concern or fear of drug addiction with opioid use (Kuperberg & Grubbs, 1997; Leegaard et al., 2011; McCaffery et al., 1997). Watt-Watson et al. (2001) indicated 44% of nurses stated 10% or more of patients develop an addiction to opioids and in another study Kuperberg and Grubbs (1997) reported 15% of patients feared drug addiction and therefore hesitated to take pain medications which resulted in dissatisfaction of pain relief.

Cogan et al. (2014) surveyed 379 patients undergoing heart surgery and reported patients were given incorrect information about pain management, the definition of pain and the side effects related to analgesics. Many patients believed that “people get addicted to pain medication very easily” and in this study 62% of patients agreed strongly or moderately. Clarke, Soneji, Ko, Yun. & Wijeysundera (2014) conducted a study of postsurgical patients with no history of opioid use and identified the relationship and risk factors associated with continuous opioid usage greater than 90 days post surgery. Finding reported 50% of postoperative patients had an opioid prescription to take home but at three months post surgery only 3.1% remained on the opioid. It is reassuring to learn that when patients are treated for their acute postoperative pain, the majority of postoperative patients do not experience prolonged use of opioids. Strassels (2008) reported the potential for opioid addiction has been low in patients receiving opioids for acute pain. However, a recent study (Bicket, Long, Pronovost, Alexander & Wu, 2017) examined issues surrounding unused opioid prescription that could lead to drug abuse, addiction and overdose. The researchers suggested controlling opioid prescribing of physicians such as safer opioid dosages upon discharge, utilizing nonopioids medications to provide pain relief and programs to take medications back to pharmacies to help reduce nonmedicinal use or diversion.
of unused opioids as well as increasing patient awareness with adequate information on how and when to wean opioids as the pain improves.

2.9 Summary

There are numerous studies on postoperative pain management and with new advances in medicine and technology, but pain continues to be an issue among nurses and patients until this present day. This literature review has identified the types of pain associated with open heart surgery and discussion surrounding the issues of both acute and chronic postoperative pain in cardiac patients. The nurses’ role in postoperative pain management is crucial in terms of pain assessment and treatment as well the barriers in pain management have been identified in the literature. The next chapter will discuss the methods undertaken in this study to answer the research questions presented in chapter 1.
Chapter 3: Methods

This section describes the study design, sampling plan, study procedures, data collection and analysis. Furthermore, ethical considerations and limitations of the study are also discussed.

3.1 Study Design

This research study was a mixed method, descriptive, cross sectional survey design that examined Registered Nurse’s (RN) knowledge base of postoperative pain and the current pain assessment practices associated with postoperative cardiac patients. The researcher invited all cardiac surgical nurses from a tertiary hospital in British Columbia to complete a web based survey that included the Visual Analogue Scale (VAS) and open ended questions to explore their knowledge of pain and practices.

The advantages of a web based survey ensures responses are anonymous, flexible and efficient in data collection from large populations. Also, survey research designs are useful in assessing practices, attitudes and beliefs of a population at a single point in time (IARC, 2015; Polit & Beck, 2012). As the internet is becoming more accessible and widely used by many populations, it makes it easy for researchers to administer data collection tools to larger populations and is much more cost effective and efficient than paper based surveys (Gordan & McNew, 2008). This research study was modelled after a Canadian study done by Watt-Watson et al. (2001) in which the same TPMI instrument was used to measure nurses’ pain knowledge. The Toronto Pain Management Inventory (TPMI) survey was utilized to explore the cardiac nurses’ postoperative pain knowledge, pain management and pain assessment practices in their postoperative patients. Five questions were added to the TPMI survey to further explore the nurses’ current postoperative pain assessment practices including neuropathic pain assessment and the challenges in managing postoperative patients with chronic pain. These additional
questions were developed based on the following research questions: What knowledge do cardiac nurses have regarding postoperative pain after open heart surgery? And also, what pain assessment practices are utilized in postoperative cardiac patients in their first week of post recovery?

3.2 Ethical Considerations

Prior to the commencement of this study approvals by the University of British Columbia Behavioral Research and Ethics Boards (BREB) and the Fraser Health Research Ethics Board (FHREB) were obtained to ensure this research study met the ethical standards and safety of the participants. Participants were invited to participate by sending an email of the Letter of Invitation and the FluidSurvey link that was distributed by the Clinical Nurse Educator (CNE).

The Letter of Invitation explained the purpose of the research study; including data collection and procedure (i.e. FluidSurvey), the time commitment, the potential risks and benefits, ensuring confidentiality and voluntary consent of the study (Appendix B). The Letter of Invitation letter also included the contact details of the investigators; details about receiving an incentive after completing the electronic survey and information that the research study is a partial fulfillment for the requirements to complete a masters of nursing degree and results will be used for research purposes only. The returned electronic survey was implied as informed consent and therefore a separate consent form was not required. Participants confidentiality was maintained; there was no personal identifiers i.e.: names and Internet Protocol (IP) addresses collected during the study and it was unknown as to who has completed the survey or not. However, participants had the option of providing their email address to receive an incentive for participating in the study. This option was available after the survey was completed and participants were redirected to another webpage to provide their email address. The email
address was not associated with the data collected from the survey. A summarized report would be forwarded to the unit manager for distribution to the nursing staff of both cardiac surgical units.

3.3 Sampling Plan

Participants were recruited through a convenience sample from two cardiac surgical units at a large tertiary hospital in British Columbia. The targeted sample for this study was \( n = 129 \) Registered Nurses with the aim to produce a sample size of \( n = 50 \) survey respondents. This number of respondents would provide an initial representation of cardiac nurses’ knowledge of postoperative pain in this setting. This type of non-probability sampling involves asking for volunteers who are easily accessible and available (Polit & Beck, 2012; Social Research Methods, 2006). It is also an inexpensive and efficient way to collect and gather data in comparison to other sampling methods such as probability sampling.

Inclusion criteria included registered nurses currently employed and working full time, part-time or casual on a cardiac unit that includes CSICU and 2 South/Cardiac Step down unit. Exclusion criteria included registered nurses currently employed in the cardiac catheterization lab unit; here, the nurse’s primary role involved assisting the cardiologist during a procedure such as an angiogram or angioplasty and nurses in this setting do not monitor postoperative pain. Registered nurses working in the intensive care unit, post anesthesia care unit, emergency unit and general medical/surgical units were excluded from this study as the focus involved understanding the knowledge level of cardiac nurses regarding postoperative pain management following cardiac surgery. Also, excluded in this study were student nurses and care aides due to their minimal responsibility for postoperative pain management. Licensed practical nurses
(LPNs) were currently not employed in the cardiac units due to the highly specialized area and were excluded from the study.

3.4 Instrumentation

A pre-existing survey tool was utilized in this study to address the research questions. The TPMI survey tool was developed by Watt-Watson et al. (2001) and permission was granted by the authors to utilize their survey tool for this study. The survey consisted of three sections the demographic profile, Toronto Pain Management Inventory (TPMI) and the open ended questions (Appendix D).

The demographic section of the survey included the participant’s level of education, the number of years as a nurse, years working on the unit, gender, language spoken at home, age and attendance of pain management training.

3.4.1 Toronto Pain Management Inventory (TPMI)

The TPMI consisted of 23 visual analogue scale (VAS) questions and has demonstrated its validity and reliability with a focus on nurse’s knowledge about pain management based on postoperative cardiac patient care (Watt-Watson et al., 2001). The authors of this survey established face and content validity with nine nurses and four medical professionals with expertise in surgical pain. Also, undergraduate nursing students evaluated the questions for clarification, how relevant it is to the postoperative setting and comprehensiveness of the content. Reliability of the instrument was established during a three-month pilot study of 33 surgical nurses (Watt-Watson et al., 2001).

Two questions (14 and 16) were modified to reflect the analgesic practices in this specific clinical setting. In question 14, the analgesic Tylenol no. 3 was replaced with Tylenol 1g because Tylenol no. 3 was not an analgesic choice in the clinical setting and also issues related to
codeine included patients’ sensitivity, problems with constipation and allergic reactions to codeine. Question 16, the opioid Morphine was replaced with Hydromorphone to reflect the practices in the clinical setting. The survey instrument examined the nurse’s knowledge about analgesia, pain experiences of the patient, nurses’ own competence level of pain assessment and support from their colleagues (Watt-Watson et al., 2001). The participants were asked to rate each question on a scale from 0-100. The individual scores were calculated and a TPMI score was obtained with scores ranging from 0 (less knowledge) to 100% (most knowledge). (Watt-Watson et al., 2001). A final score was generated in which certain items (i.e. 1, 2, 4, 5, 6, 8, 9, 11, 12, 15, 17, 18) were reversed (score subtracted from 100) and the remaining items were summed.

