DEVELOPMENT OF AN INTERNET-BASED PERIOPERATIVE EDUCATION RESOURCE FOR ADULT PATIENTS EXPERIENCING OPEN STERNOTOMY CARDIAC SURGERY

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Abstract

Background: More than 33 million Canadians have access to the internet and healthcare consumers are increasingly using the internet as a means to derive education pertaining to their health care. When undergoing open sternotomy cardiac surgery, including Coronary Artery Bypass Grafts (CABG) and valve surgery, patients must participate in extensive surgical preparation as well as adopt complex medication and recovery regimens following surgery. Currently, perioperative education for patients experiencing open sternotomy cardiac surgery at the practicum site is provided through paper-based resources as well as individual didactic education sessions. **Purpose:** The purpose of this practicum project was to develop an internet-based perioperative patient education resource that contains a comprehensive overview of the open sternotomy cardiac surgery pathway, highlights patient recovery goals and delivers essential self-care and recovery management education. **Methods:** A literature review, environmental scan and key informant consultations were completed to inform the content and design of the resource. **Results:** A comprehensive and interactive, internet-based perioperative education resource was developed for patients and families to access at any point of the cardiac surgery trajectory. In addition, this resource includes an individualized assessment of patients' understanding of recovery and self-management education, which aligns with the tenets of the Adult Learning Theory. **Conclusion:** This internet-based perioperative education resource is designed to provide patients and families with accessible and individualized education that could improve knowledge and confidence, as well as reduce negative health outcomes for patients experiencing open sternotomy cardiac surgery.

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Introduction

Canadians often use the internet to find information related to their health and medical needs. Recent trends highlight that over the past four years, internet usage among Canadians aged 55 years and older has almost tripled and this trend is expected to continue (Canadian Internet Registration Authority, 2019; Davidson & Schimmele, 2019). Thus, it is crucial that healthcare providers develop internet-based health education with local context in order to ensure that patients and families are equipped with the necessary information to care for themselves and make decisions surrounding their health. Furthermore, reliable internet-based perioperative education for patients experiencing open sternotomy cardiac surgery could help to provide this population with the education they need to adapt to the surgery and promote recovery following surgery.

Perioperative education begins during the preoperative assessment and continues until the time of discharge from hospital, with instructions for continued recovery at home. Open sternotomy cardiac surgeries, which include Coronary Artery Bypass Grafts (CABG) and/or valvular procedures, require that patients participate in extensive surgical preparation as well as adopt complex medication and self-management recovery regimens following surgery. Failure of patients to adhere to the education provided throughout the perioperative course can cause preventable postoperative complications and readmissions (Fredericks et al., 2009). According to the Canadian Institute for Health Information (CIHI) (2017), the rate of all-cause readmission following cardiac surgery in the province of Ontario is estimated to be approximately ten percent.

A reliance upon one-on-one education sessions provided just prior to a major transition, such as a surgical procedure or discharge from hospital can be a contributing

factor to postoperative complications or readmissions. The extensive education provided at these critical junctures can be impacted by anxiety, confusion, trauma, and pain. Thus, this information is unlikely to be adequately processed by the patient or family member, leading to gaps in knowledge and potentially negative patient outcomes (Fredericks et al., 2010). Therefore, the development of an internet-based education resource presents a formative opportunity to provide accessible, flexible and individualized perioperative cardiac surgery education to patients and families (Fredericks et al., 2015).

Practicum Project

The practicum site, Hamilton Health Sciences (HHS) is one of the busiest cardiac surgery centres in the province of Ontario, performing hundreds of open sternotomy cardiac surgeries on an annual basis. Patients experiencing cardiac surgery at the practicum site receive a preoperative assessment followed by preparation in an outpatient clinic or as an inpatient on the Cardiac Surgery Unit. Patients typically return to the Cardiac Surgery Unit within 12 to 18 hours of surgery, after a period of monitoring in the Cardiovascular Intensive Care Unit. Patients and families primarily receive education surrounding surgical preparation and recovery self-management through verbal one-on-one education sessions from individual nurses and the interprofessional team on the Cardiac Surgery Unit.

Patient education at the practicum site is supplemented with paper-based resources. However, patients and healthcare professionals at the practicum site have identified limitations with the current educational approach, including that the existing paper-based resources are outdated, repetitive and lack cohesion between various areas of

cardiac care at HHS. Additionally, verbal education provided to patients and families lacks standardization as teaching is dependent upon the individual practices of various healthcare professionals. These limitations could ultimately cause confusion among patients and families, along with fleeting confidence in and dependence on the only existing educational resources utilized by the practicum site. Furthermore, anecdotal information from healthcare professionals at the site report that the Cardiac Surgery Unit often receives phone calls from recently discharged patients who are concerned and have many questions, indicating that patients need more information and tools to help them successfully retain education, adapt and recover from surgery.

The internet boasts many advantages for perioperative education delivery, including heightened accessibility and the capacity to address individual learning needs and styles. Presently, the practicum site does not provide an internet-based education platform for patients experiencing cardiac surgery. This gap in practice lacks congruence with the expert recommendations outlined by the Society for Enhanced Recovery After Cardiac Surgery (2017), who emphasize the need for internet-based education to promote patient engagement and education. Therefore, the focus of this practicum project was to develop an internet-based perioperative resource that delivers comprehensive education to support patients and families throughout the cardiac surgery journey.

Purpose and Objectives

The purpose of this practicum project was to develop an internet-based perioperative resource that delivers comprehensive education to support patients and families throughout the cardiac surgery journey. In consideration of the existing gaps in

perioperative education for adult patients experiencing open sternotomy cardiac surgery at HHS, the following six objectives were utilized to guide the overall process of the practicum project.

1. Demonstrate the qualities of Advanced Nursing Practice (ANP) through clinical, research, leadership, and educational activities.
2. Conduct a comprehensive review of the literature to explore existing perioperative education resources and learning needs of patients experiencing cardiac surgery.
3. Conduct an environmental scan of internet-based or technology-supported perioperative education resources for this population.
4. Identify the key factors that have an impact on learning or knowledge retention in this population.
5. Consult and collaborate with key informants to develop an internet-based perioperative education resource for adult patients experiencing cardiac surgery.
6. Develop a perioperative education resource that provides a comprehensive overview of the cardiac surgery patient pathway, highlights patient recovery goals and delivers essential self-care and recovery management education.

Theoretical Framework

Patients who experience open sternotomy cardiac surgery at the practicum site are primarily adults over the age of 55 years. In order to maximize the accessibility and interest in an internet-based perioperative education resource, it was important to design the resource and create content in a manner that aligned with the learning needs and styles of this population. Therefore, this practicum project was guided by the Adult Learning

Theory developed by Knowles (1980), which states that adults are self-directed learners who are motivated by present problems and personal experience. Jackson and Caffarella (1994) added that adults have variable learning styles, want to be actively involved in their learning, desire connection to others, and have life situations that provide a social context and impact on learning. Furthermore, adults are able to determine their learning needs and thus, educational activities should include independent study (Caffarella & Barnett, 1994; Knowles et al., 2005).

With the principles of adult learning in mind, the internet-based perioperative education resource was designed to appeal to the self-directed and problem-focused nature of adults in the pre and postoperative experiences surrounding open sternotomy cardiac surgery. As discussed, the perioperative trajectory of cardiac surgery requires that patients acquire self-management skills and retain information with respect to, for example, medications, symptoms and lifestyle in order to ensure positive outcomes in preparation and recovery. Patients must navigate possible problems or complications and questions can arise at any point in time, from prior to surgery to recovery at home after discharge. The internet-based education resource developed for this practicum, could serve as a centralized hub of information that patients and families can refer to as needed to help them apply their learning to their current situation or problems. Additionally, as all adults do not learn in the same manner, the internet-based perioperative education resource contains elements that appeal to various types of adult learning styles. This includes interactive, visual and written content, as well as an internet-based module with review questions to assist with learning consolidation (Candela, 2016).

To satisfy the principle that adult learners want control over their learning, the resource allows patients to tailor learning to their own assessment of their learning needs by allowing patients to select topics that are of personal interest to them. As stipulated by Jackson and Caffarella (1994) and supported by recent literature, adult learners want to gain insights from and connect with fellow patients (Jones et al., 2014; Peterson et al., 2014). Therefore, this internet-based perioperative education resource contains avenues for patients to connect with others who have also undergone open sternotomy cardiac surgery procedures, through such methods as group meetings or written testimonies. As life situations intersect with an adult's ability to learn, this internet-based perioperative education resource could provide flexibility by enabling patients and families to access the education in the time and space that is most convenient for them. Finally, this internet-based perioperative education resource could further support patients by permitting access to the content as frequently as desired, prior to surgery, while in hospital and after returning home, as multiple doses of education enhance recall and application of knowledge (Fredericks et al. 2010).

