

Barriers and Enablers to Nurses' Sleep Promotion Practices in the Cardiac Post-Surgery

Population: A Theoretical Domains Framework Based Survey

Amanda Hummel

A thesis submitted in partial fulfillment of the requirements for the Master's of Science in

Nursing degree

© Amanda Hummel, Ottawa, Canada, 2021

Thesis Abstract

Cardiac post-surgery inpatients lack the amount and quality of sleep needed for optimal recovery. I aimed to investigate the non-pharmacological sleep promotion practices used by nurses and the factors that influence their use. Guided by the Theoretical Domains Framework, I developed and administered a survey to registered nurses working in the Cardiac Intensive Care Unit and the cardiac surgery ward in one cardiac centre. Findings revealed that common sleep promotion practices included orientating inpatients to the room (n=88, 96.7%), and providing additional bedding (n=86, 96.6%). The most common enablers were knowledge regarding its benefits (n=72, 100%) and an understanding of its importance (n=77, 98.7%); the most common barriers were an absence of recognition from important healthcare professionals (n=61, 85.9%) and having competing priorities (n=60, 83.3%). These findings can be used in the development of interventions to promote nurses' use of sleep promotion practices and to improve inpatients' sleep quality.

Acknowledgements

Behind my written name is many other names of whom without their support and assistance, this thesis would not be possible.

Firstly, I would like to thank Jesus Christ who is the author and perfecter of my faith. My faith in Him has guided all my decisions and He has been my source of provision throughout my life. I can confidently say that I can see God's hand in my life and have come to realize that His ways are far better than my own desires, *every time*.

I would like to thank my soon-to-be husband Aaron for his unending love and support. Aaron, you have been a steady hand and a clear mind when my own weak body has felt like a never-ending rushing stream. I am forever in awe of how strong and steadfast you are. I know that we can face anything in the future together hand-in-hand.

To my precious, wonderful family: Len, Cathy, Nathan, and Joshua. You are some of the few who know the depths of my weaknesses and yet love me regardless. Thank you for the many times you have driven up to visit me in Ottawa or have sat down with me and listened to my woes. Your constant support throughout this process have been a big blessing.

To Krystina, my supervisor who guided and directed me from the very start, you are my role model. You have taught me many valuable lessons on how to intelligently handle competing priorities, multiple research opportunities, and interpersonal relationships. Your ability to provide truthful, timely advice in a gentle manner goes unparalleled. You have always been willing to give me the benefit of the doubt and I am so blessed to have been able to work closely with you in this process.

To Janet, my supervisor who willingly joined the team just as my initial thoughts were hitting the paper. Your expertise in quantitative research, survey creation, and the TDF were

crucial throughout this process. Watching you efficiently navigate your multiple different roles throughout the years have been inspiring. Both you and Krystina have provided many opportunities for me to spread my wings and grow throughout the process. You are both a wonderful example of hard work and excellence.

To my committee members: Chantal, Carolyn, & Amy. Thank you for the time and effort you have put into this thesis. I am so grateful to have such an intelligent group to review and provide direction on my thesis.

Thank you to the University of Ottawa Heart Institute for allowing me to conduct my study within their walls.

Contribution of Collaborators

Dear reader, this thesis was executed and written in collaboration with several individuals. Below, I have outlined each of my collaborators' distinct contributions to this thesis. Decisions around authorship for the manuscript (Chapter 4) were made in accordance with the International Committee of Medical Journal Editors¹

Dr. Krystina B. Lewis RN, PhD was the primary thesis supervisor for this project and participated in every stage of the process. Krystina was involved in the idea at infancy and was huge source of guidance throughout the proposal, ethics application, data analysis, data interpretation and written work. She oversaw and approved all large sections and small details of this thesis; her strong content knowledge of cardiovascular nursing and the setting of interest should not go without adequate recognition.

Dr. Janet E. Squires, RN, PhD was my well-experienced co-supervisor. She came onto the project in the final stages of the proposal and has been with Krystina and I throughout the process. Her expertise in the Theoretical Domains Framework and quantitative studies have guided this project.

Dr. Chantal Backman, RN, PhD, Amy Charlebois, RN, MScN, Carolyn Cooper, RN, MScN were my thesis committee members. They were engaged throughout the project, from proposal development to submission. They have read through every section of this thesis (some areas more than once) and have provided their content expertise.

¹ International Committee of Medical Journal Editors (2019). *Recommendations for the conduct, reporting, editing, and publication of scholarly work in medical journals*.

<http://www.icmje.org/recommendations/>

Although not part of the thesis committee, other individuals have made important contributions to this thesis.

Sarah Visitini, a health science research liaison librarian at the University of Ottawa Heart Institute helped develop the search strategy for my literature review and assisted in adapting it to several databases.

Andrea Patey, Senior Research Associate at the Ottawa Hospital Research Institute, generously offered her time to speak with me to share her expertise on the Theoretical Domains Framework. Her insights helped guide my survey development.

Adam Heenan, a registered Clinical, Health, and Rehabilitation Psychologist with expertise in individuals with cardiac disease and sleep, generously reviewed my survey during development and offered excellent comments and suggestions to improve its content.

Finally, twelve registered nurses pre-tested the survey and offered important feedback to ensure the survey was as understandable as possible prior to its launch.

Table of Contents

<i>THESIS ABSTRACT</i>	<i>II</i>
<i>ACKNOWLEDGEMENTS</i>	<i>III</i>
<i>CONTRIBUTION OF COLLABORATORS</i>	<i>V</i>
<i>TABLE OF CONTENTS</i>	<i>VII</i>
<i>LIST OF FIGURES</i>	<i>XIII</i>
<i>LIST OF TABLES</i>	<i>XIV</i>
<i>CHAPTER ONE</i>	<i>1</i>
<i>RESEARCH PROBLEM</i>	<i>2</i>
<i>Study Rationale</i>	<i>3</i>
<i>LITERATURE REVIEW</i>	<i>5</i>
<i>Search Strategy</i>	<i>5</i>
<i>Literature Review Findings</i>	<i>6</i>
<i>Reasons for Sleep Disturbances in the Cardiac Post-Surgery Population</i>	<i>7</i>
<i>Sleep Promotion Practices</i>	<i>11</i>

<i>How can we Measure Sleep?</i>	15
<i>The Role of Nurses in Sleep Promotion</i>	16
<i>What is Known about the Barriers and Enablers to Nurses' Use of Sleep Promotion Practices?</i>	17
<i>Literature Review Conclusion</i>	18
<i>PERSONAL IMPETUS</i>	19
<i>THESIS OUTLINE</i>	20
<i>REFERENCES</i>	33
<i>CHAPTER TWO</i>	41
<i>THEORETICAL FRAMEWORKS</i>	42
<i>ROY'S ADAPTATION MODEL</i>	42
<i>OBJECTIVES</i>	44
<i>STUDY DESIGN</i>	45
<i>Setting</i>	45
<i>Sample</i>	46
<i>Sample size</i>	46

<i>Recruitment Process</i>	<i>46</i>
<i>SURVEY DEVELOPMENT.....</i>	<i>47</i>
<i>Survey Section 1. Demographics</i>	<i>48</i>
<i>Survey Section 2. Sleep Promotion Practices</i>	<i>48</i>
<i>Section 3: Barriers and Enablers to Sleep Promotion – TDF-Guided Questionnaire</i>	<i>49</i>
<i>ETHICAL APPROVAL.....</i>	<i>51</i>
<i>DATA COLLECTION</i>	<i>52</i>
<i>DATA ANALYSIS</i>	<i>52</i>
<i>Preliminary Data Management</i>	<i>52</i>
<i>Participant Demographic Characteristics.....</i>	<i>53</i>
<i>Objective One.....</i>	<i>53</i>
<i>Objective Two</i>	<i>54</i>
<i>Objective Three.....</i>	<i>54</i>
<i>Open-Ended Questions</i>	<i>55</i>
<i>REFERENCES</i>	<i>56</i>
<i>CHAPTER THREE.....</i>	<i>59</i>

<i>INTRODUCTION</i>	<i>61</i>
<i>Reasons for Poor Sleep</i>	<i>61</i>
<i>Sleep Promotion Practices.....</i>	<i>61</i>
<i>METHODS.....</i>	<i>63</i>
<i>Study Design</i>	<i>63</i>
<i>The Survey.....</i>	<i>64</i>
<i>Data Analysis</i>	<i>66</i>
<i>RESULTS</i>	<i>68</i>
<i>Participant Characteristics.....</i>	<i>68</i>
<i>Objective 1: Type and Extent of Sleep Promotion Practices</i>	<i>68</i>
<i>Objective 2: Differences in Type and Extent of Sleep Promotion Practices by Setting</i>	<i>69</i>
<i>Objective 3: Barriers and Enablers to Nurses' Use of Sleep Promotion Practices</i>	<i>69</i>
<i>Additional Comments - Qualitative Findings</i>	<i>70</i>
<i>DISCUSSION.....</i>	<i>71</i>
<i>Summary of Findings</i>	<i>71</i>
<i>Sleep Promotion Practices.....</i>	<i>72</i>

<i>Barriers and Enablers to Sleep Promotion Practices</i>	74
<i>Strengths & Limitations</i>	75
<i>CONCLUSION</i>	75
<i>REFERENCES</i>	97
<i>CHAPTER FOUR</i>	104
<i>Summary of Thesis Findings</i>	105
<i>Integrated Discussion</i>	107
<i>Implications for Nursing</i>	117
<i>Strengths & Limitations</i>	125
<i>THESIS CONCLUSION</i>	127
<i>REFERENCES</i>	128
<i>Appendix A</i>	138
<i>Appendix B</i>	140
<i>Appendix C</i>	141
<i>Appendix D</i>	142
<i>Appendix E</i>	143

<i>Appendix F</i>	146
<i>Appendix G</i>	153
<i>Appendix H</i>	154
<i>Appendix I</i>	155

List of Figures

<i>Figure 1: Literature Review Search Strategy</i>	21
--	----

List of Tables

<i>Table 1.1: Characteristics of Studies Included in the Literature Review</i>	<i>22</i>
<i>Table 3.2: Demographic Characteristics</i>	<i>86</i>
<i>Table 3.3: Sources of Sleep Promotion Practice Knowledge</i>	<i>87</i>
<i>Table 3.4: Use of Sleep Promotion Practices (n=89-91)</i>	<i>88</i>
<i>Table 3.5: Barriers to Sleep Promotion Practices Between the CSICU and the Ward.....</i>	<i>89</i>
<i>Table 3.6: Enablers to Sleep Promotion Between the CSICU and the Ward</i>	<i>91</i>
<i>Table 3.7: Differing Results Between the CSICU and the Ward</i>	<i>96</i>

Chapter One

Introduction

Research Problem

Sleep is crucial to overall health and wellbeing (Buysse, 2014). It is an important aspect in recovery from illness and surgery. In hospitalized patients, over 70% report poor sleep (Caruana et al., 2018). Reasons for inadequate sleep in hospitalized patients include anxiety, environmental stimuli, noise, hospital lighting, timing of medication administration, and nursing interventions (Tamrat et al., 2014). These reasons also apply to the cardiac post-surgical inpatient given the lingering effects of cardiopulmonary bypass and anesthesia, cardiac medication administration, and the need to adjust to a sternotomy, drainage tubes, oxygen therapy, and decreased mobility (Redeker & Hedges, 2002, 2006). In the cardiac post-surgery population specifically, sleep inadequacies are associated with adverse postoperative events, increased anxiety, delirium, depression, and negative impacts to wellbeing (Caruana et al., 2018; Choudhury et al., 2017; Zhang et al., 2015). Many healthcare providers report concerns that sleep is not prioritized in the hospital (Ye et al., 2013). Inpatient nurses are well positioned to ensure that adequate sleep is promoted (Radtke et al., 2014); however, more information is needed regarding the type and extent of sleep promotion practices that are used by nurses and the factors influencing their use in the post-surgical cardiac inpatient setting (Machado et al., 2017; Redeker & Hedges, 2006). Investigations into these factors is warranted to enhance the delivery of sleep promotion activities for cardiac post-surgical inpatients.

It is estimated that 2.4 million Canadians are currently living with heart disease (Government of Canada, 2017). Between 2013-2016, heart disease accounted for thousands of hospitalizations and cardiac surgical interventions (Canadian Institute for Health Information, 2017). At the University of Ottawa Heart Institute (UOHI) alone, 1863 cardiac surgical interventions were performed in 2018-2019 including Coronary Artery Bypass Grafting

(CABGs), valve replacements, heart transplants, and aortic root aneurysms repairs (Ottawa Heart, 2019).

For the purposes of this thesis, a *cardiac post-surgery inpatient* is defined as a patient who has had an open heart or minimally invasive cardiac surgical intervention, which includes CABG, mitral, tricuspid, and/or atrial heart valve repair or replacement, aortic root aneurysm repair, or heart transplant. At the UOHI, the general pathway for a cardiac surgical patient is as follows: the patient undergoes surgery in the Operating Room and is immediately transferred to the Cardiac Surgery Intensive Care Unit (CSICU) where they stay for a minimum of one day. When considered hemodynamically stable by the multidisciplinary team, they are transferred to the ward, where they stay for a minimum of four days. Hence, this thesis will be inclusive of both settings in which cardiac post-surgical patients recover in the hospital.

Study Rationale

Cardiac post-surgery inpatients experience serious sleep disturbances during their recovery in hospital, most often during the first post-operative week (Casida et al., 2013; Casida et al., 2018; Liao et al., 2011; Redekker et al., 2004; Yilmaz & Iskesen, 2007). Poor sleep is characterized by any of the following: inability to fall asleep, frequent awakenings, increased levels of daytime fatigue, and poor sleep quality (Hedges, 2005; Navarro-García et al., 2017; Redeker et al., 2004). Many of the sleep-disturbing factors present in the hospital can be mitigated by incorporating simple changes to hospital routines (Wesselius et al., 2018). However, creating and maintaining a culture that efficiently and consistently promotes sleep in the hospital is challenging (Kim et al., 2018; McIntosh & MacMillan, 2009). Inpatient nurses face barriers to implementing adequate sleep promotion, such as a lack of knowledge about sleep

and sleep promotion (Gellerstedt et al., 2015), which contribute to an inadequate sleeping environment for patients (Yilmaz et al., 2012).

Non-pharmacological sleep promotion practices are defined as actions that nurses undertake to promote sleep but do not involve the use of medications. Evidence-based examples include relaxation techniques (e.g. posture and relaxation training, back rub/massage, etc.), devices or equipment to decrease sleep interruptions (e.g. earplugs, eye masks, music, etc.), and educational strategies for patients (e.g. pre-operative teaching) (Machado et al., 2017). In this thesis, I will focus on cardiac nurses' use of *non-pharmacological sleep promotion practices* because 1) there is evidence to support their effectiveness to promote patients' sleep (Machado et al., 2017); 2) non-pharmacological interventions are seen as a safer alternative, as sleep-inducing pharmacological agents have possible adverse effects such as impaired cognitive function, risk dependency, or alterations to normal sleep pattern (Hu et al., 2015) ; and 3) the delivery of non-pharmacological sleep promotion practices is within the scope of all registered nurses. Although there are evidence-based sleep promotion practices reported in the literature, two systematic reviews have determined that the quality of evidence is low or very low for trials that evaluated the effects of non-pharmacological sleep promotion interventions (Hellström et al., 2010; Hu et al., 2015). Heterogeneity across the studies prevented meta-analysis of data from individual studies since the findings from similar interventions were frequently inconsistent across studies (Hu et al., 2015). Therefore, further high-quality research is needed to improve the current evidence base on this topic (Hellström et al., 2010; Hu et al., 2015).

The overall aim of this thesis was two-fold: (1) to determine the type and extent of non-pharmacological sleep promotion practices used by nurses in the cardiac post-surgical inpatient

population and (2) to identify the barriers and enablers to nurses' use of sleep promotion practices in the cardiac post-surgical inpatient population.

Literature Review

A focused literature review was conducted to achieve an in-depth understanding of sleep and non-pharmacological sleep promotion practices in the cardiac post-surgical inpatient population. This literature review reports a synthesis of the recent, available literature on this topic.

Search Strategy

The search strategy was developed with guidance from my co-supervisors at the University of Ottawa and an academic librarian at the UOHI (Appendix A). I searched four online databases: CINAHL, PsycInfo, Pubmed, and Proquest Nursing and Allied Health Database, and conducted a hand search of the reference lists of included articles which revealed two additional studies related to my topic.

Inclusion Criteria

Studies were included if they were 1) focused on adult (>18 years old) inpatients who were admitted to a hospital for cardiac surgery including CABG, valve repair/replacement, heart transplant, congenital heart surgery, and aortic root aneurysm repair; 2) focused on sleep quantity or quality, effects of surgery on sleep, nurses' non-pharmacological sleep promotion practices and their effects on patients' sleep, and barriers and enablers to nurses' sleep promotion practices; 3) primary research designs and/or knowledge syntheses; 4) written in English and 5) published in year 2000 and onwards to ensure the inclusion of the most relevant and current studies.

Exclusion Criteria

Studies were excluded if they 1) focused on children, discharged patients, and families of cardiac surgery patients; 2) focused on pharmacological sleep promotion practices or interventions for sleep; 3) were editorials, non-scientific articles, case reports, opinion pieces or commentaries; and 4) were published in a language other than English.

Literature Review Findings

Of 707 citations screened through the database searches and hand searching, 26 peer-reviewed studies met inclusion criteria (see Figure 1: **Literature Review Search Strategy**). Study characteristics were extracted from each study that was included in the literature review (See Table 1.1: **Characteristics of Studies Included in the Literature Review**). These characteristics include: study design, number of participants, setting, aim, and results (as related to my study objectives).

Current State of Sleep in the Cardiac Surgery Population

Cardiac post-surgery inpatients frequently report poor sleep (Amofah et al., 2016; Boitor, et al., 2019; Casida et al., 2013; Casida et al., 2018; Nerbass et al., 2010; Liao et al., 2011; Spence et al., 2011), which is identified as one of the most important contributors to stress after cardiac surgery (Carey et al., 2019; Nerbass et al., 2010). Cardiac post-surgery inpatients describe their sleep as inefficient, reported as an increased need for daytime napping (Nerbass et al., 2010), frequent awakenings (Navarro-García et al., 2017; Redeker et al., 2004), lengthy durations of time spent awake (Casida et al., 2013; Hedges, 2005), and limited sleep duration (Casida et al., 2013).

Many studies have shown that cardiac surgery inpatients experience the worst sleep during the first post-operative week (Casida et al., 2013; Casida et al., 2018; Redekker et al.,

2004; Yilmaz & Iskesen, 2007). Some studies specifically noted that poor sleep peaked during the second post-operative night (Casida et al., 2018; Hedges, 2005; Nerbass et al., 2010; Liao et al., 2011). However, this finding was not consistent in all studies. For example, Matukaitis and colleagues (2014) found that inpatients' quality of sleep was highest on the second post-operative night which was attributed to the general pathway for care at their institution in which patients remained in the Intensive Care Unit (ICU) for 24 hours or less post-surgery and then were transferred to the ten-bed ward. This study setting differed from the setting of interest in which patients remained in the ICU for 24 hours and then were transferred to a 30-bed ward. Amofah and colleagues (2016) found that post-aortic valve replacement patients experienced the shortest sleep time on the fifth post-operative night. This contrast highlights the importance of hospital context as there are differences in each individual hospital's post-operative care trajectory, which may affect patients' sleep experience in different ways.

Reasons for Sleep Disturbances in the Cardiac Post-Surgery Population

Hospitalized cardiac-surgery patients are exposed to a number of factors that can affect their sleep. These factors will be discussed in the following order: patient-related factors, cardiac surgery-related factors, healthcare provider-related factors, and environmental factors. These factors have been categorized based on themes found in the literature.

Patient-Related Factors

Patient-related factors such as age (Yilmaz & Iskesen, 2007) and biological sex have been shown to affect sleep quality in the cardiac post-surgery inpatient population (Liao et al., 2011; Tsai et al., 2019). In fact, older age (>60 years old) and being male have been identified as risk factors for sleep disturbances after cardiac surgery (Yilmaz & Iskesen, 2007). When compared to younger patients (<60 years old), older adults experienced an increased number of

awakenings (Liao et al., 2011), decreased sleep efficiency, and decreased total sleep duration (<60 years old) (Yilmaz & Iskesen, 2007). In Liao and colleagues' (2011) systematic review of 13 studies, they found that women reported more difficulty initiating sleep than men but perceived that they slept more consistently than men. However, the few researchers that have reported the effects of biological sex on sleep after cardiac surgery have found inconclusive results (Hedges, 2005). Regardless of the results, knowing that sleep is affected by age and sex is important to note because most sleep promotion practices are identified as most beneficial to patients if they reported good baseline sleep quality prior to admission (Díaz-Alonso et al., 2018).

Signs and symptoms from chronic comorbidities (e.g. arthritis and asthma) compounded with cardiac surgical recovery can influence sleep (Casida et al., 2013; Redeker & Hedges, 2002). Patients who undergo cardiac surgery may continue to present signs and symptoms related to their comorbid illnesses after the surgery which may be a secondary cause of sleep disturbances, such as shortness of breath, vertigo, and nocturia (Amofah et al., 2016; Hedges, 2005).

Cardiac Surgery-Related Factors

Pain is a major surgery-related factor that negatively affects sleep in these patients (Amofah et al., 2016; Boitor et al., 2019). Most cardiac centres provide analgesic administration immediately after the operation however over the course of the first week the analgesics are generally reduced and patients' pain levels may increase, negatively impacting sleep (Amofah et al., 2016). Open-heart surgery generally necessitates a sternotomy (an incision made through the sternum bone) which results in patients needing to adjust to pain, discomfort, and inflammation which can affect the ability to sleep (Casida et al., 2013).

Anxiety is another factor that can negatively impact sleep (Boitor et al., 2019; Liao et al., 2011). Nesami et al. (2016) assessed stress levels in cardiac-post surgery inpatients and found that all their participants experienced stressors, although most stressors were identified as being “slightly stressful.” However, physiological/physical stressors such as insufficient sleep and being separated from family members were perceived as more stressful after the cardiac surgery event (Nesami et al., 2016).

Length of surgery was found to have an impact on patient’s sleep patterns (Amofah et al., 2016) as well as increased duration of cross-clamp time, defined as the period of intentional cardiac arrest for a bloodless field during the surgery (Casida et al., 2013). When CABGs were performed off-pump, without a cardiopulmonary bypass machine, patients experienced worsen sleep quality due to length of ischemic time during surgery which may lead to complexities during recovery (Tsai et al., 2019). Tsai and colleagues (2019) also found that having one artery bypass in comparison to multiple arteries bypasses increased sleep disturbances. Mechanical ventilation, which takes place for the first few hours after surgery, was also a source of sleep disturbance as these patients experienced a multitude of interruptions on a ventilator (Le et al., 2012). Other studies have found that the presence of thoracic drainage tubes and vascular lines after cardiac surgery limited movement and prevented patients from finding a comfortable position in bed (Amofah et al., 2016; Navarro-García et al., 2017; Nesami et al., 2016).

Care-Related Factors

Vital signs, hemodynamic monitoring, repositioning, blood sample draws, and bedside procedures are all examples of tasks that can interrupt patients’ sleep when performed during nighttime hours (Casida et al., 2013; Casida et al., 2018; Liao et al., 2011). Casida and colleagues (2018) found that ICU patients were awakened a minimum of once every hour by

healthcare providers on the first post-operative night and every two hours on the second to fifth post-operative night. In a study conducted by Le and colleagues (2012), which observed nocturnal nursing interactions in a variety of ICUs, they found that surgical ICUs had the most frequent nocturnal nursing interactions. The authors determined that in these settings, 13.9% of all nocturnal nursing interactions, such as bedding changes, bathing, and nighttime assessments in patients with continuous monitoring in place, could be safely omitted (Le et al., 2012). This point highlights the importance of healthcare providers' critical thinking to determine the necessity of awakening a patient from sleep.

Environmental Factors

Environmental factors were ranked in the top 25% of the most distressing causes of poor sleep in the hospital setting for cardiac post-surgery patients (Liao et al., 2011). The unfamiliar hospital environment prevented inpatients from engaging in their own nighttime routines in which they would otherwise do at home (Liao et al., 2011).

Location of care, critical care versus non-critical care settings, was identified as a factor influencing sleep. Amofah and colleagues' (2016) study on aortic valve replacement patients found that patients slept better in the ICU in comparison to the ward unit. The researchers attributed this to the increase in anxiety that patients felt on a busy ward unit with less available nursing staff due to higher nurse-patient ratios (Amofah et al., 2016). Navarro-García et al. (2017) reported that the proximity of a patient's room to the nurses' station was also identified as a factor. For instance, patients who were in rooms 5.5 metres-10 metres away from the nurses' station experienced worse sleep than those who were less than 5.5 metres or greater than 10 metres away (Navarro-García et al., 2017). Therefore, not only the unit location but also the room location in relation to the nurses' station was found to affect sleep.

Noise is a major factor that affects cardiac post-surgery inpatients' sleep (Navarro-García et al., 2017; Liao et al., 2011; Spence et al., 2011). Spence and colleagues (2011) found that 92% of their participants (n=148) described a minimum of one noise event in the two nights prior to the date of data collection, that disturbed or prevented their sleep. The most frequently identified sleep disturbing noise events were audible staff noises, equipment alarms (Navarro-García et al., 2017), overhead paging, closing and opening doors, and nurses providing care to neighbours (Spence et al., 2011). Spence et al. (2011) highlighted that although noise is considered normal to healthcare providers, it is an unfamiliar stimulus for most patients.

Sleep Promotion Practices

For the purposes of this thesis, I defined *sleep promotion practices* as non-pharmacological actions taken by nurses to help their patients achieve quality sleep. The quality of sleep include factors such as duration of time asleep, and percentage of wakefulness after falling asleep and *sleep latency*, which is defined as the time taken to fall asleep (Yilmaz & Iskesen, 2007).

Sleep Promotion Practices for the Cardiac Post-Surgical Inpatient

I grouped the nurses' non-pharmacological sleep promotion practices found in the literature into five categories as follows, divided into two subcategories: (1) sleep promotion practices targeting *patients* which include: a) relaxation techniques, b) devices or equipment to minimize sleep interruptions, and c) educational strategies; and (2) sleep promotion practices targeting *nurses* which include: a) noise reduction and b) prophylactic promotion. Specifically, the first three categories were identified by Machado and colleagues (2017) in their systematic review of ten randomized controlled clinical trials. I added the latter two categories (noise

reduction and prophylactic promotion) based on this literature review. Below, each category is defined, and examples are provided.

Sleep Promotion Practices Targeting Patients.

Relaxation Techniques. Relaxation techniques can be defined as practices that assist cardiac post-surgery inpatients with becoming prepared for sleep. Care should be taken to ensure that the relaxation techniques are tailored to the patient's individual needs, preferences, and comfort level. Examples include maintaining a comfortable environment, providing a massage, and guided imagery. Creating a calm, comfortable environment by closing doors, dimming lights, and increasing comfort through positioning, is recommended as feasible, cost-effective interventions that nurses can add to their practice to promote a relaxing environment for their inpatients (Casida et al., 2013; Spence et al., 2011; Zhang et al., 2015). Since the hospital is an unfamiliar environment, intentional actions such as orienting inpatients to their room, informing them of nurses' availabilities, and leaving the call bell in reach can promote comfort and safety (Amofah et al., 2016). Encouraging relaxation through massage techniques can promote an environment conducive to sleep (Boitor et al., 2019; Conway et al., 2010; MacCune, 2010; Nerbass et al., 2010). It is generally expected that massage can contribute to a state of calmness and relaxation. There are conflicting results in the literature. For instance, Conway and colleagues' (2010) qualitative findings from ICU and ward cardiac surgery inpatients suggest that progressive muscle relaxation can assist in initiating sleep. However, Conway et al (2010)'s study and the randomized controlled trial by Boitor et al. (2019) in ICU admitted cardiac surgery patients did not find a statistically significant relationship between massage and sleep quality. Machado and colleagues (2017) further highlighted the importance of progressive muscle relaxation in reducing pain, which is a common complaint after cardiac surgery, as there is

evidence of its effectiveness in this population. Guided imagery was identified by two studies (Hadjibalassi et al., 2018; Machado et al., 2017) as a sleep promotion practice, however, the systematic review of 10 studies by Hadjibalassi et al (2018) found no statistically significant relationship between sleep and guided imagery. However, these two studies have reported guided imagery as having favourable effects on reducing environmental stimuli, pain intensity, and anxiety levels in cardiac ICU patients (Hadjibalassi et al., 2018; Machado et al., 2017).

Devices or Equipment to Minimize Sleep Interruptions. Eye masks, headphones, ear plugs, and music can be offered to patients to help reduce the environmental stimuli that interrupt sleep (Machado et al., 2017). Encouraging patients to listen to music can be helpful to control stress and promote comfort (Machado et al., 2017). White noise machines can be useful tools to mitigate the sounds of hospital-generated noises (Spence et al., 2011). Although not all institutions have these readily available, patients can bring them in from home or access white noise applications on their smartphones or tablets.

Patient Educational Strategies. Patient educational strategies, including patient education and counselling prior to surgery, are recommended by the Enhanced Recovery After Surgery Society for cardiac surgery (Engelman et al., 2019). Patient educational strategies include pre-operative teaching, non-pharmacological management of post-operative complications, and individual educational programs to promote self-care (Machado et al., 2017). Providing educational support such as pre-operative teaching regarding post-surgery expectations can reduce anxiety, depression, and the impact of pain with sleep post-surgery (Guo et al., 2012). More specifically, pre-operative education can include explaining the typical pathway of the patient in the hospital, notifying the patient of the mandatory surgery preparations, identifying post-operative expectations, and providing post-operative advice (Guo

et al., 2012). However, findings from a Spanish study that implemented pre-operative educational interventions found that these interventions positively affected sleep quality for patients who usually sleep well and negative effects for those who had poor basal sleep quality (Díaz-Alonso et al., 2018). The authors of that study suggest that increased anxiety levels in their participants could be related to increased levels of fear sparked by the pre-operative intervention (Díaz-Alonso et al., 2018).

Post-operative education has included the encouragement of daytime mobilization to promote nighttime sleep (Amofah et al., 2016; Yayla & Özer, 2019). In a randomized controlled trial conducted by Yayla and Özer (2019), an early mobilization protocol started on post-operative day zero was found to improve the quality of sleep. Results of this study also indicated patients who received the early mobilization protocol had a shorter length of hospital stay and fewer post-operative complications (Yayla & Özer, 2019).

Sleep Promotion Practices Targeting Nurses.

Noise Reduction. Hospital acquired-noise was identified as an important factor affecting sleep in the hospitalized cardiac post-surgery patients (Hedges, 2005; Liao et al., 2011; Navarro-García et al., 2017; Redeker & Hedges, 2006; Spence et al., 2011). Simple changes such as decreasing volume of conversations, intravenous infusion alarms, or telemetry alarms can assist in promoting sleep among cardiac post-surgery inpatients. Nurses can collaborate with the healthcare team to develop noise reduction strategies that limit hallway talking or loud equipment alarms to promote sleep among inpatients (Spence et al., 2011).