3.4.2 Open Ended Questions

There were five open ended questions that were created by the co-investigator which further explored the nurses’ knowledge about pain, chronic pain, neuropathic pain and the postoperative pain assessment practices currently utilized in the clinical setting. Validity of these additional questions was established by asking pain experts Judy Watt-Watson and Brenda Poulton. The questions were reviewed, feedback provided and revisions were made to the survey.

The 23 questions on the TPMI survey and four open ended questions (24, 26, 27, 28) examined the cardiac nurses’ pain knowledge and addressed research question 1.) What knowledge do cardiac nurses have regarding postoperative pain after open heart surgery? Question 25 examined whether or not cardiac nurses’ regularly assessed their postoperative cardiac patients and to describe their assessment practices; this question addressed research question 2.) What pain assessment practices are utilized in postoperative cardiac patients in their
first week of recovery? The demographic data (age, education, experience level) and the scores from the TPMI survey examined whether age, education and experience level had an impact on cardiac nurses’ knowledge which addressed research question 3.) Does cardiac nurses’ knowledge of pain management vary with their age, education and experience?

3.5 Study Procedures

3.5.1 Data Collection and Recruitment

Data was collected over a one-month period using an online survey hosted by FluidSurveys (hosted in Canada). The online link was distributed to participants via institutional email by the CNE. The Clinical Nurse Educator (CNE) from the Cardiac Surgery Intensive Care Unit (CSICU) distributed the invitation letter and the Fluid Survey link to all eligible staff via institutional email. Advertisement posters were created and posted where visible to nursing staff such as the staff education bulletin boards, staff lounge and other high traffic areas on the unit (Appendix C). The advertisement poster invited cardiac nurses to participate in an online survey to share their knowledge on postoperative pain, highlighted the opportunity to receive an incentive after participating in the survey and reminded participants of the upcoming survey. An electronic version of the advertisement poster was distributed through institutional email by the CNE to participants one week prior to the study as a reminder of the upcoming research study. Additional exposure to recruit more participants involved the Patient Care Coordinators (PCC) from both units who verbally advertised the study after their morning rounds. An email with the online link was distributed by the CNE to participants at the start of the study as well two weeks into the study. The time to complete the online survey and review the invitation letter was approximately 15 minutes. The online survey remained open for four weeks from October 2016-November 2016 which was to ensure participants had plenty of time to thoroughly review the
invitation letter and voluntarily complete the survey on their own time. It also allowed participants who don’t frequently check their institutional email to have the opportunity to view the initiation letter to participate in the study. All participants had the option to provide their email addresses after completing the online survey to receive a $10 Starbucks gift card to thank participants for taking their time to complete the online survey.

3.6 Data Analysis

Descriptive statistics were used to analyze the data collected from this research study. Descriptive statistics was deemed appropriate for this study as they describe and simplify a large amount of data and were appropriate to answer the research questions. Once the online survey closed, data was downloaded from FluidSurveys into a password protected Microsoft Excel spreadsheet. Participant’s answers were coded and inputted into Statistical Package for Social Sciences Version 20 (SPSS) for statistical analysis. Data was then analyzed; the demographic profile of participants resulted in obtaining the frequency, percentage and standard deviation (Table 1).

Research question 1) What knowledge do cardiac nurses have regarding postoperative pain after open heart surgery? The TPMI scores were used as a surrogate to quantify nurses’ knowledge of pain management for this question, and data analysis involved obtaining the mean and standard deviation. Further analysis of the TPMI questions involved evaluating the questions individually and ranking the results from highest to lowest percentage scores (Table 2). Also, additional open ended questions (questions 24, 26, 28) were used to address research question one. Answers to open ended questions involved analyzing the participant’s responses by identifying common patterns or themes that emerged and grouping them into categories.

Research question 2) What pain assessment practices are utilized in postoperative
cardiac patients in their first week of post recovery? This question was addressed using the participant’s responses to the open ended questions (questions 25, 27). Content analysis was used to organize the data, identifying common themes or words and grouping them into categories which summarized the responses of the questions (Table 4 and Table 5).

Research question 3) Does cardiac nurses’ knowledge of pain management vary with their age, education and experience? The participant’s demographic profile and the scores on the TPMI was used for analysis. Prior to data analysis the dependent variable TPMI scores were assessed for normality using the Kolmogorov-Smirnov (p = .20) and Shapiro-Wilk (p = .21) tests which indicated non normal data as the p value > 0.05. The variable was then graphed using a Q-Q plot which did not represent a straight line and also the detrended Q-Q plot had deviations away from the zero line that indicated a non-normal distribution. Therefore, the assumptions of normality were violated and a nonparametric Kruskal-Wallis H test was appropriate for analysis since this test does not require a normal distribution.

The Kruskal-Wallis H test was used to determine the hypothesis that there was no statistical significant difference between participant’s median TPMI scores and their age, education and experience level. The independent variables age, education and experience level involved grouping the participants into categories. In terms of age, five categories were created (Group 1: 22-29 years old, Group 2: 30-39 years old, Group 3: 40-49 years old, Group 4: 50-59 years old and Group 5: >60 years old). Three education levels were noted among the participants but only two categories were created [Group 1: RN diploma, Group 2: Bachelors of Science in Nursing (BSN)] as the third category had only one participant which was not valid enough to make a comparison. The variable experience level had four categories that were created (Group 1: less than 1-5 years, Group 2: 6-10 years, Group 3: 11-20 years, Group 4: 21-34
years). Assumptions for the Kruskal-Wallis H test were met; the variables analyzed include a continuous dependent variable (participant’s TPMI score) and categorical independent variables (age, education, experience). Also, the distribution of scores from each group were different and therefore, the Kruskal-Wallis H test compared the mean ranks.

3.7 Summary

Chapter 3 provided a review of the methodologies undertaken to guide this research study. This section described the study design, how the data was collected and analyzed as well how confidentiality was maintained and ethical considerations. The next chapter will discuss the data analysis and the study results.
Chapter 4: Results

The demographic profile of the participants and the results of the Toronto Pain Inventory Item (TPMI) survey are presented in this chapter. A total number of 129 eligible participants were emailed the online survey link and 63 participants accessed the online survey with a response rate of 49%. Nine participants had failed to complete the online survey or left questions unanswered and a total of 54 participants completed the online survey. The analysis of all data that was collected is presented in this chapter.

4.1 Sample Characteristics

The participants in this study were registered nurses working on a cardiac surgical unit (n = 63). Of the 61 respondents who provided their age, the mean age was 37 years (S.D. 9.93). Participants’ nursing experience ranged from less than one year to 43 years with a mean of 11.64 in which the majority of the respondents 30 (47.6%) had 1 to 5 years of experience working in their unit. There were 38 (60.3%) nurses with a diploma, 24 (38.1%) had a bachelor’s degree and 1 (1.6%) had a masters of nursing degree. In terms of continuing education relating to pain, 23 (36.5%) nurses had less than three hours of education, 7 (11.1%) had a full day, 10 (15.9%) had a half day, 21 (33.3%) had none and 2 (3.2%) had other types of training, such as patient controlled analgesia (PCA) training and palliative care training. Table 1 illustrates the characteristics of the sample.
<table>
<thead>
<tr>
<th>Characteristics (n = 63)</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td>37.8 (9.93)</td>
</tr>
<tr>
<td>22-29 years old</td>
<td>16</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>30-39 years old</td>
<td>20</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>40-49 years old</td>
<td>15</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>50-59 years old</td>
<td>8</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>&gt; 60 years old</td>
<td>2</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>52</td>
<td>82.5</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>17.5</td>
<td></td>
</tr>
<tr>
<td><strong>Nursing education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RN Diploma</td>
<td>38</td>
<td>60.3</td>
<td></td>
</tr>
<tr>
<td>BSN</td>
<td>24</td>
<td>38.1</td>
<td></td>
</tr>
<tr>
<td>MSN</td>
<td>1</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td><strong>Nursing experience</strong></td>
<td></td>
<td></td>
<td>11.64 (10.14)</td>
</tr>
<tr>
<td>&lt; 1-5</td>
<td>23</td>
<td>36.5</td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>13</td>
<td>20.6</td>
<td></td>
</tr>
<tr>
<td>11-20</td>
<td>10</td>
<td>15.6</td>
<td></td>
</tr>
<tr>
<td>21-34</td>
<td>12</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td><strong>Unit experience</strong></td>
<td></td>
<td></td>
<td>5.58 (4.01)</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>3</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>30</td>
<td>47.6</td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>19</td>
<td>30.2</td>
<td></td>
</tr>
<tr>
<td>11-20</td>
<td>4</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>&gt; 20</td>
<td>1</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td><strong>Pain related continuing education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 3 hrs</td>
<td>23</td>
<td>36.5</td>
<td></td>
</tr>
<tr>
<td>Full day</td>
<td>7</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Half day</td>
<td>10</td>
<td>15.9</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>21</td>
<td>33.3</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>3.2</td>
<td></td>
</tr>
</tbody>
</table>
4.2 **Toronto Pain Management Inventory (TPMI)**

Participants rated their knowledge on pain management from 0 to 100; a total score was calculated for each participant and then converted into a percentage. Mean knowledge scores were 72.3% (SD 7.02) and the median was 71.5%. Overall, nurses’ have moderate pain knowledge and scores ranged from 56.9% to 91.1%.