Methodology

Three processes were employed to inform the development of the internet-based perioperative education resource for patients experiencing open sternotomy cardiac surgery, namely an integrated literature review, environmental scan and key informant consultations. The literature review centered around gaining a deeper understanding of the learning needs of patients living with cardiac disease and experiencing cardiac surgery, as well as determining the impact of technology-supported patient education

interventions in cardiac surgery. The environmental scan involved assessing existing paper-based education resources at HHS and the internet-based education provided for patients through four other cardiac surgery institutions' websites. These institutions included: St. Mary's General Hospital, University Health Network, University of Ottawa Heart Institute and the Society of Thoracic Surgeons. Lastly, the key informant consultations were completed with patients recovering in hospital following cardiac surgery, clinical leaders at HHS, clinical leaders from two other cardiac surgery centres, as well as a web content specialist at the practicum site. The sections that follow summarize the information gleaned from each process.

Summary of the Integrative Literature Review

A comprehensive literature review was completed in order to determine the learning needs of adult patients experiencing cardiac surgery as well as find evidence assessing the implementation and effect of technology-supported education platforms for this population. PubMed, CINAHL, EMBASE, and Memorial University of Newfoundland databases, along with Google Scholar were searched for applicable literature.

The search was limited to full text, English studies. The MESH terms Cardiovascular Diseases, Cardiac Surgical Procedures and Thoracic Surgery were joined with 'OR' to capture patients with either medical cardiac conditions, such as heart failure, or those who undergo cardiac surgery, like CABG or valvular procedures. Although this practicum project pertains to patients undergoing open sternotomy cardiac procedures, it was necessary to also include studies surrounding cardiac disease, as patients who

experience cardiac surgery have similar learning needs to those who receive medical treatment for cardiac disease. Studies pertaining to heart transplants were excluded as patients experiencing this procedure require different care needs, medication regimens and extensive psychosocial support. The search terms patient education, patient teaching, preoperative care, postoperative care, perioperative care, and patient discharge were joined with 'OR' to identify various points in the patient's cardiac surgery trajectory where patient education may occur.

Finally, search terms such as patient portal, web, internet, educational technology, software, and mobile applications were joined with 'OR' in attempts to capture internet-based education delivery formats. The targeted interventions were to be primarily self-guided, technology-supported education resources. Therefore, the interventions where a nurse or other healthcare professional was solely responsible for delivering technology-supported perioperative education were eliminated. Articles were restricted to adult patients in order to reflect the primary population who undergo open sternotomy cardiac procedures at the practicum site. Reference lists of applicable articles were also examined for related literature. The quality of the experimental studies was evaluated according to the Public Health Agency of Canada's (2014) critical appraisal toolkit.

Research pertaining to the learning needs of patients living with cardiac disease or requiring cardiac surgery was largely found in weak-natured cross-sectional studies or surveys. However, this research provided foundational insights into understanding the learning needs of this patient population and thus, it was necessary to thoroughly investigate this research. Patients and families often rated the majority of categories in

learning need inventory studies as ‘important’ or ‘very important’ to learn, solidifying the breadth of the education needs among this population in order to adequately support them in prevention, preparation and recovery (Huriani, 2019). Education topics that were found to be important for patients living with cardiac disease included understanding heart physiology and disease, medications, nutrition, exercise and some aspects of symptom monitoring (Clark & Lan, 2004; Huriani, 2019).

Preoperative education topics that were deemed important by patients in the literature included information about: the cardiac procedure, pre and postoperative care surgical preparation and preparation for returning home in advance of surgery (Ramesh et al., 2017; Veronovici et al., 2014). Postoperative education should surround bolstering patient confidence to participate in self-management care needs while recovery continues at home (Fredericks et al., 2009). Through the use of surveys and patient learning needs scales, the works of several authors revealed the top priorities for postsurgical learning as incisional care, medication management, postoperative complications (e.g., signs of infection and pain), risk factor management, diet, and physical activity. Postoperative cardiac precautions, energy conservation, psychosocial management (e.g., stress and coping), and follow up procedures have also been identified as important learning needs for patients experiencing cardiac surgery (Fredericks et al., 2010; Fredericks & Yau, 2013; Mosleh et al., 2017; O’ Brien et al., 2013; Spyropoulos et al., 2011). Local context regarding hospital logistics and environment, the healthcare team, connection to previous patients and contact information was also found to be frequently reported by patients as a priority for learning (Jones et al., 2014; Peterson et al., 2014; van Weert et al., 2003).

These findings were ultimately used to inform the content that was included in the internet-based perioperative education resource developed for this practicum.

Upon reviewing the literature, nine experimental studies along with three systematic reviews were deemed applicable to inform the development of the internet-based education resource for the practicum site. The intervention studies that provided technology-supported perioperative education for patients with cardiac disease or experiencing cardiac surgery typically did so through the use of application software installed onto devices, internet-based educational websites or independently-viewed slideshow presentations. Fredericks et al. (2015) found in their medium-quality systematic review that internet-based education platforms are most effective when they are interactive in nature and designed to allow patients to independently navigate the content. The educational topics delivered through the experimental interventions appropriately aligned with the evidence-based learning needs of patients living with cardiac disease or experiencing cardiac surgery outlined earlier.

Several strong and medium-design studies found that technology-based perioperative education for this patient population lead to improvements in knowledge, physical and mental health and also increased performance of self-care behaviours (Beranova & Sykes, 2007; Brennan et al., 2010; DeVon et al., 2010; Fredericks et al., 2015; Martorella et al., 2012; Melholt et al., 2018; Moore et al., 2001; Scherrer-Bannerman et al., 2000; van der Meij et al., 2016; Westlake et al., 2007). It is important to note that the quality of evidence in these research studies was weakened by small sample sizes or use of a single hospital, potential sampling bias through volunteer participants,

lack of randomization, and inconsistent data collection procedures. Furthermore, the systematic reviews examined did not necessarily assess literature that purely pertained to patients experiencing cardiac surgery due to a lack of research conducted specific to this population. Therefore, findings must be interpreted with caution. However, in overall consideration of the quality of evidence provided by the research studies and systematic reviews alike, there is moderate support to suggest that the use of an internet-based perioperative education resource could have beneficial impacts for patient knowledge, confidence and health. For further insights into the literature review performed and literature summary table please see Appendix A.

Summary of the Environmental Scan

An environmental scan was performed at the practicum site to assess the availability and content of existing perioperative education resources for patients experiencing open sternotomy cardiac surgery. Following completion of the scan at HHS, an environmental scan was completed to assess the education delivered through the websites of four other major cardiac surgery institutions. As the practicum site currently lacks a comprehensive internet-based perioperative education hub for patients experiencing cardiac surgery, ascertaining how other cardiac surgery institutions delivered essential self-management education via their websites enhanced the development of this practicum project. The findings from the environmental scan of local and national perioperative education resources for this population were used to develop an internet-based resource for the practicum site. For further details about the environmental scan, please see the sections that follow and/or refer to Appendix B.

Resources at the Practicum Site

As a supplement to one-on-one verbal education sessions offered prior to perioperative transitions such as discharge home, the practicum site currently relies upon paper-based booklets as the major source of perioperative education. Existing paper-based resources provide some education pertaining to the hospital, cardiovascular intensive care and ward units, surgical preparation, postsurgical patient goals, discharge, and self-management (HHS, n.d.; 2009; 2017). The major written resource, entitled *Path to Recovery After Heart Surgery* (HHS, n.d.) is heavily relied upon in the postoperative environment at the practicum site. This 60-page booklet is typically provided for all patients to review postoperatively while in hospital and to use as a resource to refer to after returning home. This booklet is fairly comprehensive with respect to the postoperative recovery learning needs identified in the literature review, as it contains information on the following topics: follow-up appointments, what to expect after surgery, nutrition, delirium, exercise, medication, incisions, swelling, constipation, sleep, emotions, diabetes, smoking cessation, cardiac rehabilitation, and when to call for help. The booklet design hosts large font and some pictures. However, the order of presented information is not in a logical sequence, which makes the education difficult to follow.

Upon examination of the paper-based resources it was discovered that content pertaining to heart disease, various cardiac surgeries, surgical preparation, and the surgical patient pathway or processes was profoundly lacking. Additionally, those resources contained information that was not supportive of current practices, repetitive and lacking a high degree of integration between the various educational resources and

areas of cardiac care at the practicum site. The existing paper-based materials for patients experiencing cardiac surgery at the practicum site require updates to reflect current practices. However, the existing paper-based resources did provide important information with respect to the local context of the practicum site and the content is somewhat reflective of the postoperative learning needs of patients experiencing cardiac surgery that were established through the literature review. Therefore, the existing postoperative paper-based resource at the practicum site was used as a resource to guide the content of the internet-based perioperative education resource developed for this practicum project.