Prophylactic Promotion. Prophylactic promotion involves clustering care and critically thinking in advance to prevent unnecessary interruptions while the patient is sleeping to promote longer periods of uninterrupted sleep during the night (Zhang et al., 2015). It is important for

nurses to carefully consider the nursing interventions that require awakening patients during the night to determine if they are necessary by weighing the benefits of the care activity against a patient's restful sleep (Matukaitis et al., 2014). If deemed non-urgent, the timing of the intervention delivery can be adjusted to allow patients to sleep (Casida et al., 2018; Le et al., 2012; Matukaitis et al., 2014). Examples of care activities that can be assessed by the nurse to be safely postponed to when the patient naturally wakes up include daily weights, bedding changes, bathing, and blood draws (Le et al., 2012; Matukaitis et al., 2014). Based on these study findings, Matukaitis and colleagues (2014) suggested that nurses can be thoughtful and organized in their care delivery by consolidating nursing care to parallel patients' wakeful hours. The authors also emphasized the importance of prophylactic promotion as it can lead to a more-patient centered and recovery-focused care delivery (Matukaitis et al., 2014).

How can we Measure Sleep?

Sleep can be measured both objectively and subjectively. Objective measures include: polysomnography (non-invasive test to monitor sleep stages and cycles) (Liao et al., 2011), actigraphy (a non-invasive sensor usually worn on the wrist to monitor movements) (Amofah et al., 2016; Hedges, 2005; Redeker et al., 2004; Yilmaz & Iskesen, 2007), and the Maintenance of Wakefulness Test (Yilmaz & Iskesen, 2007). Subjective measures include: sleep diaries (Hedges, 2005; Liao et al., 2011; Redeker et al., 2004; Yilmaz & Iskesen, 2007), the Pittsburgh Sleep Quality Index (Caruana et al., 2018; Díaz-Alonso et al., 2018; Hedges, 2005; Liao et al., 2011; Nerbass et al., 2010; Redeker et al., 2004; Yilmaz & Iskesen, 2007), the Groningen Sleep Quality Scale (MacCune, 2010), the Epworth Sleepiness Scale (Nerbass et al., 2010; Redeker et al., 2004; Yilmaz & Iskesen, 2007), the Richards Campbell Sleep Questionnaire (Aygin & Şen 2019; Boitor et al., 2019; Díaz-Alonso et al., 2018; Navarro-García et al., 2017; Yayla & Özer,

2019), the Verran Snyder-Halpern Sleep Scale (Casida et al., 2018; Liao et al., 2011), and researcher/unit created sleep surveys (Matukaitis et al., 2014; Spence et al., 2011). Importantly, objective and subjective measures of sleep disturbances do not consistently produce the same results; therefore use of both types of measures is recommended to achieve reliable findings (Hedges, 2005). The vastness of the measures available to assess sleep exemplify the multi-modal aspects of sleep and the difficulties of utilizing one approach/strategy as a *catch-all*, hence why multiple strategies will be considered in this thesis.

The Role of Nurses in Sleep Promotion

Acute and critical care nurses are well-positioned to promote sleep for cardiac post-surgery inpatients and to improve the overall delivery of care for inpatients (Casida et al., 2018). Helping patients adapt after their surgery and solicit ways to adjust to recovery is central to the role of nursing in this population (MacCune, 2010). Promoting sleep ensures patient-centered care by helping them achieve the adequate rest that they need after surgery (Yayla & Özer, 2019). Identifying poor sleep and promoting adequate sleep is a very important aspect of nursing care (MacCune, 2010).

The American Thoracic Society recognized that healthcare providers lack deliberate education on the importance of sleep and sleep promotion for their patients (Mukherjee et al., 2015). Therefore, they recommended that healthcare providers receive formal sleep education and encourage their patients to increase their sleep duration (Mukherjee et al., 2015). The Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU (Devlin et al., 2018) recommended implementing sleep protocols that support non-pharmacological sleep promotion measures (Devlin et al., 2018).

What is Known about the Barriers and Enablers to Nurses' Use of Sleep Promotion Practices?

The barriers and enablers to nurses' use of sleep promotion practices in cardiac inpatient settings has been under investigated. Two studies have reported barriers and two studies have reported enablers that impact nurses' ability to promote sleep for their cardiac post-surgery inpatients. These include factors related to nurses and factors related to the environment.

Nurse-Related Factors

Knowledge of sleep and sleep promotion practices is a factor that affects nurses' ability to promote sleep. Greve & Pedersen (2016) stressed that nurses' knowledge of sleep and principles of sleep hygiene can be enablers to sleep promotion. For instance, the authors suggested that nurses who use their knowledge to conduct a sleep history and provide sleep promotion practices utilizing this knowledge can decrease the consequences of poor sleep on their patients (Greve & Pedersen, 2016). Conversely, Gellerstedt and colleagues (2015) revealed that nurses believed they did not have enough education on sleep promotion (Gellerstedt et al., 2015) as evidenced by their difficulties in assessing patients' sleep quality, and mainly using nonevidence-based sleep promotion practices (Gellerstedt et al., 2015). Rather, they relied mainly on strategies gained from personal experience (Gellerstedt et al., 2015). Machado et al. (2017) found that the nurses' own views regarding the importance of inpatients' sleep affected their ability to promote sleep for their patients. It was found that nurses and nursing students hold varying views regarding their role and the clinical practice of promoting sleep in the hospital setting (McIntosh & MacMillian, 2009). Some nurses believed they had a degree of responsibility in the promotion of sleep, yet many were discouraged when they were unable to do so due to time constraints and a perceived lack of freedom to do so (Gellerstedt et al., 2015).

Nurses concurred that sleep promotion needs to be considered a higher priority in the hospital setting (Gellerstedt et al., 2015).

Environmental-Related Factors

In a study conducted in cardiac post-surgery patients, it was determined that even though eye masks and ear plugs were provided by their institution, they were only used by patients less than seven percent of the time (Spence et al., 2011). Spence and colleagues (2011) could not determine a sole reason why these readily accessible sleep promotion strategies were not used. Rather, they concluded that many factors that interrupt or prevent sleep exist, the majority of which are adjustable (Spence et al., 2011).

Gellerstedt and colleagues (2015) conducted a study to determine nurses' perspectives (n= 22) on patients' sleep in nine different units (one of which was a cardiac unit). Many nurses expressed that their intentions to promote adequate sleep were hindered due to lack of sleep assessment resources and organizational and managerial support (Gellerstedt et al., 2015). Nurses in this study also communicated feelings of being confined between their intentions in a hospital in which care was not always founded on the patient's perspectives and needs as related to sleep (Gellerstedt et al., 2015).

Literature Review Conclusion

Current literature is lacking regarding the factors that promote or hinder nurses' use of sleep promoting practices in the cardiac post-surgery setting. Studies investigating specific interventions for sleep promotion are inadequate (Díaz-Alonso et al., 2018). Further research focused on the behaviours surrounding the use of sleep promotion interventions in this setting is warranted.

Based on my review of the literature, the majority of the studies found were about the factors affecting inpatients' sleep and not the factors affecting nurses' use of sleep promotion practices. In addition, only one study in this literature review was conducted in Canada (Boitor et al., 2019), which limits the applicability of the results to the Canadian healthcare context. This study will hope to improve bedside sleep promotion practices as there are currently no protocols, guidelines, or processes in place in this institution for bedside nurses to engage in sleep promotion activities. In addition, I intend to offer useful information for nurses to adequately promote sleep using non-pharmacological sleep promotion activities among the cardiac inpatient surgical population.

Personal Impetus

I have personally witnessed the effects of inadequate sleep on patients' recovery and overall well-being. As a registered nurse with experience in two cardiac surgical wards, I have noticed that one of the most common complaints heard from inpatients is related to the quality and quantity of sleep achieved while admitted to the hospital. For instance, many patients reported that they did not sleep well the night before, which affected their ability to be engaged in plans of care during the day. I am aware that there are many barriers to consider when trying to promote sleep in the hospital. These include, but are not limited to, individual nurse-related and environmental-related barriers that affect how nurses are proactive in preventing situations of inadequate sleep and intervene if necessary. In my clinical practice, I have witnessed the impact that inadequate sleep has on patients. This has fueled my interest and motivation to identify the barriers and enablers to nurses' use of sleep promotion practices to improve cardiac surgical patients' sleep and subsequent health outcomes.

Thesis Outline

This manuscript-based thesis is composed of four chapters. **Chapter One** presents the research problem and the study rationale. This is followed by a synthesis of the current literature on sleep promotion interventions, the factors influencing sleep promotion in the cardiac surgery inpatient population and nurses' actions to promote sleep in this population. This chapter concludes with my personal impetus for conducting this research and an outline of the thesis. **Chapter Two** presents the two theoretical frameworks guiding this thesis and details the methodology, including study objectives, study design, setting, sample, recruitment process, a detailed description of the Theoretical Domains Framework (TDF)-based survey and its development, data collection, data analysis, and a statement outlining the ethical considerations ascribed to during the conduct of the study. **Chapter Three** is a manuscript entitled "Barriers and Enablers to Nurses' Sleep Promotion Practices in the Cardiac Surgery Inpatient Population: A Theoretical Domains Framework Guided Survey Study" which presents the results of the cross-sectional TDF-based survey. It is formatted for submission in *Heart & Lung* (impact factor 1.730), a peer-reviewed cardiovascular nursing journal. **Chapter Four** is the integrated discussion which aims to discuss the findings of this research study and situate them within the broader theoretical and empirical literature. This chapter also offers implications for nursing practice, policy, education, and research.

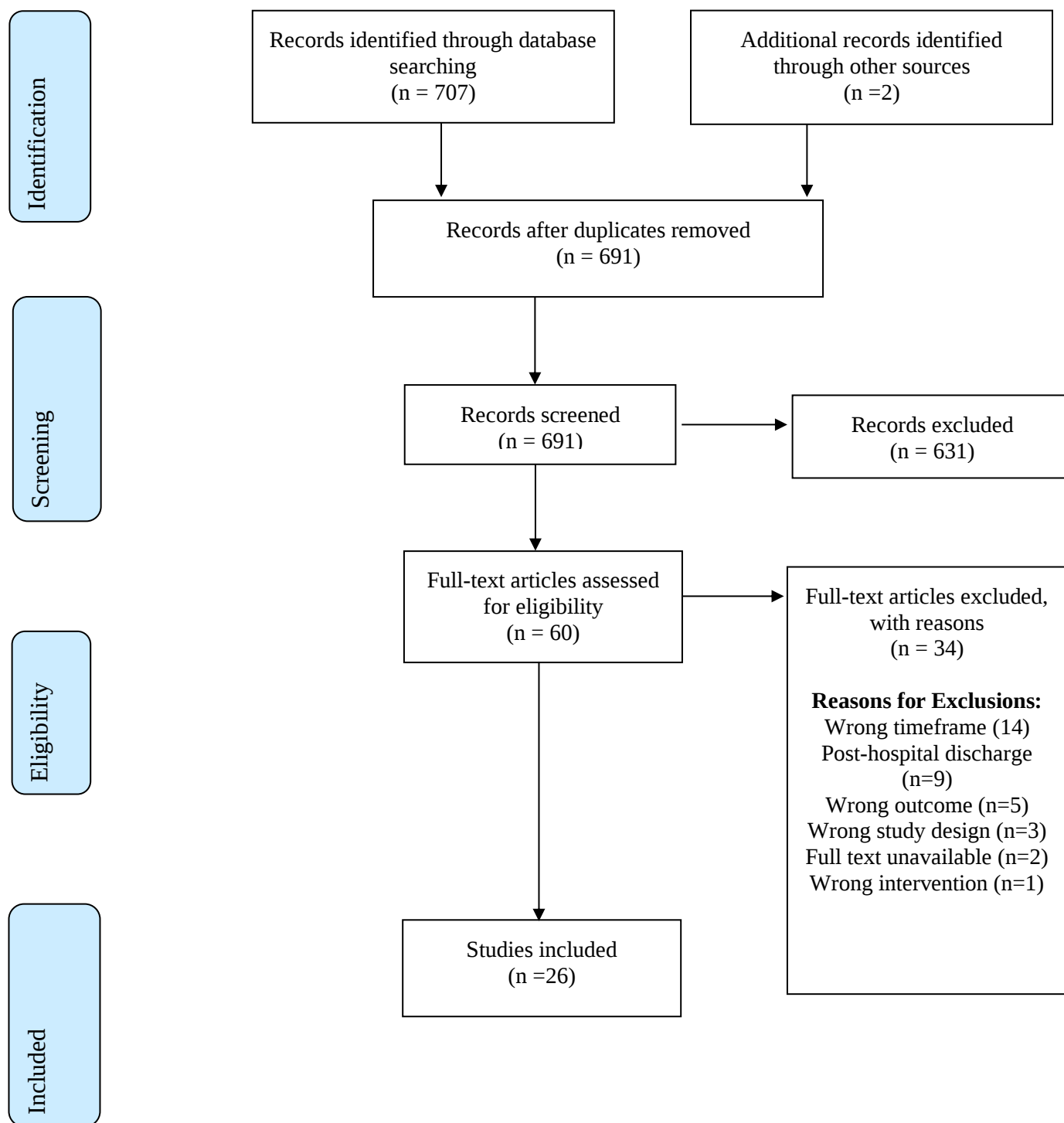
Figure 1: Literature Review Search Strategy

Table 1.1: Characteristics of Studies Included in the Literature Review

1 st Author, Year, Country	Study Design and Clinical Setting	Aim	Participants	Data Source and Collection	Results
Amofah, 2016, Norway	Prospective cohort Hospital Intensive Care (ICU) and ward	“To determine and compare the nature of self-reported sleep and insomnia, and recorded sleep- wake patterns in octogenarians during the in- hospital postoperative phase after Surgical Aortic Valve Replacement (SAVR) or Transcatheter Aortic Valve Implementation (TAVI)”	SAVR and TAVI patients aged ≥80 years (n= 143)	<u>Source:</u> self- reported surveys, medical records, & actigraphy <u>Collection:</u> Data collected pre- operation and for 5 Post-operative days (POD)s	1. SAVR patients reported much longer needed and actual sleep times than TAVI patients. SAVR patients slept more overall than TAVI patients but they had differing sleep patterns post-operatively (e.g. SAVR patients experienced the most disturbed sleep during the late PO phase) 2. sleep was poor during all post-operative nights (PON)s 3. PON 5: Lowest sleep efficiency, shortest sleep time and insomnia for SAVR patients 4. total sleep time for all patients at night was 381 minutes (median) 5. total sleep time for all patients decreased as the days increased & median total wake time increased as the days increased post-operatively 6. total sleep time during the day for all patients was 570 minutes (median) for the first 4 PODs. Patients slept the most during the first POD 7. patients had better sleep in the ICU vs the ward <u>REASONS FOR SLEEP DISTURBANCES:</u> a. hospital environment (noise & light), b. healthcare provider interventions, c. people with aortic stenosis may experience disease-related symptoms prior to surgery (shortness of breath, nocturia, chest pain, vertigo) that can cause secondary insomnia and a disturbed sleep wake pattern, d. medical devices (thoracic drainage, central/peripheral vascular lines) can prevent patients from moving during the 1 st PONs
Aygin, 2019, Turkey	Randomized pre-post- test control group design Hospital ward	“To determine the effect of acupressure on anxiety and sleep quality after cardiac surgery”	Cardiac surgery patients (n=100)	<u>Source:</u> self- reported surveys <u>Collection:</u> <i>Intervention group:</i> standard care and acupressure for 3 days <i>Control group:</i> standard care	1. it is common to experience anxiety and sleep disturbances after surgery 2. sleep quality, sleep depth & quality of falling asleep increased significantly in patients receiving acupressure 3. frequency of waking up at night and duration of staying awake at night decreased in patients received acupressure 4. acupressure decreased anxiety & increased the quality of life
Boitor, 2019, Canada	Randomized Control Trial Hospital ICU	“To evaluate the sustained effect of hand massage on the pain intensity and pain-related	Cardiac surgery patients (n=46)	<u>Source:</u> self- reported surveys <i>Passive Control Group:</i> standard	1. all post-operative patients reported light sleep, being awake 50% of the night time 2. hand massage was relaxing & conducive to falling asleep but there are no statistically significant effects of hand massage on pain-related interference with activities

		interference with functioning of cardiac surgery patients.”		care and 20 minute rest period <i>Active Control Group</i> : standard care + 20 minutes of hand holding + environmental adjustments for sleep <i>Experimental Group</i> : standard care + 20 minutes hand massage + environmental adjustments for sleep <u>Collection</u> : on POD2	3. all patients fell asleep during hand massage & continued to sleep after the hand massage, except for 2 occasions (patient was sitting in a chair) 4. data is insufficient to determine the effectiveness of promoting sleep using hand massage in the ICU. However the field & anecdotal notes express that hand massage could potentially promote sleep during & after its administration <u>REASONS FOR SLEEP DISTURBANCES</u> : a. pain, b. anxiety
Carey, 2019, USA	Prospective survey study Hospital ICU	“To identify stress-generating experiences that occur in an intensive care unit for patients after cardiac surgery.”	CABG patients (n=16)	<u>Source</u> : self-reported survey <u>Collection</u> : completed within 12-24 hours after CABG surgery	<u>Sources of stress in the CSICU</u> : 2nd most stressful = sleeplessness (1 st = pain, 2 nd (tie) = endotracheal tube)
Casida, 2013, USA	Exploratory, repeated-measures, correlational design Hospital ICU and ward	“To describe sleep patterns and inflammatory response post cardiopulmonary bypass, determine sleep pattern changes and inflammatory response over time and explore relationships between sleep and biomarkers of stress and inflammation.”	Elective cardiac surgery patients with cardiopulmonary bypass (n=20)	<u>Source</u> : actigraphy, specimen samples, self report questionnaire <u>Collection</u> : POD/PONs 1-4	1. there is a strong relationship between sleep disturbance and the inflammatory response but the directionality of the relationship has not been explored 2. during the immediate PO period, cardiac surgery patients are extremely sleep deprived regardless of their pain & anxiety or the amount of medications consumed 3. sleep deprivation is associated with higher levels of inflammation & during surgery longer cross-clamp time 4. patients had an increase in time spent awake from sleep, increase in disruptions of sleep, decrease in total time spent asleep and decrease in the ratio of total sleep time and time spent in bed 5. understanding what factors influence the patient’s sleep is an important knowledge gap that must be addressed <u>REASONS FOR SLEEP DISTURBANCES</u> : a. comorbidities in the cardiac surgery population b. care delivery (hemodynamic monitoring, recurrent vital signs, turning in bed, blood samples and/or bedside diagnostic procedures)

					c. effects of sternal retractors & cross clamp, inflammation at the surgical incision, and cardiopulmonary bypass d. stimulation of the Sympathetic Nervous System (if cross-clamp time is longer than 60 minutes)
Casida, 2018, USA	Exploratory repeated-measures Hospital ICU and ward	“To explore the context and the influence of night-time care routine interactions (NCRIs) on night-time sleep effectiveness (NSE) and daytime sleepiness (DSS) of patients in the cardiac surgery critical-care and progressive-care units of a hospital.”	Elective cardiac surgery patients (n=38)	<u>Source:</u> self-reported questionnaires by the nurses and patients <u>Collection:</u> PON1-5	1. Highest amount of sleepiness found during PON2 <u>Common nighttime routine care interactions:</u> 1. patient assessment, administration of medication, laboratory/diagnostic procedure, and PO exercises 2. 1-16 interactions every night with the highest amount of interactions occurring on PON1 and lowest PON5. 62% decrease noted between PON1 & PON2 3. patients were awakened by the Registered Nurse or other healthcare professional a minimum of once every hour on PON1 and 2 -2.5 hours on PON2 -5 between midnight & 6AM
Caruana, 2018, Australia	Prospective Observational Study Hospital Ward and ICU and once discharged (2 months and 6 months after discharge from the hospital)	“To assess sleep quality of CABG patients during and after ICU, psychological well-being, Health-related Quality of Life during recovery, and whether on- versus off-pump surgery affects sleep and recovery.”	CABG patients (n=101)	<u>Source:</u> self-reported surveys, <u>Collection:</u> in the ICU, on the hospital ward, and after discharge at 2 months and 6 months	1. 75% of patients did not sleep well in the ICU and 72% of patients did not sleep well on the ward.
Choudhury, 2017, India	Prospective clinical study Hospital ward	“To study if there exists a relationship between sleep quality, plasma levels of ET-1, and clinical outcome in patients undergoing CABG.”	Elective CABG patients (n= 156)	<u>Source:</u> self-reported survey, blood sample <u>Collection:</u> Pre-operative and 48hours PO	1. adverse post-operative events was associated with a strong relationship between poor sleep quality & the vascular polypeptide ET-1 level 2. poor sleep quality is associated with higher incidence of adverse perioperative events
Conway, 2010, Australia	Mixed Methods	“To determine if using Progressive Muscle Relaxation (PMR) improves	Cardiac surgery inpatients (n=35)	<u>Source:</u> self-report questionnaire,	1. No statistical significance found for the benefits of PMR with improving sleep quality but the qualitative results suggested that it enhanced some participants’ abilities to initiate sleep 2. 20% of participants reported improved sleep

	Hospital ICU and ward	self-rated sleep quality for patients following cardiac surgery.”		open-ended questions <u>Collection:</u> 1 day prior to surgery and every day after until POD7	3. PMR relaxed the mind & prepared the patient for sleep, distracted them from pain, & diverted negative thoughts
Diaz-Alonso, 2018, Spain	Randomized controlled trial Hospital ICU	“To evaluate the impact on sleep quality of a brief nurse intervention.”	Elective cardiac valve surgery patients (n=40)	<u>Source:</u> self-reported questionnaires, satisfaction indicators <i>Control group:</i> usual care <i>Experimental group:</i> receiving a nurse intervention the day before surgery and admission in the ICU <u>Collection:</u> pre op and POD1	1. control group sleep quality scores were higher than the experimental group (note: a higher proportion of participants in the experimental group had suboptimal sleep quality than the control group). The nurse led intervention did not have an expansive, positive impact on ICU patients’ PON1 sleep quality 2. the intervention may have increased anxiety in patients who had poor sleep at homes, which may have worsening results on sleep quality & ICU environment satisfaction 3. The effect of the intervention was positive for patients who usually sleep well (this was not statistically significant) 4. there was no difference between the groups related to ICU environment satisfaction
Guo, 2012, China	Randomized controlled trial Two Hospital wards	“To determine whether a preoperative education intervention designed for Chinese cardiac patients can reduce anxiety and improve recovery.”	Elective cardiac surgery patients (n=153)	<u>Source:</u> self-report questionnaire, medical records for length of stay <i>Control Group:</i> usual care <i>Experimental Group:</i> preoperative education to family member and patient 2 days prior to surgery. <u>Collection:</u> Baseline assessed pre-operatively and POD7	1. pre-operative education was shown to decrease anxiety, depression, pain inference of sleep, & benefit psychological health 2. the experimental group stayed 4 hours less in the ICU (but the experimental group stayed 14 days after surgery & the control group stayed 12 days)
Hadjibalassi, 2018,	Systematic review and meta-analysis	“To systematically review and synthesize, the	10 studies, 8 were cardiac focused	<u>Source:</u> self-reported questionnaire,	1. 3 studies looked at the effects of guided imagery on sleep with no statistically significant results

country not stated	Hospital ICU	evidence on the effects of guided imagery on outcomes of adult critically ill patients”		MAR, polysomnography, Electromyography, chart reviews, national database *note: many different measures were assessed (Pain, anxiety, depression, etc), not solely sleep <u>Collection:</u> varied across studies	2. Guided imagery has favourable effects on decreasing pain intensity, anxiety levels as well as length of stay
Hedges, 2005, USA	Descriptive Correlational Design Hospital ward	“To examine sleep, memory, and learning in off-pump CABG patients”	Off- pump CABG patients (n=66)	<u>Source:</u> Sleep: Actigraphy, sleep diaries, self-reported questionnaires, Memory and Learning: examiner facilitated test <u>Collection:</u> POD 2 -4	1. older patients experienced difficulties in memory and learning PO 2. no significant correlations found between global habitual sleep & learning efficiency or delated recall. 3. no significant correlations between sleep time, number of awakenings, efficiency, daytime napping, duration of awakenings, & memory and learning variables <u>CURRENT STATE OF SLEEP:</u> patients report limited quantity of sleep with high levels of nocturnal fragmentation, & high levels of daytime sleep <u>REASONS FOR SLEEP DISTURBANCES:</u> a. noise, b. nocturia, c. nursing care, d. pain
Le, 2012, USA	Prospective observational cohort study Hospital ICUs (n=5)	1. “To analyze the frequency and the nature of nocturnal nursing interactions (NNIs) among five ICUs of differing types.” 2. “To identify differences in the proportions of these interactions that could be safely omitted.”	ICU patients (n=200) (including cardiothoracic ICU patients)	<u>Source:</u> observations and self-report from bedside nurses <u>Collection:</u> Questionnaires filled out throughout the night shift from the nurses	1. most NNIs were due to assessment or patient care activity 2. surgical ICU had the most frequent NNIs & the highest proportion of NNIs that could have been safely omitted 3. nurses felt that 13.9% of NNIs could be safely omitted <u>REASONS FOR SLEEP DISTURBANCES:</u> a. patient care activity (breathing treatments, medications, bathing) b. NNIs (IV line placement & flushing, wound care) c. nursing assessments (IV pump monitoring, vital signs, neurologic checks) d. patient-initiated contact e. mechanical ventilation (these patients experience 20-60 disruptions per hour of sleep)

Liao, 2011, Countries not mentioned	Systematic Review of Observational studies Hospital (ward and ICU), and home	“To analyze and synthesize observational studies of sleep patterns and related factors in heart surgery patients to provide an overview of sleep disturbance and related factors throughout the heart surgery recovery process.”	Studies on surgeries: heart surgery, valve replacement, CABG patients (n=13)	<u>Source:</u> self-report questionnaires, actigraphy, polysomnography, <u>Collection:</u> differed across studies*	1. more than half of patients reported sleep disturbances during the first 6 months after surgery 2. major sleep disturbance: difficulty maintaining sleep (awakening duration of more than 30 minutes) 3. all patients reported sleep difficulties PO 4. during the early PODs sleep was severely deprived and then recovered back to pre-surgery pattern at 1 month after surgery 5. low pre-operative sleep efficiency and less deep sleep continued up until one month after discharge 6. POD 2-5 had the worst sleeps (average of 4.3 to 6 hours of daily sleep) 7. sleep efficacy gradually increased from 50% to 68% during hospitalization to 72% at 6 months 8. number of awakenings at night remained high after 6 months <u>REASONS FOR SLEEP DISTURBANCES:</u> a. individual: old age, gender b. physiological factors: nocturia, pain, dyspnea, cardiac function, and fatigue c. psychological factors: anxiety & depression d. environmental factors: unfamiliar beds, noise, inability to achieve a comfortable position in bed, patient medical procedures, inability to perform usual nighttime routines, and nurses' interruptions
MacCune, 2010, India	Quasi-experimental design Hospital ward	“To assess and compare the effectiveness of back-massage in improving sleep among post-CABG and valve replacement patients.”	CABG and valve replacement patients (n=60)	<u>Source:</u> self-reported survey <i>Control Group:</i> routine care <i>Experimental group:</i> back massage for 3 consecutive days from 8-9pm <u>Collection:</u> POD3 and POD6	1. back massage is effective in improving sleep quality: perceived by patients as relaxing, soothing, & an effective sleep-inducing measure. 2. back massage is therapeutic and cost-effective 3. nurses can use back massage to improve quality of sleep of postoperative patients
Machado, 2017, USA (n=4), Brazil (n=1), other countries not stated	Systematic review of randomized controlled trials Not stated	“To analyze evidence available in the literature concerning non-pharmacological interventions that are effective to treat altered sleep patterns among patients who	Studies (n=10) on adult CABG, valve, aortic or congenital heart disease surgery patients	*Source and Collection measures not stated for the studies	All studies revealed that non-pharmacological sleep promotion practices benefit patients' sleep 1. nurses with greater knowledge of sleep hygiene practice influenced the quality of sleep of their patients 2. Patients who have been sleep deprived after cardiac surgery present significantly worse scores concerning emotional well-being, mood, and social function in comparison to non-fatigued patients. 3. there was significant improvement of sleep quality among patients who received sleep promotion interventions

			underwent cardiac surgery.”		<u>TYPES OF SLEEP PROMOTION PRACTICES:</u> sleep promotion interventions were characterized by promoting decreased sleep latency and/or disruptions, while other improved the patients’ perceptions regarding quality of sleep 1. relaxation techniques (n=3 studies): -massage, progressive muscle relaxation, and posture & relaxation training -controversial massage results regarding effectiveness 2. devices or equipment to minimize sleep disruption and/or induce sleep (n=4 studies): - sleep masks, earplugs, guided imagery, & headphones -BENEFIT: reduces environmental stimuli & interference in sleep patterns 3. educational strategies (n=3 studies) - interventions addressing general care in cardiac surgery & sleep hygiene BENEFITS: significant improvements in depression, anxiety, lower interference of pain on one’s ability to sleep
Matukaitis 2014, USA	Not stated Hospital ward	Not stated	Post cardiac surgery patients (n=40)	<u>Source:</u> Self-reported survey <u>Collection:</u> Step-down unit- after implantation of bundled nursing care interventions	1. patients slept worse than pre-surgery 2. quality of sleep was higher on PON2 than overall quality of sleep 3. patients perceived noise as secondary to nursing interventions as a reason for disrupted sleep. <u>TYPES OF SLEEP PROMOTION PRACTICES:</u> 1. group tasks together, or bundle nursing care, adjust intervention times, 2. adjust medication administration times- by making this simple adjustment to the nursing routine, nurses bought patients 6 or 7 hours of uninterrupted sleep 3. daily weights were switched to the evening (if not on diuretics) instead of patients being woken early in the morning 4. avoid fixed times for blood specimen draws and draw them with pts request pain medication or during the early morning assessment <u>BENEFITS OF BUNDLING NURSING CARE:</u> 1. 2 years post-study and no missed nursing care has been reported or adverse events 2. patients has less self-perceived disruptive sleep & increased sleep quality
Navarro-García, 2017, Spain	Observational, descriptive, cross-sectional study	1. “To describe the sleep quality of patients during their first two nights of admission to an ICU after	Heart surgery (valve replacement and/or coronary revascularization)	<u>Sources:</u> sleep: self-reported surveys, observed distance from nurses’ station, MAR,	1. no associations found between age and quality of sleep 2. patients who were farther away from the nurses’ station reported more pain 3. patients who were closest to the nurses’ station stated that it was staff voices which was the factor that most interfered with their nighttime sleep