Individual survey questions were further explored by examining the TPMI results and ranking them from highest to lowest percentage scores (Table 2). The results ranged from 33.5% to 91.9%. A majority of respondents (97%) frequently utilized a pain rating scale to assess pain (Q21) which had the highest mean score of 91.9% (SD = 16.1). The second highest score was 91.6% (SD = 12.2) that asked respondents the difficulty in changing analgesic orders when patients continue to have pain (Q18). Most respondents (95%) felt competent in managing their patient’s pain (Q23) with a mean score of 88.8% (SD = 11.1) and also felt confident with their current pain knowledge in assessment and management (M = 82.5%, SD = 15.7). The respondents were asked about physician and nursing support about their decisions in managing a patient’s pain and had mean scores of 87.9% (SD = 12.3), 86.2% (SD = 14.2) respectively.

The lowest results were below 50% that included Q5, Q6, Q8, Q4 and Q7 in which these questions involved their perceptions of the patient’s experiences of postoperative pain. The TPMI item that scored the lowest asked respondents what percentage of postoperative patients experienced mild or less pain (Q7) with a mean score of 33.5% (SD = 20.2). Respondents also had a mean score of 46.1% (SD = 18.2) related to TPMI item that asked what percentage of postoperative patients experienced moderate pain (Q8). In terms of patients experiencing severe pain (Q9), respondents had a mean score of 69.9% (SD = 20.9).
The TPMI items that were related to the respondents’ knowledge of analgesia, the mean scores ranged from 62.5% to 81.9%; these included Q10, Q12, Q13, Q14, Q15, Q16 and Q17. In terms of addictions, the respondents had a mean score of 80.3% ($S.D = 24.7$). Table 2 illustrates the TPMI items that were ranked from highest to lowest scores.

Table 2 Ranking of Scores from Highest to Lowest Percentage for each TPMI item

<table>
<thead>
<tr>
<th>Questions (Q)</th>
<th>n</th>
<th>Mean(%)</th>
<th>$S.D$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Q21: How often do you use a rating scale to assess pain?</td>
<td>61</td>
<td>91.9</td>
<td>16.1</td>
</tr>
<tr>
<td>2. Q18: How difficult is it on your unit to have analgesic orders changed</td>
<td>61</td>
<td>91.6</td>
<td>12.2</td>
</tr>
<tr>
<td>3. Q23: How competent do you feel in effectively managing patients who are</td>
<td>60</td>
<td>88.8</td>
<td>11.1</td>
</tr>
<tr>
<td>having pain?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Q20: To what degree do physicians on your unit agree with your decisions</td>
<td>60</td>
<td>87.9</td>
<td>12.3</td>
</tr>
<tr>
<td>about managing a patient’s pain? e.g. 0-10?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Q19: To what degree do nurses on your unit agree with your decisions</td>
<td>60</td>
<td>86.2</td>
<td>14.2</td>
</tr>
<tr>
<td>about managing a patient’s pain?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Q3: How often do you agree with patients’ statements about their pain?</td>
<td>61</td>
<td>83.4</td>
<td>19.5</td>
</tr>
<tr>
<td>7. Q22: How adequate do you feel your current knowledge is about pain</td>
<td>60</td>
<td>82.5</td>
<td>15.7</td>
</tr>
<tr>
<td>assessment and management?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Q14: A 45-year old construction worker still complains of severe</td>
<td>61</td>
<td>81.9</td>
<td>26.5</td>
</tr>
<tr>
<td>incisional pain 2 days after surgery despite taking Tylenol 1g po QID.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After assessment, would you give him the ordered Morphine 10 mg SC q4H?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Q1: With effective pain management, what pain rating should patients</td>
<td>63</td>
<td>80.3</td>
<td>15.7</td>
</tr>
<tr>
<td>experience after surgery? *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Q17: What percentage of patients in hospital who take opioids for pain</td>
<td>61</td>
<td>80.3</td>
<td>24.7</td>
</tr>
<tr>
<td>become addicted? *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Q15: Mrs. N’s morphine has been increased within a range because of her</td>
<td>60</td>
<td>80</td>
<td>26.7</td>
</tr>
<tr>
<td>unrelieved pain. She has begun to experience nausea and is given an antiemetic. Your nursing colleague suggests you should also decrease the morphine dose. Would you follow this advice? *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Q16: Mr. Z, in spite of receiving Hydromorphone 2 mg po q3H, continues to</td>
<td>61</td>
<td>77.9</td>
<td>28.3</td>
</tr>
<tr>
<td>report moderate pain on his first postoperative day. Would you ask the</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>physician for a higher dose?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Q12: How often do you tell patients that they need to wait for their</td>
<td>60</td>
<td>76.7</td>
<td>19.8</td>
</tr>
<tr>
<td>next analgesic?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To address research question number 3) Does cardiac nurses’ knowledge of pain management (dependent variable) vary with their age, education level and experience (independent variable). To explore these variables (age, education, nursing experience) and the nurses’ postoperative pain knowledge indicated by the mean rank of TPMI scores a non-parametric Kruskal Wallis H test was used to analyze the available data. A Kruskal Wallis H test revealed that there were no significant effects of TPMI scores on the participant’s education level \( [H(2) = 2.78, p > 0.05] \), age \( [H(4) = 1.25, p > 0.05] \) and nursing experience level \( [H(3) = .928, p > 0.05] \).

### 4.3 Participants Reported Experiences of Pain Management

In addition to the TPMI survey, participants were asked five open ended questions that further explored their knowledge of chronic and neuropathic pain as well as postoperative pain
assessment practices. The graft site reported to cause the most pain was the internal mammary artery (IMA), more specifically the bilateral internal mammary artery (BIMA) then followed by the single graft site the left internal mammary artery (LIMA), right internal mammary artery (RIMA), radial artery graft and the saphenous vein graft (SVG). The findings indicate the BIMA graft caused more pain than any other graft sites. One participant shared their opinion:

“Yes, we definitely see more pain associated with removal of the right and/or left mammary. I feel this may be due to the technical procedure involved in taking down this artery as well as the occurrence of thoracic chest tubes placed in the area” (RN Participant).

Participants (2/53) stated patients with a leg graft (SVG) had more pain along the upper thigh compared to the lower leg incision while three participants did not see a difference between pain levels and graft sites in their postoperative cardiac patients. Participants reported that the sternum (3/53) and chest tube placement (4/53) were other areas where patients would complain of pain. Table 3 summarizes the findings from the open ended questions relating to painful graft sites viewed by the participants.

Table 3 Distribution of Participants relating to Painful Sites

<table>
<thead>
<tr>
<th>Graft Site</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIMA</td>
<td>20</td>
<td>38.5</td>
</tr>
<tr>
<td>LIMA</td>
<td>19</td>
<td>36.5</td>
</tr>
<tr>
<td>RIMA</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>SVG</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>No difference</td>
<td>3</td>
<td>5.7</td>
</tr>
</tbody>
</table>

(n = 52/63)
Of the 63 participants, 56 (89%) reported that they regularly assessed for postoperative pain in their patients and 7 (11%) left the question unanswered. The NPRS was the assessment tool reported by 30/56 nurses when assessing for postoperative pain (Table 4). One participant explained their assessment practice:

“I usually ask them to rate their pain while they are at rest. Then I ask them to protect their chest by using "shoulder to shoulder" method and cough then I ask them what their pain level is now. After they are up and mobile, I also ask them how bad their pain is. I ask them what makes the pain better or worse. I ask where the pain is and if it is a chronic pain” (RN Participant).

Another pain assessment method reported by 24/56 nurses was observing the patient (Table 4). For example, one participant shared:

“The patient shows signs of discomfort through their body language and facial expressions such as guarding, tense muscles, agitation, grimacing, difficulty in moving or not able to deep breath and cough, an increase in heart rate, blood pressure and respiration rate” (RN Participant).