Internet-Based Education for Cardiac Surgery

It is worthy of mention that the paper-based resources provided to patients at the practicum site are available on the institution's website in a document format. However, patients must currently be able to independently search for these resources on the website through the patient education library, which is not necessarily an intuitive process. Thus, the education that is available for patients on the practicum site's website is not only difficult to access but also outdated and non-interactive. Presently at the practicum site, a centralized hub of internet-based cardiac surgery specific education does not exist for patients experiencing cardiac surgery. Therefore, it was necessary to examine the internet-based education provided by other cardiac care institutions. These institutions included: St. Mary's Hospital (Kitchener, Ontario), University Health Network (UHN) (Toronto, Ontario), University of Ottawa Heart Institute (UOHI) (Ottawa, Ontario), and the Society of Thoracic Surgeons. These institutions were selected as they represent comparable healthcare settings that provide open sternotomy cardiac surgeries in Ontario,

as well as one organization that represents the current research, education and best practices available for patients undergoing cardiac surgery.

All of the reviewed websites were interactive in nature, allowing users to navigate through the webpages independently and select the desired content based on individual learning needs. These websites demonstrated the need to include interactive features, such as videos, diagrams and external links to enhance written content and consolidate patient learning. Each institution's website had an easy-to-access and centralized learning area, specific to cardiac surgery education, which contained information and associated links that would be relevant for patients to review throughout their cardiac surgery journey. The content of each website significantly aligned with the learning needs of patients experiencing cardiac surgery that were established through the literature review. Comprehensive education was delivered through each website, which included detailed information surrounding the entirety of the cardiac surgery trajectory, from prior to hospital admission to continuing recovery after discharge from hospital. This assessment of the websites developed by other cardiac care institutions was used to inform the development of the content, design and layout of the internet-based perioperative education resource for patients experiencing open sternotomy cardiac surgery at HHS.

Summary of the Key Informant Consultations

In order to develop a resource that is effective at delivering education and grounded in the learning needs of patients who experience open sternotomy cardiac surgeries, it was a necessary step to collaborate with patients, colleagues and various stakeholders through a comprehensive consultation process. Therefore, patients in the

postoperative period of open sternotomy cardiac surgery, clinical leaders at the practicum site, clinical leaders from other cardiac surgery centres, and a website content specialist from the practicum site were consulted for their various areas of knowledge and expertise. Patients were initially provided with an informative letter regarding the practicum project and the reason for consultation. The writer then approached patients to further explain the project and determine interest in participating in the consultation process. Once verbal consent was obtained, the writer proceeded to complete a semi-structured consultation questionnaire. All other consultees were initially provided with an informative letter via email, followed by telephone contact if no reply was initially made or further information about the project was required. Once consultees were in agreeance for an interview and a date and time were set, semi-structured interviews were completed by phone or in person based on the preferences of the consultees. For further information about the objectives, methods and outcomes of the consultation process, please refer to Appendix C.

Postoperative Patients

In order to create an internet-based resource that was representative of the learning needs of patients experiencing open sternotomy cardiac surgery, it was crucial to engage patients at HHS in the consultation process. A volunteer, convenience sample of patients (n=8) who had recently experienced open sternotomy cardiac surgery and were recovering at the practicum site constituted the patient sample. The sample of patients had an average age of 66 years and the majority (n=6) of patients regularly and independently accessed the internet.

The majority of the patients reported they had at least started to read through the paper-based resources in hospital and validated the clear readability and comprehensive nature of the postoperative booklet provided to patients. However, the patients also indicated that there are improvements that should be made to the existing postoperative resource including: the provision of updated and reliable recovery milestone expectations, as well as information pertaining to incisional care and symptom or complication management. Most importantly, all eight patients reported that preoperative education with respect to heart anatomy and the surgical procedure was entirely lacking. This created an extensive unawareness and educational gap concerning what could be expected prior to undergoing open sternotomy cardiac surgery procedures at the practicum site.

All of the patients who were consulted reported that they would definitely access an internet-based perioperative education resource, including two patients who did not have internet in their homes. Those without internet in their homes reported that if such an education resource existed, they would likely ask family members to access the information or would use internet services provided at their place of employment. Many patients explained that internet-based perioperative education would increase their sense of comfort and preparedness as they could access the information repeatedly and throughout the entirety of their cardiac surgery journey. Patients provided an extensive list of the educational content that they felt would be most important including: hospital admission procedures, surgical preparation and procedure information, postoperative care and precautions, as well as medication and symptom management. Patients also highlighted the need for interactive features such as explanatory diagrams and videos.

Clinical Nurse Leaders at the Practicum Site

Consultations were completed with two clinical nurse leaders in the cardiac surgery program at the practicum site. Those key informants were involved with the management of both pre and postoperative patient care and have input into the future directions and quality improvement plans for the cardiac surgery program. Both consultees identified limitations with the existing paper-based education resources, including the expense associated with printing and damages easily incurred by paper-based materials. Additionally, these clinical leaders agreed that the current lack of preoperative education through existing perioperative resources impedes patients' rights to informed decision-making.

Clinical nurse leaders also identified a limitation of the existing paper-based resources as lacking integration across all aspects of the HHS cardiovascular program, thus resulting in repetitive material, unclear education delivery and gaps in content. Both leaders supported the development of an internet-based perioperative education resource for this population, delivered through the healthcare institution's existing website. They explained that an internet-based education resource would allow for simplification of the education update process and standardize education delivery. Both consultees identified that the challenges of developing the resource would include bringing awareness to patients and families that an internet-based resource is available and creating an internet-based resource that is easy for people of all technological capabilities to navigate.

Provincial Clinical Leaders in Cardiac Care

To determine the strengths and challenges of developing and implementing an internet-based education resource at a healthcare institution, it was vital to seek the insights of nurse leaders at other cardiac surgery centres that had already executed this type of education platform. The healthcare institutions were selected based on the fact that they represent major cardiac surgery centres in the province of Ontario and the web-based educational resources provided through these institutions were reviewed in the environmental scan. The informants from other cardiac centres held different roles dependent on the institution, but all were involved with the development or maintenance of the internet-based perioperative education resources for patients experiencing cardiac surgery at their sites. These key informants included clinical managers of cardiac surgery departments, clinical educators and Advanced Practice Nurses from St. Mary's General Hospital, Kitchener, Ontario and UOHI, Ottawa, Ontario.

Consultations with provincial nurse leaders in cardiac care revealed that internet-based patient education currently exists at their cardiac care institutions as a means to enhance patient preparedness and reduce patient anxiety surrounding cardiac surgery. Additionally, consultees identified that internet-based education serves as an appropriate outlet to communicate current cardiac surgery care practices and local context, reducing the likelihood that patients are misinformed through poor quality information elsewhere on the internet. Consultees also underscored the fact that patients can repetitively access the internet-based resource to increase their knowledge retention throughout the entirety of their cardiac surgery trajectory, from prior to admission to after discharge from hospital. The matters of gaps in patient knowledge, lack of preparedness and anxiety are

issues that the practicum project site currently faces, highlighting that the implementation of an internet-based perioperative education resource would be beneficial. The clinical leaders identified the need for a concerted effort amongst a multidisciplinary team to create and annually review the educational content delivered. They all agreed that the most important information to include in an internet-based perioperative resource pertained to preoperative, postoperative and preventative information, which aligns with the findings from the literature review and patient consultations.

Provincial clinical leaders emphasized the importance of patient involvement in not only identifying appropriate educational content to be included in the internet-based resource but also evaluating the resource. They stressed that patient feedback is needed to evaluate the effectiveness of internet-based education delivery and accessibility. Challenges that persist for them include access for patients who are not computer literate or do not have internet services or have low comprehension of education delivered in English. Consultees discussed that these challenges spoke to the notion that internet-based education should serve as an adjunct to and not replace one-on-one verbal education that is provided prior to surgery or discharge. Overall, the clinical leaders reported that internet-based education has been well-received by patients undergoing cardiac surgery and it has improved patient confidence and knowledge, while simultaneously preparing patients to make informed decisions regarding surgery and recovery.

Web Content Specialist at the Practicum Site

As a means to understand the policies and processes for developing, implementing and evaluating an internet-based education resource on the HHS website, a web content

specialist at the practicum site was consulted by phone. The web content specialist provided information about the procedures that should be followed if comprehensive perioperative education was to be included as part of the cardiac surgery section of the existing website at the practicum site. This process primarily entails following a specific template and website planning guide to ensure cohesion between various webpages and accessibility standards are achieved. Educational content that is developed must be presented to clinical managers or program directors and reviewed by the institution's web content team for approval. Literacy was reported as a major point of consideration by the web content specialist, who explained that internet-based perioperative education should include simple language, short sections clearly identified by subheadings and abbreviations should be spelled out.

Additionally, the specialist drew attention to the fact that highly interactive models and features should be avoided as some people find it difficult to consume interactive formats of education. Finally, the consultee identified that various points of user uptake data can be gleaned from internet-based education delivered through the existing website at the practicum site. This feature will be valuable for demonstrating the frequency of user access and gaining deeper understanding into which aspects of the perioperative education resource users most commonly examine.