	Hospital ICU	undergoing heart surgery.” 2. “To identify and quantify the main conditioning factors of sleep.”	inpatients in the ICU (n=66)	<u>Collection:</u> PON1&2 in ICU	<u>CURRENT STATE OF SLEEP:</u> sleep is poor characterized by: quick onset, frequent awakenings, and a quick return back to sleep <u>REASONS FOR SLEEP DISTURBANCES:</u> a. pain & discomfort caused by monitoring devices, drainages, & a foreign bed b. environmental noise (e.g. staff voices, noise of monitor alarms, ambient noise) c. distance from the nurses’ station (5.5-10m) had worse sleep quality than people who were at a distance of <5.5m and >10m
Nerbass, 2010, Brazil	Randomized Control Trial Hospital ward	“To evaluate whether massage therapy is an effective technique for improving sleep quality in patients following CABG”	Elective CABG patients (excluded pts with thoracic drain) on the wards (n=57)	<u>Source:</u> self-reported survey, sleep diary <i>Control group:</i> sat in comfortable chairs for 3 nights <i>Experimental Group:</i> Massage Therapy (massage on neck, shoulder, and back by a physiotherapist) 2-3 hours before sleep) <u>Collection:</u> Days 1-3 on the ward	1. massage improved the comfort level of participants 2. recovery from fatigue was significantly faster in the massage group by POD 1&2 3. sleep effectiveness was higher in the massage group 4. all participants had a certain degree of sleep disorder following surgery and a necessity for daily naps, both of which significantly decreased from POD2-3
Nesami, 2016, Iran	Descriptive-analytical study Hospital ICU	“To investigate stressors after CABG surgery and identify stressors that predict anxiety “	CABG patients (n=186)	<u>Source:</u> self-reported questionnaires <u>Collection:</u> POD 2 or 3	1. insufficient sleep during hospitalization was a major physiological post-surgery stressor 2. highest stressful score was noted for being in pain, having a chest tube, and hearing ICU staff talking about the patient 3. other stressors included: being away from family members & procedures not explained by the nurse 4. no patient reported complete absence of stress
Redeker, 2004, USA	Not stated Hospital ward and at home * the focus of this study was on 4 th and 8 th weeks PO	“To examine the relations of sleep patterns to physical function and emotional well-being 4 and 8 weeks after cardiac surgery.”	Patients (n= 72) who had elective, first cardiac surgery (CABG, mitral or aortic valve replacement)	<u>Source:</u> actigraphy, sleep diaries, self-reported questionnaires, <u>Collection:</u> 3 day periods pre surgery, on POD 2-4, during the 4 th	1. cardiac surgery patients report frequent awakenings 2. sleep pattern alternations & partial sleep deprivation are associated with both physical function & emotional well-being 4 & 8 weeks after cardiac surgery

				week PO and the 8 th week PO	
Spence, 2011, USA	Cross-sectional descriptive study Hospital ward	“To learn what noise events prevented or interrupted nighttime sleep, what relaxation and sleep aids available to patients were used to promote nighttime sleep, and whether patient characteristics were associated with noise events during recovery from cardiac surgery.”	Adult CABG/valve surgery/other cardiac operations patients (n=148)	<u>Source:</u> self-reported survey <u>Collection:</u> POD4 on cardiac intermediate care unit	<u>REASONS FOR SLEEP DISTURBANCES:</u> a. noise (92% of participants identified at least 1 noise event that prevented or interrupted nighttime sleep) Examples of noise that keeps patient’s awake: - overhead paging - alarms on equipment - people talking in the hallways - call light alarms, equipment moving in the hallway - doors opening, closing or slamming - noise created by nurses talking at bedside, performing procedures nearby, & socializing at the nurses’ station -CABG plus valve patients are more likely to be disturbed by overhead paging than other cardiology patients <u>SLEEP PROMOTION PRACTICES:</u> a. pain assessment b. pain medication, c. nurses using soft voices d. white noise machine e. creating a nighttime environment by closing doors; dimming lights; and combining laboratory specimen collection, weights, and vital signs to decrease sleep interruptions may heighten nurses’ use of soft voices. <u>BARRIERS TO SLEEP PROMOTION:</u> 1. common sleep aids, such as relaxation tapes, eye shields, and earplugs, were not chosen by patients as a means to reduce noise, even though they were readily available
Tsai, 2019, Taiwan	Prospective trial 6 Hospital wards and home	“To identify distinct trajectories of cardiac symptoms seen over time in a cohort of patients during the 3-month post-CABG period, and determine clinical characteristics associated with different symptom trajectories postoperatively”	Elective CABG patients (n=198)	<u>Source:</u> self-report questionnaire <u>Collection:</u> at pre-op, 1 week, 6 weeks and 3 months after CABG	All symptoms improved consistently over the postoperative period (expect surgical pain and lower extremity edema) 6 most disturbing symptoms after CABG: 1. angina 2. dyspnoea 3. depression 4. fatigue 5. sleep problems 6. anxiety <u>FACTORS ASSOCIATED WITH WORSE SYMPTOMS:</u> a. age, b. longer ICU stay (prolonged ICU stay = worse angina), c. fewer vessels bypassed, d. off-pump CABG, smoking history,

					e. lack of regular exercise f. patients who have one artery bypassed have worse sleep outcomes
Yayla, 2019, Turkey	Quasi experimental with a control group Hospital ward	“To determine the effects of an early mobilization protocol performed in patients who underwent cardiac surgery on post-operative outcomes”	Elective cardiac surgery patients (n=102)	<u>Source:</u> Self-report questionnaires, Pedometers <u>Collection:</u> <i>Control group:</i> routine mobilization practices <i>Experimental group:</i> education booklet provided to patients on the early mobilization protocol and the protocol was implemented	1. Experimental group: shorter length of stay, significantly fewer complications, and higher sleep quality scores on POD 5 2. Exercise improves the quality of sleep in patients with sleep disorders
Yilmaz, 2007, Turkey	Controlled Cohort Study Not mentioned	“To investigate the changes in sleep characteristics in patients who underwent CABG surgery, using both subjective and objective tests in preoperative and postoperative periods.”	CABG patients (n=45) and healthy patients (n=40)	<u>Sources:</u> <i>Subjective measures:</i> Sleep diary, self-reported survey <i>Objective measures:</i> Observational, actigraphy <u>Collection:</u> <i>Control group:</i> healthy Subjects who wore an actigraphy for 7 days <i>Experimental Group:</i> took place 3 days pre op, the first week PO, the 1 st month PO and the 2 nd month PO	1. Sleep latency & wakefulness after sleep onset times were longer in older patients than younger patients and sleep efficiency was decreased in older patients 2. It takes 1 month longer for older patients to return to normal sleep patterns <u>REASONS FOR SLEEP DISTURBANCES:</u> a. Surgical intervention: due to temporary deterioration of the circulation of the centers of the brain stem & hypothalamus that control sleep and awakening. b. age >65 years c. male sex
Zhang, 2015, China	Prospective cohort study	“To identify the incidence and independent	CABG patients (n=76)	<u>Source:</u> observational assessment, self-	1. Patients with poor quality of sleep & electrolyte imbalances had a higher risk of developing delirium

Hospital ICU	perioperative risk factors associated with postoperative delirium of patients who underwent CABG in a large ICU"	report questionnaires <u>Collection:</u> preoperative and during their hospital stay	2. poor quality of sleep, represented by symptoms of sleep disorder or sleep deprivation was an independent predictor of PO delirium 3. Of the 57 cases with poor quality of sleep, 36 cases developed delirium
--------------	--	--	--

Abbreviations: CABG (Coronary Artery Bypass Grafting), ET-1 (Endothelin 1), ICU (Intensive Care Unit), MAR (Medication Administration Record), NNI (nocturnal nursing interactions), PMR (Progressive Muscle Relaxation), PO (Post-Operative), POD (Post-Operative Day), PON (Post-Operative Night), TAVI (Transcatheter Aortic Valve Implantation), SAVR (Surgical Aortic Valve Replacement), SNS (Sympathetic Nervous System)

References

- Amofah, H., Broström, A., Fridlund, B., Bjorvatn, B., Haaverstad, R., Hufthammer, K., Kuper, K. K. J., Ranhoff, A. H., Norekvål, T. M., Thompson, D. R., & Moser, D. K. (2016). Sleep in octogenarians during the postoperative phase after transcatheter or surgical aortic valve replacement. *European Journal of Cardiovascular Nursing*, 15(2), 168-177. <https://doi.org/10.1177/1474515115620992>
- Aygin, D., & Şen, S. (2019). Acupressure on anxiety and sleep quality after cardiac surgery: A randomized controlled trial. *Journal of PeriAnesthesia Nursing*, 34(6), 1222-1231. <https://doi.org/10.1016/j.jopan.2019.03.014>
- Boitor, M., Martorella, G., Maheu, C., Laizner, A., & Gélinas, C. (2019). Does hand massage have sustained effects on pain intensity and pain-related interference in the cardiac surgery critically ill? A randomized controlled trial. *Pain Management Nursing*, 20(6), 572-579. <https://doi.org/10.1016/j.pmn.2019.02.011>
- Buyse, D. (2014). Sleep health: Can we define it? Does it matter? *SLEEP*, 37(1), 9-17. <https://doi.org/10.5665/sleep.3298>
- Canadian Institute for Health Information (2017). *Cardiac care quality indicators report*. https://secure.cihi.ca/free_products/cardiac-care-quality-indicators-report-en-web.pdf
- Carey, M. G., Qualls, B. W., Burgoyne, C. (2019). Patients' perception of stressful events in the intensive care unit after cardiac surgery. *American Journal of Critical Care*, 28(2), 149-151. <https://doi.org/10.4037/ajcc2019254>
- Caruana, N., McKinley, S., Elliot, R., & Gholizadeh, L. (2018). Sleep quality during and after cardiothoracic intensive care and psychological health during recovery. *Journal of*

Cardiovascular Nursing. 33(4). E40-E49.

<https://doi.org/10.1097/JCN.0000000000000499>

Casida, J., Davis, J., Shpakoff, L., & Yarandi, H. (2013). An exploratory study of the patients' sleep patterns and inflammatory response following cardiopulmonary bypass (CPB). *Journal of Clinical Nursing*, 23(15-16), 2332-2342.

<https://doi.org/10.1111/jocn.12515>

Casida, J., Davis, J., Zalewski, A., & Yang, J. (2018). Night-time care routine interaction and sleep disruption in adult cardiac surgery. *Journal of Clinical Nursing*, 27(7-8), e1377-e1384. <https://doi.org/10.1111/jocn.14262>

Choudhury, M., Gupta, A., Hote, M., Kapoor, P., Khanna, S., Kalaivani, M., & Kiran, U. (2017). Does sleep quality affects the immediate clinical outcome in patients undergoing coronary artery bypass grafting: A clinico-biochemical correlation. *Annals of Cardiac Anaesthesia*, 20(2), 193-199. https://doi.org/10.4103/aca.ACA_30_17

Conway, A., Nebauer, M., & Schulz, P. (2010). Improving sleep quality for patients after cardiac surgery. *British Journal of Cardiac Nursing*, 5(3), 142-147. <https://doi.org/10.12968/bjca.2010.5.3.46833>

Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D., Slooter, A. J., Pandharipande, P. P., Watson, P. L., Weinhouse, G. L., Nunnally, M. E., Rochweg, B., Balas, M. C., van den Boogaard, M., Bosma, K. J., Brummel, N. E., Chanques, G., Denehy, L., Kress, J. P., Lanphere, J. A., McKinley, S., ... Alhazzani, W. (2018). Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Critical Care Medicine*, 46(9). E825-E873. <https://doi.org/10.1097/CCM.0000000000003299>

- Díaz-Alonso, M., Smith-Plaza, M., Suárez-Mier, M., & Lana, M. (2018). Impact of a nurse intervention to improve sleep quality in intensive care units: Results from a randomized controlled trial. *Dimensions of Critical Care Nursing*, 37(6), 310-317. <https://doi.org/10.1097/DCC.0000000000000319>
- Engelman, D. T., Ali, W. B., Williams, J. B., Perrault, L. P., Reddy, V. S., Arora, R. C., Roselli, E. E., Khoynezhad, A., Gerdisch, M., Jerrold, H. L., Lobdell, K., Fletcher, N., Kirsch, M., Nelson, G., Engelman, R. M., Gregory, A. J., & Boyle, E. (2019). Guidelines for perioperative care in cardiac surgery: Enhanced recovery after surgery society recommendations. *JAMA Surgery*, 154(8), 755-766. <https://doi.org/10.1001/jamasurg.2019.1153>
- Gellerstedt, L., Medin, J., Kumlin, M., & Rydell Karlsson, M. (2015). Nurses' experiences of hospitalised patients' sleep in Sweden: A qualitative study. *Journal of Clinical Nursing*, 24, 3664-3673. <https://doi.org/10.1111/jocn.12985>
- Government of Canada (2017, February 10). *Heart Disease in Canada*. <https://www.canada.ca/en/public-health/services/publications/diseases-conditions/heart-disease-canada.html>
- Greve, H., & Pedersen, P. U. (2016). Improving sleep after open heart surgery: Effectiveness of nursing interventions. *Journal of Nursing Education and Practice*, 6(3), 15-22. <https://doi.org/10.5430/jnep.v6n3p15>
- Guo, P., East, L., & Arthur, A. (2012). A preoperative education intervention to reduce anxiety and improve recovery among Chinese cardiac patients: A randomized controlled trial. *International Journal of Nursing Studies*, 49(2), 129-137. <https://doi.org/10.1016/j.ijnurstu.2011.08.008>

- Hadjibalassi, M., Lambrinou, E., Papastavrou, E., & Papathanassoglou, E. (2018). The effect of guided imagery on physiological and psychological outcomes of adult ICU patients: A systematic literature review and methodological implications. *Australian Critical Care*, 31(2), 73-86. <https://doi.org/10.1016/j.aucc.2017.03.001>
- Hedges, C. (2005). Sleep, memory, and learning in off-pump coronary artery bypass patients. *Research in Nursing & Health*, 28(6), 462-473. <https://doi.org/10.1002/nur.20101>
- Hellström, A., Fagerström, C., & Willman, A. (2010). Promoting sleep by nursing interventions in health care settings: A systematic review. *Worldviews on Evidence-Based Nursing*, 8(3), 128-142. <https://doi.org/10.1111/j.1741-6787.2010.00203.x>
- Hu, R., Jiang, X., Chen, J., Zeng, Z., Chen, X., Li, Y., Huining, X., Evans, D. J. W., & Wang, S. (2015). Non-pharmacological interventions for sleep promotion in the intensive care unit. *The Cochrane Database of Systematic Reviews*, 10, 1-101. <https://doi.org/10.1002/14651858.CD008808.pub2>
- Kim, S. C., Pedersen, C., & Yi, C. (2018). Validity and reliability of sleep promotion questionnaire and predictors of quality of care. *SAGE Open Medicine* 6, 1-9. <https://doi.org/10.1177/2050312118794595>
- Le, A., Friese, R., Hsu, C., Wynne, J., Rhee, P., & O’Keeffe, T. (2012). Sleep disruptions and nocturnal nursing interactions in the intensive care unit. *Journal of Surgical Research*, 177(2), 310-314. <https://doi.org/10.1016/j.jss.2012.05.038>
- Liao, W., Huang, C., Huang, T., & Hwang, S. (2011). A systematic review of sleep patterns and factors that disturb sleep after heart surgery. *Journal of Nursing Research*, 19(4), 275-288. <https://doi.org/10.1097/JNR.0b013e318236cf68>

- MacCune, S. (2010). Effect of back massage on sleep among post-operative CABG and valve replacement patients. *The Nursing Journal of India*, 101(4), 86-88.
<https://pubmed.ncbi.nlm.nih.gov/21053666/>
- Machado, F. S., Souza, R. C. S., Poveda, V. B., & Costa, A. L. S. (2017). Non-pharmacological interventions to promote sleep of patients after cardiac surgery: A systematic review. *Revista Latino-Americana de Enfermagem*, 25, 2926-2936. <https://doi.org/10.1590/1518-8345.1917.2926>
- Matukatitis, J., Eckman, T., Baxter, K., Bradley, E., Hawrylack, H., Johnson, S., Mooney, R., Papanicolas, D., & Briggs, P. (2014). Sleepless in stepdown. *Nursing2014*, 44(7), 15-18.
https://journals.lww.com/nursing/Citation/2014/07000/Sleepless_in_stepdown.6.aspx
- McIntosh, A. E., & MacMillan, M. (2009). The attitudes of student and registered nurses to sleep promotion in hospitals. *International Journal of Nursing Practice*, 15(6), 560–565.
<https://doi.org/10.1111/j.1440-172X.2009.01770.x>
- Mukherjee, S., Patel, S., Kales, S., Ayas, N., Strohl, K., Gozal, D., & Malhotra, A. (2015). An official American thoracic society statement: The importance of healthy sleep. Recommendations and future priorities. *American Journal of Respiratory and Critical Care Medicine*, 191(12), 1450-1458. <https://doi.org/10.1164/rccm.201504-0767ST>
- Navarro-García, M., de Carlos Alegre, V., Martinez-Oroz, A., Irigoyen-Aristorena, M., Elizondo-Sotro, A., Indurain-Fernández, S., Martorell-Gurucharri, A., Sorbet-Amóstegui, M. R., Prieto-Guembe, P., Ordoñez-Ortigosa, E., García-Aizpún, Y., & García-Ganuza, R. (2017). Quality of sleep in patients undergoing cardiac surgery during the postoperative period in intensive care. *Enfermería Intensiva (English Ed.)*, 28(3), 114-124. <https://doi.org/10.1016/j.enfie.2017.03.002>

- Nerbass, F., Feltrim, M., Souza, S., Ykeda, D., & Lorenzi-Filho, G. (2010). Effects of massage therapy on sleep quality after coronary artery bypass graft surgery. *Clinics*, 65(11), 1105-1110. <https://doi.org/10.1590/S1807-59322010001100008>
- Nesami, M., Shorofi, S., Jafari, A., Khalilian, A., & Tabari, S. (2016). The relationship between stressors and anxiety levels after CABG in Sari, Iran. *Iranian Red Crescent Medical Journal*, 18(5), 1-7. <https://doi.org/10.5812/ircmj.25407>
- Ottawa Heart (2019). *Ottawa Heart Institute Facts*.
<https://www.ottawaheart.ca/about-us/who-we-are/ottawa-heart-institute-facts>
- Radtke, K., Obermann, K., & Teymer, L. (2014). Nursing knowledge of physiological and psychological outcomes related to patient sleep deprivation in the acute care setting. *MedSurg Nursing*, 23(3), 178-184.
<https://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=7aa99e3d-e62f-470d-98eb-ad083f242f84%40sdc-v-sessmgr01>
- Redeker, N. S., & Hedges, C. (2002). Sleep during hospitalization and recovery after cardiac surgery. *The Journal of Cardiovascular Nursing*, 17(1), 56-68.
<https://doi.org/10.1097/00005082-200210000-00006>
- Redeker, N. S., Hedges, C. (2006) Sleep and the cardiac surgery patient. In: T. Lee-Chiong (Ed.), *Sleep: A comprehensive handbook* (pp. 909-912). John Wiley & Sons, Inc.
- Redeker, N. S., Ruggiero, S., & Hedges, C. (2004). Sleep is related to physical function and emotional well-being after cardiac surgery. *Nursing Research*, 53(3), 154-162.
<https://doi.org/10.1097/00006199-200405000-00002>
- Spence, J. S., Murray, T. M., Tang, A., Butler, R., & Albert, N. (2011). Nighttime noise issues

- that interrupt sleep after cardiac surgery. *Journal of Nursing Care Quality*, 26(1), 88-95.
<https://doi.org/10.1097/NCQ.0b013e3181ed939a>
- Tamrat, R., Huynh-Le, M., & Goyal, M. (2014). Non-pharmacologic interventions to improve the sleep of hospitalized patients: A systematic review. *Journal of General Internal Medicine*, 29(5), 788-795. <https://doi.org/10.1007/s11606-013-2640-9>
- Tsai, M., Tsay, S., Moser, D., Huang, T., & Tsai, F. (2019). Examining symptom trajectories that predict worse outcomes in post-CABG patients. *European Journal of Cardiovascular Nursing*, 18(3), 204-214. <https://doi.org/10.1177/1474515118809906>
- Wesseliuss, H. M., van den Ende, E. S., Alisma, J., ter Maaten, J. C., Schuit, S. C. E., Stassen, P. M., de Vries, O. J., Kaasjager, K. H. A. H., Haak, H. R., van Doormaal, F. F., Hoogerwerf, J. J., Terwee, C. B., van de Ven, P. M., Bosch, F. H., van Someren, E. J. W., & Nanayakkara, P. W. B. (2018). Quality and quantity of sleep and factors associated with sleep disturbance in hospitalized patients. *JAMA Internal Medicine*, 178(9), 1201-1208. <https://doi.org/10.1001/jamainternmed.2018.2669>
- Yayla, A., & Özer, N. (2019). Effects of early mobilization protocol performed after cardiac surgery on patient care outcomes. *International Journal of Nursing Practice*, 25(6), 1-11. <https://doi.org/10.1111/ijn.12784>
- Ye, L., Keane, K. C., Johnson, S., & Dykes, P. (2013). How do clinicians assess, communicate about, and manage patient sleep in the hospital? *The Journal of Nursing Administration*, 43(6), 342-347. <https://doi.org/10.1097/NNA.0b013e3182942c8a>
- Yilmaz, H., & Iskesen, I. (2007). Follow-up with objective and subjective tests of the sleep characteristics of patients after cardiac surgery. *Circulation Journal: Official*

Journal of the Japanese Circulation Society, 71(10), 1506-1510.

<https://doi.org/10.1253/circj.71.1506>

Yilmaz, M., Sayin, Y., & Gurler, H. (2012). Sleep quality of hospitalized patients in surgical units. *Nursing Forum*, 47(3), 183-192. <https://doi.org/10.1111/j.1744-6198.2012.00268.x>

Zhang, W., Wu, W., Gu, J., Sun, Y., Ye, X., Qiu, W., Su, C., Zhang, S., & Ye, W. (2015). Risk factors for postoperative delirium in patients after coronary artery bypass grafting: A prospective cohort study. *Journal of Critical Care*, 30(3), 606-612.

<https://doi.org/10.1016/j.jcrc.2015.02.003>

Chapter Two

Methodology

The purpose of this chapter is to describe the methodology of this thesis. Specifically, I will describe the guiding and complementary model and theoretical framework, study design, survey development, setting, sample, recruitment process, data collection, and data analysis.

Theoretical Frameworks

Two theoretical frameworks guided this research in distinct and complementary ways. First, the Roy Adaptation Model (Roy, 2006) guided the overall research project, specifically in regard to the concept of sleep, the nurses' role in sleep promotion, and the nursing interventions to promote positive adaption and equilibrium for cardiac surgery inpatients. As indicated in the literature review, there are many factors that affect nurses' ability to promote sleep. For this reason, I selected the Theoretical Domains Framework (TDF) (Michie et al., 2005) to guide my data collection and analysis. Specifically, the TDF guided the identification of the barriers and enablers to nurses' use of sleep promotion practices to support patients' sleep during the recovery after cardiac surgery. First, I will describe Roy's Adaptation Model and how it has guided the content of this thesis. I will then describe the TDF in greater detail in this chapter's *Survey Development* section.

Roy's Adaptation Model

Sister Callista Roy's view of people as adaptive, holistic systems provided a paradigm for the way that nurses connect with and relate to the individuals, groups, neighbourhoods, and populations of which they are a part (Roy, 2006). Roy stressed that nurses have a responsibility to devote to health by focusing on the life processes of people in their environments (Roy, 2006).

The RAM posits that a person is an adaptative system which is in continuous communication with an everchanging environment (Roy, 2006). Stimuli from the external and internal environment trigger coping processes in each person, which yield behavioural responses

corresponding to four modes of adaptation: (1) physiological needs, (2) self-concept (3) role function, and (4) interdependence (Roy, 2006). *Physiological Needs* include the physiological activities of the body's cells, tissues, organs, and systems (Roy, 2006). The *Self-Concept* mode focuses on a person's feelings and beliefs about herself/himself (Roy, 2006). The *Role Function* mode encompasses the position that one occupies in society and the behaviours that they enact because of this position (Roy, 2006). The *Interdependence* mode is the combination of one's relationship and interactions with others (Roy, 2006). The graphical representation of Roy's Adaptation Model featuring these four modes can be viewed in Appendix B.

This model guided my thesis by providing insight into the role of nurses in relation to patients' sleep, as patients adapt to the hospital environment and bodily changes post-operatively. For instance, following surgery, the nurse is responsible for ensuring that their patients' physiologic needs are met, such as oxygenation, mobility, infection prevention, pain control, and need for sleep. Goals of care are focused on ensuring that the patient can adequately care for themselves once discharged (which includes encouraging adequate sleep and sleep hygiene) (*Physiological Needs*). The nurse would also ensure that the patient has the knowledge to live in their temporary new role as a recovering surgery patient (*Role Function*). As the patient transitions home, the nurse would ensure that their support people are adequately trained and available to assist them in adjusting (*Interdependence*). Lastly, the nurse would assist in ensuring the patient's integrity of their self-concept during their hospitalization (*Self-concept*).

This model recognizes that it is the nurses' role to be proactive and manage stimuli that influence patients' adaptation (Roy, 2006). This model states that positive adaptation promotes health and integrity and negative adaptation leads to disequilibrium and disease (Roy, 2006). The

responses from the four modes can support integrity and wholeness (positive adaption) or be ineffective in adding to the goals of the holistic system (Roy, 2006).

Assessing for and mitigating a patient's sleep disturbance is a crucial aspect of providing holistic nursing care to patients (MacCune, 2010). Nurses hold an important role in journeying patients through the adaptation process in order to reach optimal recovery post-surgery and health. Roy labelled nursing interventions as actions that increase, change, maintain or decrease environmental stimuli (Roy, 2006). In the context of sleep, nurses' interventions involve maintaining an environment that promotes sleep, helping patients adjust to the environmental factors that may impact their sleep, or increasing comfort measures. In addition, nurses need to be cognisant of the nurse-related factors that influence their patients' sleep.

Díaz-Alonso and colleagues (2018) conducted a study on the nurse's role in promoting patients' sleep promotion in the hospital setting. These researchers developed a nursing education intervention guided by the RAM to prepare patients to anticipate potential stressful stimulus post-cardiac surgery and assist them in using practical adaptive behaviours to overcome them (Díaz-Alonso et al., 2018).

The RAM provided guidance throughout this thesis as nurses' role in promoting sleep addresses all four modes as described above. The RAM kept my focus on the role of nursing and how nurses can anticipate and address stimuli that affect patients' ability to sleep well in the hospital environment.

Objectives

The overall aim of this thesis was to investigate the sleep promotion practices used by registered nurses in the cardiac post-surgical setting, and to identify the factors that influence their use. Specific objectives included:

- 1) To determine the type and extent of sleep promotion practices used by nurses in the cardiac post-surgery population.
- 2) To determine if there is a difference in type and extent of nurses' sleep promotion practices by setting (critical care vs. ward)
- 3) To identify the barriers and enablers to nurses' use of sleep promotion practices in the cardiac post-surgery inpatient population based on setting (critical care vs. ward).

Study Design

A cross-sectional survey study was conducted. A cross-sectional design captures the status of a phenomenon at a single period of time (Polit & Beck, 2017). A self-reported survey was chosen because it provides data that is based on real-world occurrences can produce a large amount of data in a shorter period of time, and can examine a wide breadth of items on a particular topic (Kelley et al., 2003).

Setting

The study took place at the University of Ottawa Heart Institute (UOHI), an academic cardiac center in Eastern Ontario. Registered Nurses (RNs) were recruited from three units where care is provided to patients following cardiac surgery: the Cardiac Surgery Intensive Care Unit (CSICU) and two hospital ward units (H3 and H4). In the CSICU, there were 22 beds. On H3 and H4, there were 64 beds in total. Across the three units, there were 204 RNs employed (including casual, part time, and full time) during the time of recruitment.

At the UOHI, the trajectory of care for patients' post-cardiac surgery is as follows: immediately after surgery patients are taken to the CSICU where they generally stay for one day. On post-operative day one, if there are no major complications, patients are transferred to the cardiac surgery ward for four to five days. By post-operative day five, the majority of patients

are discharged. Currently, there are no sleep promotion protocols guiding sleep promotion practices on any unit at the UOHI.

Sample

The sample consisted of RNs working with cardiac post-surgery inpatients. The RNs were categorized into two groups: (1) cardiac surgery nurses who work in the CSICU and (2) cardiac surgery nurses who work on the surgical wards (H3 and H4). As per institutional policy, nurses are employed in either the CSICU or the ward units; they cannot work in both areas. It is possible that some nurses may have previously worked on the ward unit and have transitioned to the CSICU or vice versa. With this in mind, survey respondents were asked to specify which unit they were currently working on.

Sample size

A sample size of 80 was determined for this study, based on the required sample size to conduct the statistical analysis (t-test) which we had anticipated to conduct for the second and third objective (to determine the barriers and enablers to sleep promotion) (Polit, 2010). At the time of recruitment, the number of eligible nurses was 204. Based on a conservative 50% response rate, 102 participants were expected to respond, which was well above the required sample size.

Recruitment Process

All nurses employed by the UOHI on the units identified above were recruited using a census sampling approach (Lavraka, 2008). Recruitment strategies included: (1) posters in the staff rooms, (2) study packages handed out by myself (AH) during various shifts, and (3) emails sent through the units' nurse educator.

First, at the beginning of the six-week recruitment period, I placed recruitment posters on each unit's staff room bulletin boards. The posters (Appendix C) included a brief description of the research, my contact information in case further information was needed, and a link and QR code to access the questionnaire. Second, I visited the units on a variety of different shifts to explain the study and distribute information packages with the intent to reach as many potential participants as possible. The package included a survey information letter (Appendix D), the link to the online survey, and both a tea bag and an instant coffee package as a small incentive. Third, each unit's nurse educator emailed the study recruitment message to all staff nurses (see 0) which included the survey information letter and a direct link to the survey. Following the initial invitation (February 7, 2020), a follow up email was sent at approximately one week (February 18, 2020) and two weeks later (March 2, 2020). The follow up email was sent to all potential participants regardless of whether they had filled out the survey or not, as I did not know who had completed the survey since personal identifiable information, such as names and contact information, was not collected.

As an added incentive to encourage participation, there was a competition between the three units. We informed eligible participants that the unit which completed the most surveys would receive a unit incentive (i.e. pizza lunch). Since the CSICU had more employed RNs than the two ward units, the winner was determined based on the ratio of completed surveys to nurses on the unit. I promoted this competition weekly with a poster showing response rates from each unit.

Survey Development

In the absence of tools and instruments to investigate our phenomenon of interest, the research team developed a study-specific survey. The survey consisted of three sections:

demographics, sleep promotion practices, and a TDF based questionnaire assessing the barriers and enablers to nurses' use of sleep promotion practices (Appendix F). To ensure that the survey was filled out by the population of interest, an eligibility question was posed at the start of the survey: *Are you a RN who provides care to post-cardiac surgery patients at the University of Ottawa Heart Institute?* If they answered no, then they were exited out of the survey.

Survey Section 1. Demographics

The following socio-demographic characteristics were collected: gender, age, years of nursing experience, years of experience on the unit of current employment, highest level of education achieved (college diploma, university degree, master's degree or higher), employment status (full-time, part-time, casual), unit of employment (CSICU, H3, or H4), and the type of shift worked most of the time (night shift, day shift, or both).

Survey Section 2. Sleep Promotion Practices

This section focused on participants' use, and perception and acquisition of knowledge of sleep promotion practices with cardiac post-surgical patients. The first two questions used the five categories of sleep promotion practices identified in my literature review (relaxation techniques, devices or equipment to help induce sleep, educational strategies, decreasing noise, and prophylactic promotion). There was an open-text *other* category if the participant used sleep promotion practices that were outside of the categories listed. If participants selected this option, they were prompted to name and describe the practice. To determine the frequency of their use, participants were asked to rate their use of each category of sleep promotion practices on a 5-point Likert scale where 1=never, 2=rarely, 3=sometimes, 4=often, and 5=very often. To determine participants' perception of how beneficial the practices were in promoting patients' sleep, they were asked to rank the types of sleep promotion practices from 1 (most beneficial) to

5 (least beneficial). Question three asked participants to identify the source of their sleep promotion knowledge (i.e. formal nursing education, personal experience, advice from mentors, advice from patients, professional development or other).

Section 3: Barriers and Enablers to Sleep Promotion – TDF-Guided Questionnaire

To identify the barriers and enablers to nurses' use of sleep promotion practices in the cardiac post-surgery population, the TDF was used as a framework to guide the creation of the questionnaire items.