Participants also reported asking patients directly if they have any pain (patient’s self-report of pain) or using a translator for non-English speaking patients. Participants reported using the BPS, Wong-Baker FACES ® pain scale, LOTARP (Location, Onset, Timing, Alleviating, Aggravating, Rating and Patient’s perception), PQRST (Precipitating factors, Quality of pain, Radiation, Severity and Timing) to assess for pain (RNAO, 2013); these are questions to consider during assessment of pain. The Wong-Baker FACES ® pain scale utilizes pictures of faces to represent how much pain one feels (IASP, 2017). Pain assessment also involves reassessing and re-evaluating the patient after administering pain medications to determine the
effectiveness of the treatment and only 8 (14.3%) participants reported performing this practice.

Table 4 summarizes the findings from the open ended question in terms of pain assessment practices.

Table 4 Distribution of Participants by Postoperative Pain Assessment Practices

<table>
<thead>
<tr>
<th>Assessment tools</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPRS</td>
<td>30</td>
<td>53.6</td>
</tr>
<tr>
<td>Observations</td>
<td>24</td>
<td>42.9</td>
</tr>
<tr>
<td>Patient’s verbal report of pain</td>
<td>12</td>
<td>21.4</td>
</tr>
<tr>
<td>Behavioral pain scale</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>Faces pain scale</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>LOTARP</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>PQRST</td>
<td>1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

(n = 56/63)

The findings indicate the nurses used a pain assessment tool on their postoperative patients, however, there was wide variation in participants’ opinions of how often a pain scale should be performed. Participants responses varied from every shift, twice a shift or as necessary, hourly, 1-2 hours and every 4 hours. Other participants reported assessing for pain at rest, during activity (i.e. deep breathing and coughing) and after administering pain medications.

Participants reported two main challenges when managing postoperative patients with chronic pain: 1) reordering the patient’s pre-operative medications for their chronic pain and 2) finding the right combination of medications to manage both acute and chronic pain. For example, this participant expressed their viewpoint:

“Pain is never relieved for patient. Hard to manage chronic pain makes it difficult for patient to mobilize. Sometimes med orders are increased but still seems ineffective” (RN Participant).
There were other challenges mentioned by the participants such as understanding the pharmacology of analgesics, their own comfort level in administering higher doses of analgesia and not enough analgesic ordered (i.e. small dose). Also, differentiating between acute and chronic pain was a challenge as one participant states “assessing which is surgery related pain or part of the chronic condition and trying to manage both safely and adequately.” Other participants specifically mentioned the challenges having patient’s medications ordered in a timely manner. For example, one participant stated “Not giving them what they prescribed at home immediately post-op due to drs not ordering it” while another participant stated “Anesthetist who feel they need to change the patients pain meds (different than regimen from home”).

Participants were asked to describe their assessment practices for patients with possible neuropathic pain (Table 5). Most participants 42/63 (67%) described their assessment practices, however 18/63 (29%) left the question unanswered. A few of the nurses 3/63 (5%) do not know or do not particularly assess for neuropathic pain. Of those participants who assess neuropathic pain, nurses reported asking the patient for a description of their pain and the location of the pain when assessing for possible neuropathic pain. Descriptors of neuropathic pain included stabbing, burning sensation, shocking, tingling, aching, numbness, shooting, sharp or dull, pins or needles and sensitivity to touch. One participant shared their assessment practice when investigating neuropathic pain:

“I ask my patients to describe their pain... if it is burning, tingling, numb, sharp or dull. I ask what makes it better or worse and what they would do with the same pain at home.
I would do the full assessment including the neuro assessment including vital signs as well as the the pain assessment and ask if they are taking any pain medications” (RN Participant).

The other assessment practices reported by participants include reviewing the patient’s medical history (medication and pain history) to identify pre-existing neuropathic pain. Participants also reported using the pain scales (i.e. NPRS, LOTARP, PQRST) and performing a neurological assessment. Table 5 summarizes the findings from the open ended question in terms of neuropathic pain assessment.

*Table 5 Distribution of Participants by Neuropathic Pain Assessment Practices*

<table>
<thead>
<tr>
<th>Neuropathic pain assessment</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking the patient to describe the pain</td>
<td>26</td>
<td>47.3</td>
</tr>
<tr>
<td>Patient’s medical/pain history</td>
<td>25</td>
<td>45.5</td>
</tr>
<tr>
<td>Pain scale</td>
<td>6</td>
<td>10.9</td>
</tr>
<tr>
<td>LOTARP</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>Neurological assessment</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>PQRST</td>
<td>1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

*(n = 42/63)*

Participants (19/63) had additional suggestions for assessing or managing pain in their postoperative cardiac patient. For example, participants suggested having tools (i.e. visual aids with words) translated for times when a translator was not available, having more information about the patient’s medical history (i.e. on analgesic for chronic pain), and having additional educational sessions on pain management. Participants also mentioned providing pre-operative teaching to patients would be beneficial when managing postoperative pain. One participant shared their viewpoint:
“Teaching patients prior to surgery about the importance of pain management—what to expect, when to notify RN some people, due to personal beliefs/cultures, believe they deserve to feel pain & some people refuse to take medications because they believe they will become addicted” (RN Participant).

4.4 Summary

Participating Registered Nurses on a cardiac ward had moderate levels of pain knowledge. There were no differences in TPMI evident, when compared by the participant’s age, level of education and years of nursing experience. The majority of nurse participants used a pain rating scale when assessing for postoperative pain. Nurses felt their current pain knowledge about assessment and management was adequate but only 14% reported re-evaluating the effectiveness of the analgesic. Participating nurses regularly assessed their patients for postoperative pain using pain assessment tools such as the numeric pain scale and behavioral pain scale. Nurses also reported the BIMA and LIMA graft sites were more painful than other sites such as the RIMA and SVG, postoperative patients with chronic pain posed challenges in pain management such as finding the appropriate combination of analgesics, also assessment methods were described for assessing patients for neuropathic pain. Overall, the nurses felt they don’t require any assistance when managing their patient’s pain and had adequate knowledge of pain. In the next chapter, the findings will be further discussed in relation to the research study and literature.
Chapter 5: Discussion

This chapter presents the discussion of the study findings within the context of the research questions and the relevant literature. The purpose of this study was to explore cardiac nurses’ knowledge, assessment practices and management of postoperative pain in their postoperative patients. This study will improve our understanding of strategies to improve cardiac nurses’ knowledge on pain management and practices. The study’s limitations are also explored.

5.1 Cardiac Nurses’ Postoperative Pain Knowledge

Overall, based on the TPMI scores, the nurses in this study had moderate levels of pain management knowledge ($M = 72.3\%, S.D. = 7.02$, range 56.9% to 91.1%). The study conducted by Watt-Watson et al. (2001) involved a larger sample size of nurses ($n = 94$) from three teaching hospitals on four different cardiovascular units. Nurses in their study were between the ages 30 to 39 years old who were RN diploma trained nurses, had less than 1 to 5 years of nursing experience and half of the nurses did not have any pain related continuing education courses which had similar participant characteristics in the present study. Also, the researchers reported nurses also had moderate pain knowledge ($M = 68\%, range 53\% to 90\%$) which was similar to the findings in this present study, therefore this might suggest that nurses’ level of pain knowledge has not changed over the intervening years and a knowledge gap continues to exist.

One major difference in Watt-Watson et al. (2001) study and this one was the involvement of patients; the researchers examined the relationship between the nurses’ postoperative pain knowledge and their patient’s outcomes and the present study only explored nurses’ postoperative pain knowledge.
With regards to nurses’ knowledge, the majority of participants reported their knowledge as adequate despite having less than 3 hours of pain related continuing education. It is unknown where the participants were obtaining their source of information and pain education. In my experience, as a registered nurse working in a hospital setting, nurses generally receive their pain knowledge through undergraduate nursing programs, unit orientations, informal training, personal experiences, and nursing and physician colleagues. Pain education has been integrated into the curriculum of undergraduate programs in health sciences faculties to help prepare students become competent in pain management (Briggs, Carr & Whittaker, 2011; Watt-Watson et al., 2009). These study findings indicated nurses’ education level had no significance to their knowledge scores which was consistent with other research studies (Karahan, Kucuksarac, Soran, Ordahan, Tekin & Basarn, 2014; Watt-Watson et al., 2001). Watt-Watson et al. (2009) surveyed health science faculty members regarding the number of formal hours of pain content in their programs and 68% could not indicate the amount of time spent teaching pain since the content was combined throughout other courses and clinical conferences. Briggs et al. (2011) surveyed undergraduate students of varying healthcare programs and found on average 12 hours of pain content was taught in their program. Other research suggests that students should be educated about pain knowledge and pain management at the undergraduate level to provide a solid foundation for the future (Briggs et al., 2011).