An Internet-Based Perioperative Patient Education Resource

Utilizing the information acquired from the literature review, environmental scan and consultation processes an internet-based perioperative education resource was developed for adult patients experiencing open sternotomy cardiac surgeries. The

resource can be seen in Appendix D. The following section is a brief discussion of the development process, design and content of the resource.

Development Process

The existing paper-based postoperative education resource at the practicum site, entitled *Path to Recovery After Heart Surgery* (HHS, n.d.) was a primary source of information utilized in the development of an internet-based resource for adult patients experiencing open sternotomy cardiac surgery. As some of the patient consultees identified, they found the postoperative information provided in the booklet to be fairly comprehensive and overall helpful. Likewise, the clinical leaders consulted from other cardiac surgery centres identified that the content provided and language used through the internet-based resource must be standardized and consistent with other education formats provided to patients. However, the environmental scan at the practicum site also revealed that the paper-based resources provided to patients were outdated, lacking consistency with current practices and were not only entirely devoid of preoperative, procedural, and heart anatomy or disease education but also lacked the means to promote patient connections to others. Therefore, the education would need to be appropriately updated, augmented and enhanced to improve the comprehensiveness, clarity and interactivity of the education delivered as well as appeal to adult learners seeking internet-based education resources. The findings from the literature review, consultations and environmental scan were also used to develop the internet-based resource.

Clinical leaders at the practicum site granted the writer permission to both utilize and update the existing paper-based postoperative education resource for the purposes of

designing a centralized hub of internet-based perioperative education that could be delivered via the institution's website. This content was updated and the format enhanced for the website to create a logical flow and interactive nature while maintaining consistency between paper-based and internet-based education resources at the practicum site. Education topics that were added included explanations of: heart pathophysiology and anatomy, cardiac surgery, perioperative procedures and processes, and hospital logistics, as well as an outlet for patient connection. The design process also required an extensive collaborative effort with an interprofessional team including nurses, physiotherapists and physician assistants. The content of the internet resource was reviewed by this team and their input was used to refine and further develop the resource. They specifically assisted with providing feedback on the new updated sections and provided an expert review of topics, such as pharmacology and postoperative exercises.

Resource Design and Content

The internet-based perioperative education resource for adults experiencing open sternotomy cardiac surgery was designed for direct placement within the existing infrastructure of the HHS website. As such, the layout of the resource was created to have the same colour palette and features that currently exist in other sections of the practicum site's website. These design features include drop down navigation bars, allowing the user to independently select whichever education topic is of most interest to them at the time they are seeking the education.

This customization of learning is supported by the findings of Fredericks et al. (2015), who found that tailored education interventions lead to more significant

improvements in an adult patient's adoption of self-care behaviours than structured education interventions. Throughout the internet-based resource there are interactive features such as pictures and diagrams to supplement standardized written content as well as videos that explain open sternotomy cardiac surgery procedures. Additionally, there are numerous links located throughout the resource connecting users to other areas of the existing host website, existing education resources, as well as reliable external websites for further information about certain topics, such as heart healthy cooking. The internet-based resource also contains links to supplemental resources that can be downloaded or printed, such as a hospital map or charts for recording biophysical parameters, such as weight, heart rate and blood pressure. Furthermore, the content is presented in varying formats such as tables, to improve the ease of readability and maintain learner attention (Candela, 2016).

The education topics included in the internet-based perioperative education resource satisfy the learning needs of patients experiencing open sternotomy cardiac surgery and provide comprehensive education for the entirety of the cardiac surgery journey. The sections included in the internet-based education resource are as follows: Understanding Your Heart and Heart Surgery, Getting Ready for Heart Surgery, After Heart Surgery: Recovery in Hospital, After Heart Surgery: Recovery at Home, Connecting with Other Patients, Helpful Links and Resources, Contact Information and Acknowledgements.

Additionally, this resource contains a link to an interactive module that was created using Prezi software, which consolidates patient learning through 20 questions

that test their knowledge on multiple topics throughout the recovery phase of open sternotomy cardiac surgery. Sample slides from the module can be seen in Appendix D7. This module involves simple navigation, requiring users to only use the right arrow button on a keyboard or click a computer mouse to progress through the module. Users will progress through 'true or false' questions about what can be expected during recovery as well as multiple choice questions where users must decide if they should continue to monitor an issue, contact their doctor, or seek emergency medical attention. This interactive module appeals to the learning style of adults as they want to be actively involved in their learning and are more likely to retain the education if the topics or questions are relevant to their current life situation or the knowledge can be easily adapted (Candela, 2016; Knowles, 1980; Jackson & Cafarella, 1994). The education provided throughout the resource and module can allow users to easily utilize and apply the knowledge they gain to navigate questions or concerns that they face throughout their preparation for and recovery following open sternotomy cardiac surgery.

Discussion of Advanced Nursing Practice Competencies

A significant objective of this practicum project was to demonstrate ANP qualities through direct comprehensive care, optimizing health systems, consultation and collaboration, research, leadership, and education activities as outlined by the Canadian Nurses Association (CNA) (2019). The development of an internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery has facilitated further exploration and expansion of personal capacities in each of these domains.

Direct Comprehensive Care

The purpose of this practicum was to develop a comprehensive perioperative education resource to support patients and families throughout the cardiac surgery trajectory. The development of this resource demonstrates direct comprehensive care as it provides patients with the knowledge and tools to navigate questions that arise throughout the perioperative experience and potentially circumvent postoperative complications. This internet-based education resource serves not only as another method to disseminate crucial preventative, preparatory and recovery cardiac surgery information but also as an adjunct to one-on-one verbal teaching, further improving the likelihood of knowledge retention among patients. Furthermore, this internet-based resource provides standardized written content and education delivery for all patients and families, while also permitting enhanced accessibility to perioperative education. The development of this resource therefore satisfies the direct comprehensive care competency to, "minimize variances in care and prevent adverse outcomes" (CNA, 2019, pp. 30).

Optimizing Health Systems

This project has incorporated new knowledge into the education standards for patients and families undergoing cardiac surgery and has the potential to enhance the learning process for these patients. Through ongoing evaluation and enhancement, this resource could provide continuous support to patients as they navigate transitions within the cardiac surgery experience and serve as a supplement to one-on-one teaching. This practicum project provides evidence of the need to deliver internet-based education resources as a necessary means to not only bolster patient knowledge and confidence, but

also support positive healthcare system interactions and reduce negative health outcomes. If implemented and evaluated properly, this internet-based resource could optimize the health care system by reducing postoperative readmissions or complications associated with cardiac surgery, thus contributing to cost-effectiveness within the organization.

Consultation and Collaboration

The attainment of consultation and collaborative qualities was apparent through the consultation and resource development processes of the practicum project. Patients in the postoperative experience of open sternotomy cardiac surgery were authentically engaged in the consultation process to determine their learning needs and expectations of a comprehensive internet-based perioperative education resource. Likewise, clinical leaders from the practicum site and other cardiac surgery centres were consulted for their expertise in resource development, as well as project planning and evaluation. Finally, collaboration with an interprofessional team was crucial for the creation and update of the content for the internet-based perioperative education resource. This consultation and collaboration process ensured that the internet-based education resource would deliver the most current information and provide the most benefit to adult patient learners.

Research

Research competencies were a substantial piece of this practicum project, thus providing the potential to expand upon personal research capabilities. Most notably, the literature review component afforded the opportunity to discover and appraise research surrounding the learning needs of patients with cardiac disease or experiencing cardiac

surgery, as well as the impact of technology-supported education for this patient population. The findings of this research and appraisal process ultimately impacted the development of the internet-based perioperative education resource for patients at the practicum site and might eventually improve patient care or outcomes.

Leadership

Leadership competencies were attained throughout this project by taking a leadership role in the evaluation of existing resources, identifying issues inherent in the current educational content and education delivery process at the practicum site and developing a means to ameliorate those gaps. Leadership demands innovation, and therefore, developing an internet-based resource to deliver perioperative patient education was a novel method for this practicum site to provide patients with comprehensive self-management and recovery education.

Education

With respect to educational competencies, the CNA expects that Advanced Practice Nurses contribute to client and family health and wellness learning (2019). Through the process of the environmental scan and consultations, it became quite evident that patients experiencing open sternotomy cardiac surgery had an unfulfilled need of access to a local and comprehensive internet-based perioperative education resource. The notion that the planning and development of this internet-based education resource was centered around the priorities of patients in this cardiac surgery population demonstrates behaviours consistent with the education competency.