Theoretical Domains Framework

The TDF is a framework encompassing 33 theories of behaviour change with 14 domains and 84 component constructs (Cane et al., 2012). This framework was created to streamline and harmonize an overabundance of behaviour change theories and to make behaviour change theory more usable to, and accessible by, other disciplines (Cane et al., 2012).

The main advantages of the TDF include extensive coverage of potential influences on behaviour, component constructs which provide clarity about each type of influence, utilization in both qualitative and quantitative data collection, and the ability to make links between approaches of behaviour change to address implementation challenges (Cane et al., 2012). There are 14 domains in the TDF: (1) knowledge, (2) skills, (3) social/professional role and identity, (4) beliefs about capabilities, (5) optimism, (6) beliefs about consequences, (7) reinforcement, (8) intentions, (9) goals, (10) memory, attention and decisions processes, (11) environmental context and resources, (12) social influences, (13) emotion, and (14) behavioural regulation (Cane et al., 2012). Each domain holds a varied number of constructs ranging from three to 11 per domain (Cane et al, 2012). For instance, the knowledge domain holds the following constructs:

knowledge, procedural knowledge, and knowledge of the task environment. See Table 3.1 for a table of all the domains, constructs, and their associated definitions.

I selected the TDF to guide my data collection to ensure that my findings were founded in a preestablished, evidence-based theory and not based solely on the researcher's, or healthcare provider's intuition or experience. This framework was useful for my intended study aims because it provided a guide for classifying and analyzing behaviours (Atkins et al., 2017).

Questionnaire Item Development

As per the guidance by Atkins and colleagues (2017), previously published TDF-based questionnaires were used as templates (Gnich et al., 2015; Huijg, Gebhardt, Crone, Dusseldorp, & Presseau, 2014; Huijg, Gebhardt, Dusseldorp, Verheijden et al., 2014; Skoien et al., 2016; Taylor Lawton, & Conner, 2013; Taylor, Parveen, Robins, Slater, Lawton, 2013). I utilized a similar questionnaire development approach as Huijg, Gebhardt, Dusseldorp, Verheijden et al. (2014), which was shown to have high consistency reliability and content validity. To begin, I adapted items from existing TDF-based questionnaires representing TDF constructs (Gnich et al., 2015; Huijg, Gebhardt, Crone, Dusseldorp, & Presseau, 2014; Huijg, Gebhardt, Dusseldorp, Verheijden et al., 2014; Skoien et al., 2016; Taylor Lawton, & Conner, 2013; Taylor, Parveen, Robins, Slater, Lawton, 2013) to nurses' sleep promotion activities in the inpatient setting and organized them according to the 14 TDF domains. Each item was rated on a 6-point Likert scale where 6=very strongly agree, 5=strongly agree, 4=agree, 3=disagree, 2=strongly disagree, and 1=very strongly disagree. A neutral score was specifically avoided (*neither agree nor disagree*) because it does not provide an answer as to whether the item is a barrier or an enabler.

Preliminary items were then presented and discussed with the research team where they were further adjusted to ensure relevance to the cardiac post-surgery inpatient population. If

there was an important construct that was not explicitly covered, a new item was created informed by Cane and colleagues' definitions (2017) (see Table 3.1). A draft of the questionnaire was peer reviewed by a researcher with extensive TDF research experience, and a psychologist with content expertise in cardiac patients' sleep. With their feedback, items were revised by the research team and eliminated if deemed irrelevant or repetitive. A detailed log was kept with rationales for each eliminated item/construct.

Pre-Testing of the Questionnaire

As per Devellis (2003)'s guide to scale development, we utilized multiple strategies to ensure that the questionnaire items were not double-barreled, negatively worded, had ambiguous pronoun references, or exceptionally lengthy. Prior to the survey's formal launch, the questionnaire was pre-tested with twelve nurses external to the eligible sample so as to not lose potential participants to pre-testing, using the *think aloud* (Collins, 2003) method to ensure that the survey items were understood as intended, could be adequately answered, and to determine the average time taken to answer them. There was open dialogue between each respondent and I (AH) as the survey was completed. During this time the respondent stated their thoughts and asked questions. This allowed me to have a clear understanding of how the items were interpreted by respondents. Following every three to four pre-tests, the research team met to adjust items based on their suggested modifications. There were three iterations of this process with 12 participants in total.

Ethical Approval

Ethical approval to complete this study was obtained from the Ottawa Health Science Network Research Ethics Board (OHSN-REB) (20200009-01H) and the University of Ottawa

Office of Research Ethics and Integrity (H-01-20-5434). Other ethical considerations such as implied consent and confidentiality of information were ensured throughout the research process.

Data Collection

The questionnaire was hosted on REDCap (www.project-redcap.org), a secure web application for creating and directing online surveys which is available on computers and on mobile devices. The participants could access the survey through the link and QR code provided on the poster, information packages, and emails. Submitting the survey constituted as consent. The survey was launched on February 7th, 2020 and closed on March 20th, 2020, a six-week recruitment period which aligned with the timeline and the feasibility of a master's thesis project.

Data Analysis

This section describes the preliminary data management and the analytical approach used for the 1) participant demographics, 2) objective one, 3) objective two, 4) objective three, and 5) open-ended questions. The data was housed on password-protected computers and transferred from REDCap to IBM SPSS version 26 Statistics for Mac, where all statistical analyses were performed. Statistical significance was set at an alpha of .05

Preliminary Data Management

The first step was to review and evaluate the data to gain a general idea of the results. Specifically, we looked for illogical responses and incompleteness of data. Decision rules were created and documented in terms of use of these responses, which guided the data cleaning process (Appendix G). All missing data were coded in SPSS with the code: 999. A missing data analysis was completed, using SPSS, and the distributions were analyzed for each item. If the participant only completed *Section 1: Demographics* without providing any responses for the rest of the survey, then those cases were eliminated (n=3). However, if the participant completed

sections after the demographic section, then responded items were included in the analysis and the incomplete portion eliminated. In one case, the unit of work was not specified. Since comparison across units is a major study objective, this case was eliminated.

Participant Demographic Characteristics

Demographic profiles were created for each setting: CSICU nurses and ward nurses (H3 and H4 combined). Frequencies and percentages were determined for categorical variables (e.g. gender, age, educational achievement, unit of employment, common shift worked, and employment status). To compare these variables between both groups, chi square tests were run for items with normal distributions and a Fishers Exact test was run for items that did not satisfy that requirement. Means and standard deviations were determined for continuous variables (e.g. years of nursing experience and years of unit experience). To compare these variables between groups, a Mann Whitney U test was computed for each item, since the items were significantly skewed and did not meet the assumptions for a t test.

Objective One

The first objective was to determine the type and extent of sleep promotion practices used by nurses in the cardiac post-surgical population. To satisfy this objective, the data from the *Section 2: Sleep Promotion Practices* section of the survey were analyzed. Percentages, frequencies, and central tendencies of the items were presented for the total sample. Due to the fact that many of the items were significantly skewed, median values were presented for each item by setting (CSICU or ward) and for the total sample. The median value of each item was used to order the frequency of use. The item was considered frequently used if the participant marked it as *often* or *very often*.

Objective Two

The second objective was to determine the difference in nurses' sleep promotion practices by setting (CSICU or ward). To satisfy this objective, the data from *Section 2: Sleep Promotion Practices* were analyzed. A test of significance was computed for both settings if there was a difference in the medians. A Mann Whitney U test was run because the items were severely skewed as determined by calculating the error of skewness. Any items that were statistically significant ($p < .05$) were highlighted and their results verified by JS and KL to ensure there was no error when computing the data. In this section, the responses included in the open-text field *Other: Please Specify* were analyzed, organized and presented using content analysis (Krippendorff, 2004). The responses were synthesized and were separated into additional sleep promotion practice categories over and above the ones identified in my literature review. The qualitative analysis was done by AH and verified by JS and KL.

Objective Three

The third objective was to identify the barriers and enablers to nurses' sleep promotion practices by setting (CSICU compared to the ward). To satisfy this objective, the Likert scale responses in the survey *Section 3: Barriers and Enablers to Sleep Promotion Practices* were analyzed to determine the barriers and enablers to the use of sleep promotion practices in the cardiac post-surgery inpatient population. Negatively worded items ($n=14$) were reverse coded in SPSS (Appendix H). All TDF items were presented in a table with their mean, maximum and minimum values, and standard deviation. All items with means of 3.5 (agreement) or greater were labelled as enablers, and all items with means of 3.49 and less were labelled as barriers. This scoring was verified by looking at the proportions to ensure that the data was accurately labelled, for instance if the proportion of agreement was greater than 50% then it confirmed that

the item should be labelled as an enabler (see Appendix G for the decision rules). The items were then ordered based on the proportions. Items that contrasted based on setting (e.g. was an enabler in the CSICU but a barrier in the ward) were identified and categorized in a table. The statistical analysis was completed by AH and verified by JS and KL.

Open-Ended Questions

At the end of the questionnaire, participants were given the opportunity to add any additional information regarding sleep promotion practices in an open-text comment section. Responses were coded and organized using content analysis (Krippendorff, 2004) and presented themes and subthemes. This process was done by AH and verified by JS.

References

- Atkins, L., Francis, J., Islam, R., O'Connor, D., Patey, A., Ivers, N., Foy, R., Duncan, E. M., Colquhoun, H., Grimshaw, J. M., Lawton, R., & Michie, S. (2017). A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science*, 12(1), 1-18. <https://doi.org/10.1186/s13012-017-0605-9>
- Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the Theoretical Domains Framework for use in behaviour change and implementation research. *Implementation Science*, 7, 1-17. <https://doi.org/10.1186/1748-5908-7-37>
- Collins, D. (2003). Pretesting survey elements: An overview of cognitive methods. *Quality of Life Research*, 12, 229-238. Kluwer Academic Publishers
- DeVellis, R. F. (2003). Guidelines in scale development. In M. H. Seawell (Ed.), *Scale development theory and applications*. 2nd edition (pp. 60-101). SAGE Publications
- Díaz-Alonso, M., Smith-Plaza, M., Suárez-Mier, M., & Lana, M. (2018). Impact of a nurse intervention to improve sleep quality in intensive care units: Results from a randomized controlled trial. *Dimensions of Critical Care Nursing*, 37(6), 310-317. <https://doi.org/10.1097/DCC.0000000000000319>
- Gnich, W., Bonetti, D., Sherriff, A., Sharma, S., Conway, D. I., & Macpherson, L. M. D. (2015). Use of the theoretical domains framework to further understanding of what influences application of fluoride varnish to children's teeth: A national survey of general dental practitioners in Scotland. *Community Dentistry and Oral Epidemiology*, 43(3), 272-281. <https://doi.org/10.1111/cdoe.12151>

- Huijg, J., Gebhardt, W. A., Crone, M. R., Dusseldorp, E., & Presseau, J. (2014). Discriminant content validity of a theoretical framework questionnaire for use in implementation research. *Implementation Science*, 9 (11), 11-27. <https://doi.org/10.1186/1748-5908-9-11>
- Huijg, J. M., Gebhardt, W. A., Dusseldorp, E., Verheijden, M. W., van der Zouwe, N., Middelkoop, B. J., & Crone, M. R. (2014). Measuring determinants of implementation behavior: Psychometric properties of a questionnaire based on the theoretical domains framework. *Implementation Science*, 9, 33-48. <https://doi.org/10.1186/1748-5908-9-33>
- Krippendorff, K. (2004). *Content analysis: An introduction to its methodology (2nd edition)*. Sage Publications Inc.
- Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, 15(3), 261-266. <https://doi.org/10.1093/intqhc/mzg031>
- Lavrakas, P. J. (2008). *Encyclopedia of survey research methods*. Sage Publications Inc. <https://doi.org/10.4135/9781412963947>
- MacCune, S. (2010). Effect of back massage on sleep among post-operative CABG and valve replacement patients. *Nursing Journal of India*, 101(4), 86-88. <https://pubmed.ncbi.nlm.nih.gov/21053666/>
- Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., & Walker, A. (2005). Making psychological theory useful for implementing evidence based practice: A consensus approach. *Quality and Safety in Health Care*, 14(1), 26-33. <https://doi.org/10.1136/qshc.2004.011155>
- Polit, D. F. (2010). T Tests: Testing two mean differences. In M. Connor (Ed). *Statistics and data analysis for nursing research* (pp. 114-136). Pearson Education Inc.

Polit, D.F., & Beck, C.T. (2017). *Nursing research: generating and assessing evidence for nursing practice*. (10th edition). Wolters Kluwer.

Roy, C. (2006). *The Roy adaptation model third edition*. Pearson.

Skoien, W., Page, K., Parsonage, W., Ashover, S., Milburn, T., & Cullen, L. (2016). Use of the theoretical domains framework to evaluate factors driving successful implementation of the accelerated chest pain risk evaluation (ACRE) project. *Implementation Science*, 11(1), 136-147. <https://doi.org/10.1186/s13012-016-0500-9>

Taylor, N., Lawton, R., & Conner, M. (2013). Development and initial validation of the determinants of physical activity questionnaire. *The International Journal of Behavioral Nutrition and Physical Activity*, 10(1), 1-11.
<https://ijbnpa.biomedcentral.com/articles/10.1186/1479-5868-10-74>

Taylor, N., Parveen, S., Robins, V., Slater, B., & Lawton, R. (2013). Development and initial validation of the Influences on Patient Safety Behaviours Questionnaire. *Implementation Science*, 8(1), 1-8.
<https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-8-81>

Chapter Three

Barriers and Enablers to Nurses' Use of Sleep Promotion Practices in the Cardiac Post-Surgery Inpatient Population: A Theoretical Domains Framework Guided Survey Study

This chapter is formatted for submission to the Heart & Lung Journal

Amanda Hummel¹, Janet E. Squires^{1,2}, Chantal Backman¹, Amy Charlebois³, Carolyn Cooper³,

Krystina B. Lewis^{1,3}

¹School of Nursing, University of Ottawa

²Ottawa Hospital Research Institute

³University of Ottawa Heart Institutettawa Hospital Research Institute

ABSTRACT

BACKGROUND: Poor sleep is common among cardiac post-surgery inpatients. Nurses are well positioned to ensure proper sleep promotion.

OBJECTIVES: To investigate non-pharmacological sleep promotion practices (SPP) used by nurses in cardiac post-surgical settings, and to identify the factors influencing their use.

METHODS: A Theoretical Domains Framework guided cross-sectional survey was completed by cardiac surgery intensive care and ward nurses at a Canadian cardiac centre. All statistical analysis were performed on IBM SPSS ($p < 0.05$).

RESULTS: Ninety-one surveys were used in the analysis. Frequently used SPP were orienting inpatients to the room ($n = 88$, 96.7%) and providing additional bedding ($n=86$, 96.6%). Nurses ranked decreasing noise as the most beneficial SPP. Common enablers to SPP were knowledge of its benefits ($n=72$, 100%) and understanding of its importance ($n=77$, 98%). Common barriers were competing priorities ($n=60$, 83%) and lack of recognition from healthcare professionals ($n=61$, 86%).

CONCLUSIONS: Identified barriers offer targets for the design/development of behavior change interventions to optimize nurses' SPP among cardiac post-surgical inpatients.

Key words: Sleep, Sleep Promotion, Cardiac Surgery

Introduction

Adequate sleep is crucial to overall health and wellbeing¹ and is important in recovery from illness and surgery.²⁻⁸ In the cardiac post-surgery inpatient population specifically, poor sleep is common and associated with negative outcomes such as increased hospital mortality, increased post-operative anxiety, delirium, depression, and decreased quality of life.⁹⁻¹¹ Cardiac post-surgery inpatients experience serious sleep inadequacies during their hospital recovery, most often during the first post-operative week.^{4,5,7,12,13} Many of the factors that contribute to poor sleep in the hospital can be mitigated by incorporating simple changes to hospital routines.¹⁴ However, creating and maintaining a culture that efficiently and consistently promotes sleep in the hospital is challenging.^{15,16}

Reasons for Poor Sleep

A myriad of patient-, cardiac surgery-, healthcare provider-, and environment-related factors can affect cardiac post-surgical inpatients' sleep. Patient-related factors include chronic comorbidities (e.g. arthritis, asthma, and obstructive sleep apnea).^{4,17} Cardiac-surgery-related factors include pain,^{2,3} the inflammatory effects of a sternotomy,⁴ and anxiety.^{3,7} Healthcare provider-related factors include continuous monitoring and nursing care activities during sleeping hours.⁴⁻⁷ Environmental-related factors include the setting of care^{2,18} and noise.^{7,8,18}

Sleep Promotion Practices

Critical care and staff ward nurses are well-positioned to promote inpatients' sleep.¹⁹ In this paper, we have defined sleep promotion practices as non-pharmacological actions taken by nurses to assist their patients in achieving optimal sleep. In this study, we focused on non-pharmacological sleep promotion practices because: 1) there is evidence to support their effectiveness to promote inpatients' sleep,²⁰ 2) they are considered a safer alternative to sleep-

inducing pharmacological agents,²¹ and 3) their delivery is within the scope of nursing practice. We identified five categories of non-pharmacological sleep promotion practices in the literature, targeting either patients or nurses. Sleep promotion practices targeting *patients* included: 1) relaxation techniques (e.g. maintaining a comfortable environment^{4,8,11}, providing a back rub/massage,^{3,6,22,24} and guided imagery^{20,23}) 2) devices or equipment to minimize sleep interruptions (e.g. eye masks,²⁰ ear plugs,²⁰ headphones,²⁰ and white noise machines⁸); and 3) educational strategies (e.g. patient education,^{20,25} encouraging daytime activity²⁶, and non-pharmacological management of post-operative complications²⁰). Sleep promotion practices targeting *nurses* included: 1) noise reduction (e.g. decreasing the volume of intravenous alarms, talking in quiet voices, and ensuring proper placement of heart monitor leads to minimize unnecessary/false alarms)⁸; and 2) prophylactic promotion (e.g. clustering care,²⁷ and avoiding non-essential care while the patient is sleeping^{5,27,28}).

Barriers and Enablers to Nurses' Use of Sleep Promotion Practices

Nurses face numerous barriers to sleep promotion²⁹ which contribute to an inadequate sleeping environment for patients.³⁰ In various acute care settings, known barriers to sleep promotion practices include nurse-related factors such as inadequate knowledge of sleep and sleep promotion practices,^{20,29} and nurses' negative attitudes and beliefs regarding the importance of inpatients' sleep.²⁰ Environmental barriers include lack of managerial support and lack of resources to guide sleep assessments.²⁹ Enablers include knowledge³¹ and nurses' values of the importance of sleep.²⁰ However, the barriers and enablers to nurses' sleep promotion practices in the cardiac post-surgery population have not been well explored. Further investigation is needed regarding the types of sleep promotion practices that are used by nurses

and the factors influencing their use with this population to optimize the delivery of sleep promotion practice by nurses and, ultimately, improve cardiac post-surgery inpatients' sleep.³²

The overall aim of this study was to investigate the non-pharmacological sleep promotion practices used by nurses in two cardiac post-surgical settings, the cardiac surgical intensive care unit (CSICU) and cardiac surgical wards, and to identify the factors that influence their use. The specific objectives were:

- 1) to determine the type and extent of sleep promotion practices used by nurses in the cardiac post-surgical population; and
- 2) to determine if there is a difference in type and extent of nurses' sleep promotion practices by setting (CSICU vs. ward); and
- 3) to identify the barriers and enablers to nurses' use of sleep promotion practices in the cardiac post-surgery inpatient population by setting (CSICU vs. ward).

Methods

Study Design

We conducted a cross-sectional study. We invited cardiac surgical registered nurses to participate in a one-time self-reported questionnaire. We obtained ethical approval from the Ottawa Health Science Network Research Ethics Board (OHSN-REB) (20200009-01H) and the University of Ottawa Office of Research Ethics and Integrity (H-01-20-5434).

Setting

We distributed the questionnaire to registered nurses working in the CSICU and two wards) at a Canadian cardiac centre, where there are currently no sleep promotion protocols guiding clinical practice.

Participants, Sample Size, and Recruitment

Eligibility criteria included of registered nurses who provide direct care for cardiac surgery patients in either the CSICU or the wards. In total, the eligible study population was 204 nurses. To conduct the anticipated statistical analysis (t-test), a sample size of 80 was needed.³³

We recruited potential participants through a census sampling approach. Recruitment strategies included: 1) posters placed in the staff rooms, 2) study packages distributed to nurses during various shifts, and 3) emails sent by the units' nurse educators. We included one coffee and one tea bag in each study package as an incentive. To promote competition between units, we awarded a complimentary lunch to the unit with the highest response rate of submitted surveys.

All data were collected via a three-part online questionnaire which was hosted on RedCap 8.5.6.³³ A direct link to the survey was available on the recruitment posters, in the information packages and the recruitment emails. Participants could access the survey for a six-week period from February 7th, 2020 to March 20th, 2020. In the study information letter and on the first page of the questionnaire link, the participants were informed that submitting the questionnaire implied consent.

The Survey

Guided by the existing literature on sleep promotion practices and the Theoretical Domains Framework (TDF) (described below),^{34,35} we developed a questionnaire that specifically addressed our study aims. The three-part questionnaire included the following sections: (1) demographics, (2) sleep promotion practices, (3) barriers and enablers to nurses' use of sleep promotion practices.

Section 1: Socio-Demographics

Socio-demographics collected included: gender, age, years of nursing experience, unit of employment, years of nursing experience on the current unit, level of education, employment status, and most common shift worked.

Section 2: Sleep Promotion Practices

Items in this section focused on five categories of sleep promotion practices, which were derived from existing literature^{3-6,8,11,20,22-28}: 1) relaxation techniques, 2) devices or equipment to help induce sleep, 3) educational strategies, 4) decreasing noise, and 5) prophylactic promotion. For each of the five sleep promotion categories, we asked questions to determine participants' use of sleep promotion practices and their perceived benefit of sleep promotion practices. All questions were asked using a 5-point Likert scale from 1 (never) to 5 (very often) with the exception of one question in which participants were asked to rank the types of sleep promotion practices from 1 (most beneficial) to 5 (least beneficial). In addition, we asked participants to identify the source of their sleep promotion practice knowledge using a multiple choice *select all that apply* question.

Section 3: Barriers and Enablers to Nurses' Use of Sleep Promotion Practices

To identify the barriers and enablers to nurses' use of sleep promotion practices in the cardiac post-surgery population, we designed a questionnaire guided by the TDF. This ensured that our barriers/enablers assessment was founded in a preestablished, evidence-based theory. The TDF is an overarching framework of behaviour change encompassing 33 theories with 14 theoretical domains and 84 component constructs (see Table 3.1).^{34,35} As per published guidance regarding TDF use in research,³⁶ we used previously published TDF-based questionnaires³⁷⁻⁴² as

preliminary templates to guide our questionnaire development. Where possible, we adapted previous items to fit our topic and population. If a construct was not explicitly presented in an existing item, we created new items informed by the TDF domain and construct definitions.³⁵ In total, 66 items were included. All items were rated on a 6-point Likert scale from 1 (very strongly agree) to 6 (very strongly disagree).

Section 4: Additional Comments

On the last page of the questionnaire, an open-text field allowed participants to provide additional comments about sleep promotion.

Questionnaire Pre-testing

To determine face and content validity, we presented the items to a psychologist with expertise in sleep in cardiac patients. The questionnaire was also pre-tested with nurses to ensure that items were understood as intended and to determine the average time needed to answer all items. Twelve nurses, not part of the main study sample, were involved in the pre-testing using the *think aloud* method⁴³ where respondents stated their thoughts while filling out the questionnaire. Once a minimum of three respondents pre-tested the questionnaire, the research team reviewed the feedback and made adjustments to the items as required. There were three iterations of this process.

Data Analysis

All statistical analysis took place in SPSS IBM Statistics version 26 for Mac. Statistical significance was set at an alpha of .05.

Demographic profiles were created for each setting (CSICU and ward). Categorical variables were presented as frequencies and percentages. To compare differences between the CSICU and the ward, we ran Chi-Square tests for items with normal distributions and a Fisher's

Exact Test for variables that did not meet statistical assumptions. Continuous variables were presented as means and standard deviations. Since variables were skewed, we used a Mann Whitney U test for each item to determine significance.

To address Objective 1 (to determine the type and extent of sleep promotion practices) and Objective 2 (to determine if there is a difference in type and extent of nurses' sleep promotion practices by setting), we analyzed data from *Section 2: Sleep Promotion Practices*. We used frequencies and proportions to examine nurses' sources of sleep promotion practice knowledge, their rankings of the perceived benefit of sleep promotion practices, and their extent of their use of sleep promotion practices. We also calculated medians by setting (CSICU and ward) to further examine the extent of sleep promotion practices' use; we ran a Mann Whitney U test to determine if any median differences between settings were statistically significant. To address the last objective (to identify the barriers and enablers to nurses' use of sleep promotion practices), we analyzed the data obtained in *Section 3: Barriers and Enablers to the Use of Sleep Promotion Practices*. All negatively worded items were reverse coded in SPSS (see Appendix H). We presented the mean, standard deviation, minimum values, and maximum values. To identify whether an item was considered a barrier or an enabler, we assessed the mean values. All items with means of 3.5 (agreement) or higher were labelled as *enablers* and all items with means of 3.49 and less were labelled as *barriers*. We verified this scoring by looking at the proportions of nurses who agreed or disagreed with each item to ensure that the data was accurately labelled. For example, if the proportion of agreement was greater than 50% than it verified that the item was considered an enabler by the majority of the participants.

We used content analysis to synthesize, organize, and categorize open-ended responses provided in *Section 4: Additional Comments*.⁴⁴

Results

One hundred-six participants opened the online questionnaire (51.0% response rate). Of these, 15 participants were excluded because they did not meet the eligibility criteria (n=4), did not complete the questionnaire beyond the eligibility criteria (n=7), completed only the demographics section (n=3), or did not state which unit they worked on (n=1). A total of 91 participants were included in the analysis.

Participant Characteristics

Demographic characteristics for the full sample (n=91), and by setting (CSICU (n=41) compared to ward (n=50)) are presented in Table 3.2. The majority of participants were between 20-39 years old (n=70, 76.9%), female (n=76, 83.5%), and held a bachelor's degree (n=81, 87.9%). The average length of experience as a nurse was 9.8 years, and time on the unit was 6.7 years. Statistically significant differences were found between nurses in the CSICU and wards in terms of age, years of nursing experience, most common shift worked, and employment status (Table 3.2).

Objective 1: Type and Extent of Sleep Promotion Practices

The majority of nurses reported acquiring their knowledge of sleep promotion practices through personal experience (n=75, 82.9%) followed by advice from mentors (n= 44, 48.4%) and formal nursing education (n=44, 48.4%) (see Table 3.3).

The three most frequently used sleep promotion practices were: 1) orienting the inpatient to the room (n= 88, 96.7%) (category: devices and equipment to minimize sleep disruptions); 2) providing additional bedding (n=86, 96.6%) (category: relaxation techniques); and 3) dimming or turning off bright lights (n = 86, 94.5%) (category: prophylactic promotion). The three least used sleep promotion practices were: 1) guided imagery (n=8, 8.9%) (category: relaxation

techniques); 2) eye masks (n= 15, 16.5%) (category: devices or equipment to minimize sleep disruptions) and 3) headphones (n= 32, 35.2%) (category: devices or equipment to minimize sleep disruptions). With respect to ranking of the five categories of sleep promotion practices from most to least beneficial, nurses ranked decreasing noise (n=37, 56.9%) as the most beneficial followed by prophylactic promotion (n=25, 30.5%), relaxation techniques (n=2, 3.0%), devices and equipment to minimize sleep disruptions (n=2, 2.5%) and lastly, educational strategies (n=1, 1.5%).

Objective 2: Differences in Type and Extent of Sleep Promotion Practices by Setting

There were no statistically significant differences between CSICU and ward nurses with respect to 1) where they obtained their knowledge on sleep promotion practices, or 2) how beneficial they perceived sleep promotion practices to be. There were three sleep promotion practices that significantly differed by setting according to their frequency of use by nurses: 1) providing headphones ($p = 0.001$), 2) providing ear plugs ($p=0.003$) and 3) providing pre-operative teaching regarding sleep after surgery ($p = 0.001$) (Table 3.4). Ward nurses used these three practices more often than CSICU nurses.

Objective 3: Barriers and Enablers to Nurses' Use of Sleep Promotion Practices

In total, we identified 15 barriers and 45 enablers. All barriers and enablers identified are reported in Tables 3.5 and 3.6. The three most common barriers identified across all nurses were: 1) absence of recognition from important healthcare professionals after promoting sleep (TDF domain: reinforcement) (n=61, 85.9%); 2) often having something else more important than promoting sleep (TDF domain: goals) (n=60, 83.3%); and 3) encountering problems when trying to promoting sleep (TDF domain: beliefs about capabilities) (n=59, 80.8%). The three most common enablers identified across all nurses were: 1) the belief that promoting sleep will benefit

inpatients' health (TDF domain: beliefs about consequences) (n=72, 100.0%); 2) understanding why it is important for inpatients to get as many hours of sleep as possible (TDF domain: knowledge) (n=77, 98.7%); and 3) understanding why it is important for inpatients to have minimal or no interruptions during their sleep (TDF domain: knowledge) (n=77, 98.7%).

Six factors were considered barriers in one setting and enablers in the other setting (Table 3.7). Of these six factors, four were identified as barriers on the ward but enablers in the CSICU: 1) having enough time to promote sleep, 2) being trained in general on how to promote sleep, 3) nurses' level of emotional exhaustion affecting their ability to promote sleep, and 4) absence of other colleagues encouraging sleep promotion. The two remaining factors were identified as barriers in the CSICU but enablers on the ward: 1) finding it easy to promote sleep, and 2) promoting sleep being a part of the unit routine.

Additional Comments - Qualitative Findings

Twenty-seven nurses provided additional comments regarding their use of sleep promotion practices. We identified six common themes. The most frequent theme was *unit norms, routines and care protocols* (n=15) in which nurses felt constrained in their ability to promote sleep because of the unit practices and policies such as morning weights and frequent nightly blood work. For instance, one nurse stated: "it is often difficult in the CSICU to promote sleep in the immediate post op period as the patients require constant titration of medication, frequent blood draws, dangles, cardiac output calculation...etc all per our post-[surgery] policy. Each time we are either lying the patients flat, sitting them up, making noise with the IV pump or moving their arm to access their lines. None of this promotes sleep" (participant #29). The second theme, was *hospital-related factors that restrict nurses from adequately promoting sleep* (n=14); as stated by one participant "methods that might help is to have better curtains around

beds (the ones we have are often not sufficient to block hallway light), decreasing the volume of overhead announcements” (participant #2). Third, *lack of availability of sleep devices or equipment to minimize sleep disruptions* (n=11) (e.g. eye masks, earplugs, etc.). One participant stated: “Sleep is so important to patient’s healing however it is difficult to accomplish due to the lack of resources to promote sleep” (participant #85). Fourth, was *a need for more education/training* (n=9); one participant stated: “I don’t really know what sleep assessments are” (participant #64). Fifth, *previous problems with sleep promotion practices* (n=7); as commented by one participant “as much as I think that sleep is important, I often can’t let them sleep as much as I would like” (participant #89). The sixth and final theme was *clustering care is part of the nurses’ individual decision* (n=3) For instance, one nurse stated: “patients usually wake on their own through the night and clustering needed interventions around that is effective.” (participant #99). And another nurse stated, “overall, I believe most nurses try to cluster care and promote sleep for their patients, however there are few that ... do not cluster their care.” (participant #78).