Participants reported feeling competent in managing their patient’s postoperative pain (88.8 %) but yet participant’s perceived postoperative patients experienced severe pain (69.9 %) and suggests a pain knowledge deficit exists which is evident in other studies (Leegaard et al., 2011; Watt-Watson, 2001).
Findings in this study indicated the nurses’ age and level of nursing experience had no significant impact on the nurses’ pain knowledge scores. This finding was comparable to other studies (Karahan et al., 2014; Watt-Watson et al., 2001; Wilson, 2007). However, McCaffery & Robinson (2002), found junior nurses to score lower than older nurses on pain knowledge and attitudes of pain management.

Participants reported receiving support from nursing and physician colleagues when making decisions about their pain management practices. However, participants reported a high result (91.6 %) to the TPMI question that asked participants the level of difficulty in changing analgesic orders in their unit which could be a main barrier in pain management. Van Niekerk & Martin (2003), found nurses perceived physicians as a barrier in providing effective pain relief such as lack of physician support regarding the nurse’s suggestion, inadequate analgesic orders, poor pain knowledge and perceptions of pain.

Nurses reported a high score (80.3%) for the TPMI question relating to addiction to opioids in which these responses could be related to the large number of participants (n = 23) with less than 1 to 5 years of nursing experience who maybe inexperienced in pain management. In contrast to findings reported here, other literature reported drug addiction to opioids was a main barrier in pain management for both nurses and patients that resulted in poor pain relief (Kuperberg & Grubbs, 1997; Leegaard et al., 2011; McCaffery et al., 1997; Watt-Watson et al., 2001). Findings here may reflect differences in length of admission to the ward settings, in this setting the postoperative cardiac patients stayed in hospital for about 5 to 7 days and nurses were rarely faced with the challenge of opioid addiction. Patients who were discharged home and prescribed with an opioid and continued with this prescription greater than three months after
surgery are at risk for opioid addiction but despite this, the literature reported the risk of opioid addiction to be low (Clarke et al., 2014).

Most nurses identified the IMA specifically the BIMA as the most painful graft site complained by postoperative cardiac patients. The IMA may cause more pain due to the time required and the complexity of harvesting the artery and the surgical positioning of the patient (Sharma et al., 2000). However, current research suggests the IMA remains the gold standard of choice for arterial grafting because of its longer patency that prevents atherosclerosis, reduce rates of reoperation and improvements in cardiac morbidity, however, postoperative pain is significantly higher in these patients compared to those without the IMA grafting (Mailis et al., 2000; Watt-Watson & Stevens, 1998; Yorke et al., 2004).

5.2 Postoperative Pain Assessment

Majority of participants reported regularly assessing their postoperative patients using the numerical pain rating scale as an assessment tool. The numerical pain rating scale is a validated assessment tool that measures the intensity of pain from 0 to 10 in which a higher pain rating indicates more pain intensity (Wells et al., 2008). Another pain assessment tool reported was observing the patient’s behaviour or visual cues that would indicate pain and is commonly used in the intensive care units for nonverbal patients (Rose et al., 2012). Based on the participant’s responses, it is unknown whether or not the nurses on the cardiac step down unit also used visual cues or observational assessments as a method for assessing pain. These findings are inconsistent with the literature, several studies (Dihle et al., 2006; Ene et al., 2008; Manias el al., 2004) indicated the nurses did not, or seldom used a pain assessment tool even though the tools were readily available. It is encouraging to learn the nurses in this study regularly assessed for postoperative pain using a pain assessment tool and would investigate the patient’s pain with
further questioning. However, reassessment and re-evaluation of analgesia was occasionally done on the patient.

Pain assessment practices varied among each participant from every shift, twice a shift or as necessary, 10-30 minutes, hourly, 1-2 hours to every 4 hours. Also, there were some participants that mentioned their reassessment practices post analgesia, however, there were other participants that did not state re-evaluating their patient’s pain level which was consistent with other research studies. Dihle et al. (2006) similarly found that nurses had different approaches in assessing pain, reassessment of pain was not often done and there was no routine for evaluating postoperative pain. Pain assessment and management would be ongoing throughout the patient’s hospital stay and the findings indicate there were no specific guidelines the nurses were following. It is unknown if the nurses were aware of any practice guidelines in terms of pain assessment. The Registered Nurses of Ontario (RNAO) created guidelines supporting evidence base practice to guide nurses when assessing and managing pain. In terms of how often one should monitor and assess pain depends on the type of interventions utilized, the patient’s condition, patient’s self-report of pain and observation to pain responses (RNAO, 2013). The literature also reported that patients should be “routinely monitored “or done on a “regular basis” (Barr, et al., 2013; Wells et al., 2008). It appears there are no strict timeframes for assessing pain but it is recommended to be consistent when using the same assessment tool to obtain proper reassessments in terms of pain intensity and existence of pain (RNAO, 2013; Wells et al., 2008). Local unit policy also does not specify how frequent postoperative pain should be assessed and is dependent on the type of intervention used such as a patient controlled analgesia (PCA), epidurals/spinal and nerve blocks (Fraser Health Authority, 2012a, 2012b). With this type of pain management, nurses would be more aware of the patient’s pain as there are specific
guidelines to follow for pain assessment. Patients on a PCA require pain assessment every 2 hrs for 24 hrs then every 4 hours if stable. Also, after administering opioids (orally, intravenous or intramuscular) pain assessment would occur much frequently.

Pain assessment tools alone cannot rate pain objectively nor the behaviours related to pain therefore, a comprehensive assessment along with these tools would help in learning the patient’s painful experience much better (Gregory, 2012).

5.3 **Neuropathic Pain Assessment**

Neuropathic pain assessment was reported as undertaken by 67% of participants and three participants stated “they don’t know,” or that neuropathic pain assessment was “not particularly done.” Neuropathic pain assessment tools and assessment forms were not available and was not a standard practice in the clinical setting and therefore less likely to be incorporated into daily assessment practices. The findings indicated most of the participants had some knowledge about neuropathic pain and were able to describe their assessment practices. However, the study findings indicated insufficient knowledge in terms of assessing for neuropathic pain. Participants reported using a NPRS to assess for neuropathic pain but the literature suggests this scale does not accurately identify neuropathic pain and other assessment tools such as the DN4 or the LANSS are tools for screening neuropathic pain which are combined with identifying the individual’s signs and symptoms and lead to improved pain management (Barker, 2009; Bennett et al., 2007)

In the literature, as far as the author is aware there were no relevant studies, which indicated that neuropathic pain assessment was routinely done in the cardiac surgical population and therefore it is unknown if these patients potentially could have neuropathic pain. Based on the study findings, it is unclear whether or not participants regularly assessed their postoperative
cardiac patients for neuropathic pain. One would speculate the participants would assess for possible neuropathic pain if the patient presented certain signs and symptoms such as numbness, tingling, pins and needles sensations, sharp, burning pain or extreme sensitivity to touch.

Studies were limited in terms of nurse’s neuropathic pain knowledge, pain assessment practices and pain management and therefore, it is difficult to understand the nurses’ competence level in managing these patients with neuropathic pain. Rognstad et al. (2012), surveyed doctors and nurses’ understanding, perceptions and competence level about managing pain in postoperative patients and in terms of neuropathic pain only 16% of participants reported being competent in managing neuropathic pain. This low percentage for self-reported competence of neuropathic pain maybe related to the difficulty in diagnosing and treating neuropathic pain and it is less prevalent after surgery (Rognstad et al., 2012). Neuropathic pain does not often occur immediately following surgery and ongoing persistent pain related to surgical procedures with some type of nerve injury or changes in the somatosensory nervous system may increase the risk of chronic pain and the incidence of neuropathic pain (Hayes, Browne, Lantry & Burstal, 2002).

Taverner et al. (2011) studied community nurse’s pain knowledge and perceptions of pain in the management of leg ulcers and in terms of neuropathic pain, the nurses had some knowledge and were able to identify the chronic leg ulcer pain may have a neuropathic pain component but did not fully understood neuropathic pain and its management. In a more recent study (Karahan et al., 2014), nurses were surveyed to determine baseline data regarding their knowledge and experience with neuropathic pain and management. The researchers found nurses had significant knowledge deficits in neuropathic pain and assessment and suggested nurses’ knowledge improved with basic and continuing education.
Based on the study findings and the literature, neuropathic pain knowledge is limited in nurses that work in a variety of settings. Educating nurses about neuropathic pain management would increase their knowledge level, awareness of neuropathic pain and improve their assessment skills that would help identify patients with possible neuropathic pain. Further research studies are required for the educational needs of nurses to manage and treat neuropathic pain. Introducing a standard tool such as the (DN4) within the institution along with education would also improve identification of neuropathic pain and therefore provide appropriate pain treatment.