Implementation and Evaluation Plan

In order to successfully implement the internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery, the resource and module must be approved by administration at the practicum site. The resource and module have been reviewed by key members of the Cardiac Surgery Unit's Continuous Quality Improvement leadership team, who suggested minor revisions and additions. The next step in implementation would be approval by the clinical manager of the Cardiac Surgery Unit, who must also review the educational resource's content and design. Once approved, the manager would submit the resource to the web content specialist and web design team at HHS. The resource's content will then be reviewed by the website development team to ensure consistency and standardization of education delivery across the existing website and within the resource itself. The website development team at the practicum site will also review the resource to ensure that accessibility standards are met. Having met the requirements set by the website development team, the resource could then be launched on the Cardiac Surgery Unit section of the HHS website.

Leading up to and following the launch of the internet-based perioperative patient education resource on the HHS website, it will be of the utmost importance to spread awareness to staff and patients alike that comprehensive patient education is now available online. This will require various forms of education or advertisement, as well as support from the interdisciplinary team. This is especially true for the Registered Nurses who will be teaching patients and families during hospitalization, as they would be key in

showing patients and families how to access the internet-based education while in hospital and at home.

Following implementation of the internet-based perioperative education resource it will be important to evaluate user uptake of and satisfaction with the new method of education delivery. The website team at the practicum site will be able to monitor user uptake, such as the length of time spent on webpages and the topics most often accessed. The user reports generated from the website development team will then be used to further understand the learning needs of patients experiencing open sternotomy cardiac surgery. Finally, as discussed in consultations with clinical leaders at other cardiac surgery centres, it is essential to obtain direct user feedback. Feedback from patients and families at various instances of the perioperative cardiac surgery experience will be vital for understanding persistent knowledge gaps in the learner and for making ongoing improvements or revisions to the content and design of the internet-based perioperative education resource. This could be accomplished through the use of a 1-month and 6-month post-hospitalization internet-based survey delivered electronically that patients and family members could complete.

Conclusion

The provision of timely and comprehensive health education to patients undergoing events that can have significant impacts on health and wellbeing is crucial to support their decision making and maximize the potential for positive health outcomes. As the population of adults experiencing open sternotomy cardiac surgery becomes increasingly technologically savvy and seeks health education through internet sources, it

is important to have reliable perioperative education resources available on the websites of local healthcare institutions (Davidson & Schimmele, 2019; Enhanced Recovery After Cardiac Surgery Society, 2017). Many cardiac surgery centres have already successfully implemented internet-based perioperative education for adult patients experiencing open sternotomy cardiac surgeries. Therefore, it is an accepted practice to develop and implement a comprehensive internet-based perioperative education resource that would support patients and families throughout the cardiac surgery journey, providing thorough surgical preparation, self-care and recovery management education.

The approaches used throughout this practicum project, including a literature review, environmental scan and key informant consultations permitted the opportunity to demonstrate ANP competencies, while also developing an internet-based education resource that is grounded in the learning needs of adult patients experiencing open sternotomy cardiac surgery. The internet-based perioperative education resource developed for this practicum promotes educational strategies that align with the Adult Learning Theory and permits flexibility and accessibility in learning as the education is available in any time or space where learning is most conducive to the user. Through ongoing evaluation and enhancement, this resource could provide continuous support to patients as they navigate transitions within the cardiac surgery experience and serve as a supplement to one-on-one verbal teaching. This practicum project provides evidence of the need to deliver internet-based education resources as a necessary means to not only bolster patient knowledge and confidence, but also support positive healthcare system interactions and reduce negative health outcomes.

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Appendices

Appendix A: Integrative Literature Review

Development of An Internet-Based Perioperative Education Resource for Adult Patients Experiencing Open Sternotomy Cardiac Surgery: An Integrative Literature Review

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More than 33 million Canadians have access to the internet and healthcare consumers are displaying heightened interest in using the internet to derive their health education information (Government of Canada, 2019; Guo, 2015; Jones et al., 2014). Although the internet provides access to a wealth of health resources, not all sources are reliable and many people are unable to critically assess the validity of the health information they find (Kurup et al., 2013). However, research shows that internet-based health education that is developed by healthcare professionals and contains local and personal context has beneficial effects for patient knowledge, self-care behaviours as well as physical and mental health (Fredericks et al., 2015). Therefore, it would be expected that internet-based perioperative education for adult patients experiencing open sternotomy cardiac surgery developed by experts in the field, would be an accessible, reliable and valid health resource for this patient population.

Perioperative education is the education provided to surgical candidates starting at the preoperative assessment until the time of discharge with instructions for care at home. Patients who experience open sternotomy cardiac surgeries, including Coronary Artery Bypass Grafts (CABG) and/or valvular procedures, require that patients participate in extensive surgical preparation as well as adopt complex medication and recovery regimens following surgery. Failure of patients to adhere to the self-management recovery education provided in hospital can cause preventable postoperative complications (Fredericks et al., 2009). However, research shows that a single, didactic education session provided immediately prior to a major transition, such as a surgical procedure or just before discharge from hospital is unlikely to be adequately processed by

the patient or family member, leading to gaps in knowledge and negative patient outcomes (Fredericks et al., 2010). Internet-based health education presents a formative opportunity to provide accessible, flexible and individualized perioperative education. The purpose of this literature review is to inform the development of an internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery. The author will examine the learning needs of patients requiring open sternotomy cardiac surgery and assess the current evidence surrounding internet-based education interventions for this population. In conjunction with the existing literature, the Adult Learning Theory will be used as a framework to support the development of the internet-based perioperative education resource.

Background

Heart failure and ischemic heart disease are examples of cardiac diseases in which blood flow to the heart is reduced. Approximately 2.4 million Canadians are living with cardiac disease. It is the second leading cause of death and one of the top-five reasons for hospitalization in the nation. Recent statistics show that ischemic heart disease and heart failure diagnoses increase with age and are more prevalent among men (Canadian Institute for Health Information (CIHI), 2017; 2019). According to the Public Health Agency of Canada (PHAC) (2017), more than 90,000 Canadians over the age of 40 are newly diagnosed with heart failure each year. Cardiac disease can lead to dyspnea, fluid retention, myocardial infarction, and reduced quality of life. Open sternotomy cardiac surgeries, such as CABG and/or valvular procedures are methods used to improve a patient's experience of symptoms. As surgery is not curative, patients and their families require extensive perioperative education in order to make long-term lifestyle

modifications and prevent further progression of the cardiac disease (Heart & Stroke Foundation, 2019).

Current statistics reveal that almost 40,000 cardiac surgeries occur in Canada on an annual basis (CIHI, 2017). Iribarne et al. (2017) found in their study that the 30-day readmission rate following cardiac surgery is encroaching 20%, while Fredericks and Yau (2013) discuss that at least one-quarter of all patients experiencing CABG and/or valvular procedures are readmitted to hospital within three months of surgery. Many readmissions following cardiac surgery are deemed preventable with the most common causes of readmission cited as infection and volume overload (Iribarne et al., 2017). Furthermore, Polster (2015) indicates that rates of readmissions and health outcomes can be improved through effective patient education. The average hospital stay following cardiac surgery is decreasing, which places impetus on the provision of effective recovery and self-management education for patients and their family members (Mosleh et al., 2017).

Unfortunately, confusion, anxiety and the trauma of a cardiac event itself can impede retention and recall of education provided prior to the cardiac surgery or discharge home (Fredericks & Yau, 2013; Lim et al., 2010). Additionally, attendance at cardiac rehabilitation programs, where discharge education and self-management strategies are reinforced, is typically attended by less than half of all patients who experience cardiac surgery (Dinesen et al., 2019). These factors are barriers to providing patients with perioperative education surrounding cardiac surgery and emphasize the need for innovative formats of education delivery to be developed, such as internet-based perioperative education resources.

Over the past four years, internet usage among those 55 and older has almost tripled (Canadian Internet Registration Authority, 2019). Recent trends show that 68% of Canadian adults 65 and older use the internet and this percentage is expected to increase (Davidson & Schimmele, 2019). The delivery of internet-based perioperative education presents an opportunity to supplement didactic teaching as well as enhance patient knowledge and self- efficacy (Fredericks et al., 2010). The cardiac surgery inpatient unit at Hamilton General Hospital, is host to one of the busiest cardiac surgery programs in the province of Ontario. Presently at this site, perioperative education is typically delivered through a single, didactic session between the patient and nurse and supplemented with paper-based handouts. This unit often receives phone calls from concerned patients or family members after discharge who feel they lack or have forgotten important information. Additionally, patients and health care professionals explain that paper-based materials are outdated, repetitive and disjointed between the different settings of perioperative cardiac care. An internet-based education resource does not presently exist for patients who undergo cardiac surgery at this practicum site. The purpose of this practicum is to develop an internet-based perioperative education resource for patients experiencing open sternotomy cardiac surgery. Thus, it is necessary to review the literature surrounding technology-supported perioperative education resources and the learning needs of patients experiencing open sternotomy cardiac surgery, in order to inform the development of an internet-based perioperative education resource.