Discussion

Summary of Findings

In this study, we explored the type, extent of, and determinants of sleep promotion practices among nurses caring for cardiac post-surgery inpatients and identified whether there are differences by setting (CSICU and ward). Common types of sleep promotion practices used were orienting the inpatient to the room (n=88, 96.7%), providing additional bedding (n=86, 96.6%), and dimming or turning off bright lights (n=86, 94.5%). Decreasing noise was identified as the most beneficial sleep promotion practice and relaxation techniques as the least beneficial. Few differences were identified across both settings. The three most common barriers between

settings were: 1) lack of recognition from important healthcare providers when promoting sleep (n=61, 85.9%), 2) competing priorities (n=60, 83.3%), and 3) encountering problems when trying to promoting sleep (n=59, 80.8%). The three most common enablers were: 1) the belief that promoting sleep will benefit inpatients' health (n=72, 100%), 2) understanding why it is important for inpatients to get as many hours of sleep as possible (n=77, 98.7%), and 3) understanding why it is important for inpatients to have minimal or no interruptions during their sleep (n=77, 98.7%). This study was novel in that it presented the types and frequencies of sleep promotion practices as perceived by cardiovascular nurses and evaluated the barriers and enablers from a behaviour change theory perspective.

Sleep Promotion Practices

We identified non-pharmacological sleep promotion practices that were the most used and least used in this cardiac post-surgery population. The most common sleep promotion practices identified by nurses in our study were consistent with those identified in another study.⁴⁵ In a study focused on health care professionals' (n=62) (i.e. nurses (n=52), physicians (n=8), a pharmacist (n=1) and a respiratory therapist (n=1)) views of sleep promotion in hospital settings, the authors found that the most common sleep promotion practices included moderating visiting hours, decreasing noise, dimming lights, and relaxation techniques.⁴⁵ These practices aimed at either creating an adequate sleeping environment or selecting patient-tailored interventions based on patients' individual sleep needs.⁴⁵ Other studies have suggested implementing overnight periods of decreased noise, lightning, and interruptions for unnecessary clinical monitoring.⁴⁶ We found similarities in our study in which dimming or turning off bright lights, talking in quiet voices, clustering care activities and avoiding non-essential care were also commonly used.⁴⁵

Future research exploring sleep promotion practices tailored to individual patient needs is warranted. We suggest that simple sleep promotion strategies such as decreasing noise, turning off bright lights and clustering care be readily implemented in the cardiac post-surgery setting as useful ways of promoting sleep for patients.

The least common sleep promotion practices used by nurses in our study were providing patients with devices or equipment (e.g. headphones, eye masks, ear plugs, and music). A cross-sectional Swedish study focused on nurses' experiences and management of inpatients' sleep in a variety of acute care hospitals (n=36) reported similar findings.⁴⁷ Even when devices and equipment were institutionally provided, they were infrequently used.⁸ It has been suggested that patients may feel uncomfortable or unfamiliar with using these items.⁸ Yet, evidence suggests that the distribution of devices or equipment could be beneficial for patients as noise is a major sleep disturbing factor for cardiac post-surgery inpatients.^{7,8,18} To mitigate this, patients could be encouraged pre-operatively through preparatory education classes and/or written instructions to bring these devices and equipment in from home. Additionally, a systematic review on the effectiveness of sleep promotion nursing interventions found that music was also effective in promoting sleep in coronary artery bypass grafting patients.⁴⁸

In both the CSICU and ward settings, nurses similarly perceived benefits of the five types of sleep promotion practices. The only statistically significant differences between settings were related to the frequency of use of three distinct practices: providing headphones, ear plugs, and pre-operative teaching regarding post-surgery sleep. This differs from Ye and colleagues' (2013) study in which they found that use of sleep promotion strategies such as ensuring an adequate environment conducive to sleep, decreasing noise, and limiting light varied depending on the unit involved.⁴⁵ A systematic review found that there were challenges to implementing the same

sleep promotion intervention used across multiple settings.⁴⁸ Given we found similar results in both the CSICU and ward, unit-specific interventions to promote sleep may not be necessary. Hence, it is reasonable to consider implementing the same sleep promotion practices in both settings given the similar population; however, as much as possible, it is important to individualize patient-targeted interventions based on patient needs and preferences when providing holistic nursing care.

Barriers and Enablers to Sleep Promotion Practices

In this study, the number of enablers (n=45) to sleep promotion practices identified by the nurses substantially outweighed the number of barriers (n=15). This is important because it suggests that nurses are set up for success to promote sleep for their inpatients. We revealed that 97% of nurses across both settings currently asked inpatients and/or their families for the sleep promotion strategies that work well for them. This finding was similar in the study by Ye et al. (2013) in which open dialogue with patients and individualized interventions were also identified as enablers.⁴⁵

Similarly, barriers regarding formal training and inadequate hospital infrastructure were identified by other authors.⁴⁵ In our study, nurses acquired their sleep promotion knowledge and skills mainly from personal experience or advice from mentors. This aligns with the literature that indicates that nurses lack formal training regarding the importance of patients' sleep and how to promote it.^{45,49} Our findings suggest that nurses in fact have the knowledge of the importance of sleep for their inpatients (as knowledge was an enabler), however they have competing priorities of care, lack recognition from healthcare providers that are important to them after promoting sleep, do not feel supported by their managers when trying to promote sleep, and have previously encountered problems when promoting sleep. Therefore, although

studies have shown that formal sleep training for nurses has shown favourable results,^{31,49} such as improving nurses' attitude regarding sleep and sleep knowledge.⁴⁹ It is thus important to consider the barriers that prevent nurses from using their knowledge. As echoed in the literature, we recommend including sleep content in institutional training and continuing professional development opportunities.⁴⁷

Strengths & Limitations

The results of this study must be considered in view of some limitations. First, the questionnaire was developed by the researchers and not formally validated prior to the project. During the questionnaire development process, efforts were made to ensure an adequate level of rigour, such as basing original items on existing TDF surveys that have shown validated results, seeking face and content validity of our modified items with TDF and content experts, and three iterative rounds of pre-testing. Second, although we were able to determine barriers and enablers to sleep promotion, we were unable to explain why they were considered as such by the participants. Therefore, future research should explore these determinants. Third, the opt-in sampling strategy may have led to self-selection bias. Nurses who chose not to participate may hold different views about sleep promotion than were captured in our results. Fourth, decreasing noise was identified as the most beneficial sleep promotion practice, however, there was no item on noise within the TDF section of the survey; hence any data regarding factors associated with noise may have been inadvertently missed.

Conclusion

Sleep is essential for the health and recovery of cardiac post-surgery patients. In this population, the most commonly used sleep promotion practices by nurses were orienting the inpatient to the room, providing additional bedding, and dimming or turning off bright lights.

The enablers to sleep promotion practice far outnumbered the barriers, with few differences between the CSICU and the wards. The barriers and enablers identified targets for the design and development of behavior change interventions to improve nurses' use of sleep promotion practices for cardiac post-surgical inpatients.

Table 3.1: TDF Domain and Construct Definitions

Domain	Domain Definition ¹	Construct	Construct Definition ¹
Knowledge	Awareness of the existence of something	Knowledge	An awareness of the existence of something
		Procedural Knowledge	Knowing how to do something
		Knowledge of the task environment	Knowledge of the social and material context in which a task is undertaken
Skills	Abilities or proficiencies acquired through practice	Skills	An ability or proficiency acquired through training and/or practice
		Skill development	The gradual acquisition or advancement through progressive stages of an ability or proficiency acquired through training and practice
		Competence	One's repertoire of skills, and ability especially as it is applied to a task or set of tasks
		Ability	Competence or capacity to perform a physical or mental act. Ability may be either unlearned or acquired by education and practice
		Interpersonal Skills	An aptitude enabling a person to carry on effective relationships with others, such as an ability to cooperate, to assume appropriate social responsibilities or to exhibit adequate flexibility
		Practice	Repetition of an act, behavior, or series of activities, often to improve performance or acquire a skill
		Skills Assessment	A judgement of the quality, worth, importance, level, or value of an ability or proficiency acquired through training and practice
Social/Professional role and Identity	Coherent set of behaviours and displayed personal qualities of a person	Professional identity	The characteristics by which an individual is recognized relating to, connected with or befitting a particular profession
		Professional role	the behavior considered appropriate for a particular kind of work or social position

	in a social or work setting	Professional confidence	An individual's belief in his or her repertoire of skills, and ability especially as it is applied to a task or a set of tasks
		Social identity	The set of behavioral or personal characteristics by which an individual is recognizable (and portrays) as a member of a social group
		Identity	An individual's sense of self defined by a) a set of physical and psychological characteristics that is not wholly shared with any other person and b) a range of social and interpersonal affiliations (i.e. ethnicity) and social roles
		Professional boundaries	The bounds or limits relating to, or connected with a particular profession or calling
		Group Identity	The set of behavioral or personal characteristics by which an individual is recognizable (and portrays) as a member of a social group
		Leadership	The process involved in leading others, including organizing, directing, coordinating and motivating their efforts toward achievement of certain group or organization goals
		Organizational commitment	An employee's dedication to an organization and wish to remain part of it. Organizational commitment is often described as having both an emotional or moral element and a more prudent element
Beliefs about Capabilities	Acceptance of truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use	Self-confidence	Self-assurance or trust in one's own abilities, capabilities and judgement
		Perceived competence	An individual's belief in his or her ability to learn and execute skills
		Self-efficacy	An individual's capacity to act effectively to bring about desired results, as perceived by the individual
		Perceived behavioural control	An individual's perception of the ease or difficulty of performing the behavior of interest

		Beliefs	The thing believed; the proposition or set of propositions held true
		Self-esteem	The degree to which the qualities and characteristics contained in one's self-concept are perceived to be positive
		Empowerment	The promotion of the skills, knowledge and confidence necessary to take great control of one's life as in certain educational or social schemes; the delegation of increased decision-making powers to individuals or groups in a society or organization
		Professional Confidence	An individual's belief in his or her repertoire of skills, and ability especially as it is applied to a task or a set of tasks
Optimism	Confidence that things will happen for the best or that desired goals will be attained	Optimism	The attitude that outcomes will be positive and that people's wishes or aims will ultimately be fulfilled
		Pessimism	The attitude that things will go wrong and that people's wishes or aims are unlikely to be fulfilled
		Unrealistic Optimism	The inert tendency for humans to over-rate their own abilities and chances of positive outcomes compared to those of other people
		Identity	An individual's sense of self defined by a) a set of physical and psychological characteristics that is not wholly shared with any other person and b) a range of social and interpersonal affiliations (i.e. ethnicity) and social roles
Beliefs about consequences	Acceptance of truth, reality, or validity about outcomes of a behaviour in a given situation	Beliefs	The thing believed; the proposition or set of propositions held true
		Outcomes expectations/expectancies	Cognitive, emotional, behavioral, and affective outcomes that are assumed to be associated with future or intended behaviors. These assumed outcomes can either promote or inhibit future behaviors

		Characteristics of outcome expectations	Characteristics of the cognitive, emotional and behavioral outcomes that individuals believe are associated with future or intended behaviors and that are believed to either promote or inhibit these behaviors. These include whether they are sanctions/rewards, proximal/distal, valued/not valued, probable/improbable, salient/not salient, perceived risks or threats
		Anticipated regret	A sense of the potential negative consequences of a decision that influences the choice made: for example, an individual may decide not to make an investment because of the feelings associated with an imagined loss
		Consequences	An outcome of behavior in a given situation
Reinforcement	Increasing the probability of a response by arranging a dependant relationship, contingency, between the response and a given stimulus	Rewards (proximal/distal, valued/not valued, probable/improbable)	Return or recompense made to, or received by a person contingent on some performance
		Incentives	An external stimulus, such as condition or object, that enhances or serves as a motive for behavior
		Punishment	The process in which the relationship between a response and some stimulus or circumstance results in the response becoming less probable; a painful, unwanted or undesired event or circumstance imposed as a penalty on a wrongdoer
		Consequences	An outcome of behavior in a given situation
		Reinforcement	A process in which the frequency of a response is increased by a dependant relationship or contingency with a stimulus
		Contingencies	A conditional probabilistic relation between two events. Contingencies may be arranged via dependencies or they may emerge by accident

		Sanctions	A conditional probabilistic relation between two events. Contingencies may be arranged via dependencies or they may emerge by accident
Intentions	Conscious decision to perform a behaviour or resolve to act in a certain way	Stability of intentions	Ability of one's resolve to remain in spite of disturbing influences
		Stages-of-Change model	A model that proposes that behavior change is accomplished through five specific stages: pre-contemplation, contemplation, preparation, action, and maintenance
		Transtheoretical model and stages-of-change model	A five-stage theory to explain changes in people's health behavior. It suggests that change takes time, that different interventions are effective at different stages, and that there are multiple outcomes occurring across the stages
Goals	Mental representations of outcomes or end states that a person wants to achieve	Goals (distal/proximal)	Desired state of affairs of a person or system, these may be closer (proximal) or further away (distal)
		Goal Priority	Order of importance or urgency of end states toward which one is striving
		Goal/target setting	A process that establishes specific time-based behavior targets that are measurable, achievable and realistic
		Goals (autonomous/controlled)	The end state toward which one is striving: the purpose of an activity of endeavor. It can be identified by observing that a person ceases or changes its behavior upon attaining this state; proficiency in a task to be achieved within a set period of time
		Action planning	The action or process of forming a plan regarding a thing to be done or a deed
		Implementation Intention	The action or process of forming a plan regarding a thing to be done or a deed
Memory, Attention and decision processes	Ability to retain information, focus,	Memory	The action or process of forming a plan regarding a thing to be done or a deed

	selectively on aspects of the environment, and chose between 2 or more alternatives	Attention	A state of awareness in which the senses are focused selectively on aspects of the environment and the central nervous system is in a state of readiness to respond to stimuli
		Attention Control	A state of awareness in which the senses are focused selectively on aspects of the environment and the central nervous system is in a state of readiness to respond to stimuli
		Decision Making	The cognitive process of choosing between two or more alternatives, ranging from the relatively clear cut to the complex
		Cognitive Overload/tiredness	The cognitive process of choosing between two or more alternatives, ranging from the relatively clear cut to the complex
Environmental context and resources	Any circumstance of an individual's situation or environment that discourages or encourages the development of skills and abilities, independence, social competences, and adaptive behaviour	Environmental Stressors	External factors in the environment that cause stress
		Resources/material resources	Commodities and human resources used in enacting a behavior
		Organizational culture/climate	A distinctive pattern of thought and behavior shared by members of the same organization and reflected in their language, values, attitudes, beliefs and customs
		Salient events/critical incidents	Occurrences that one judges to be distinctive, prominent or otherwise significant
		Person x Environment Interaction	Interplay between the individual and their surroundings
		Barriers and Facilitators	in psychological contexts barriers/facilitators are mental, emotional or behavioral limitations/strengths in individuals or groups
Social Influences	Interpersonal processes that can cause people to change their	Social Pressure	The exertion of influence on a person or group by another person or group

	thoughts, feelings, or behaviours		
		Social Norms	Socially determined consensual standards that indicate a) what behaviors are considered typical in a given context and b) what behaviors are considered proper in the context
		Group Conformity	The act of consciously maintaining a certain degree of similarity to those in your general social circles
		Social Comparisons	The process by which people evaluate their attitudes, abilities or performance relative to others
		Group Norms	Any behavior, belief, attitude or emotional reaction held to be correct or acceptable by a given group in society
		Social Supports	The apperception or provision of assistance or comfort to others, typically in order to help them cope with a variety of biological, psychological and social stressors. Support may arise from any interpersonal relationship in an individual's social network, involving friends, neighbors, religious institutions, colleagues, caregivers or support groups
		Power	The capacity to influence others, even when they try to resist this influence
		Intergroup Conflict	Disagreement or conformation between two or more groups and their members. This may involve physical violence, interpersonal discord, or psychological tension
		Alienation	Estrangement from one's social group; a deep seated sense of dissatisfaction with one's personal experiences that can be a source of lack of trust in one's social or physical environment or in oneself; the experience of separation between thoughts and feelings

		Group Identity	The set of behavioral or personal characteristics by which an individual is recognizable (and portrays) as a member of a social group
		Modelling	In developmental psychology, the process in which one or more individuals or other entities serve as examples (models) that a child will copy
Emotions	Complex reaction patterns, involving experiential, behavioural, and physiological elements, through which a person attempts to deal with a personally significant matter or event	Fear	In developmental psychology, the process in which one or more individuals or other entities serve as examples (models) that a child will copy
		Anxiety	A mood state characterized by apprehension and somatic symptoms of tension in which an individual anticipates impending danger, catastrophe or misfortune
		Affect	An experience or feeling of emotion, ranging from suffering to elation, from the simplest to the most complex sensations of feelings and from the most normal to the most pathological emotional reactions
		Stress	A state of physiological or psychological response to internal or external stressors
		Depression	A mental state that presents with depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration
		Positive/negative affect	The internal feeling/state that occurs when a goal has/has not been attained, a source of threat has/has not been avoided, or the individual is/is not satisfied with the present state of affairs
		Burnout	Physical, emotional or mental exhaustion, especially in one's job or career, accompanied by decreased motivation, lowered performance and negative attitudes towards oneself and others
Behavioural Regulation	Anything aimed at managing or	Self-monitoring	A method used in behavioral management in which individuals keep a record of their behavior, especially

	changing objectively observed or measured actions		in connection with efforts to change or regulate the self; a personality trait reflecting an ability to. Modify one's behavior in response to situation
		Breaking Habit	To discontinue a behavior or sequence of behaviors that is automatically activated by relevant situational cure
		Action Planning	The action or process of forming a plan regarding a thing to be done or a deed

¹Domain and construct definitions as per Cane et al., 2012

Table 3.2: Demographic Characteristics

Characteristic	Ward (n=50)	CSICU (n=41)	Total (n=91)	P value
Years of RN experience Mean (SD)¹				
	7.64 (8.64)*	12.51 (9.38)	9.83 (9.25)	0.001
Years working on current unit Mean (SD)¹				
	5.55 (6.81)	8.05 (8.44)	6.69 (7.65)	0.198
Gender n (%)²				0.777
Male	6 (12)	7 (17.1)	13 (14.3)	
Female	43 (86)	33 (80.5)	76 (83.5)	
Prefer not to respond	1 (2)	1 (2.4)	2 (2.2)	
Age n (%)^{2,3}				
Age 20-29*	28 (56)	8 (19.5)	36 (39.6)	0.00046
Age 30-39*	12 (24)	22 (53.7)	34 (37.4)	0.0037
Age 40-49	5 (10)	6 (14.6)	11 (12.1)	0.483
Age 50-59	5 (10)	4 (9.8)	9 (9.9)	1
Age ≥ 60	0	1 (2.4)	1 (1.1)	0.271
Highest level of education n (%)²				0.863
College diploma	6 (12)	4 (9.8)	10 (11)	
Bachelor's degree	43 (86)	37 (90.2)	81 (87.9)	
Masters degree or higher	1 (2)	0	1 (1.1)	
Most common shift n (%)^{2,3}				
Day shift*	20 (40)	2 (4.9)	22 (24.2)	0.000096
Night shift	7 (14)	3 (7.3)	10 (11)	0.317
Both*	23 (46)	36 (87.8)	59 (64.8)	0.000027
Employment status n (%)^{2,3}				
Casual	2 (4)	2 (4.9)	4 (4.4)	0.841
Part time*	19 (38)	3 (7.3)	22 (24.2)	0.00067
Full time*	29 (58)	36 (87.8)	65 (71.4)	0.0019

*p<0.05

¹Continuous variable associations were tested with Mann Whitney U.²Categorical variable associations were tested with Chi Square or Fishers Exact Test.³Post hoc analysis conducted

Table 3.3: Sources of Sleep Promotion Practice Knowledge

Knowledge Source	Ward (n=50) n(%)	CSICU (n=41) n(%)	Total (n=91) n(%)	P value
Personal experience	43 (86)	32 (78)	75 (82.4)	0.409
Advice from mentors	27(54)	17 (41.5)	44 (48.4)	0.293
Formal nursing education	22 (44)	22 (53.7)	44 (48.4)	0.404
Advice from patients	25 (50)	14 (34.1)	39 (42.9)	0.142
Professional development	10 (20)	4 (9.8)	14 (15.4)	0.246
Other ¹	1 (2)	2 (4.9)	3 (3.3)	0.587
None of the above ²	0	1 (2.4)	1 (1.1)	0.451

¹Other reported knowledge sources were Cognitive Behaviour Therapy for insomnia (n=1), experience in the profession over the years (n=1), being a Personal Support Worker in a nursing home (n=1)

²The participant who selected *None of the above* did not select *Other* or stated a *Please specify*

Table 3.4: Use of Sleep Promotion Practices (n=89-91)

Category	Sleep promotion practice	Ward Median	CSICU Median	Total Median
Relaxation Techniques	Massage/Backrub	3	3	3
	Guided Imagery	1	1	1
	Encouraging Deep Breathing	4	4	4
	Assisting in achieving a comfortable position prior to sleeping	5	5	5
	Assisting with bedtime routine	4	4	4
Devices and Equipment to Minimize Sleep Disruptions	Orienting to the room	5	5	5
	Providing additional bedding for patient comfort	5	5	5
	Headphones* (p=0.001)	2	1	2
	Eye masks	2	2	2
	Ear Plugs* (p=0.003)	3	2	2
	Music	2	2	2
	Room Temperature adjustment	4	4	4
Educational Strategies	Pre-operative teaching regarding sleep after surgery* (p=0.001)	3	1	2
	Teaching proper sleep routine or self-care	3	3	3
	Encouraging daytime activity	4	5	4
Decreasing Noise	Talking in quiet voices	4	4	4
	Avoiding conversations near patient areas	4	4	4
	Decreasing the volume of IV alarms	3	3	3
	Ensuring proper placement of heart monitor leads to minimize unnecessary/false alarms	4	4	4
	Offering toileting prior to sleeping	4	4	4
Prophylactic Promotion	Clustering care	5	5	5
	Dimming or turning off bright lights	5	5	5
	Avoiding non-essential care during sleeping hours	4	4	4
	Encouraging avoidance of caffeine consumption	3	3	3

Legend: 1= Never, 2= Rarely, 3= Sometimes, 4= Often, 5= Very Often

*Statistically significant p<0.05

Table 3.5: Barriers to Sleep Promotion Practices Between the CSICU and the Ward

TDF Domains	Barriers to Sleep Promotion in the Ward	Mean (std)	n (%)	Barriers to Sleep Promotion in the CSICU	Mean (std)	n (%)
Skills Ward: n=45 CSICU: n= 33	I have been trained in general, on how to promote sleep for inpatients	3.49(1.71)	22(51.1)			
	I have been trained on how to promote sleep specifically for cardiac post-surgery inpatients	3.11(1.191)	29(64.4)	I have been trained on how to promote sleep specifically for cardiac post-surgery inpatients	3(1.299)	21(63.3)
Beliefs about Capabilities Ward: n=42-43 CSICU: n=30-32				I find it easy to promote sleep for my inpatients	3.33(.96)	18(60)
	I have control over my sleep promoting activities for my inpatients	3.42(.698)	24(55.8)	I have control over my sleep promoting activities for my inpatients	3.33(.994)	15(50)
	I have previously encountered problems when trying to promote sleep ¹	2.88 (.79)	25(81.4)	I have previously encountered problems when trying to promote sleep ¹	3.03 (.994)	24(80)
	I feel empowered on my unit to try different sleep promotion activities	3.43(1.039)	24(57.1)	I feel empowered on my unit to try different sleep promotion activities	3.33(.884)	15(50)
Reinforcement Ward: n=41 CSICU: n=30	Whenever I promote sleep, I get recognition from my inpatients	3.34(.794)	24(58.5)	Whenever I promote sleep, I get recognition from my inpatients	3.33(.817)	20(66.7)
	Whenever I promote sleep, I get recognition from health professionals that are important to me	2.61(.862)	37(90.2)	Whenever I promote sleep, I get recognition from health professionals that are important to me	2.93(1.048)	24(80)
Goals Ward: n= 42 CSICU: n=30	There often is something else more important than promoting sleep ¹	2.79(.842)	37(88.1)	There often is something else more important than promoting sleep ¹	2.77(.897)	23(76.7)

Memory, Attention and Decision processes Ward: n= 42 CSICU: n=30	There are justifiable reasons why I often decide not to promote sleep ¹	3.36(.906)	23(54.8)	There are justifiable reasons why I often decide not to promote sleep ¹	3.03(1.217)	19(63.3)
Environmental Context and Resources Ward: n= 42 CSICU: n=30	In general, I have enough time to promote sleep on my shift	3.4(.939)	24(57.1)			
	The infrastructure on my unit is adequate to promote sleep	2.71(.891)	34(81)	The infrastructure on my unit is adequate to promote sleep	3.33(1.241)	16(53.3)
	I have the necessary resources to promote sleep	3.05(1.011)	26(61.9)	I have the necessary resources to promote sleep	3.43(1.251)	15(50)
				In the unit I work on, promoting sleep is routine	3.37(1.217)	16(53.3)
Social Influences Ward: n= 40-41 CSICU: n=29	Other colleagues (e.g. Advance Practice Nurses, the Educator, physicians) encourage me to promote sleep	3.49(1.052)	22(53.7)			
	My nurse manager encourages me to promote sleep	3.45(1.037)	25(62.5)	My nurse manager encourages me to promote sleep	2.97(1.348)	17(58.6)
Emotions Ward: n= 41-42 CSICU: n=29	When my inpatients are anxious, it prevents me from adequately promoting sleep ¹	3.4(1.307)	20(47.6)	When my inpatients are anxious, it prevents me from adequately promoting sleep ¹	3.07(1.252)	21(72.4)
	I feel frustrated when I cannot promote sleep ¹	3.12(.842)	27(65.9)	I feel frustrated when I cannot promote sleep ¹	3.07(1.307)	21(72.4)
	My level of emotional exhaustion affects my ability to promote sleep ¹	3.5(1.13)	22(52.4)			

¹reverse coded items

Table 3.6: Enablers to Sleep Promotion Between the CSICU and the Ward

TDF Domains	Enablers to Sleep Promotion in the Ward	Mean (std)	N(%) Total: 45-43	Enablers to Sleep Promotion in the CSICU	Mean (std)	N(%) Total: 33-29
Knowledge (n=45) Ward: n=45 CSICU: n=33	Promoting sleep is strongly supported by research	4.67(.98)	41(91.1)	Promoting sleep is strongly supported by research	4.7 (.95)	29(87.9)
	I understand why it is important for my patients to get as many hours of sleep as possible	5.33(.64)	45(100)	I understand why it is important for my patients to get as many hours of sleep as possible	5.06 (.79)	32(97)
	I understand why it is important for my patients to have minimal or no interruptions during their sleep	5.27(.69)	45(100)	I understand why it is important for my patients to have minimal or no interruptions during their sleep	5.15 (.83)	32(97)
	I am familiar with how to promote sleep	4.56(.78)	43(95.6)	I am familiar with how to promote sleep	4.61(.79)	32(97)
	I know what steps are needed to promote sleep	4.42(.92)	41(91.1)	I know what steps are needed to promote sleep	4.52(.83)	30(90.9)
Skills Ward: n=45 CSICU: n=33				I have been trained in general on how to promote sleep for inpatients	3.67(1.08)	18(60.4)
	I have practiced promoting sleep for my inpatients	4.57(.76)	43(97.7)	I have practiced promoting sleep for my inpatients	4.64(1.08)	31(93.9)
	I have the necessary skills to perform sleep assessments	3.8(1.04)	29(64.4)	I have the necessary skills to perform sleep assessments	3.97(1.04)	24(72.7)
	I have the necessary skills to promote sleep	4.22(.79)	40(88.9)	I have the necessary skills to promote sleep	4.16(.99)	29(90.6)
Social/ Professional role and identity Ward: n=45	As a nurse it is my role to promote sleep	4.67(.83)	45(100)	As a nurse it is my role to promote sleep	4.69(.90)	30(93.7)
	I encourage other nurses to promote sleep for their inpatients	3.91(1.2)	31(68.9)	I encourage other nurses to promote sleep for their inpatients	4.34(.90)	29(87.5)

CSICU: n=32	I am supported by other nurses on my unit to use sleep promotion practices	3.84(1.17)	31(68.9)	I am supported by other nurses on my unit to use sleep promotion practices	4.06(1.04)	23(71.9)
Beliefs about Capabilities	I find it easy to promote sleep for my inpatients	3.53(.73)	23(53.5)			
Ward: n=43	I am confident that if I want to promote sleep, I can	3.65(.81)	25(58.1)	I am confident that if I want to promote sleep, I can	3.7(.91)	20(66.7)
CSICU: n=30						
	I usually expect the best when promoting sleep	3.77(.72)	29(67.4)	I usually expect the best when promoting sleep	3.7(.88)	17(56.7)
Optimism	I hardly ever expect things to go my way when trying to promote sleep ¹	3.67(.92)	24(55.8)	I hardly ever expect things to go my way when trying to promote sleep ¹	3.67(.99)	17(56.7)
Ward: n=43						
CSICU: n=29-30	I am always optimistic about the future when promoting sleep	3.74(.76)	27(62.8)	I am always optimistic about the future when promoting sleep	3.67(.96)	18(60)
	If I promote sleep it will benefit my inpatients' health	5.16(.75)	43(100)	If I promote sleep it will benefit my inpatients' health	5.14(.69)	29(100)
Beliefs about Consequences	If I promote sleep it will benefit me	4.58(1.07)	37(86)	If I promote sleep it will benefit me	4.67(.88)	27(90)
Ward: n=41-43	Promoting sleep has undesirable consequences for my inpatients ¹	4.83(1.15)	38(88.4)	Promoting sleep has undesirable consequences for my inpatients ¹	5.1(.88)	29(96.7)
CSICU: n=29-30						
	Promoting sleep has undesirable consequences for me ¹	4.86(1.14)	38(88.4)	Promoting sleep has undesirable consequences for me ¹	4.97(.96)	28(93.3)
	Whenever I promote sleep, I feel like I am making a difference	4.02(1.04)	31(75.6)	Whenever I promote sleep, I feel like I am making a difference	4.17(.95)	23(76.7)
Reinforcement						
Ward: n=41-43	Whenever I promote sleep it is discouraged by health professionals that are important to me ¹	4.51(1.01)	38(88.4)	Whenever I promote sleep it is discouraged by health professionals that are important to me ¹	4.33(.71)	28(93.3)
CSICU: n=30						

	Whenever I promote sleep it is discouraged by inpatients ¹	4.77(1.00)	40(93)	Whenever I promote sleep it is discouraged by inpatients ¹	4.67(.84)	29(96)
Intentions Ward: n=43 CSICU: n=30	Promoting sleep is something that I am inclined to do	4.58(.79)	41(95.3)	Promoting sleep is something that I am inclined to do	4.77(.82)	29(96.7)
	I start each shift intending to promote sleep	3.84(1.23)	27(62.8)	I start each shift intending to promote sleep	4.2(1.27)	21(70)
	On my next shift, I intend to promote sleep	4.42(.85)	39(90.7)	On my next shift, I intend to promote sleep	4.5(.94)	26(86.7)
Goals Ward: n=42 CSICU: n=30	I am motivated to promote sleep	4.4(.77)	40(95.2)	I am motivated to promote sleep	4.33(.80)	26(86.7)
	I have a clear plan of how I will promote sleep	3.79(.92)	22(52.4)	I have a clear plan of how I will promote sleep	3.67(1.09)	15(50)
Memory, Attention, and Decision Processes Ward: n=42 CSICU: n=30	It is easy to remember to promote sleep	4.19(.92)	44(81)	It is easy to remember to promote sleep	4.43(.97)	26(86.7)
	I am able to concentrate on promoting sleep	3.71(.89)	23(54.8)	I am able to concentrate on promoting sleep	4.07(1.08)	21(70)
Environmental Context and Resources Ward: n=42 CSICU: n=30				In general, I have enough time to promote sleep on my shift	4(1.17)	22(73.3)
	In the unit I work on, promoting sleep is routine	3.55(.86)	23(54.8)			
Social Influences Ward: n=41-42 CSICU: n=29	I believe it is my inpatient's desire to sleep well in the hospital	4.98(.87)	41(97.6)	I believe it is my inpatient's desire to sleep well in the hospital	4.9(.817)	28(96.6)
	I believe sleep is considered a value of my inpatients' families	4.86(.90)	40(95.2)	I believe sleep is considered a value of my inpatients' families	4.83(.80)	29(100)
	I ask my inpatients and/or their families for their input on sleep promotion strategies that work well for them	3.95(1.28)	28(68.3)	I ask my inpatients and/or their families for their input on sleep promotion strategies that work well for them	4(1.10)	25(97.3)