5.4 Challenges in Managing Chronic Pain

5.4.1 Pain Medications

Many participants expressed their challenges when caring for postoperative cardiac patients with pre-existing chronic pain, especially resuming the patients pre-operative chronic pain medications after surgery. The findings suggested the patient’s chronic pain medications were not reordered in a timely manner or physicians would change the patient’s medications while in hospital which makes it difficult to control the patient’s pain. Siedlecki et al. (2014) reported the nurses expressed their frustration with physicians when caring for patients with chronic pain. The nurses in the study expressed the physicians lacked knowledge, their personal beliefs and attitudes would affect the treatment plan and therefore, physicians would change or reduce the pain medications that the patient was taking at home. Finding the appropriate combination of pain medications to manage both the patient’s acute pain and chronic pain was reported as another challenge by participants. Also, the type of medications to use, the frequency, managing side effects of larger opioid doses and comfort level when administering higher opioid doses.
5.4.2 Acute Pain versus Chronic Pain

Another challenge reported by participants was differentiating between which is the acute pain versus the chronic pain, and managing each pain with the appropriate combination of medications. These challenges were frequently cited by participants and this suggests participants may have limited chronic pain knowledge such as pharmacology of drugs prescribed for chronic pain, uncertainty with pain assessment skills or have limited experience managing patients with chronic pain.

Bergeron, Bourgault & Gallagher (2015) surveyed nurses in primary care about their knowledge on chronic pain management and found the nurses also lacked the competence and knowledge (i.e. opioid administration, assessment practices), had inappropriate beliefs and reported having little or no training on pain education. In another study (Siedlecki et al., 2014) nurses reported questioning their own level of chronic pain knowledge and acknowledged the need for more education.

Chronic pain is a complex multidimensional experience, difficult to assess and manage and an in depth assessment is important to fully understand the patient’s condition and manage the patient’s pain more adequately. A thorough medical and pain history along with an assessment prior to or on admission should be done on all patients to identify those with preexisting chronic pain or at risk for the development of postsurgical chronic pain. An additional comprehensive assessment is needed for those identified to explore and begin to understand the impact that chronic pain may have on their function and quality of life. It should be examined from the psychosocial aspects of their life, not just the biological or physical context to provide improved pain management, care and impact their surgical recovery.
5.5 **Limitations**

This research study was a mixed method, cross sectional survey design that recruited specific sample of nurses at one hospital at one health region who may not be representative of Canadian cardiac surgical nurses. The clinical setting involved two cardiac surgical units providing postoperative pain management to cardiac patients. Given the specific inclusion criteria obtaining a large sample size was a challenge and therefore, limits the generalization of the study results. A larger sample size that included other cardiac surgical units in B.C may have given results more generalizable to the population.

The methodology utilized was appropriate for this research study, however, a nonparametric test (Kruskal-Wallis H) was used to address research question three. Analyzing the data (TPMI scores) involved losing information since this test ranked the data which makes it less powerful in discriminating possible relationships than a parametric test.

Nurses that did not respond to the survey may have minimal interest in pain management or were afraid of incorrectly answering the questions and therefore, the reported findings may represent those nurses with greater pain knowledge in pain assessment and management.

Another limitation was the online survey; participants could have rushed through the survey, did not read the questions carefully and left questions unanswered. Participants could have discussed the questions with other nurses or found other sources of information to answer the online survey. The additional five open ended questions that explored nurses’ knowledge on pain assessment, chronic pain and neuropathic pain was another limitation. The questions limited the ability to capture the true perceptions of the nurses’ pain knowledge and an interviewer would have provided a more in depth analysis into those questions. The open ended questions allowed participants to express their personal opinions but participants could have
given simple answers as there was no interviewer to further explore their responses. It would have been interesting to explore the participant’s knowledge regarding chronic pain and neuropathic pain and whether they understood the differences between these types of pain and the pain management.

5.6 Summary

Several studies (Dihle et al., 2006; Manias et al., 2004; Rose et al., 2012; Watt-Watson & Stevens, 1998) have placed emphasis on pain knowledge deficits that include pain assessment and pain management of nurses and a need for education for nurses as well as patients. The RNAO has set out practice guidelines as a resource for nurses providing appropriate structures and evidence based practice care (RNAO, 2013).

Most of the study findings are consistent with the literature in terms of pain knowledge specifically differentiating between acute and chronic pain, assessment practices and the need for further education. The major findings in this study found the nurses had moderate amount of pain knowledge and felt competent in pain assessment and management. The majority of nurses used a simple numerical pain assessment tool and others asked for quality descriptors of the pain, however, there was no standardized approach in pain assessment practices. Knowledge gaps were found in specific areas of pain assessment and pain management. The main knowledge deficit found was the challenges in caring for postoperative patients with chronic pain, understanding the differences in acute pain and chronic pain, pharmacology of drugs and establishing the appropriate treatment for these patients with a chronic pain condition. Although 67% of participants were able to describe their neuropathic pain assessment practices a knowledge deficit exists and with a lack of an available standardized neuropathic assessment
tool, this could significantly impact the patients receiving adequate pain management with both immediate and long term consequences.

   Overall, the results of this study suggests the nurses felt they have adequate pain knowledge and felt competent in pain assessment. However, knowledge deficits continue to appear to exist, and this knowledge is not reflected in clinical practice as pain continues to be an issue. A focused education seems a key component to improve pain knowledge, provide effective pain relief and improve patient care outcomes.

   The next chapter will summarize the research study, discuss the implications of the findings as it relates to nursing practice, education and health policy and recommendations for future research studies.
Chapter 6: Conclusions and Implications

This chapter summarizes the research findings related to the research questions, implications for nursing practice are discussed, education and health policy and recommendations for future research studies.

6.1 Summary

The purpose of this study was to explore cardiac nurses’ pain knowledge base of postoperative pain and current pain assessment practices associated with postoperative cardiac patients.

To answer the question: What knowledge do cardiac nurses have regarding postoperative pain after open heart surgery? It seems that, cardiac nurses’ have moderate levels of pain knowledge, nurses perceived their levels of pain knowledge as adequate and competent in assessing and managing their patient’s pain postoperatively. It appears the nurses have shown their understanding of pain knowledge, importance of pain assessments and they identified areas requiring further pain education.

The following questions were further explored to understand the nurses’ knowledge about chronic pain and neuropathic pain assessment practices:

i. Do patients seem to complain of more pain when certain sites are used for grafting? If yes, please specify which sites (i.e. Saphenous Vein Graft, Left Internal, Mammary Artery, etc.…)?

Based on the results, the nurses appeared to have an understanding of the various graft sites used for harvesting and are aware of which sites were painful for patients. Participants reported the bilateral internal mammary artery graft as a common graft site to cause more pain in
postoperative patients. The bilateral internal mammary artery is considered the gold standard for arterial grafting in cardiac surgery as it is much more patent.

ii. What do you find most challenging in managing cardiac surgery patients with chronic pain?

From the study findings, the reported challenge was knowing the difference between what is acute pain and what is chronic pain. Another challenge was reordering the patients chronic pain medications within an appropriate timeframe and finding the right combination of pain medications to manage both the acute pain and chronic pain. Others reported their lack of understanding with regards to the pharmacology of the drugs and their comfort level in administering larger doses of opioids.

iii. Describe your assessment for neuropathic pain in the cardiac surgery postoperative patient?

Nurses in this study had some neuropathic pain knowledge and described their neuropathic pain assessments such as reviewing the patient’s medical and medication history, asking the patient to describe their pain, the location of the pain and using an assessment tool. However, neuropathic pain assessment was not routinely done on the cardiac surgical units.

iv. Is there anything else that would assist you in assessing or managing pain in the cardiac surgery postoperative patient?

Most of the nurses in this study did not further indicate assistance was needed in assessing and managing pain. Although, there were some nurses that identified areas of pain management that would be helpful such as the use of translation tools, educational sessions for nurses and preoperative teaching for patients.
In identifying what pain assessment practices were utilized in postoperative cardiac patients in their first week of post recovery? The participants reported performing pain assessments on their patients and a number of assessment tools were described in which the numerical pain rating scale was the tool utilized most frequently. However, nurses described varying opinions of how often the pain scale should be performed. Reassessment and evaluation of treatment was mentioned by some nurses, but others did not specify their assessment practices and therefore, it is unknown whether those nurses reassessed their patient’s pain level.

Lastly to explore if cardiac nurses’ knowledge of pain management varied with their age, education and experience? Here, nurses’ age, education and experience level appeared to have no impact to the nurses’ level of pain knowledge. This finding was similar to previous research findings.