Search Methodology

The literature review was conducted through searching PubMed, CINAHL, EMBASE, and Memorial University of Newfoundland databases, along with Google Scholar. The

search was limited to full text, English studies. The MESH terms Cardiovascular Diseases, Cardiac Surgical Procedures and Thoracic Surgery were joined with 'OR' to capture patients with either medical cardiac conditions, such as heart failure, or those who undergo cardiac surgery, like CABG or valvular procedures. Although this practicum project pertains to patients who undergo open sternotomy cardiac procedures, it is necessary to also include studies surrounding cardiac disease, as patients who experience cardiac surgery will have similar learning needs as those who receive medical treatment for cardiac disease. Studies pertaining heart transplants were excluded as patients experiencing this procedure require different care needs, medication regimens and extensive psychosocial support. The search terms patient education, patient teaching, preoperative care, postoperative care, perioperative care, and patient discharge were joined with 'OR' to identify various points in the patient's trajectory where patient education may occur. Finally, search terms such as patient portal, web, internet, educational technology, software, and mobile applications were joined with 'OR' in attempts to capture internet-based education delivery formats.

The targeted interventions were to be primarily self-guided, technology-supported education resources. Therefore, interventions where a nurse or other healthcare professional was solely responsible for delivering perioperative education via the internet were eliminated. Articles were restricted to adult patients in order to reflect the primary population who undergo open sternotomy cardiac procedures at the practicum site. Reference lists of applicable articles were also examined for related literature. The quality of experimental studies was evaluated according to the PHAC (2014) critical appraisal toolkit.

Learning Needs of Adults Living with Cardiac Disease

Generally, the literature surrounding the learning needs of adults living with cardiac disease or undergoing cardiac surgery was largely discussion based and descriptive with the use of many cross-sectional studies and surveys. Although this literature by nature would be considered weak, it provides foundational insights into understanding the learning needs of these patients. One valid and reliable instrument used to measure the learning needs of this population is the Cardiac Patient Learning Needs Inventory (CPLNI) (Galdeano et al., 2014; Gerard & Peterson, 1984; Huriani, 2019). In a study with patients experiencing myocardial infarction, Huriani (2019) used the CPLNI and found that patients and families believed that symptom management and medication information were the most crucial areas of learning for this population. However, patients typically rate all items in the inventory to be 'important' or 'very important', including introduction to the cardiac unit, anatomy and physiology of the heart, psychological factors, lifestyle factors, dietary and physical activity information as well as support system information (Huriani, 2019). In this study, the author demonstrates that patients living with cardiac disease require a wealth of information on multiple subjects. Similarly, Clark and Lan (2004) used the Outpatient Heart Failure Learning Needs Inventory to identify the most important learning needs of patients living with heart failure, finding that education pertaining to signs and symptoms of disease exacerbation and the actions to take if that occurs is crucial. Other important learning needs included medications, risk factors, disease information, diet, activity, and psychological factors.

Along with medication adherence and symptom management education, Paul (2008) discussed the importance of providing specific diet information such as sodium

and fluid restriction and monitoring daily weights. In their education delivery for patients with coronary artery disease, Peterson et al. (2014) also placed emphasis on psychological factors such as stress reduction and smoking cessation. Researchers have also demonstrated that patients have a need for local context in their cardiac disease education. When seeking the website content preferences of patients with cardiac disease, Jones et al. (2014) identified that patients wanted directions within the facility, information about specific hospital protocols and a telephone contact number connected to the hospital if issues arise. Likewise, patients also highlighted that they find it beneficial to gain insight into the disease through other patients sharing their own experiences (Jones et al., 2014; Peterson et al., 2014).

Perioperative Education for Patients Experiencing Cardiac Surgery

Patients experiencing cardiac surgery progress through several perioperative transitions. Preoperative assessments and consultations begin days or weeks prior to the cardiac procedure, followed by surgery, an admission to a critical care unit, then postoperative ward, and finally discharge home where recovery is expected to continue. The patients in the perioperative transitions of cardiac surgery often have similar education needs as patients living with cardiac disease with respect to the desire for information surrounding anatomy and physiology of the heart, heart disease, symptom management, medication, and healthy lifestyle maintenance. However, there are some additional education needs for patients experiencing cardiac surgery.

Preoperative Learning Needs

Veronovici et al. (2014) as well as Ramesh et al. (2017) conducted medium-quality systematic reviews in which they discussed how preoperative education allows

patients to understand and mentally prepare for the procedure and postoperative recovery. Veronivici et al. (2014) explained how this information should include pre and postoperative care events, procedural information, behavioural instructions (e.g., deep breathing and coughing, pain management), and preparatory information for returning home. In a small survey (n=51), patients who were awaiting cardiac surgery indicated that they had questions regarding the hospital and ward environment, surgical preparation, postoperative hospital stay, and postoperative lifestyle (van Weert et al., 2003). These education needs were echoed in a small survey of patients who searched the internet prior to surgery and indicated they were interested in finding information about the surgery and specific surgical procedures (Murero et al., 2001).

There is moderate evidence to suggest that preoperative education significantly reduces patient anxiety, postoperative pain and complications. However, this conclusion is based on a limited number of studies, many of which had small sample sizes (Ramesh et al., 2017; Veronovici et al., 2014). Hounsome et al. (2017) found in a large, medium-quality systematic review that preoperative education did not impact anxiety levels or postoperative pain. However, many of the studies in this review had a high risk of bias. Guo (2015) argues that although the effect of preoperative information on patient anxiety and other outcomes is inconclusive, patients request preoperative and postoperative education in advance of surgery and to withhold such information would be unethical. Moreover, the learning needs of patients and family are stable over time, so providing education prior to hospitalization is likely beneficial for preparation and postoperative experience (Lindsay et al., 1997; O'Brien et al., 2013).

Postoperative Learning Needs

Fredericks et al. (2009) discussed that the goal of postoperative cardiac surgery education is to assist the patient to feel confident and knowledgeable in performing self-care behaviours in the home, reducing the likelihood of complications and enhancing recovery. To identify patients' postoperative learning needs, authors Fredericks and Yau (2013) and Mosleh et al. (2017) asked patients to complete the Patient Learning Needs Scale, which was originally created by Bubela et al. (1990) for patients undergoing general surgery. Patients identified the top priority of postoperative learning as incisional care, followed by medication, postoperative complications (e.g. signs of infection and pain), risk factor management, diet, and physical activity (Mosleh et al., 2017).

Postoperative cardiac precautions, personal hygiene, energy conservation, psychosocial management (e.g., stress and coping), and follow up procedures have also been identified as important learning needs for patients experiencing cardiac surgery (Fredericks et al., 2010; Fredericks & Yau, 2013; O' Brien et al., 2013; Spyropoulos et al., 2011). A rigorous qualitative study with patients after discharge following cardiac surgery revealed that in-hospital discharge instructions were insufficient. Furthermore, patients would have preferred more extensive discharge education provided at multiple intervals (Lapum et al., 2011). Therefore, the internet represents a formative method for perioperative education delivery that can be accessed at multiple intervals, not only prior to surgery and while in hospital, but also after returning home.

Internet-Based Education for Patients Experiencing Cardiac Surgery

Upon review of the literature, nine articles were found that utilized an internet-based education platform to provide perioperative education to patients living with cardiac disease or undergoing cardiac surgery. Among these nine studies, four were strong-design randomized controlled trials (RCT) (Barnason et al., 2006; DeVon et al., 2010; Martorella et al., 2012; Moore et al., 2001), two studies were strong-design non-randomized control trials (NRCT) (Brennan et al., 2001; Westlake et al., 2007), two studies were weak-design uncontrolled before-after trials (Cook et al., 2014; Melholt et al., 2018), and the study by Scherrer-Bannerman et al. (2000) was a moderate-strength controlled before-after design. Four studies focused on patients undergoing open sternotomy cardiac surgeries (Baranson et al., 2006; Cook et al., 2014; Martorella et al., 2012; Moore et al., 2001) while DeVon et al. (2010) studied patients who experienced percutaneous coronary interventions. Two studies included patients who were living with cardiac disease (Brennan et al., 2010; Westlake et al., 2007) and Melholt et al. (2018) provided education interventions for patients who had cardiac disease or experienced cardiac surgery. Only two studies provided internet-based preoperative education (Martorella et al., 2012; Scherrer-Bannerman et al., 2000), while all others provided internet-based education in hospital or after discharge home. It is interesting to note that not a single program provided a comprehensive resource that offered education pertaining to the entire perioperative course.

In addition, three systematic reviews were found that included relevant literature on internet-based education interventions, all of which were rated as medium quality. The

systematic review by Beranova and Sykes (2007) evaluated five studies which used computer-supported interventions for patients with cardiac disease, while Fredericks et al. (2015) examined 19 internet-based interventions for patients who experienced cardiac surgery. The systematic review by van der Meij et al. (2016) was not specific to adult patients experiencing heart disease or cardiac surgery but did include studies that designed internet-based programs for these populations. The systematic reviews covered a broad spectrum of internet-based interventions with various outcomes reported in each study. Due to the heterogenous nature of that data, meta-analyses could not be conducted in any of the systematic reviews.