Emotions Ward: n=41-42 CSICU: n=29	Most people who are important to me think that I should promote sleep (e.g. family/friends)	3.76(1.12)	29(69)	Most people who are important to me think that I should promote sleep (e.g. family/friends)	3.9(1.34)	18(62.1)
	My inpatients and/or their families encourage me to promote sleep	4(1.08)	31(73.8)	My inpatients and/or their families encourage me to promote sleep	4.14(1.16)	22(75.9)
	Staff nurses encourage me to promote sleep	3.6(1.01)	18(52.4)	Staff nurses encourage me to promote sleep	3.69(1.34)	22(62.1)
				Other colleagues (e.g. Advances Practice Nurses, the Educator, physicians) encourage me promote sleep	3.48(1.53)	16(55.2)
	Promoting sleep causes conflicts between interprofessional team members (e.g. between nurses or other health professionals) ¹	4.24 (1.30)	30(73.2)	Promoting sleep causes conflicts between interprofessional team members (e.g. between nurses or other health professionals) ¹	4.21(1.23)	21(72.1)
	I feel anxious when I think about promoting sleep ¹	4.48(.80)	40(95.8)	I feel anxious when I think about promoting sleep ¹	4.45(.83)	28(96.6)
	Promoting sleep for my inpatients is stressful ¹	3.83(.93)	29(69)	Promoting sleep for my inpatients is stressful ¹	4.1(.98)	23(79.3)
	I feel accomplished when I promote sleep	4.29(1.02)	35(83.3)	I feel accomplished when I promote sleep	4.52(1.15)	26(89.7)
				My level of emotional exhaustion affects my ability to promote sleep ¹	3.79(1.35)	15(51.7)
Behavioral Regulation Ward: n=41-42 CSICU: n=30	I see positive patient outcomes when I promote sleep	4.83(.73)	42(100)	I see positive patient outcomes when I promote sleep	4.83(.80)	28(96.6)
	Promoting sleep is part of my usual shift routine	4.32(.82)	35(85.4)	Promoting sleep is part of my usual shift routine	4.48(.99)	26(89.7)

	I have a clear plan on how to deliver sleep promotion activities	3.79(.78)	27(64.3)	I have a clear plan on how to deliver sleep promotion activities	4.1(1.08)	21(72.4)
--	--	-----------	----------	--	-----------	----------

¹reverse coded items

Table 3.7: Differing Results Between the CSICU and the Ward

Domain	Item	Ward	CSICU
Environmental Context and Resources	In general, I have enough time to promote sleep on my shift	Barrier	Enabler
Beliefs about Capabilities	I find it easy to promote sleep for my inpatients	Enabler	Barrier
Skills	I have been trained in general, on how to promote sleep for inpatients	Barrier	Enabler
Environmental Context and Resources	In the unit I work on, promoting sleep is routine	Enabler	Barrier
Emotions	My level of emotional exhaustion affects my ability to promote sleep	Barrier	Enabler
Social Influences	Other colleagues (e.g. Advance Practice Nurses, the Educator, physicians) encourage me promote sleep	Barrier	Enabler

References

1. Buysse D. Sleep health: Can we define it? Does it matter? *SLEEP*, 2014;37(1):9-17.
doi:10.5665/sleep.3298
2. Amofah H, Broström A, Fridlund B, et al. Sleep in octogenarians during the postoperative phase after transcatheter or surgical aortic valve replacement. *European Journal of Cardiovascular Nursing*. 2016;15(2):168-177. doi:10.1177/1474515115620992
3. Boitor M, Martorella G, Maheu C, Laizner A, Gélinas C. Does hand massage have sustained effects on pain intensity and pain-related interference in the cardiac surgery critically ill? a randomized controlled trial. *Pain Management Nursing*, 2019;20(6):572-579.
doi:10.1016/j.pmn.2019.02.011
4. Casida J, Davis J, Shpakoff L, Yarandi H. An exploratory study of the patients' sleep patterns and inflammatory response following cardiopulmonary bypass (CPB). *Journal of Clinical Nursing*, 2014;23(15-16):2332-2342. doi:10.1111/jocn.12515
5. Casida J, Davis J, Zalewski A, Yang J. Night-time care routine interaction and sleep disruption in adult cardiac surgery. *Journal of Clinical Nursing*, 2018;27(7-8):e1377-e1384.
doi:10.1111/jocn.14262
6. Nerbass F, Feltrim M, Souza S, Ykeda D, Lorenzi-Filho G. Effects of massage therapy on sleep quality after coronary artery bypass graft surgery. *Clinics*, 2010;65(11):1105-1110.
doi:10.1590/S1807-59322010001100008
7. Liao W, Huang C, Huang T, Hwang S. A systematic review of sleep patterns and factors that disturb sleep after heart surgery. *Journal of Nursing Research*, 2011;19(4):275-288.
doi:10.1097/JNR.0b013e318236cf68

8. Spence JS, Murray TM, Tang A, Butler R, Albert N. Nighttime noise issues that interrupt sleep after cardiac surgery. *Journal of Nursing Care Quality*, 2011;26(1):88-95.
doi:10.1097/NCQ.0b013e3181ed939a
9. Caruana N, McKinley S, Elliot R, Gholizadeh L. Sleep quality during and after cardiothoracic intensive care and psychological health during recovery. *Journal of Cardiovascular Nursing*. 2018;33(4):E40-E49. doi:10.1097/JCN.0000000000000499
10. Choudhury M, Gupta A, Hote M et al. Does sleep quality affects the immediate clinical outcome in patients undergoing coronary artery bypass grafting: A clinico-biochemical correlation. *Annals of Cardiac Anaesthesia*, 2017;20(2):193-199. doi:10.4103/aca.ACA_30_17
11. Zhang W, Wu W, Gu J, et al. Risk factors for postoperative delirium in patients after coronary artery bypass grafting: A prospective cohort study. *Journal of Critical Care*, 2015;30(3):606-612. doi:10.1016/j.jcrc.2015.02.003
12. Redeker NS, Ruggiero S, Hedges C. Sleep is related to physical function and emotional well-being after cardiac surgery. *Nursing Research*, 2004;53(3),154-162.
doi:10.1097/00006199-200405000-00002
13. Yilmaz H, Iskesen I. Follow-up with objective and subjective tests of the sleep characteristics of patients after cardiac surgery. *Circulation Journal: Official Journal of the Japanese Circulation Society*, 2007;71(10),1506-1510. doi:10.1253/circj.71.1506
14. Wesselius HM, van den Ende ES, Alisma J, et al. Quality and quantity of sleep and factors associated with sleep disturbance in hospitalized patients. *JAMA Internal Medicine*, 2018;178(9):1201-1208. doi:10.1001/jamainternmed.2018.2669
15. Kim SC, Pedersen C, Yi C. Validity and reliability of sleep promotion questionnaire and predictors of quality of care. *SAGE Open Medicine* 2018;6:1-9. doi:10.1177/2050312118794595

16. McIntosh AE, MacMillan M. The attitudes of student and registered nurses to sleep promotion in hospitals. *International Journal of Nursing Practice*, 2009;15(6):560-565. doi:10.1111/j.1440-172X.2009.01770.x
17. Redeker NS, Hedges C. Sleep during hospitalization and recovery after cardiac surgery. *The Journal of Cardiovascular Nursing*, 2002;17(1):56-68. doi:10.1097/00005082-200210000-00006
18. Navarro-García M, de Carlos Alegre V, Martinez-Oroz A, et al. Quality of sleep in patients undergoing cardiac surgery during the postoperative period in intensive care. *Enfermería Intensiva (English Ed.)*, 2017;28(3):114-124. doi:10.1016/j.enfie.2017.03.002
19. Radtke K, Ohermann K, Teymer L. Nursing knowledge of physiological and psychological outcomes related to patient sleep deprivation in the acute care setting. *MedSurg Nursing*, 2014;23(3):178-184.
<https://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=97df45c8-cee5-4729-b538-f6e84ab0ab4f%40sdc-v-sessmgr01>
20. Machado FS, Souza RCS, Poveda VB, Costa ALS. Non-pharmacological interventions to promote sleep of patients after cardiac surgery: a systematic review. *Revista Latino-Americana de Enfermagem*, 2017;25:2926-2936. doi:10.1590/1518-8345.1917.2926
21. Hu R, Jiang X, Chen J, et al. Non-pharmacological interventions for sleep promotion in the intensive care unit. *The Cochrane Database of Systematic Reviews*, 2015;10:CD008808-CD008808. [doi:14651858.CD008808.pub2](https://doi.org/10.14651858.CD008808.pub2)
22. Conway A, Nebauer M., & Schulz, P. Improving sleep quality for patients after cardiac surgery. *British Journal of Cardiac Nursing*, 2010;5(3),142-147. doi:10.12968/bjca.2010.5.3.46833

23. Hadjibalassi M, Lambrinou E, Papastavrou E, Papathanassoglou E. The effect of guided imagery on physiological and psychological outcomes of adult ICU patients: A systematic literature review and methodological implications. *Australian Critical Care*, 2018;31(2),73-86. doi:10.1016/j.aucc.2017.03.001
24. MacCune S. Effect of back massage on sleep among post-operative CABG and valve replacement patients. *The Nursing Journal of India*, 2010;101(4),86-88.
<https://pubmed.ncbi.nlm.nih.gov/21053666/>
25. Guo P, East L, Arthur A. A preoperative education intervention to reduce anxiety and improve recovery among Chinese cardiac patients: A randomized controlled trial. *International Journal of Nursing Studies*, 2012;49(2),129-137. doi:10.1016/j.ijnurstu.2011.08.008
26. Yayla A, & Özer N. Effects of early mobilization protocol performed after cardiac surgery on patient care outcomes. *International Journal of Nursing Practice*, 2019;25(6),1-11.
doi:10.1111/ijn.12784
27. Matukaitis J, Eckman T, Baxter K et al. Sleepless in stepdown. *Nursing* 2014. 2014;44(7),15-18. doi:10.1097/01.NURSE.0000450790.10849.13
28. Le A, Friese R, Hsu C, Wynne J, Rhee P, O'Keeffe T. Sleep disruptions and nocturnal nursing interactions in the intensive care unit. *Journal of Surgical Research*, 2012;177(2),310-314. doi:10.1016/j.jss.2012.05.038
29. Gellerstedt L, Medin J, Kumlin M, Karlsson RM. Nurses' experiences of hospitalised patients' sleep in Sweden: A qualitative study. *Journal of Clinical Nursing*, 2015;24(23-24):3664-3673. doi:10.1111/jocn.12985
30. Yilmaz M, Sayin Y, Gurler H. Sleep quality of hospitalized patients in surgical units. *Nursing Forum*, 2012;47(3):183-192. doi:[10.1111/j.1744-6198.2012.00268.x](https://doi.org/10.1111/j.1744-6198.2012.00268.x)

31. Greve H, Pedersen PU. Improving sleep after open heart surgery: effectiveness of nursing interventions. *Journal of Nursing Education and Practice*, 2016;6(3),15-22.
doi:10.5430/jnep.v6n3p15
32. Redeker NS, Hedges C. Sleep and the Cardiac Surgery Patient. In: Lee-Chiong T, ed. *Sleep: A Comprehensive Handbook*. Hoboken, New Jersey: Wiley-Liss. John Wiley & Sons, Inc; 2006: 909-912.
33. Polit DF. *T Tests: Testing two mean differences*. In Connor M, ed. *Statistics and Data Analysis for Nursing Research*. Upper Saddle River, NJ: Pearson Education Inc; 2010:114-136.
33. RedCap. www.redcap-project.org. Updated 2020. Accessed January 2020
34. Michie S, Johnston M, Abraham C, Lawton R, Parker D, Walker A. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Quality and Safety in Health Care*, 2005;14(1):26-33. doi:10.1136/qshc.2004.011155
35. Cane J, O'Connor D, Michie S. Validation of the Theoretical Domains Framework for use in behaviour change and implementation research. *Implementation Science*, 2012;7,1-17.
doi:10.1186/1748-5908-7-37
36. Atkins L, Francis J, Islam R, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science*, 2017;12(1),1-18. doi:10.1186/s13012-017-0605-9
37. Gnich W, Bonetti D, Sherriff A, Sharma S, Conway DI, Macpherson LMD. Use of the theoretical domains framework to further understanding of what influences application of fluoride varnish to children's teeth: A national survey of general dental practitioners in Scotland. *Community Dentistry and Oral Epidemiology*, 2015;43(3):272-281.
doi:10.1111/cdoe.12151

38. Huijg J, Gebhardt WA, Crone MR, Dusseldorp E, Presseau J. Discriminant content validity of a theoretical framework questionnaire for use in implementation research. *Implementation Science*, 2014;9(11):11-27. www.implementationscience.com/content/9/1/11
39. Huijg JM, Gebhardt WA, Dusseldorp E, et al. Measuring determinants of implementation behavior: Psychometric properties of a questionnaire based on the Theoretical Domains Framework. *Implementation Science*, 2014;9:33-48. doi:10.1186/1748-5908-9-33
40. Skoien W, Page K, Parsonage W, Ashover S, Milburn T, Cullen L. Use of the theoretical domains framework to evaluate factors driving successful implementation of the accelerated chest pain risk evaluation (ACRE) project. *Implementation Science*, 2016;11(1):136-147. doi:10.1186/s13012-016-0500-9
41. Taylor N, Lawton R, Conner M. Development and initial validation of the determinants of physical activity questionnaire. *The International Journal of Behavioral Nutrition and Physical Activity*, 2013;10(1):1-11. doi:[10.1186/1479-5868-10-74](https://doi.org/10.1186/1479-5868-10-74)
42. Taylor N, Parveen S, Robins V, Slater B, Lawton R. Development and initial validation of the Influences on Patient Safety Behaviours Questionnaire. *Implementation Science*, 2013;8(1):1-8. doi:[0.1186/1748-5908-8-81](https://doi.org/10.1186/1748-5908-8-81)
43. Collins D. Pretesting survey elements: An overview of cognitive methods. *Quality of Life Research*, 2003;12:229-238. Netherlands: Kluwer Academic Publishers
44. Krippendorff K. *Content Analysis: An Introduction to Its Methodology (2nd edition)*, 2004; Thousand Oaks: SAGE Publications
45. Ye L, Johnson S, Dykes P. How do clinicians assess, communicate about, and manage patient sleep in the hospital? *Journal of Nursing Administration*, 2013;43(6):342-347. doi:10.097/NNA.0b013e3182942c8a

46. Soong C, Burry L, Cho H, et al. An implementation guide to promote sleep and reduce sedative-hypnotic initiation for noncritically ill inpatients. *JAMA Intern Med.* 2019;179(7):965-972. doi:10.1001/jamainternmed.2019.1196
47. Gellerstedt L, Medin J, Kumlin M, Karlsson RM. Nursing care and management of patients' sleep during hospitalisation: A cross-sectional study. *Journal of Clinical Nursing*, 2019;28(19-20):3400-3407. doi:10.1111/jocn.14915
48. Hellström A, Fagerström C, Willman A. Promoting sleep by nursing interventions in health care settings: a systematic review. *Worldviews on Evidence-Based Nursing*, 2010;8(3):128-42. doi:10.1111/j.1741-6787.2010.00203.x
49. Massengale J, Murphy M, Cadena S, Wang, T. *The role of nursing practice in promoting sleep during brain injury rehabilitation* [PhD thesis]. Minneapolis, MN: Walden University; 2015

Chapter Four

Integrated Discussion

The purpose of this chapter is three-fold. First, to summarize the findings of the thesis as a whole, including the literature review (Chapter 1), the theoretical underpinnings (Chapter 2) and the survey study (Chapter 3). Second, to discuss two important considerations that have resulted from the development of this work; 1) the use of the nursing process to approach sleep promotion, and 2) the TDF (Cane et al., 2012; Michie et al., 2005)'s usefulness in guiding questionnaire development, analysis, and planning future nurse-targeted interventions to promote inpatient sleep. Third, to discuss implications from this thesis for nursing practice, policy, education, and research.

Summary of Thesis Findings

The overall purpose of the thesis was to determine the type and extent of sleep promotion practices used, and the factors affecting their use, for cardiac post-surgery patients in both the critical care and ward settings. In the literature review (Chapter 1), I found that there were many factors that contributed to sleep quality and quantity of the cardiac post-surgery inpatient which can be categorized into patient-related factors (Amofah et al., 2016; Casida et al., 2013; Díaz-Alonso et al., 2018; Hedges, 2005; Liao et al., 2011; Redeker & Hedges, 2002; Tsai et al., 2019; Yilmaz & Iskesen, 2007), cardiac surgery-related factors (Amofah et al., 2016; Boitor et al., 2019; Casida et al., 2013; Le et al., 2012; Liao et al., 2011; Navarro-García et al., 2017; Nesami et al., 2016; Tsai et al., 2019), healthcare provider-related factors (Casida et al., 2013; Casida et al., 2018; Le et al., 2012; Liao et al., 2011), and environmental factors (Amofah et al., 2016; Liao et al., 2011; Navarro-García et al., 2017; Spence et al., 2011). The literature review revealed that the evidence on this topic was primarily focused on the factors that affect inpatients' sleep and is lacking on the factors that affect the nurses' ability to promote sleep, specifically in the cardiac post-surgery inpatient population. To narrow this gap, I utilized the TDF (Cane et al., 2012;

Michie et al., 2005) to guide the data collection and analysis of a questionnaire tailored specifically to nurses caring for cardiac post-surgery inpatients (Chapter 2). The Roy Adaption Model (RAM) (Roy, 2006) was selected as a theoretical lens from which to view nurses and their role in sleep promotion for inpatients (Chapter 2).

Study findings (Chapter 3) revealed that the most common types of sleep promotion practices were orienting the patient to the room (n=88, 96.7%), providing additional bedding (n=86, 96.6%), and dimming or turning off bright lights (n=86, 94.5%). Nurses obtained their sleep promotion knowledge mainly from personal experience (n= 75, 82.4%), followed by advice from mentors (n= 44, 48.4%) and formal nursing education (n= 44, 48.4%). There were no statistically significant differences regarding where nurses obtained their knowledge of sleep promotion practices (e.g. from personal experience, advice from mentors, formal nursing education, professional development, etc.) or the perceived benefits of use of sleep promotion practices when comparing the Cardiac Surgical Intensive Care Unit (CSICU) and the ward. The responses identified that there were three statistically significant differences in the frequency of use of sleep promotion practices in the CSICU and ward (out of 24 sleep promotion practices identified in the literature review), which are providing headphones, providing earplugs, and pre-operative teaching regarding sleep after surgery. I identified a total of 15 barriers and 45 enablers to nurses' use of sleep promotion practices. The most common barriers were an absence of recognition from other healthcare providers after promoting sleep (n=61, 85.9%), having something else more important than promoting sleep (n=60, 83.3%), and encountering problems when trying to promote sleep (n=59, 80.8%). The most common enablers were the belief that promoting sleep will benefit the patient's health (n=72, 100%), understanding why it is important for inpatients to get as many hours of sleep as possible (n=77, 98.7%), and understanding why it

is important for inpatients to have an absence of interruptions during their sleep (n=77, 98.7%). From the 66 survey items, there were six that differed in whether they were enablers or barriers based on setting (CSICU vs ward). The six factors were: having enough time to promote sleep (CSICU mean=4, 26.7%; ward mean=3.4, 57.1), being trained in general on how to promote sleep (CSICU mean=3.67, 39.4%; ward mean=3.49, 51.1%), the level of nurses' emotional exhaustion (CSICU mean=3.79, 48.3%; ward mean=3.5, 52.4%), the absence of other colleagues encouraging sleep promotion (CSICU mean=3.49, 44.8%; ward mean=3.48, 53.7%), finding it easy to promote sleep (CSICU mean=3.33, 60%; ward mean=3.53, 46.5%), and promoting sleep being a part of the unit routine (CSICU mean=3.55, 53.3%; ward mean=3.37, 45.2%). Qualitatively, nurses identified that they struggled to promote sleep for various reasons, including lack of resources, unit norms, and mandated post-surgical care protocols.

Integrated Discussion

The findings from this thesis highlight two important considerations: (1) the use of the nursing process to approach sleep promotion; and (2) the TDF's (Cane et al., 2012; Michie et al., 2005) usefulness in guiding questionnaire development, analysis, and planning future nurse-targeted interventions to promote inpatient sleep.

The Nursing Process can be Used by Nurses to Approach Sleep Promotion

Theoretically and empirically, findings from this thesis support that promoting sleep is part of the role of nurses working in the cardiac post-surgery inpatient settings and can be viewed through the stepwise approach outlined in the nursing process.

As stipulated in the RAM, which views patients as adaptive systems in an everchanging environment, nurses have a role in assisting their patients in adapting to changes in their environment (Roy, 2006). Stimuli from the environment generate coping processes in each

person, which cause behavioural responses across four modes of adaptation: physiological needs, role function, interdependence, and self-concept (Roy, 2006). In acute phases of illness and recovery, such as post-surgery, the RAM stipulates that patients need assistance to adapt across these four modes. Sleep promotion practices identified in the literature review (Chapter 1) mainly address the physiological needs (e.g. massage, room temperature adjustment, encouraging deep breathing) but also target the self-concept mode (e.g. encouraging proper sleep routine or self-care). Hence, the RAM is useful in providing a lens from which to view the nurses' role in supporting cardiac post-surgical patients in adapting to sleep disruptions.

Recovering from cardiac surgery can be a major life event for patients and they need support in the post-operative phase, hence why they are generally hospitalized for five days. Sleep is an important aspect in recovery from illness and surgery, yet there are many factors that can interfere with cardiac patients' sleep post-surgery, including pain (Amofah et al., 2016; Boitor et al., 2019), anxiety (Boitor et al., 2019; Liao et al., 2011), a sternotomy (Casida et al., 2013), intra-operative factors (Amofah et al., 2016; Casida et al., 2013), and the environment (Gellerstedt et al., 2015; Spence et al., 2011). One way in which nurses can help patients adapt to these sleep-disrupting factors is by selecting and delivering non-pharmacological sleep promotion practices.

The selection and delivery of sleep promotion practices can be viewed through the lens of the nursing process. The nursing process, the core problem-solving approach in the practice of nursing, involves five steps: assessment, nursing diagnosis, planning, intervention, and evaluation (Potter et al., 2019). This framework offers nurses a systematic method to identify and diagnose a problem, select appropriate interventions and evaluate the patient's response (Baraki et al., 2017; Leslie, 2018). The nursing process is imperative for effective communication

amongst healthcare providers and can be used as a feedback tool for identifying areas of improvement after an intervention (Leslie, 2018). The first step, *assessment*, involves the collection of objective and subjective data. This data is used to inform the second step, a *nursing diagnosis* (Herdman & Kamitsuru, 2018; Potter et al., 2019). The third step is the *planning* phase, in which the nurse prioritizes the issues identified during the assessment and determines which issues could benefit from a nursing intervention (Yildirim & Özkahraman, 2011). The fourth step, *intervention*, is where the nurse implements a plan of care (Potter et al., 2019). In the fifth and final phase, the nurse *evaluates* the intervention and determines if the plan of care should continue, be modified, or be terminated based on the patient's outcomes and goals (Potter et al., 2019). The nursing process is useful in that it offers a consistent framework for care (Yildirim & Özkahraman, 2011) and is intended as a sequence of thoughtful interpretation, action, and evaluation of the outcomes of action (Potter et al., 2019).

In the following section, I will use the nursing process to integrate and interpret my thesis findings.

Assessment. The RAM emphasizes that nurses have a responsibility to focus on people within their environments and help them adapt to the stimuli in those environments (Roy, 2006). Assessing for sleep disturbances is an essential component of a holistic nursing care approach (MacCune, 2010). In my findings, 27% in the CSICU and 36% in the ward believed they do not have the proper skills to perform sleep assessments. Further, one nurse qualitatively reported that they were unsure what sleep assessments are (Chapter 3).

Ritmala-Castren et al. (2016) found that nurses' assessments of patients' (n=21) sleep/wake state in the intensive care unit (ICU) was accurate only 66% of the time when compared to polysomnography device readings. There was no equivalence between the nurses'

observations of sleep latency, awakenings or movements and the actual movements detected by the polysomnography device (Ritmala-Castren et al., 2016). Hence, Ritmala-Castren (2016) and colleagues demonstrated that nurses face challenges when attempting to determine their patient's sleep/wake state. The authors suggested that more education on the characteristics of sleep and its vital importance to recovery is needed for nurses to be able to adequately assess patients' sleep (Ritmala-Castren et al., 2016). Not only have nurses' assessments of sleep been inconsistent with objective measures (e.g. the polysomnography device), but it has been demonstrated that they can also be inconsistent with patients' self-report of sleep. For instance, in a study comparing nurses' assessment of patients' sleep and patients' self-assessments (n=144), it was found that assessments of sleep quality vastly differed between nurses' interpretation and the patient's self-report (Delaney et al., 2018). In this study, 34.2% of patients reported their sleep quality to be fair, compared to 61.1% of nurses who perceived that their patients' sleep was of fair quality (Delaney et al., 2018). The authors also found that nurses overestimated patients' sleep time (Delaney et al., 2018). Another study has shown that 43% of healthcare providers are not confident in their ability to accurately assess patients' sleep (Kamdar et al., 2016). Yet, to ensure the delivery of appropriate sleep promotion practices, nurses need to be able to accurately assess patients' sleep. This was one of the gaps in practice that my thesis aimed to address.

Diagnosis. The consolidation of data collected during the assessment phase and identification of a problem may lead to the formulation of a diagnostic statement: a nursing diagnosis. The North American Nursing Diagnosis International (NANDA-I) created a domain entitled *activity/rest* which includes a specific class on sleep (Herdman & Kamitsuru, 2018). The diagnoses within this class include: insomnia, sleep deprivation, readiness for enhanced sleep,

and disturbed sleep pattern (Herdman & Kamitsuru, 2018). *Disturbed sleep pattern* is the diagnosis that most aligns with the field of inquiry investigated in my thesis and is defined as “periodic awakenings on account of external factors” (Herdman & Kamitsuru, 2018, pg. 230). NANDA-I offers related factors to disturbed sleep patterns, which include insufficient privacy, barriers in the environment, or disruption by others (Herdman & Kamitsuru, 2018). Open-ended survey responses revealed additional factors such as unit norms (e.g. daily weights being completed by the night shift staff at 6AM instead of after 7AM by the day shift), unit-based protocols/expectations for vital signs monitoring/administering medications/frequent bloodwork draws, and lack of supplies such as earplugs, eye masks, and headphones to provide to inpatients. Factors affecting sleep disturbance and many other individual patient-related factors needed to be identified since they assist the nurse in directing their sleep promotion practices (Herdman & Kamitsuru, 2018).

Planning. Planning involves prioritizing problems and formulating goals and desired outcomes (Potter et al., 2019). From these, nursing interventions are selected. In the fast-paced environment of the hospital, it is recommended that nurses set realistic priorities with the inpatients (Yildirim & Özkahraman, 2011) to address any sleep disturbances and identify patient readiness to improve their sleep. In my survey study (Chapter 3), the majority of nurses agreed (n=37 (88%) in the ward and n=23 (77%) in the CSICU) that there is often something else more important than promoting sleep. However, my data also showed that the majority of ward nurses (n=25, 58%) and CSICU nurses (n=20, 67%) who responded to this item are confident that if they want to promote sleep they can. In addition, most ward nurses (n=27, 63%) and CSICU nurses (n=21, 70%) reported that they start each shift intending to promote sleep, with half of ward nurses (n=22, 52%) and CSICU nurses (n=15, 50%) having a clear plan on how they will

promote sleep. Therefore, incorporating sleep promotion practices in their care may take planning and priority setting but it is possible, as evidenced by my findings that promoting sleep is a part of the majority of nurses' usual shift routine in the ward (n=35, 85%) and in the CSICU (n=26, 90%). To overcome the barrier of competing priorities, nurses can plan ahead by clustering their care and adjusting the timing of non-time-sensitive tasks (Matukaitis et al., 2014). For instance, in my findings, two nurses reported that patients' daily weights are expected to be done by the night shift prior to 7AM, however this practice is disruptive to sleep as many inpatients need to be awoken to complete this task. To prevent this avoidable awakening, nurses may wish to discuss with their patient during the evening assessment about the need for a morning weight and to determine a timing that works the best time for the patient. The nurse can also weigh the advantages and disadvantages of waking their patient up in the morning by considering the potential challenges that the day staff may experience if the task is left to them.

Implementation. In the context of this thesis, the implementation of sleep promotion practices seeks to improve the quality and quantity of patients' sleep (Potter et al., 2019). From the literature review (Chapter 1), I determined that there were five core categories of sleep promotion practices for this population: 1) relaxation techniques (Amofah et al., 2016; Boitor et al., 2019; Casida et al., 2013; Conway et al., 2010; Hadjibalassi et al., 2018; MacCune, 2010; Machado et al., 2017; Nerbass et al., 2010; Spence et al., 2011; Zhang et al., 2015), 2) devices and equipment to minimize sleep disruption (Machado et al., 2017; Spence et al., 2011), 3) patient educational strategies (Amofah et al., 2016; Díaz-Alonso et al., 2018; Guo et al., 2012; Machado et al., 2017; Yayla & Özer, 2019), 4) noise reduction (Spence et al., 2011) and 5) prophylactic promotion (Casida et al., 2018; Le et al., 2012; Matukaitis et al., 2014; Zhang et al., 2015). In each category, there is a minimum of four sleep promotion practices with a total of 24

across all categories. Participants identified a number of practices that are frequently used based on these categories. Nurses perceived noise reduction to be the most beneficial category; however, none of the specific sleep promotion practices in this category were used often, which may be due to barriers that nurses face. This is why one of the main purposes of my study was to determine the barriers and enablers to nurses' implementation of sleep promotion practices. My survey findings (Chapter 3) revealed that the number of enablers (n=45) far outweighed the number of barriers (n=15). My data provided a unique insight into the reasonings why sleep promotion practices may not always be used as it is clear from my findings that nurses have the knowledge and skills regarding sleep promotion practices and intend to promote sleep at every shift but are met with various barriers interfering with the delivery of sleep promotion practices.

Researchers have shown that behaviours are not solely driven by motivation (e.g. intentions) and perceived behavioural control (Sniehotta, 2009). As such, it is important to determine how intentions translate into behaviour (Sniehotta, 2009). The TDF is a useful framework for this study's data collection and analysis as it captured both pre-and post-intentional factors that can affect desired behaviours (Michie et al., 2005). Identifying these post-intentional factors can offer a comprehensive account of the level of the barriers; not solely at the level of individual nurses but also at the level of the unit, organization, or the broader health system. For instance, one may consider the sleep promotion practice of *dimming or turning off bright lights* as easily implementable. But once all factors are considered, it may be revealed that the infrastructure of the hospital is set up in a way that many lights do not turn off and that the curtains do not block enough light. Therefore, the nurse may intend to promote sleep by dimming the lights but may be faced with these post-intentional barriers inhibiting their ability to do so.