6.2 Implications for Nursing

6.2.1 Nursing Practice

Nurses play an important role when managing a patient’s pain. Based on the study findings the nurses were using the NPRS to assess their postoperative patients for pain; however, assessment practices differ from each nurse and some nurses assessed pain at rest, with activity and after administering pain medications while others did not. Postoperative patients are often treated with analgesics and opioids and as part of pain management, nurses should be reassessing their patient’s level of pain after administering pain medications regularly and documenting the effectiveness of the treatment.

A systemic standardized approach for pain assessment and documentation could help improve pain management in the postoperative patient. A tool could be created with the nurses’ input to incorporate information pertinent to the nurses’ needs when assessing for pain. This tool
could include the PQRSTU assessment, the NPRS, analgesic treatments with the appropriate time frames for reassessment which can be used as a guideline for nurses. A standard neuropathic pain assessment tool or incorporating a DN4 tool in the nurses’ flowsheet could help identify neuropathic pain which would have significant impact for patients and the management of neuropathic pain. Also, a pain flowsheet could be created to document the pain rating scale and the effectiveness of the treatment. These tools and documentation could prompt nurses to make the necessary steps and reevaluate their interventions. A pain document or diary utilized by the patient could help them self-manage their pain which would also help improve outcomes.

Other studies have reported using a standardized tool for pain management and found many advantages such as having a consistent approach to postoperative pain assessments, provided direction for treatment decisions and useful for new nurses with little pain management skills (Puntillo, Stannard, Miakowski, Kehrle & Gleeson, 2002). With a standardized flowsheet, documentation could improve and would lead to improved pain assessment practices and effective pain relief (Voight, Paice & Pouliot, 1995).

Nurses’ could also help identify patients with preexisting chronic pain and those at high risk for developing chronic postsurgical pain and develop an individualized proactive pain management plan in the perioperative period. This would include medication reconciliation with home analgesics, standardized postoperative analgesic regimes, effective nonpharmacological interventions and awareness of past addiction history/opioid misuse or patient concerns. By understanding these factors, this would improve pain management, facilitate timely restart of any preoperative analgesics and nonpharmacological interventions and provide preventative interventions to minimize the impact of poor pain control the development of chronic postoperative pain and surgical recovery.
6.2.2 Education

Education is one key component in strengthening pain knowledge and participants identified their learning needs in terms of pain management. Nurses are often busy providing patient care and pain education should conform the educational needs of nurses. Educators or the clinical resource nurses could provide brief sessions on the unit during the afternoon or early evenings where it is less busy. Also, have education sessions including short focused lunch and learn sessions as well as devoted pain education days once or twice a year in which nurses could learn about pain management, assessment, drug pharmacology and new policies and guidelines or other areas of interest relating to pain. Another strategy may be incorporating pain education sessions into unit orientation for newly hired nurses to review pain management, assessment practices and pharmacology.

Nurses could also benefit from having educational sessions about neuropathic pain, neuropathic pain assessment and management; focusing on improving nurses’ knowledge both on neuropathic pain and chronic pain and its potential for disabling impact on both short term (pain and surgical recovery) and long term (biopsychological aspects of chronic pain). These educational sessions could be incorporated into the strategies mentioned earlier.

Patient education is also important in pain management; preoperative patients could be educated on the importance in good pain management on their recovering. Including information about the need to rate their pain and the relationship between pain, activity and recovery, a review of the pain scales and assessments that will be used by staff, the goals for pain relief, and being vocal about their pain and discomfort to nurses. This could encourage patients to become more involved in their care while in hospital.
6.2.3 Health Policy Recommendations

Hospitals and health authority supports are needed to make changes in pain management and standardize pain assessment tools and policies across the regional health authority. This would provide a standardized method and incorporated into patient documentation, which will promote and enable nurses and other health professionals to prove pain care that is appropriate, effective and consistent. The Winnipeg Regional Health Authority (WRHA) and the Registered Nurses of Ontario (RNAO) created clinical practice guidelines based on pain research and clinical expertise in pain to assist health care providers in quality pain assessments and effective pain management (RNAO, 2013; WRHA, 2012). Pain management is a multidisciplinary approach that involve nurses, physicians, pharmacists and other healthcare providers and should be a collaborative effort to advocate for best effective pain management possible for the individual patient.

6.3 Recommendations for Future Research

Future research studies could involve using a qualitative research design to further explore the nurses’ perceptions and their experiences of pain assessment and pain management. This can provide an in depth view of the way a nurse perceives pain management. Also, another area of interest for research could be evaluating the nurses’ documentation of pain on the flowsheet or assessment record. A chart audit could be done to determine if nurses are charting the patient’s pain level and this could identify the gaps in the nurses’ documentation of pain. Another possible research study could involve understanding the patient’s pain experience following cardiac surgery as the patient’s voice is often the strongest influence in moving needed improvement or changes in healthcare and nursing practice.
Another possible research study could involve determining the number of post cardiac surgery patients that develop chronic postsurgical pain three months or longer after surgery. It would be interesting to explore chronic pain and the possibility of neuropathic pain because as nurses we do not know the patient’s outcome once discharged from the hospital. This knowledge could increase nurses concern and realization of the importance of good pain management in the cardiac surgery population.

6.4 Conclusions

Pain management and assessment continues to be a challenge for nurses and this impacts patients pain experiences and outcomes after surgery. The major findings in this study found the nurses perceived themselves as having sufficient knowledge in managing postoperative pain in cardiac patients but demonstrated both knowledge and practice deficits in this area. Pain assessment tools need to be standardized and utilized more consistently to ensure pain is managed appropriately. However, specific areas were identified that posed challenges such as managing postoperative patients with a chronic pain condition and neuropathic pain assessment requiring further education for nurses.

Pain assessment and pain management is crucial during the immediate postoperative period for this population. Acute postoperative pain that remains unrelieved could further progress to chronic postsurgical pain and nurses need to be aware of how this would impact an individual’s function and quality of life. Pain assessment not only involves utilizing pain assessment tools but also identifying those at risk of developing chronic pain such as patients with high postoperative pain scores, preoperative anxiety, depression and the presence of neuropathic symptoms. Managing postoperative pain appropriately is also important for recovery and involves providing patients with adequate amounts of analgesics, utilizing
nonpharmacological interventions and advocating and consulting pain management experts when pain relief is not adequate. Nurses are the frontline caregivers and need to advocate and be leaders in improving pain management practices and therefore improve outcomes for our cardiac surgery patients.
References


*Anesthesiology,10*(5), 794-800.


*Pain Medicine, 11*, 1849-1858.

Leegaard, M., Watt-Watson, J., McGillion, M., Costello, J., Elgie-Watson, J., &


Appendices

Appendix A: Introduction Letter to Manager

Letter of Introduction to the Manager of Cardiac Services

Manager of Cardiac Services
Royal Columbian Hospital
New Westminster, B.C

Dear Suzanne Burns,

My name is Maria Maglanque. I am a registered nurse working in the Cardiac Surgery Intensive Care Unit (CSICU) at Royal Columbian Hospital. I am currently completing my Master of Science in Nursing at the University of British Columbia. As part of my graduate study work, I am interested in conducting a study on cardiac nurses’ knowledge of postoperative pain in the cardiac patient.

Postoperative pain levels after cardiac surgery has been reported to be moderate to severe and undertreated and the effects strongly prolong patient recovery. Nurses are a key contributor to adequate pain control during the postoperative period. It is hoped that the findings will help inform practice and educational needs of cardiac nurses to improve pain management and health outcomes of cardiac patients. For further details of this study, please see the attached research proposal or please contact me: Maria Maglanque or my primary supervisor and the Principal Investigator: Dr. Jennifer Kryworuchko.

Prior to beginning recruitment, I will obtain approval for this research study from the University of British Columbia Behavioral Research and Ethics Boards (BREB). Then, I would like to invite nurses from your cardiac surgical units to complete an online survey from October-November 2016. With your permission, I would like to circulate the online study link through the CSICU Clinical Nurse Educator and involve the Patient Care Coordinators (PCC) from both units to mention the study after morning rounds. I would like to display advertisement posters on the nursing unit bulletin boards and nursing lounge to invite participants to the study. No personal identifiers will be collected in this study and only group data will be identified in the report. Results of the study will be reported in a graduate thesis and may also be published in journal(s). A summary of findings will be made available to you and the nursing staff.