The intervention studies provided education through a variety of means. Three studies provided education through applications installed onto handheld devices (Baranson et al., 2006; Cook et al., 2014; Martorella et al., 2012) while the remaining six studies provided education through websites on the internet or slide presentations on a computer (Brennan et al., 2010; DeVon et al., 2010; Melholt et al., 2018; Moore et al., 2001; Scherrer-Bannerman et al., 2000; Westlake et al., 2007). The majority of intervention studies provided both education that was standardized with respect to content as well as education that could be tailored to individual patient learning needs through the option to select education topics that were relevant to personal need or interest (Brennan et al., 2010; Cook et al., 2014; Martorella et al., 2012; Melholt et al., 2018; Moore et al., 2001; Scherrer-Bannerman et al., 2000; Westlake et al., 2007). Many of these interventions used the interactive nature of the internet to allow for multimedia educational content, which included text, photos, videos, messaging capabilities, and

links to other informative web-based resources. Fredericks et al. (2015) found in their systematic review that internet-based education platforms are most effective when they are interactive in nature and designed to allow patients to independently navigate the content. Thus, the internet-based perioperative education resource for patients experiencing cardiac surgery at the practicum site will be created to enable independent and interactive navigation and will also include multimedia features such as those outlined in the 'ActiveHeart' website developed by Melholt et al. (2018). Further information about these studies can be found in literature summary tables (Appendix A1).

Patient Education Topics Addressed

The majority of the internet-based education interventions included self-guided modules that covered a range of topics. Martorella et al. (2012) however, focused only on providing education surrounding pain management following cardiac surgery. The educational topics provided in the experimental interventions appropriately align with the learning needs of patients living with cardiac disease or experiencing cardiac surgery as discussed earlier in this review. Although the education provided in each intervention was variable between studies, typical education topics included information regarding: cardiac disease and/or surgery, hospital routines, symptoms, complications and management strategies, medications, recovery and self-monitoring instructions, healthy lifestyle (e.g., nutrition, exercise, smoking cessation), appropriate contact information and follow-up procedures. In their systematic review, Fredericks et al. (2015) also found that the education topics covered in internet-based programs supported the learning needs of patients experiencing cardiac surgery. The topics covered in the 19 studies reviewed were

most commonly surrounding medications, nutrition, activity, signs and symptoms of infection, incision care, and complications. It should also be noted that two of the experimental studies (Moore et al., 2012; Scherrer-Bannerman et al., 2000) included a component in the intervention that allowed patients to send electronic messages to healthcare providers or fellow patients, or the option to participate in discussion groups. Additionally, the systematic reviews by Fredericks et al. (2015) and van der Meij et al. (2016) included telehealth interventions where patients were able to contact nurses during recovery. These findings speak to the need for patients to have an opportunity to understand the experiences of fellow patients and the ability to contact providers as part of the perioperative education process.

Impact of Internet-Based Education Resources

Three studies (Beranova & Sykes, 2007; DeVon et al., 2010; Melholt et al., 2018) found that internet-based education led to improvements in knowledge for patients with cardiac disease or experiencing cardiac surgery, while Scherrer-Bannerman et al. (2000) found no difference in knowledge scores. Although DeVon et al. (2010) used a strong study design, the quality is reduced due to possible bias from delivering post-tests differently between the intervention and control groups as well as limited generalizability due to the use of a single hospital and small sample size. Likewise, the weak design study by Melholt et al. (2018) is limited due to a small sample size from a single hospital as well as a poor response rate to questionnaires (<50%).

Six studies, including one systematic review (Brennan et al., 2010; Martorella et al., 2012; Moore et al., 2001; Scherrer-Bannerman et al., 2000; van der Meij et al., 2016;

Westlake et al., 2007) found that internet-based education interventions had a positive impact on physical and/or mental health, while the study by Baranson et al. (2006) found no difference in health between intervention and control groups. For instance, Martorella et al. (2012) found that patients who received an internet-based education intervention experienced less pain with deep breathing exercises and fewer pain related barriers. Although strong designs, the studies by Brennan et al. (2010) and Martorella et al. (2012) did include some nurse interaction and it is therefore difficult to differentiate whether the positive outcomes are related to individual nursing practices. Significant improvements in mental health included reduced anxiety or depression and improved perception of control ($p \leq .001$). Although the authors of the studies which found improvement in physical and/or mental health used strong or moderate strength designs, the quality of the evidence is limited by small sample sizes or use of a single hospital, potential sampling bias through volunteer participants, lack of randomization, and inconsistent data collection procedures. It is also important to note that many of these studies had a gender imbalance with more male participants, lack of ethnically diverse groups and few participants of low education or socioeconomic status, which could limit generalizability. However, a largely male population is typically characteristic of the population of patients who experience cardiac surgery (Fredericks et al., 2009).

With respect to the systematic reviews, Fredericks et al. (2015) found that internet-based interventions lead to increased performance of self-care behaviours following cardiac surgery. However, almost three quarters of the studies were of low methodological quality and telehealth interventions were included in the review, thus

evidence must be interpreted with caution. On the other hand, the majority of studies in the systematic review by van det Meij et al. (2016) were of low or medium risk of bias and focused on educational or supportive websites. Approximately two-thirds of the studies that used internet-based education had positive effects on physical and mental health (van der Meij et al., 2016). Therefore, there is moderate evidence to suggest that the use of an internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery could have beneficial impacts for patient knowledge and health.

Adult Learning Theory Applied to an Internet-Based Education Resource

The development of an internet-based perioperative education resource for this practicum site will be guided by the theory of adult learning as a theoretical framework. Knowles (1980) developed the original tenets of the theory, stating that adults are self-directed learners, motivated by present problems and personal experience. Jackson and Caffarella (1994) added that adults have variable learning styles, want to be actively involved in their learning, desire connection to others, and have life situations that provide a social context and impact on learning. Furthermore, adults are able to determine their learning needs and thus, educational activities should include independent study (Caffarella & Barnett, 1994; Knowles et al., 2005).

With the principles of adult learning in mind, the internet-based perioperative education resource will appeal to the self-directed and problem-focused nature of adults who will undergo or have already experienced cardiac surgery. As discussed, the perioperative trajectory of cardiac surgery requires that patients acquire self-management

skills and retain information with respect to, for example, medications, symptoms and lifestyle in order to ensure positive outcomes in recovery. Patients will face questions, possible problems or complications at any point in time from prior to surgery to after discharge. This resource will serve as a centralized point of information that adult patients will be able to refer to when needed and apply their learning to their current situation. Additionally, as all adults do not learn in the same manner, the resource will contain elements that appeal to various types of adult learning styles. This will include interactive, visual and written content, as well as a module with questions to consolidate learning (Candela, 2016).

Since adult learners want control over learning, the resource will be tailored to patients' assessments of personal learning needs and allow patients to select the topic of their choice. This customization of learning is supported by the findings of Fredericks et al. (2015), who found that tailored education interventions lead to more significant improvements in a patient's adoption of self-care behaviours ($p < .05$) than structured education interventions. Thus, it is important that an internet-based health education resource provides the opportunity for patients to select the information they are interested in learning about. As stipulated by Jackson and Caffarella (1994) and supported by recent literature, adult learners want to gain insights from and connect with fellow patients (Jones et al., 2014; Peterson et al., 2014). Therefore, an internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery should also include stories from former patients who previously underwent open sternotomy cardiac surgery. As life situations intersect with an adult's ability to learn, an

internet-based perioperative education resource should provide flexibility to the individual's life circumstances as the internet enables the person to access the education in the time and space that is most convenient for him or her. Finally, the internet-based perioperative education resource should allow patients to access the content as frequently as desired, prior to surgery and after returning home, as multiple doses of education enhance recall and application of knowledge (Fredericks et al. 2010).

Conclusion

Patients experiencing open sternotomy cardiac surgery need perioperative education, yet most often only receive pre and postoperative education during one or two in-person didactic education sessions in hospital. The effect of open sternotomy cardiac surgery on function and lifestyle creates extensive learning needs for self-management that begins at diagnosis and continues throughout recovery at home. Researchers across the literature demonstrate that education targeted towards patients experiencing cardiac surgery should include the following topics: cardiac disease and surgery, hospital routines, symptom and complication management, medications, recovery and self-monitoring instructions, healthy lifestyle maintenance, hospital contact information, follow-up procedures, and connections to previous patients (Fredericks & Yau, 2013; Fredericks et al., 2015; Huriani, 2019; Mosleh et al. 2017; Veronivici et al. 2014). However, these large amounts of information along with the physical and emotional impact on the patient and family as a result of the procedure present barriers to the retention of education provided in hospital (Spyropoulos et al., 2009). Fredericks and Sidani (2008) identify that patients are more commonly accessing internet sources to seek

education pertaining to their health and thus, the internet presents a means to improve patient knowledge.