Evaluation. In the final step, evaluation, the nurse collects data on the delivery of the intervention and the desired outcome (e.g. sleep). For example, the nurse can ask the patient if the sleep promotion practices used were beneficial in achieving quality sleep. The nurse can also ask about the number of awakenings during the previous night or, in the morning, ask whether the patients feels they are well rested (Potter et al., 2019). My findings revealed that nurses ask their patients and/or their families for sleep promotion strategies that work well for them (97% on the ward and 69% in the CSICU). This can be done in the planning stage of the nursing process but can also be done to evaluate the sleep promotion practices used. During this phase the nurse can determine if the desired outcome was achieved and if the intervention was effective (Yildirim & Özkahraman, 2011). Evaluating the intervention is a crucial step as it affects future steps in the process, for instance, if the sleep promotion practice was not effective for an individual, then the plan will need to be modified or changed altogether (Yildirim & Özkahraman, 2011). Finally, it is important to be reminded that the nursing process is cyclical; the evaluation phase is ongoing, and as the patient's condition changes or new data emerges, the nursing diagnosis may change (Herdman & Kamitsuru, 2018).

In summary, the nurse's role in sleep promotion can be viewed through the lens of the RAM and the nursing process. Nurses can assess, diagnose, plan, implement, and evaluate patients' sleep and the delivery of sleep promotion practices targeting any of the four modes of adaptation as identified by the RAM. This, with the goal of optimizing patients' sleep and promoting recovery after cardiac surgery.

The TDF's Usefulness in Guiding the Questionnaire and Planning Future Interventions

The TDF was originally created to determine influences on healthcare provider behaviour surrounding the implementation of evidence-based practices (Atkins et al., 2017). In this section,

I will expand on my experience using the TDF for quantitative questionnaire development and discuss the importance of using theory-informed findings to design interventions.

This thesis is novel in that, to my knowledge, this is the first study using the TDF to investigate nurses' views of sleep promotion practices in the cardiac post-surgery inpatient population using quantitative methods. The TDF is primarily used with qualitative methods (Atkins et al., 2017). Hence, my thesis can be used as a guide for those wishing to develop quantitative TDF-based data collection tools to investigate nurses' use of evidence-based practices in the cardiovascular setting or other nursing contexts to plan the design and development of future interventions.

Developing my questionnaire based on a theoretical framework (Cane et al., 2012; Michie et al., 2005) with a published guide for its use (Atkins et al., 2017) was beneficial in reducing research bias, ensuring that potential influences on the behaviour (e.g. sleep promotion) were accounted for, and identifying factors to address when developing future interventions to improve nurses' use of sleep promotion practices. Initially, I attempted to create items based on each of the 84 TDF constructs, yet, this approach resulted in numerous repetitive items. For example, attempting to create unique items based on the constructs of *optimism* and *unrealistic optimism* in the context of sleep promotion proved to be challenging. Therefore, after consultation with a researcher with TDF expertise, I was advised to base the items on the 14 TDF domains (as is done when the framework is used qualitatively) and use the constructs for guidance. In addition, the lack of published quantitative questionnaires/surveys that were based on the newest version of the TDF (Michie et al., 2005) (e.g. 14 domains (Cane et al., 2012) instead of 12 domains (Michie et al., 2005)) led me to create items that were not previously tested to ensure that they fit entirely within the domain of interest. I recommend that future

researchers be cognizant of this and take action to ensure the reliability and validity of their newly created items. I sought to achieve this by presenting my questionnaire to a clinician-researcher with content expertise in sleep, another researcher with methodological expertise in use of the TDF, and by pre-testing the questionnaire with 12 nurses (Chapter 2).

It is recommended that behaviour change interventions specifically be designed based on applicable theories (Michie et al., 2009). As using a theory to identify constructs that are related to a specific behaviour provides the targets of an intervention and can provide beneficial effects (Michie et al., 2009). In the same way that a medical intervention is based on a diagnosis identified through a medical exam, in order to change behaviour, understanding is needed as to why behaviours are what they are and what needs to change in order for a desired behaviour to occur (Atkins & Michie, 2015). There are two main approaches to designing interventions: (1) common sense, or ISLAGIATT as originally coined by Martin Eccles to indicate *it seemed like a good idea at the time* (Powell et al., 2019) and (2) using theory (Atkins & Michie, 2015; Brown et al., 2020; ICEBeRG, 2006; Nilsen, 2015). First, common sense approaches are solely informed by the clinical context of what has been done prior, what is considered feasible, and the stakeholders' own intuitions (ICEBeRG, 2006) and implicit assumptions (Nilsen, 2015). In addition, researchers who use the ISLAGIATT approach design interventions without taking the necessary steps to understand what the targets of change are and how to attempt to make changes (Brown et al., 2020). Common sense often consists of beliefs and certain ways of thinking that can be difficult to challenge (Nilsen, 2015). However, theory-informed approaches to intervention design have the potential to lead to efficient and practical intervention development due to its ability to produce knowledge that is applicable to a variety of contexts (ICEBeRG, 2006). Theory-informed interventions produce data that can be replicated and assist in discerning

the mechanisms of why and how an intervention succeeds or fails (ICEBeRG, 2006). Further, theory-informed interventions are open to question and examination because they are explicit, instead of implicit assumptions and they provide meaningful context when analyzing data (Nilsen, 2015).

As my results showed few differences in barriers and enablers across settings, I argue that the TDF-informed barriers and enablers revealed in my study are applicable to both the CSICU and the ward (Chapter 3). The TDF can assist in the selection of important factors that can be the target of behaviour change (Patton et al., 2017). For example, in terms of the TDF domains, my findings revealed that, first, nurses believe they have the knowledge of sleep promotion practices yet are limited in beliefs about their capabilities and the environmental context and resources such as having inadequate infrastructure and lack of resources to promote sleep (Chapter 3). Therefore, this necessitates a completely different intervention than solely educating nurses, which may have been the initial approach if I had not identified through this study that nurses have the knowledge. Second, nurses reported that they encourage others to promote sleep and feel supported by other nurses on their unit to use sleep promotion practices (Chapter 3). However, they did not believe that their nurse manager encouraged them to promote sleep. This is an important finding as a behaviour change intervention could be focused on maximizing the already present supportive relationships between nurses. These findings are crucial as it helps researchers and those in leadership positions identify what barriers future interventions should aim to overcome and assist with leveraging the identified enablers.

Implications for Nursing

The findings from this thesis have implications for nursing practice, policy, education, and research.

Implications for Nursing Practice

In my literature review, I identified that the current state of sleep in cardiac post-surgery inpatient is suboptimal (Amofah et al., 2016; Boitor et al., 2019; Casida et al., 2013; Casida et al., 2018; Nerbass et al., 2010; Liao et al., 2011; Spence et al., 2011). Nurses are in the unique position to promote sleep for their inpatients; however they face multiple barriers to do so (Chapter 3). My thesis findings emphasized that promoting sleep is an important part of the nurses' role and this section will provide step-by-step guidance of how to use the nursing process (Potter et al., 2019) for this specific aim.

I believe that head to toe assessments are an opportune moment for nurses to inquire about factors related to sleep disturbances. Using the NANDA-I diagnoses, nurses can assess for reasons for disturbed sleep patterns such as insufficient privacy, disruption caused by the environment (e.g. inappropriate lighting, or disruptive noises) or inability to mobilize into a comfortable position (Herdman & Kamitsuru, 2018), pain (Amofah et al., 2016; Boitor et al., 2019), and anxiety (Boitor et al., 2019; Liao et al., 2011). Sample questions that nurses can ask their patient are: a) was there something in particular that kept you up last night?, b) do you feel comfortable in your bed to be able to sleep?, c) ideally, how many hours of sleep a night do you need to feel rest/well during the day?, d) what is your usual bedtime routine?, e) what helps you to sleep at home?

In addition to these questions, there are both subjective and objective sleep assessment tools available in the literature (Chervin, 2011), which can be chosen and adapted based on appropriateness for the cardiac post-surgery population. A tool such as the Richard Campbell's Sleep Questionnaire (RCSQ) (Frisk & Nordström, 2003; Richards, O'Sullivan, & Phillips, 2000) (Appendix I) which has demonstrated favourable psychometric properties (Cronbach's α .82–

.92), is easy to score, and quick to complete (Hoey et al., 2014). The RCSQ consists of six items (sleep depth, sleep latency, awakenings, returning to sleep, sleep quality, and noise) (Richards et al., 2000; Frisk & Nordström, 2003). All questions are scored by the respondent from 0-100 on a visual analogue scale in which a higher score represents better sleep (Frisk & Nordström, 2003).

In the hospital setting where my research study was conducted, there are no sleep assessment tools currently integrated into the standardized nursing assessment forms. This is consistent with Hoey and colleagues' (2014) literature review findings: the use of sleep assessment tools in hospital settings is limited. I recommend adding a section on sleep assessments or one of the existing tools to this standardized assessment form. Managers or advanced practice nurses are in a position to lead this proposed change. Including a validated tool (e.g. the RCSQ) in the standardized assessment, forms may ensure that comprehensive sleep assessments are taking place, and as a result, individualized sleep promotion practices are being selected (Chen et al., 2018; Gellerstedt et al., 2020).

In my literature review, I identified 24 sleep promotion practices that can be implemented for this population (Chapter 1). Participants in my study stated that reducing noise (e.g. talking in quiet voices, avoiding conversations near patient areas, decreasing the volume of intravenous alarms, ensuring proper placement of heart monitor leads to minimize unnecessary/false alarms), and prophylactic promotion (e.g. offering toileting prior to sleeping, clustering care, dimming or turning off bright lights, avoiding non-essential care during sleeping hours, encouraging avoidance of caffeine consumption) are the most beneficial practices for their patients. Since all these sleep promotion practices were considered beneficial by nurses working with the cardiac post-surgery population, I suggest that these be implemented as needed at the discretion of the nurse. However, although it is the bedside nurse who implements the sleep promotion practices,

the responsibility is also placed on those in leadership roles to assist in ensuring that the nurses have the time, resources, and support to do so. In a sleep promotion protocol created by Knauert et al. (2018), (to be discussed in further detail later in this chapter), the protocol included a multi-level approach that elicited support at the institution level, at the unit level and by the bedside nurses. The authors indicated that leadership support was essential in being able to properly implement a sleep promotion practice protocol (Knauert et al., 2018).

Lastly, the nurse will need to evaluate the impact of their selected sleep promotion practices with their patient the next morning to inquire whether it had the desired effect, if the selected sleep promotion practices should be changed or a new plan created for the next night. Research has shown that nurses tend to overestimate their patients' sleep (Chen et al., 2018); therefore, eliciting a patient's self-report is important for the evaluation. For instance, the nurse can ask the patient the following questions: a) do you think the [*name* of sleep promotion practice used] was beneficial for you last night? b) is there anything I/the team can do differently so that you can sleep well/better tonight? The RCSQ (Frisk & Nordström, 2003; Richards et al., 2000) can be used before and after the implementation of a sleep promotion practice to evaluate the patient's sleep. To aid in the communication of useful sleep promotion practices to other nurses providing care for the same patient, it is important that the nurse documents the type of sleep promotion practice used and its result. This is consistent with the College of Nurses of Ontario standards of practice, which emphasizes that documentation communicates to all healthcare providers the plans of care, assessment, interventions and the outcomes and evaluation of those actions (College of Nurses of Ontario, 2008).

Nursing Policy & Protocols

Nurses in leadership positions could consider integrating sleep promotion practices in institutional policies and procedures. In a multinational survey which included data from nurse managers of 522 ICUs, it was found that only nine percent of ICUs had a protocol for managing sleep disturbances, and only one percent had sleep questionnaires provided to their nurses to assist with their sleep assessments (Hofhuis et al., 2018). In that study, the majority of nurse managers (72%) stated that they would like to implement a sleep promotion protocol in the future (Hofhuis et al., 2018). A survey study of 1223 ICU healthcare providers in 24 countries found that only a small number of respondents (32%) had a sleep promotion protocol in their ICU (Kamdar et al., 2016). Healthcare providers who used sleep promotion protocols stated that they were able to better assess their patients' sleeping pattern, had control over lighting conditions, control over levels of environmental noise, and were able to delay non-urgent nursing care to allow their patient to sleep (Kamdar et al., 2016). Healthcare providers who did not have established sleep protocols were more likely to interrupt their patients' sleep as lower quality than those with established protocols (Kamdar et al., 2016). In addition, Knauert and colleagues (2019) created a sleep promotion protocol for ICU patients which restricted non-time sensitive bedside care from midnight until 4AM in which all medications and tests were scheduled before/after this restricted time. Further, any urgent care that needed to be provided during the restricted naptime was clustered as much as possible (Knauert et al., 2018). This protocol was implemented at the level of the nurse but relied on support of nursing management and leadership, coordination from laboratory medicine and pharmacy, avoidance of unit level

overhead paging, and adjustments to visitor policies (Knauert et al., 2018). Implementing this protocol significantly decreased in-room activity and sound from midnight to 4AM (Knauert et al., 2019). Therefore, I suggest the development of nursing guidelines/protocols/policies on how to properly perform sleep assessments and provide guidance on the selection and delivery of sleep promotion practices for the cardiac post-surgery inpatient population. These guidelines/protocols/policies should include a guide for how to assess sleep (e.g. the RCSQ) and examples of sleep promotion practices targeted specifically to cardiac post-surgery inpatients (e.g. the sleep promotion practices that I have identified in Chapter 3).

As demonstrated by my findings, barriers to sleep promotion included post-surgical nursing policies and procedures such as routine bloodwork draws, hemodynamic monitoring and daily weights. Therefore, this suggests that the current protocols/policies in place may hinder nurses' intentions and abilities to promote sleep. Nurses rely on institutional policies to guide their clinical practice, even if they are not based in research (Squires et al., 2007). Hence, it is suggested that organizations review their policies to ensure that they are evidence-based, and current so they do not interfere with other important nursing care such as sleep promotion.

Education

Although lack of knowledge was not identified as a barrier in my study, my findings showed that nurses are acquiring sleep promotion practice knowledge mainly from personal experience. This means that they need to work to acquire sleep promotion knowledge. This is consistent with available research in Sweden, which found that sleep was not formally addressed in their syllabus or program learning outcomes (Gellerstedt et al., 2019b). Gellerstedt et al. (2019b) found that since there was a lack of sleep education in the nursing curriculum, it caused the nursing students to rely solely on their own experiences when addressing and intervening on

poor sleep problems. The Canadian Nurses Association, together with the Registered Nurses of Ontario (2010) in their document entitled: *Nurse Fatigue and Patient Safety*, recommended that nurses be educated in being able to recognize and manage fatigue in themselves and others so that they can understand the science of sleep and the negative effects associated with sleep disturbances and fatigue. In addition, a Canadian study assessing sleep quality in first-year nursing students found that 84% of nursing students experienced poor sleep quality and nursing students tended to overestimate their sleep (Wall, 2018). It is suggested that educating nursing students on sleep quality will not only benefit their future patients but also benefit themselves (Wall, 2018). Hence, nursing students would benefit from formal sleep education so that they can have knowledge of sleep disturbances, sleep promotion practices and sleep hygiene prior to starting their professional work as a nurse. There are several studies calling upon university and college nursing programs to formally educate their students on sleep, factors related to poor sleep, and adequate sleep hygiene (Gellerstedt et al., 2019b; Huang et al., 2014; Thomas et al., 2017; Wall, 2018). Therefore, I suggest that sleep physiology education and the nurses' role in promoting sleep be included in undergraduate education curriculum. Basic sleep education could be included in the anatomy and physiology class with a laboratory focused on non-pharmacological sleep promotion practices. In addition, a focus on sleep could be incorporated into nursing clinical placements (e.g. consolidation) as nursing students are exposed to a variety of shifts (including night shifts).

Second, my findings revealed that nurses lack formal training on how to promote sleep for cardiac post-surgery inpatients. Formal training regarding sleep promotion for nurses has shown positive results (Greve & Pederson, 2016; Massengale et al., 2015). For instance, in research conducted by Greve & Pederson (2016), nurses who received formal training had better

understanding of what it means to have *good sleep*. Training content included education on sleep challenges, sleep hygiene factors, and guidance on how to identify patients' sleep habits, sleep history, and sleep patterns (Greve & Pederson, 2016). Nurses then modified their evening routines to target patients' wishes regarding sleep needs (Greve & Pederson, 2016). Patients benefited from this intervention as evidenced by better sleep quality score two months later (Greve & Pederson, 2016). Organizations may consider including sleep promotion content in their institutional orientations and professional development opportunities (Gellerstedt et al., 2019a) to raise awareness and encourage sleep promotion amongst inpatients.

Future Research

While I was able to identify which factors were barriers or enablers, I was unable to divulge into why nurses considered them as such, and why there were numerous enablers and few barriers. Next steps could include qualitative investigations to further explore the implementability of sleep promotion practices in this context to inform subsequent intervention strategies. The aim of such a subsequent study could be to further explore all nurses' experiences of implementing sleep promotion practices (considering all steps of the nursing process as described above). Examples of content areas for interviews/focus groups with nurses would include the relative ease of implementing various sleep promotion practices, considerations regarding unit flow, existing protocols and available resources, and influence of nursing leadership on implementation. Further, as suggested by Michie and colleagues (2011), I could seek to determine what conditions internal to nurses and within their physical and social environments would need to be leveraged for sleep promotion to occur and seek to determine what factors underlie variation in this behaviour. With a deeper understanding of the factors

affecting sleep promotion use in the cardiac post-surgical settings, a behaviour change intervention addressing the barriers specific to this population and context could be developed.

The intention of using the TDF to identify the factors influencing nurses' use of sleep promotion practices is to highlight the most important barriers as initial targets for behaviour change interventions (Atkins et al. 2015; Cane et al. 2012). Hence, another next step in this research process is to map these barriers (e.g. absence of recognition from important healthcare professionals after promoting sleep [TDF domain: reinforcement], often having something else more important than promoting sleep [TDF domain: goals], encountering problems when trying to promote sleep [TDF domain: beliefs about capabilities]) to guide the choice of behaviour change techniques and intervention components. Future research could focus specifically on these three domains (Reinforcement, Goals, and Beliefs about Capabilities) and use examples from previously published research as guidance (Cowdell & Dyson, 2019) to develop a behaviour change intervention for this setting and population using an integrated knowledge translation approach (with users as stakeholders in the development process). Once developed, the focus could shift to its implementation. For example, Taylor et al. (2013) used the TDF to guide the implementation of behaviour change interventions using a stepwise approach. They started by forming an implementation team (composed of nurses, pharmacists, consultants, registrars, and physicians), identifying a target behaviour, understanding existing barriers to the behaviour, and creating intervention strategies to address the barriers (Taylor et al., 2013). A similar approach could be used to overcome the barriers identified in my study.

Strengths & Limitations

This thesis is novel in that it presented types and frequencies of sleep promotion practices from the cardiovascular nurses' perspectives and is the first of its kind to do so. Second, it

evaluated barriers and enablers from a behaviour change theory perspective. Third, the use of a quantitative survey resulted in being able to reach a larger sample size than what may have been possible with a qualitative study. Fourth, it highlighted the unique position of the nurse in sleep promotion for their inpatients.

As is prominent in any work, there are some limitations. When I conducted the literature review, it was apparent that the currently available literature on sleep promotion in the cardiovascular inpatient setting is limited. Therefore, the categories on sleep promotion practices for the cardiac post-surgery inpatient population may be missing sleep promotion practices used in this context. Therefore, I may have missed some sleep promotion practices that nurses currently use. The choice of the RAM for the content of the thesis offered a lens from which to view sleep promotion to help patients adapt to the stimuli in their post-surgical inpatient environment. However, a theory that specifically focuses on sleep physiology may have been helpful in delving deeper into the sleep process and offering a clearer understanding on the physiological effects of inadequate sleep. When I initially started this thesis, I searched for a theory that could address this aspect but was unable to find one that fit into my aim and purpose on sleep promotion by nurses.

The questionnaire was developed by the researchers and not formally validated prior to data collection. However, I made a conscious effort to ensure that the questionnaire was developed with rigor, such as basing my items on previously published TDF questionnaires, determining face and content validity on my modified items with professionals who are experts in the field of sleep medicine and behavioral change. I also conducted three iterations of pre-testing with 12 nurses to ensure that the questions were interpreted as intended.

Thesis Conclusion

Sleep promotion is an important component of nursing care for inpatients recovering from cardiac surgery in the CSICU and ward settings. In this thesis, I investigated the sleep promotion practices used by registered nurses in the cardiac post-surgical setting, and identified the factors that influence their use. According to participating nurses, noise reduction and prophylactic promotion were the most beneficial sleep promotion practices and orienting the inpatient to the room and providing additional bedding were the most frequently used sleep promotion practices (Objective 1). Overall, CSICU and ward nurses agreed with respect to how beneficial they perceived each category of sleep promotion practices to be. Ward nurses provided headphones, earplugs, and pre-operative teaching regarding sleep after surgery more frequently than CSICU nurses (Objective 2). I revealed forty-five enablers and 15 barriers, with few differences identified across settings (Objective 3). Hence, future sleep promotion practices may not need to be tailored to a specific unit. Using a theory-guided approach to identify these barriers and enablers will be helpful to design and develop interventions to help nurses promote inpatients' sleep.

References

- Amofah, H., Broström, A., Fridlund, B., Bjorvatn, B., Haaverstad, R., Hufthammer, K., Kuper, K. K. J., Ranhoff, A. H., Norekvål, T. M., Thompson, D. R., & Moser, D. K. (2016). Sleep in octogenarians during the postoperative phase after transcatheter or surgical aortic valve replacement. *European Journal of Cardiovascular Nursing*, 15(2), 168-177. <https://doi.org/10.1177/1474515115620992>
- Atkins, L., Francis, J., Islam, R., O'Connor, D., Patey, A., Ivers, N., Foy, R., Duncan, E. M., Colquhoun, H., Grimshaw, J. M., Lawton, R., & Michie, S. (2017). A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science*, 12(1), 1-18. <https://doi.org/10.1186/s13012-017-0605-9>
- Atkins, M., Michie, S. (2015). Designing interventions to change eating behaviours. *Proceedings of the Nutrition Society*, 74(2), 164-170. <https://doi.org/10.1017/S0029665115000075>
- Baraki, Z., Girmay, F., Kidanu, K., Gerensea, H., Gezehgne, D., & Teklay, H. (2017). A cross sectional study on nursing process implementation and associated factors among nurses working in selected hospitals of Central and Northwest zones, Tigray Region, Ethiopia. *BMC Nursing*, 16(1), 54-59. <https://doi.org/10.1186/s12912-017-0248-9>
- Boitor, M., Martorella, G., Maheu, C., Laizner, A., & Gélinas, C. (2019). Does hand massage have sustained effects on pain intensity and pain-related interference in the cardiac surgery critically ill? a randomized controlled trial. *Pain Management Nursing*, 20(6), 572-579. <https://doi.org/10.1016/j.pmn.2019.02.011>
- Brown, S., Sharp, L., Sniehotta, F. F., Skinner, R., & Araújo-Soares, V. (2020). The

development of health behaviour change interventions for childhood cancer survivors:

The need for a behavioural science approach. *Pediatric Blood & Cancer*, 67(9), 1-4.

<https://doi.org/10.1002/pbc.28500>

Canadian Nurses Association & Registered Nurses' Association of Ontario. (2010). *Nurse fatigue and patient safety: Research report*. https://cna-aic.ca/~media/cna/page-content/pdf-en/fatigue_safety_2010_report_e.pdf

Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the Theoretical Domains Framework for use in behaviour change and implementation research. *Implementation Science*, 7, 1-17. <https://doi.org/10.1186/1748-5908-7-37>

Casida, J., Davis, J., Shpakoff, L., & Yarandi, H. (2013). An exploratory study of the patients' sleep patterns and inflammatory response following cardiopulmonary bypass (CPB). *Journal of Clinical Nursing*, 23(15-16), 2332-2342. <https://doi.org/10.1111/jocn.12515>

Casida, J., Davis, J., Zalewski, A., & Yang, J. (2018). Night-time care routine interaction and sleep disruption in adult cardiac surgery. *Journal of Clinical Nursing*, 27(7-8), e1377–e1384. <https://doi.org/10.1111/jocn.14262>

Chen, L., Ji, D., Zhang, F., Li, J., Cui, L., Bai, C., Liu, H., & Liang, Y. (2018). Richards-Campbell sleep questionnaire: psychometric properties of Chinese critically ill patients. *Nursing in Critical Care*, 24(6), 362-368. <https://doi.org/10.1111/nicc.12357>

Chervin, R.D. (2011). Use of clinical tool and tests in sleep medicine. In M. H. Kryer, T. Roth, & W. C. Dement (Eds.), *Principles and practice of sleep medicine* (5th ed., pp. 666-679). Elsevier.

College of Nurses of Ontario. (2008). *Documentation, revised 2008*. Practice standard

https://www.cno.org/globalassets/docs/prac/41001_documentation.pdf

Conway, A., Nebauer, M., & Schulz, P. (2010). Improving sleep quality for patients after cardiac surgery. *British Journal of Cardiac Nursing*, 5(3), 142-147.

<https://doi.org/10.12968/bjca.2010.5.3.46833>

Cowdell, D., & Dyson, J. (2019). How is the theoretical domains framework applied to developing health behaviour interventions? A systematic search and narrative synthesis.

BMC Public Health, 19(1), 1-6. <https://doi.org/10.1186/s12889-019-7442-5>

Delaney, L., Currie, M., Huang, H., Lopez, V., & Van Haren, F. (2018). “They can rest at home”: An observational study of patients’ quality of sleep in an Australian hospital. *BMC Health Services Research*, 18(1), 524-529.

<https://doi.org/10.1186/s12913-018-3201-z>

Díaz-Alonso, M., Smith-Plaza, M., Suárez-Mier, M., & Lana, M. (2018). Impact of a nurse intervention to improve sleep quality in intensive care units: Results from a randomized controlled trial. *Dimensions of Critical Care Nursing*, 37(6), 310-317.

<https://doi.org/10.1097/DCC.0000000000000319>

Frisk, U., & Nordström, G. (2003). Patients’ sleep in an intensive care unit—patients’ and nurses’ perception. *Intensive & Critical Care Nursing*, 19(6), 342-349.

[https://doi.org/10.1016/s0964-3397\(03\)00076-4](https://doi.org/10.1016/s0964-3397(03)00076-4)

Gellerstedt, L., Medin, J., Kumlin, M., & Rydell Karlsson, M. (2015). Nurses’ experiences of hospitalised patients’ sleep in Sweden: A qualitative study. *Journal of Clinical Nursing*, 24(23-24), 3664-3673. <https://doi.org/10.1111/jocn.12985>

Gellerstedt, L., Medin, J., Kumlin, M., & Rydell Karlsson, M. (2019a). Nursing care and management of patients’ sleep during hospitalisation: A cross-sectional study. *Journal of*

- Clinical Nursing*, 28(19-20), 3400-3407. <https://doi.org/10.1111/jocn.14915>
- Gellerstedt, L., Medin, J., Kumlin, M., & Rydell Karlsson, M. (2019b). Sleep as a topic in nursing education programs? A mixed method study of syllabuses and nursing students' perceptions. *Nurse Education Today*, 79, 168–174.
<https://doi.org/10.1016/j.nedt.2019.05.030>
- Gellerstedt, L., Rydell Karlsson, M., Medin, J., & Kumlin, M. (2020). Patients' self-assessed sleep as a nursing tool during hospital care: A pilot study. *Nordic Journal of Nursing Research*, 40(3), 123-129. <https://doi.org/10.1177/2057158520913227>
- Greve, H., & Pedersen, P. U. (2016). Improving sleep after open heart surgery: Effectiveness of nursing interventions. *Journal of Nursing Education and Practice*, 6(3), 15-22.
<https://doi.org/10.5430/jnep.v6n3p15>
- Guo, P., East, L., & Arthur, A. (2012). A preoperative education intervention to reduce anxiety and improve recovery among Chinese cardiac patients: A randomized controlled trial. *International Journal of Nursing Studies*, 49(2), 129-137.
<https://doi.org/10.1016/j.ijnurstu.2011.08.008>
- Hadjibalassi, M., Lambrinou, E., Papastavrou, E., & Papathanassoglou, E. (2018). The effect of guided imagery on physiological and psychological outcomes of adult ICU patients: A systematic literature review and methodological implications. *Australian Critical Care*, 31(2), 73-86. <https://doi.org/10.1016/j.aucc.2017.03.001>
- Hedges, C. (2005). Sleep, memory, and learning in off-pump coronary artery bypass patients. *Research in Nursing & Health*, 28(6), 462-473.
<https://doi.org/10.1002/nur.20101>
- Herdman, T. H., & Kamitsuru, S. (Eds.). (2018). *NANDA international nursing diagnoses:*

Definitions and classification, 2018-2020. Thieme Publishing.

Hoey, L. M., Fulbrook, P., & Douglas, J. A. (2014) Sleep assessment of hospitalised patients: A literature review. *International Journal of Nursing Studies*, 51(9), 1281-1288.

<https://doi.org/10.1016/j.ijnurstu.2014.02.001>

Hofhuis, J. G. M., Rose, L., Blackwood, B., Akerman, E., McGaughey, J., Egerod, I., Fossum, Foss, H., Georgiou, E., Graff, H. J., Kalafati, M., Sperlinga, R., Berardo, A., Schäfer, A., Wojnicka, A. G., & Spronk, P. E. (2018). Clinical practices to promote sleep in the ICU: A multinational survey. *International Journal of Nursing Studies*, 81, 107-114.

<https://doi.org/10.1016/j.ijnurstu.2018.03.001>

Huang, C., Yang, L., Wu, L., Liu, Y., & Chen, H. (2014). Determinants of daytime sleepiness in first-year nursing students: A questionnaire survey. *Nurse Education Today*, 34(6), 1048–1053. <https://doi.org/10.1016/j.nedt.2013.11.005>

Improved Clinical Effectiveness Through Behavioural Research Group (ICEBeRG). (2006).

Designing theoretically-informed implementation interventions. *Implementation Science*, 1(1), 1-8. <https://doi.org/10.1186/1748-5908-1-4>

Kamdar, B. B., Knauert, M. P., Jones, S. F., Parsons, E. C., Parthasarathy, S., Pisani, M. A. (2016). Perceptions and practices regarding sleep in the ICU: a survey of 1,223 critical care providers. *Annals of the American Thoracic Society*, 13, 1370-1377.

<https://doi.org/10.1513/AnnalsATS.201601-087OC>

Knauert, M. P., Redeker, N. S., Yaggi, H. K., Bennick, M., Pisani, M. A. (2018) Creating naptime: An overnight, nonpharmacologic intensive care unit sleep promotion protocol. *Journal of Patient Experience*, 5(3), 180-187.