Sincerely,

Maria Maglanque, RN
Appendix B: Invitation Letter to Participants

TITLE: Cardiac Nurses' Knowledge, Assessment Practices and Management of Postoperative pain

INVITATION TO PARTICIPATE

Principal Investigator: Dr. Jennifer Kryworuchko, PhD RN
Associate Professor
UBC School of Nursing

Co-Investigator: Maria Maglanque, BSN, RN
Graduate Student
UBC School of Nursing

Dr. Bernie Garrett, PhD, RN
UBC School of Nursing

Brenda Poulton, MN, RN, NP
UBC School of Nursing

Contact Address: UBC School of Nursing
T201-2211 Westbrook Mall
Vancouver, BC, Canada V6T 2B5

Dear Participant,

You are invited to participate in an online survey about cardiac nurses’ knowledge regarding postoperative pain, pain assessment practices and pain management. We are asking you to take part in this survey because you are a Registered Nurse working on a cardiac surgical unit at Royal Columbian Hospital who provide direct care to postoperative cardiac patients. Your knowledge and opinions are very important and this information will help inform current practices and educational needs of cardiac nurses.

The following information will help you make an informed decision about participating in this study.
Purpose of Study
This research focuses on nurses’ knowledge regarding postoperative pain in the cardiac patient. The study is being conducted by Maria Maglanque as part of her Master of Science in Nursing studies at the University of British Columbia.

Study Activities
If you agree to participate, you will complete an online survey hosted by Fluid Surveys. The survey takes approximately 10-15 minutes to complete. The survey will not ask you to include your name, although there will be a few demographic questions such as education level, years of nursing experience and years working on the unit.

Possible Risks involved
There are no foreseeable risks, direct costs or harms from participation in this study. Participating in this study will not affect your employment.

Possible Benefits involved
The findings from this study will inform practice and the educational needs of cardiac nurses that will provide valuable information when managing postoperative pain in the cardiac patient.

Compensation
Unfortunately, we cannot offer any compensation for participation in this study. However, all participants will receive a $10 Starbucks Gift Cards if desired. At the end of the survey, there will be an optional field to enter your email address. The email you provide will not be associated with your survey responses, and will only be used for the purpose of providing your gift card.

Voluntary Participation and Consent
Your participation in this project is entirely voluntary and you may refuse to participate in the study or any element of the survey activities listed above at any time without giving a reason and without any negative impact on your employment, professional standing, or any relationship with UBC. Completion and submission of the online survey will be taken to imply your consent to participate in the study.

Confidentiality
The survey does not ask for any personal identifiers and your computer’s IP address will not be collected. Data will be collected using Fluid Surveys. Fluid Surveys is compliant with Canadian privacy (all data resides on Canadian servers) and accessibility standards (W3C). Data will be exported from Fluid Surveys into a password protected Excel spreadsheet, and shared with the Primary investigator and members of the thesis committee. After 5 years, per standard research protocol, the electronic computer database of recording will be erased and any hard copies of notes will be shredded for disposal.
Sharing the Results
The results of this study will be reported in a graduate thesis and may also be published in journal articles. You will not be identified and only group data will be identified in the report. Findings of this study will be made available to you.

Contacts for questions about the research study
If you have any questions related to this project of wish to have further information with respect to the study, you may contact me or my primary supervisor and Principal Investigator Dr. Jennifer Kryworuchko.

Contacts for concerns or complaints about the research study
If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free at 1-877-822-8598. Contact the Fraser Health Research Ethics Board Co-Chair by calling 604-587-4681.

Survey Link
If you would like to participate in this study, please complete the survey at the following link: https://survey.ubc.ca/s/postoperativepain/

The survey will be open until midnight November 30, 2016.

Thank you for your time!

Maria Maglanque
Graduate Student
Appendix C: Advertisement Poster

ATTENTION: CARDIAC NURSES
WE NEED YOUR HELP!

What do you know about Postoperative PAIN?
• Help us improve pain management in the cardiac surgery population
• Share your knowledge and practices and help identify gaps in pain management

Please complete a quick Online survey --- Will take less than 15 minutes, it is entirely voluntary.
You will be getting an email with a survey link... Soon!

A $10 Starbucks gift card will be provided for participating

Contact Information:
Primary Contact (Co-Investigator):
Maria Maglanque, BSN, RN
Graduate Student
UBC School of Nursing
T201 2211 Westbrook Mall
Vancouver, BC, Canada V6T 2B5

Primary Investigator
Dr. Jennifer Kryworuchko, PhD, RN, CNCC(C)
Associate Professor
UBC School of Nursing

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

Version 3: August 12, 2016
Appendix D: Online Survey


Cardiac Nurse’s Knowledge of Postoperative Pain

Thank you for agreeing to take part in this survey. Your experiences and opinions are very important and are needed to understand the current knowledge of pain management in the cardiac surgical units. You can, at any time change your mind about completing the survey. Just close the browser window before you reach the end of the survey. Your response will only be collected if you complete the entire survey.

Nurse Information
a.) Education level: RN____ BScN____ MSN/MN____ other____
b.) Years of nursing experience: ______ years
c.) Years of working on this unit: _____ years
d.) Gender: F____ M____
e.) Language spoken at home: __________
f.) Age: _____ years
g.) Prior pain continuing education sessions:
   none____ <3 hours ____ half day ____ full day ____ other ____

Please place a mark (/) on the following lines:
(1) With effective pain management, what pain rating should patients experience after surgery?
   No pain 0_______________________________________________________100 worst pain

(2) How often do patients tend to overstate their pain? (i.e. what percentage of the time)
   Never 0%__________________________________________________100% always

(3) How often do you agree with patients’ statements about their pain?
   Never 0%__________________________________________________100% always

(4) To what degree is pain relief directly related to the type of surgery the patients has had?
   Never 0%__________________________________________________100% always

(5) How often do patients tell you without being asked that they are having pain?
   Never 0%__________________________________________________100% always

(6) How often do patients ask you voluntarily for an analgesic?
   Never 0%__________________________________________________100% always

(7) What percentage of postoperative patients where you work experience mild or less pain?
   0%____________________________________________________100%
(8) What percentage of postoperative patients where you work experience moderate pain?
0%____________________________________________________100%

(9) What percentage of postoperative patients where you work experience severe pain?
0%____________________________________________________100%

(10) What percentage of the time would you give opioid analgesics orally where there is a choice of route?
Never 0%________________________________________________100% always

(11) What pain rating should patients have before the next analgesic dose is given?
No pain 0_________________________________________________100 worst pain ever

(12) How often do you tell patients that they need to wait for their next analgesic?
Never 0%_________________________________________________100% always

(13) How often would you give surgical patients analgesics for their chronic pain if they can be distracted?
Never 0%_________________________________________________100% always

(14) A 45-year old construction worker still complains of severe incisional pain 2 days after surgery despite taking Tylenol 1g po QID. After assessment, would you give him the ordered Morphine 10 mg SC q4H?
Never 0%_________________________________________________100% always

(15) Mrs. N’s morphine has been increased within a range because of her unrelieved pain. She has begun to experience nausea and is given an antiemetic. Your nursing colleague suggests you should also decrease the morphine dose. Would you follow this advice?
Never 0%_________________________________________________100% always

(16) Mr. Z, in spite of receiving Hydromorphone 0.2-0.4 mg I.V q30 mins, continues to report moderate pain on his first postoperative day. Would you ask the physician for a higher dose?
Never 0__________________________________________________100 always

(17) What percentage of patients in hospital who take opioids for pain become addicted?
0%____________________________________________________100%

(18) How difficult is it on your unit to have analgesic orders changed when your patients continue to experience pain?
Not difficult________________________________________________100 extremely difficult

(19) To what degree do nurses on your unit agree with your decisions about managing a patient’s pain?
Never 0%_________________________________________________100% always
(20) To what degree do physicians on your unit agree with your decisions about managing a patient’s pain?
Never 0%__________________________________________100% always

(21) How often do you use a rating scale to assess pain (e.g. 0-10)?
Never 0%__________________________________________100% always

(22) How adequate do you feel your current knowledge is about pain assessment and management?
Not adequate 0__________________________________________100 very adequate

(23) How competent do you feel in effectively managing patients who are having pain?
Not competent 0__________________________________________100 very competent

Additional Questions:
(24) Do patients seem to complain of more pain when certain sites are used for grafting? If yes, please specify which sites (i.e. Saphenous Vein Graft, Left Internal Mammary Artery, etc.)?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(25) Do you assess for postoperative pain in your cardiac surgery patients? If yes, how?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(26) What do you find challenging in managing cardiac surgery patients with chronic pain?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(27) Describe your assessment for neuropathic pain in the cardiac surgery postoperative patient?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

(28) Is there anything else that would assist you in assessing or managing pain in the cardiac surgery postoperative patient?
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

If you would like to receive a $10 Starbucks gift card, please provide your email address.
____________________________________________________________________________
____________________________________________________________________________

Thank You!