<https://doi.org/10.1177/2374373517747242>

- Knauert, M., Pisani, M., Redeker, N., Murphy, T., Araujo, K., Jeon, S., & Yaggi, H. (2019). Pilot study: An intensive care unit sleep promotion protocol. *BMJ Open Respiratory Research*, 6(1). 1-6. <https://doi.org/10.1136/bmjresp-2019-000411>
- Le, A., Friese, R., Hsu, C., Wynne, J., Rhee, P., & O’Keeffe, T. (2012). Sleep disruptions and nocturnal nursing interactions in the intensive care unit. *Journal of Surgical Research*, 177(2), 310-314. <https://doi.org/10.1016/j.jss.2012.05.038>
- Leslie, J. L. (2018). Employment of the nursing process to facilitate recovery from surgery: A case study. *Online Journal of Issues in Nursing*, 23(2), 1-10. <https://doi.org/10.3912/OJIN.Vol23No02PPT07>
- Liao, W., Huang, C., Huang, T., & Hwang, S. (2011). A systematic review of sleep patterns and factors that disturb sleep after heart surgery. *Journal of Nursing Research*, 19(4), 275-288. <https://doi.org/10.1097/JNR.0b013e318236cf68>
- MacCune, S. (2010). Effect of back massage on sleep among post-operative CABG and valve replacement patients. *The Nursing Journal of India*, 101(4), 86-88. <https://pubmed.ncbi.nlm.nih.gov/21053666/>
- Machado, F. S., Souza, R. C. S., Poveda, V. B., & Costa, A. L. S. (2017). Non-pharmacological interventions to promote sleep of patients after cardiac surgery: a systematic review. *Revista Latino-Americana de Enfermagem*, 25, 2926-2936. <https://doi.org/10.1590/1518-8345.1917.2926>
- Massengale, J., Murphy, M., Cadena, S., & Wang, T. (2015). *The role of nursing practice in promoting sleep during brain injury rehabilitation* (Publication No. 3718796) [Doctoral dissertation, Walden University]. ProQuest Dissertations Publishing.
- Matukatitis, J., Eckman, T., Baxter, K., Bradley, E., Hawrylack, H., Johnson, S., Mooney, R.,

- Papanicolas, D., & Briggs, P. (2014). Sleepless in stepdown. *Nursing* 2014, 44(7), 15-18.
https://journals.lww.com/nursing/Citation/2014/07000/Sleepless_in_stepdown.6.aspx
- Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., & Walker, A. (2005). Making psychological theory useful for implementing evidence based practice: A consensus approach. *Quality and Safety in Health Care*, 14(1), 26–33.
<https://doi.org/10.1136/qshc.2004.011155>
- Michie, S., Fixsen, D., Grimshaw, J., Eccles, M. P. (2009) Specifying and reporting complex behaviour change interventions: the need for a scientific method. *Implementation Science*, 4(1), 1-6. <https://doi.org/10.1186/1748-5908-4-40>
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), 1-11. <https://doi.org/10.1186/1748-5908-6-42>
- Navarro-García, M., de Carlos Alegre, V., Martínez-Oroz, A., Irigoyen-Aristorena, M., Elizondo-Sotro, A., Indurain-Fernández, S., Martorell-Gurucharri, A., Sorbet-Amóstegui, M. R., Preito-Guembe, P., Ordoñez-Ortigosa, E., García-Aizpún, Y., & García-Ganuza, R. (2017). Quality of sleep in patients undergoing cardiac surgery during the postoperative period in intensive care. *Enfermería Intensiva (English Ed.)*, 28(3), 114-124. <https://doi.org/10.1016/j.enfie.2017.03.002>
- Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, 10, 1-13. <https://doi.org/10.1186/s13012-015-0242-0>
- Nerbass, F., Feltrim, M., Souza, S., Ykeda, D., & Lorenzi-Filho, G. (2010). Effects of massage therapy on sleep quality after coronary artery bypass graft surgery. *Clinics*, 65(11), 1105-1110. <https://doi.org/10.1590/S1807-59322010001100008>

- Nesami, M., Shorofi, S., Jafari, A., Khalilian, A., & Tabari, S. (2016). The relationship between stressors and anxiety levels after CABG in Sari, Iran. *Iranian Red Crescent Medical Journal*, 18(5), 1-7. <https://doi.org/10.5812/ircmj.25407>
- Patton, D., Hughes, C., Cadogan, C., & Ryan, C. (2017). Theory-based interventions to improve medication adherence in older adults prescribed polypharmacy: A systematic review. *Drugs & Aging*, 34(2), 97–113. <https://doi.org/10.1007/s40266-016-0426-6>
- Potter, P. A., Perry, A. G., Stockert, P. A., Hall, A. M., Astle, B., Duggleby, W. (Eds.). (2019). *Canadian fundamentals of nursing (6th ed.)*. Mosby/Elsevier Canada.
- Powell, B. J., Fernandez, M. E., Williams, N. J., Aarons, G. A., Beidas, R. S., Lewis, C. C., McHugh, S. M., & Weiner, B. J. (2019). Enhancing the impact of implementation strategies in healthcare: A research agenda. *Frontiers in Public Health*, 7(3), 1-9. <https://doi.org/10.3389/fpubh.2019.00003>
- Redeker, N. S., & Hedges, C. (2002). Sleep during hospitalization and recovery after cardiac surgery. *The Journal of Cardiovascular Nursing*, 17(1), 56-68. <https://doi.org/10.1097/00005082-200210000-00006>
- Ritmala-Castren, M., Virtanen, I., Vahlberg, T., Leivo, S., Kaukonen, K., & Leino-Kilpi, H. (2016). Evaluation of patients' sleep by nurses in an ICU. *Journal of Clinical Nursing*, 25(11-12), 1606-1613. <https://doi.org/10.1111/jocn.13148>
- Richards, K. C, O'Sullivan, P. S., Phillips, R. L. (2000). Measurement of sleep in critically ill patients. *Journal of Nursing Measurement*, 8(2), 131-44. <https://doi.org/10.1891/1061-3749.8.2.131>
- Roy, C. (2006). *The Roy adaptation model third edition*. Pearson
- Sniehotta, F. F. (2009). Towards a theory of intentional behaviour change: Plans, planning, and

- self-regulation. *British Journal of Health Psychology*, 14(2), 261-273.
<https://doi.org/10.1348/135910708x389042>
- Spence, J. S., Murray, T. M., Tang, A., Butler, R., & Albert, N. (2011). Nighttime noise issues that interrupt sleep after cardiac surgery. *Journal of Nursing Care Quality*, 26(1), 88-95.
<https://doi.org/10.1097/NCQ.0b013e3181ed939a>
- Squires, J., Moralejo, D., & Lefort, S. (2007). Exploring the role of organizational policies and procedures in promoting research utilization in registered nurses. *Implementation Science*, 2(1), 1-11. <https://doi.org/10.1186/1748-5908-2-17>
- Taylor, N., Parveen, S., Robins, V., Slater, B., & Lawton, R. (2013). Development and initial validation of the Influences on Patient Safety Behaviours Questionnaire. *Implementation Science*, 8(1), 1-8.
<https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-8-81>
- Thomas, C. M., McIntosh, C. E., Lamar, R., & Allen, R. L. (2017). Sleep deprivation in nursing students: The negative impact for quality and safety. *Journal of Nursing Education and Practice*, 7(5), 87-93. <https://doi.org/10.5430/jnep.v7n5p87>
- Tsai, M., Tsay, S., Moser, D., Huang, T., & Tsai, F. (2019). Examining symptom trajectories that predict worse outcomes in post-CABG patients. *European Journal of Cardiovascular Nursing*, 18(3), 204-214. <https://doi.org/10.1177/1474515118809906>
- Wall, N. (2018). *Student nurses' perception of sleep quality*. (Publication No. 10973625)
[Master's thesis]. ProQuest Dissertations Publishing.
- Yayla, A., & Özer, N. (2019). Effects of early mobilization protocol performed after cardiac surgery on patient care outcomes. *International Journal of Nursing Practice*, 25(6), 1-11.
<https://doi.org/10.1111/ijn.12784>

Yildirim, B. & Özkahraman, S. (2011). Critical thinking in nursing process and education.

International Journal of Humanities and Social Science, 1(13). 257-262.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.465.5170&rep=rep1&type=pdf>

Yilmaz, H., & Iskesen, I. (2007). Follow-up with objective and subjective tests of the sleep characteristics of patients after cardiac surgery. *Circulation Journal: Official Journal of the Japanese Circulation Society*, 71(10), 1506-1510.

<https://doi.org/10.1253/circj.71.1506>

Zhang, W., Wu, W., Gu, J., Sun, Y., Ye, X., Qiu, W., Su, C., Zhang, S., & Ye, W. (2015). Risk factors for postoperative delirium in patients after coronary artery bypass grafting: A prospective cohort study. *Journal of Critical Care*, 30(3), 606-612.

<https://doi.org/10.1016/j.jcrc.2015.02.003>

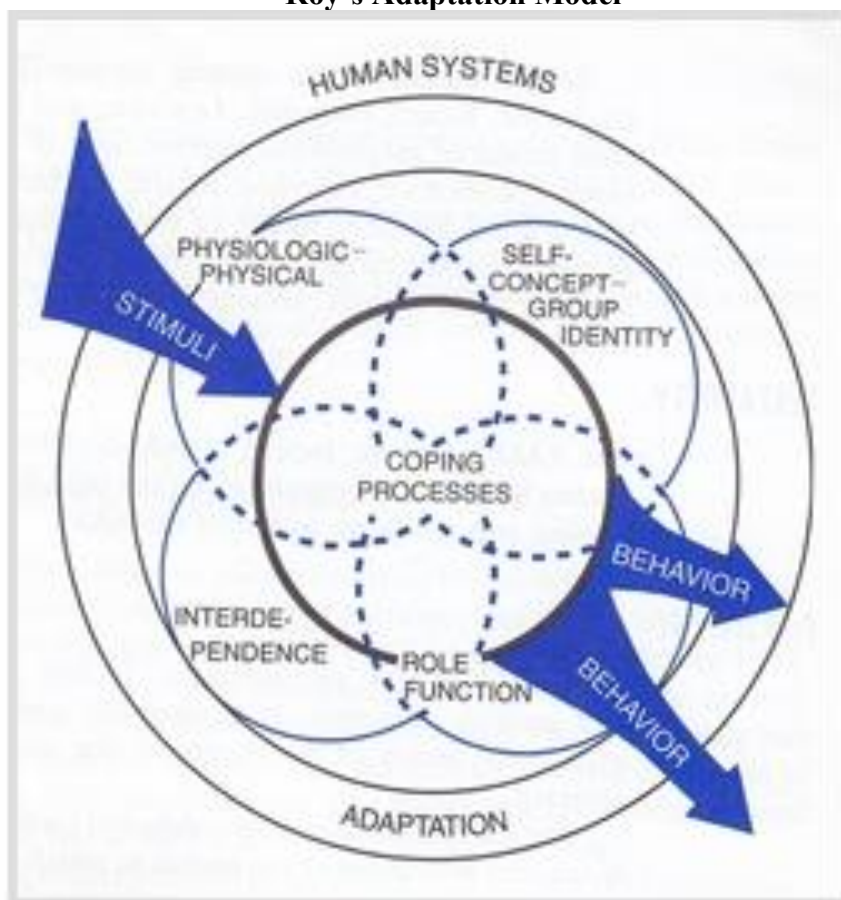
Appendix A

Search Terms and Search Strategies

Database	Search terms
CINHAL	MH sleep* AND TI (cardiac surgical procedures or coronary artery bypass graft* or cardiopulmonary bypass or valve replacement or valve repair or ((cardiac or heart or valve) and (surgical* or surger* or transplant* or operation or operations))) OR AU (cardiac surgical procedures or coronary artery bypass graft* or cardiopulmonary bypass or valve replacement or valve repair or ((cardiac or heart or valve) and (surgical* or surger* or transplant* or operation or operations))) AND TI (inpatient* or in-patient* or acute care or ward or intensive care unit* or critical care or ICU or CSICU or hospitaliz* or hospitalis* or in-hospital* or admitted or inpatients) OR AU (inpatient* or in-patient* or acute care or ward or intensive care unit* or critical care or ICU or CSICU or hospitaliz* or hospitalis* or in-hospital* or admitted or inpatients)
Database	Search terms
PsycINFO	exp Sleep/ AND cardiac surgical procedures or coronary artery bypass graft* or cardiopulmonary bypass or valve replacement or valve repair or ((cardiac or heart or valve) and (surgical* or surger* or transplant* or operation or operations)) AND inpatient* or in-patient* or acute care or ward or intensive care unit* or critical care or ICU or CSICU or hospitaliz* or hospitalis* or in-hospital* or admitted or inpatients
Database	Search terms
Pubmed	sleep*[tiab] OR sleep[MeSH Terms] AND "cardiac surgical procedures"[MeSH Terms] OR "coronary artery bypass graft*" OR "cardiopulmonary bypass" OR "valve replacement" OR "valve repair" OR ((cardiac[tiab] OR heart[tiab] OR valve[tiab]) AND (surgical*[tiab] OR surger*[tiab] OR transplant*[tiab] OR operation[tiab] OR operations[tiab])) AND inpatient*[tiab] OR in-patient*[tiab] OR "acute care"[tiab] OR ward[tiab] OR intensive care unit*[tiab] OR critical care[tiab] OR ICU[tiab] OR CSICU[tiab] OR hospitaliz*[tiab] OR hospitalis*[tiab] OR in-hospital*[tiab] OR admitted[tiab] OR inpatients[MeSH Terms]
Database	Search terms

ProQuest	<u>mesh.Exact("Sleep") OR ab(sleep*) OR ti(sleep*)</u>
Nursing and	AND
Allied Health	cardiac surgical procedures OR "coronary artery bypass graft*" OR "cardiopulmonary bypass"
Database	OR "valve replacement" OR "valve repair" OR ((cardiac OR heart OR valve) AND (surgical* OR surger* OR transplant* OR operation OR operations))
	AND
	npatient* OR in-patient* OR "acute care" OR ward OR intensive care unit* OR critical care
	OR ICU OR CSICU OR hospitaliz* OR hospitalis* OR in-hospital* OR admitted OR
	inpatients

Appendix B
Roy's Adaptation Model



(Roy, 2006)

Appendix C Recruitment Poster

PARTICIPANTS NEEDED FOR RESEARCH IN SLEEP PROMOTION

We are looking for volunteers to take part in a study on nurses' sleep promotion practices in cardiac post-surgery inpatients. You are eligible to participate if you are a RN on H3, H4, or the CSICU.

If you are interested and choose to participate you would be asked to complete a survey.

The survey will take approximately 20 minutes to complete.

Tea and coffee packages will be offered as a token of our appreciation for your involvement.

Information sessions will be held on your unit throughout the next 6 weeks

Survey Access: <https://bit.ly/2RNz8V2>



Version Date: January 15, 2020
Protocol # 20200009-01H

University of Ottawa School of Nursing Thesis Project

Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	
Sleep Promotion Research https://bit.ly/2RNz8V2	

Appendix D
Survey Information Letter
Barriers and Facilitators to Nurses' Sleep Promotion Practices in the Post-Cardiac Surgery
Inpatient Population: A Theoretical Domains Framework Guided Survey Study
Protocol #20200009-01H

Information Letter

You are invited to participate in a survey study. The purpose of this study is to:

- (1) identify the barriers and facilitators to nurses' sleep promotion practices for cardiac post-surgery inpatients,
- (2) investigate whether there is a difference between the sleep promotion practices identified in the critical care unit compared to ward units,
- (3) identify which barriers and facilitators are prevalent in the different locations.

This study is being done as part of a University of Ottawa Masters of Science in Nursing project being carried out by Ms. Amanda Hummel and is co-supervised by Dr. Krystina Lewis and Dr. Janet Squires in collaboration with Dr. Chantal Backman, Ms. Carolyn Cooper (manager of UOHI H3), and Ms. Amy Charlebois (APN Cardiac Surgery).

Your participation will consist of completing a 20-minute, online survey. Completing and returning the on-line survey <https://bit.ly/2RNz8V2> indicates that your consent to participate is implied.



Participation in the study is voluntary and will have no impact on your current or future employment with the UOHI. The information that you share will remain confidential. Your identity will remain anonymous. You may withdraw from participation at any time without having to provide a reason; however, due to the anonymous nature of the survey it will not be possible to withdraw from participation once the completed survey has been submitted.

As a token of our appreciation, please enjoy complementary tea or coffee package. In addition, the unit who completes the most surveys will win a free lunch.

If you have any questions about the study, you may contact the student researcher or her supervisors.

Appendix E
Recruitment Email

Subject Line: Invitation to participate in research

To whom it may concern,

You are being asked to participate in a research study. Participation is voluntary.

Briefly, the study involves a survey of nurses' sleep promotion practices in the cardiac post-surgery inpatient population. Your participation will consist of completing one online survey which will take approximately 20 minutes to complete. If you have questions, we will be hosting informal information sessions on your unit in the following weeks.

As a token of our appreciation, please enjoy complimentary tea or coffee packages (available at information sessions and from any member of the research team).

The unit who completes the most surveys will be treated with a free lunch.

If you would like to participate in this study, please click on the link below to access the information letter followed by the survey: <https://bit.ly/2RNz8V2>



The information that you share will remain strictly confidential.

Your identity will remain anonymous. By completing the survey, you are providing your consent to participate in the study.

If you have any questions, please contact Amanda Hummel

Please note, we will be sending two reminder emails within the next few weeks with the survey link included.

Thank you,

Amanda Hummel

1st Reminder Email

Subject Line: Invitation Reminder to participate in research

To whom it may concern,

An email was sent to you one week ago about participation in my research study. Participation is voluntary.

I wanted to send you a quick reminder. Briefly, the study involves a survey of nurses' sleep promotion practices in the cardiac post-surgery inpatient population. Your participation will consist of completing one online survey which will take approximately 20 minutes to complete. As a thank you for taking the time to read this letter, I have provided coffee and tea packages available in your unit's break room. Please feel free to take one!

The unit that completes the most surveys will be treated to a free lunch.

If you would like to participate in this study, please click on this link to access the survey:

<https://bit.ly/2RNz8V2>



The information that you share will remain strictly confidential. Your identity will remain anonymous. By completing the survey, you are providing your consent to participate in the study.

If you have any questions, please contact Amanda Hummel

Please note, we will be sending a second reminder emails within the next few weeks with the survey link included.

Thank you,
Amanda Hummel

2nd Reminder Email

Subject Line: Invitation Reminder to participate in research

To whom it may concern,

An email was sent to you three weeks ago about participation in our research study. Participation is voluntary.

I wanted to send you a quick reminder. Briefly, the study involves a survey of nurses' sleep promotion practices in the cardiac post-surgery inpatient population. Your participation will consist of completing one online survey which will take approximately 20 minutes to complete.

As a thank you for your consideration of this study, I have provided coffee and tea packages which are available in your unit's break room. Please feel free to take one. The unit that completes the most surveys will be treated to a free lunch.

If you would like to participate in this study, please click on the link below to access the survey:

<https://bit.ly/2RNz8V2>

The information that you share will remain strictly confidential. Your identity will remain anonymous. By completing the survey, you are providing your consent to participate in the study.

If you have any questions, please contact Amanda Hummel

Please note: recruitment for this study will close in three weeks.

Thank you,
Amanda Hummel
University of Ottawa

Appendix F

Sleep Promotion Survey

Are you an RN who provides care to post-cardiac surgery patients at the University of Ottawa Heart Institute?

Yes

No

If the participant selects “no” then they will be exited from the survey*

PART ONE: Demographic Questions

While answering the following questions, please think about your current area of work (e.g. H3, H4, or CSICU).

What is your gender?

1. Male
2. Female
3. Transgender
4. Other
5. Prefer not to respond

Please indicate your age in years.

1. Less than 20
2. 20-29
3. 30-39
4. 40-49
5. 50-59
6. Greater than 60

How many years of RN experience do you have?

How many months of RN experience do you have?

Please indicate which unit you work on:

1. H3
2. H4
3. CSICU

How many years have you worked on this unit?

How many months have you worked on this unit?

Please indicate your highest level of education in nursing:

1. College diploma
2. Bachelor's degree
3. Master's degree or higher

What shift do you work most of the time (i.e. greater than 50% of the time)

1. Day Shift (0700-1900)
2. Night shift (1900-0700)
3. Both (e.g. equal day and night shifts)

What is your employment status?

1. Casual

2. Part time
3. Full time

PART TWO: Sleep Promotion Practices for your Inpatients

This section of the survey is about the sleep promotion activities that you use for your cardiac- post surgical inpatients.

Thinking about a typical shift how often do you use the following sleep promotion practices with your cardiac post-surgical inpatients?

		Never	Rarely	Sometimes	Often	Very Often
Sleep Promotion Practice #1: Relaxation Techniques	Massage/ Back Rub					
	Guided Imagery					
	Encouraging deep breathing					
	Helping your patient achieve a comfortable position prior to sleeping					
	Assisting your patient with their bedtime routine					
	Orienting your patient to the room (e.g. providing call bell, bathroom location, informing of nurse availability)					
	Providing additional bedding for patient comfort (e.g. blankets, pillows)					
	Other (please specify)					
	Other (please specify)					
	Other (please specify)					
Sleep Promotion Practice #2: Devices or equipment to minimize sleep interruptions	Headphones					
	Eye Masks					
	Ear Plugs					
	Music					
	Room temperature adjustment					
	Other (please specify)					
	Other (please specify)					
Sleep Promotion Practice #3: Educational and cardiac surgery related strategies	Pre-operative teaching regarding sleep after surgery					
	Teaching proper sleep routine or self-care					
	Encouraging your patient to increase daytime activity					
	Other (please specify)					
	Other (please specify)					
	Other (please specify)					
Sleep Promotion Practice #4: Decreasing Noise	Talking in quiet voices					
	Avoiding conversations near patient areas					
	Decreasing the volume of IV alarms					

This includes healthcare provider generated noise and noise from alarms, unit pages and machines	Ensuring proper placement of heart monitor leads to minimize unnecessary/false alarms					
	Other (please specify)					
	Other (please specify)					
	Other (please specify)					
Sleep Promotion Practice #5: Prophylactic Promotion This includes clustering care and postponing nonessential procedures while the patient is asleep to reduce unnecessary interruptions	Offering toileting prior to sleeping					
	Clustering Care					
	Dimming or turning off bright lights					
	Avoiding non-essential care while your patient is sleeping (e.g. daily weights, non-time dependent blood draws)					
	Encouraging your patient to avoid afternoon caffeine consumption					
	Other (please specify)					
	Other (please specify)					
	Other (please specify)					

Rank the types of sleep promotion practices in terms of how beneficial they are to your patients. (1 = most beneficial and 5 = least beneficial)

Please note you can only select each number once

- Relaxation techniques (e.g. massage, guided imagery, etc.)
- Devices or equipment to minimize sleep interruptions (e.g. headphones, eye masks, etc.)
- Educational and cardiac surgery- related strategies (e.g. pre-operative teaching, increasing daytime activity, etc.)
- Decreasing noise (e.g. talking in quiet voices, avoiding conversations near patient areas, etc.)
- Prophylactic promotion (e.g. offering toileting, clustering care, etc.)

Where did you get the knowledge of your sleep promotion practices (select all that applies)?

- Formal nursing education
- Personal experience
- Advice from mentors
- Advice from patients
- Professional development (e.g. huddles, lunch and learns, conferences, articles)
- None of the above
- Other (please specify)

PART THREE: Factors that influence your sleep promotion practices for your inpatients

The following questions are related to factors that influence sleep promotion practices.

Please focus only on your experiences promoting sleep in the cardiac post-surgery population.

These questions may seem repetitive but there are important differences in each of them, kindly answer all questions.

Please indicate your agreement with each statement.

Factor #1: Knowledge

This refers to what you know and how this influences your sleep promotion practices

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
--	-------------------------------	--------------------------	-----------------	--------------	-----------------------	----------------------------

Promoting sleep is strongly supported by research						
I understand why it is important for my inpatients to get as many hours of sleep as possible						
I understand why it is important for my inpatients to have minimal or no interruptions during their sleep						
I am familiar with how to promote sleep						
I know what steps are needed to promote sleep						

Factor #2: Skills

This refers to what you know about HOW you should be promoting sleep and HOW this influences your actions

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I have been trained in general on how to promote sleep for inpatients						
I have been trained on how to promote sleep specifically for cardiac post-surgery inpatients						
I have practiced promoting sleep for my inpatients						
I have the necessary skills to perform sleep assessments						
I have the necessary skills to promote sleep						

Factor ##3: Social/Professional Role and Identity

This refers to who you are as a health care professional and whether that influences your sleep promotion practices or not.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
As a nurse, it is my role to promote sleep						
I encourage others to promote sleep for their inpatients						
I am supported by other nurses on my unit to use sleep promotion practices						

Factor #4: Beliefs about Capabilities

This refers to what you think you should do and how this thinking affects whether you promote sleep or not.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I find it easy to promote sleep for my inpatients						
I have control over my sleep promoting activities for my inpatients						
I am confident that if I want to promote sleep, I can						
I have previously encountered problems when trying to promote sleep						
I feel empowered on my unit to try different sleep promotion activities						

Factor #5: Optimism

This refers to whether you are optimistic or pessimistic about sleep promotion and how that influences what you do.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I usually expect the best when promoting sleep						
I hardly expect things to go my way when trying to promote sleep						
I am always optimistic about the future when promoting sleep						

Factor #6: Beliefs about Consequences

This refers to the situations that arise from your sleep promotion practices and how they influence what you do in the future.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
If I promote sleep it will benefit my inpatients' health						
If I promote sleep it will benefit me						
Promoting sleep has undesirable consequences for my inpatients						
Promoting sleep has undesirable consequences for me						

Factor #7: Reinforcement

This refers to the impact that your past experiences have on your future sleep promotion practices.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
Whenever I promote sleep, I get recognition from my inpatients						
Whenever I promote sleep, I get recognition from health professionals that are important to me						
Whenever I promote sleep, I feel like I am making a difference						
Whenever I promote sleep, I get reprimanded from health professionals that are important to me						
Whenever I promote sleep, it is discouraged by inpatients						

Factor #8: Intentions

This refers to how inclined you are to promote sleep and how that influences your actions.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
Promoting sleep is something that I am inclined to do						
I start each shift intending to promote sleep						
In my next shift, I intend to promote sleep						

Factor #9: Goals

This refers to the importance of what you do and how that influences whether you promote sleep or not. This includes the expectations that you are trying to reach and how they influence your sleep promotion practices.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
There often is something else more important than promoting sleep						
I am motivated to promote sleep						
I have a clear plan of how I will promote sleep						

Factor #10: Memory, Attention, and Decision Processes

This refers to your ability to remember to promote sleep and how that influences whether you do it or not. This includes your ability to focus on promoting sleep, the decisions that you make about sleep promotion practices, and how these influence your actions.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
It is easy to remember to promote sleep						
I am able to concentrate on promoting sleep						
There are justifiable reasons why I often decide NOT to promote sleep						

Factor #11: Environmental Context and Resources

This refers to the things in the environment that influence your sleep promotion practices.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
In general, I have enough time to promote sleep on my shift						
The infrastructure on my unit is adequate to promote sleep						
I have the necessary resources to promote sleep						
In the unit that I work on, promoting sleep is routine						

Factor #12: Social Influences

This refers to the impact that others have on your sleep promotion practices and how that influences your actions.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I believe it is my inpatients' desire to sleep well in the hospital						
I believe sleep is considered a value of my inpatients' families						
I ask my inpatients and/or their families for their input on sleep promotion strategies that work well for them						
Most people who are important to me think that I should promote sleep (e.g. family, friends)						
My inpatients and/or their families encourage me to promote sleep						
Staff nurses encourage me to promote sleep						
Other colleagues (e.g. Advanced Practice Nurses, Educators,						

Physicians) encourage me to promote sleep						
My nurse manager encourages me to promote sleep						
Promoting sleep causes conflicts between interprofessional team members (e.g. between nurses or other healthcare professionals)						

Factor #13: Emotions

This refers to how you feel about promoting sleep and how that influences your actions.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I feel anxious when I start to think about promoting sleep						
When my inpatients are anxious, it prevents me from adequately promoting sleep						
I feel frustrated when I cannot promote sleep						
Promoting sleep for my inpatients is stressful						
I feel accomplished when I promote sleep						
My level of emotional exhaustion affects my ability to promote sleep						

Factor #14: Behavioural Regulation

This refers to strategies that you think would help you to promote sleep.

	Very Strongly Disagree	Strongly Disagree	Disagree	Agree	Strongly Agree	Very Strongly Agree
I see positive patient outcomes when I promote sleep						
Promoting sleep is a part of my usual shift routine						
I have a clear plan on how I will deliver sleep promoting activities						

Please use this space if there is anything else you would like to say about sleep promotion in the cardiac post-surgical population.

Appendix G
Decision Rules

1. If there was an invalid response in the age or years of experience category (e.g. 20220020 years of experience) the researchers reviewed the pattern of the numbers as well as the identified age of the participants and then made consensus with 3 researchers (JS, KL, & AH).

2. One participant did not indicate which unit they worked on and there was no indicator in the survey as to which unit they worked on. Since knowing the unit was necessary for our analysis this participant's data was removed. This decision was verified by 3 researchers (JS, KL, & AH).

3. When determining if an item was a barrier or an enabler we uses the mean value. If the mean was 3.51 or greater it was labelled as an enabler. This was verified by checking the proportions for the cumulative percentage of each item. If the proportion was 50% of agreeance it was confirmed that this was an enabler. However, if the proportion was 50% then we used the mean value to finalize the labelling.

Appendix H
Reverse Coded Items

Domain	Item	Initial Code	Reverse Code
Beliefs about capabilities	I have previously encountered problems when trying to promote sleep		
Optimism	I hardly ever expect things to go my way when trying to promote sleep		
Beliefs about consequences	Promoting sleep has undesirable consequences for my inpatients		
Beliefs about consequences	Promoting sleep has undesirable consequences for me		
Reinforcement	Whenever I promote sleep it is discouraged by health professionals that are important to me		
Reinforcement	Whenever I promote sleep it is discouraged by inpatients		
Goals	There often is something else more important than promoting sleep	6=very strongly agree	6= very strongly disagree
Memory, attention and decision processes	There are justifiable reasons why I often decide NOT to promote sleep	5=strongly agree	5=strongly disagree
		4=agree	4=disagree
		3=disagree	3=agree
		2=strongly disagree	2=strongly agree
Social Influences	Promoting sleep causes conflicts between interprofessional team members (e.g. between nurses or other health professionals)	1=very strongly disagree	1=very strongly agree
Emotions	I feel anxious when I think about promoting sleep		
Emotions	When my inpatients are anxious, it prevents me from adequately promoting sleep		
Emotions	I feel frustrated when I cannot promote sleep		
Emotions	Promoting sleep for my inpatients is stressful		
Emotions	My level of emotional exhaustion affects my ability to promote sleep		

Appendix I
Richards Campbell Sleep Questionnaire

Measure	Question ^a
1. Sleep depth	My sleep last night was: light sleep (0) ... deep sleep (100)
2. Sleep latency	Last night, the first time I got to sleep, I: just never could fall asleep (0) ... fell asleep almost immediately (100)
3. Awakenings	Last night, I was: awake all night long (0) ... awake very little (100)
4. Returning to sleep	Last night, when I woke up or was awakened, I: couldn't get back to sleep (0) ... got back to sleep immediately (100)
5. Sleep quality	I would describe my sleep last night as: a bad night's sleep (0) ... a good night's sleep (100)
6. Noise ^b	I would describe the noise level last night as: very noisy (0) ... very quiet (100)
^a Each question is scored by using a 100-mm visual analog scale in which a higher score is better.	
^b Question 6 is not a part of the original 5-item Richards-Campbell Sleep Questionnaire (RCSQ), but was included in this project for consistency with other studies that used the RCSQ. ¹¹	

(Richards et al., 2000)