The use of internet-based perioperative education for adult patients experiencing open sternotomy cardiac surgery has exhibited positive effects on not only patients' knowledge but also their physical and mental health. Furthermore, an internet-based education resource boasts the opportunity to accompany patients and family members throughout the perioperative journey, including after returning home, as the education can be accessed as often as necessary when individuals feel prepared to learn. Through completion of this literature review, it is clear that there is moderate quality evidence to support that an internet-based perioperative education resource would be beneficial for patients experiencing open sternotomy cardiac surgery at the practicum site. An internet-based perioperative education resource presents a flexible platform, supplementary to in-hospital didactic education, that can be customized to the individual learning needs of patients. However, there was a paucity of research surrounding internet-based education platforms that included comprehensive education pertaining to the entirety of the perioperative trajectory for patients experiencing open sternotomy cardiac surgery, which speaks to the necessity of developing such a resource.

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APPENDIX A1: Literature Summary Tables

Key Question: What are the learning needs of adult patients experiencing open sternotomy cardiac surgery and what is the impact of perioperative internet-based education resources?

Study Design	Methods	Key Results	Quality & Comments
Author(s): Baranson et al. (2006) Study Design: RCT Title: Impact of a telehealth intervention to augment home health care on functional recovery outcomes of elderly patients undergoing CABG	N: 232 Pts. following CABG (≥65 years) Setting: 4 Midwestern tertiary hospitals, Nebraska, United States Intervention Group: • Received discharge education PLUS 6-week Health Buddy education and self-assessment intervention • Content included: assessment of CABG recovery symptoms (e.g., rest, pain), strategies to manage symptoms, education of CABG recovery (self-care/wound management), positive reinforcement to increase self-efficacy • Daily sessions provided Pts. with feedback through standardized responses based on algorithms tied to questions • No interaction between HCPs and Pts. Control Group: • Received usual discharge education Data Collection and Outcomes:	• Both groups had significant physical and mental health improvements over time • Intervention group had increased energy expenditure compared to control at 3wk. follow up (prior to starting cardiac rehab) • Intervention group noted to report "more intense" types of physical activity • Control group had significantly higher long-term energy expenditure • Both groups had similar healthcare use	Strength of Design: Strong Quality Rating: Medium • 83% of sample was male, limits generalizability to female population • >20% attrition rate • Preop activity measured subjectively but objectively postop • Potential information bias through Pt. self-report • Improvements in QoL may

	• Valid & Reliable tools: Modified 7-day activity interview, RT3 accelerometers, physical activity and exercise diary, Medical Outcomes Study Short Form 36 • Self-report and health records of healthcare use • Follow up times: 3 and 6 wks and 3 and 6 months		represent a result of the CABG itself
Author(s): Beranova et al. (2007) Study Design: Systematic Review Title: A systematic review of computer-based softwares for educating patients with coronary heart disease	N: 5 studies which included adult Pts. with coronary heart disease Interventions: • Computer-based education used alone or alongside a health care professional • Standard care included usual verbal or leaflet education Data Collection and Outcomes: • Searched 3 databases for studies from 1999-2005 • Also used unpublished literature • Two authors individually assessed for quality • Examined effectiveness of the software	• Overall large effect size of interventions o Effect size= 1.01 • All studies reported significant knowledge increases when computer software used as compared to standard education • Knowledge differences between groups persisted to 6 months follow up • High Pt. satisfaction with program use and all programs reported that elderly had no difficulty utilizing computers o Many Pts. were computer	Quality Rating: Medium • Few studies to form decision upon • Variable intervention styles • Only two reviewers used • Possible sources of confounding not controlled for: Potential for differences in knowledge between groups prior to intervention

		illiterate at baseline	
Author(s): Brennan et al. (2010) Study Design: NRCT Title: Technology-enhanced practice (TEP) for patients with chronic cardiac disease	N: 282 Pts. with chronic cardiac disease Setting: Pt. homes in rural and urban areas served by home care agencies in Mid-West United states • Agency offices randomly assigned to deliver TEP or usual care Intervention Group (TEP): 146 Pts. • Nurses delivering home care taught Pts. how to use a web-based resource (HeartCare II) and tailored education during visits to Pts. needs based on the HeartCare website information • Website provided self-management info, self-monitoring tools, messaging services • Expected Pts. to access website outside of nursing visits by Pt. and family • Topics included: disease, medications, symptom monitoring, measurement tracker Control Group (UC): 136 Pts. • Usual in-home nursing care and agency-standardized paper-based education based on Pt. needs and MD orders	• Majority of website access occurred during first 4 wks. of enrollment • TEP lead to greater physical health than UC at wks 1 & 4 o p= .020; .014 • TEP lead to greater mental health at wks. 1 & 8 o p= .027; .001 • No differences found between groups for satisfaction of nursing care, unplanned service use, QoL or self-management	Strength of Design: Strong Quality Rating: Medium • Lack of randomization • Pts. classified as sicker than Pts. in other studies (possibly explains modest effect) • Questionnaires not completed in consistent manner • Pts. understanding and use of website could differ based on individual nurse practices • Some missing data

	Data collection and outcomes: • Clinical status (SF-12); Self-management (Self-care HF index); QoL (Multidimensional Index for Life Quality Questionnaire for CVD); Satisfaction with nursing care; Unplanned service use • Demographics and baseline characteristics collected via self-report during in-home visit • Trained RA collected data on outcome measures at wks. 1, 4, 8,12, and 24 through phone or mail questionnaire (Pt. preference) • Random effects regression model used		
Author(s): Cook et al. (2014) Study Design: UCBA Title: Patient education self-management during surgical recovery	N: 149 Pts. having elective cardiac surgery (>50 yrs.), with length of stay at least 5-7 days Setting: Mayo Clinic, Minnesota, United States Intervention: 149 Pts. • Pts. received an iPad in hospital that delivered educational modules and a daily list of care activities that should occur • Platform contains education, recovery planning and daily self-assessments • Included template content and configurable o Configurable: based on type of surgery, surgery-specific procedure; education modules specific to Pts. other conditions	• Completion rate varied from 94% on day of surgery to 68% on day 5 postop • 84% of education modules utilized • 90% of users reported that they understood the majority of the content on day of discharge • Increased age not associated with decreased use	Strength of Design: Weak Quality Rating: Medium • Lacks randomization • Lacks control group • Single hospital • Not a reliable/validated means to assess understanding

	(e.g. diabetes, sleep apnea); posthospital planning (exercise, diet, complications) • Content on surgery day directed for family to review Data Collection and Outcomes: • iPad communicated wirelessly with a cloud-based information system where data was pooled to track use of the resource • iPad-based questionnaires asked whether Pt. understood material (yes/no response only) • Electronic health record used to collect demographic data	• Completion rates not associated with health status	• Can't determine if modules viewed by Pt. or family member
Author(s): DeVon et al. (2010) Study Design: RCT Title: *Know & Go!* program improves knowledge for patients with coronary heart disease	N: 64 Pts. in hospital post-PCI; group assignment stratified by gender (equal number gender/group) Setting: Cardiac intervention unit at a tertiary care center in the Midwest, United States; December 2006 to March 2008 Intervention Group: 32 Pts. • Viewed slide presentation in hospital at baseline as well as 2 and 4 month after discharge • Slide show covers symptoms, risk factors, and care-seeking information Control Group: 32 Pts. • Usual post-PCI care and education	• Intervention had higher pretest scores; controlled for via ANCOVA Intervention Group: • Significantly higher post-test scores compared to control group at 4 months o $p < .001$ o Large effect size= 1.26 o Increased scores could be due to the fact that Intervention Pts.	Strength of Design: Strong Quality Rating: Medium • Single unit at a single hospital • Possible interviewer bias; Post-tests delivered differently between groups o Researchers asked questions

	Data collection and outcomes: • 20-item pre/post-test questionnaire to evaluate learning after the slideshow (content validated by multiple nurses and researchers) ○ Intervention completed post-test in hospital after viewing presentation at 4months Control completed post-test by phone at 4 months. • Likert-scale satisfaction survey returned by mail • Intervention safety evaluated • Investigators not blinded to group allocation, assisted with intervention delivery	viewed slideshow immediately prior to completing post-test • High satisfaction rates with slide presentation • Determined to be easy to use and safe	over phone in same order • Possible sampling bias: women and older adults more likely to decline participation
Author(s): Fredericks et al. (2015) Study Design: Systematic Review Title: Systematic review of web-based educational interventions	N: 19 studies of adults who underwent heart surgery Interventions: • Web-based interventions used to improve postoperative and self-care behaviours (SCBs) • Includes telehealth interventions • Most common topics: med management, nutrition, activity, signs and symptoms of infection, incision care, complications • Control group usually received an educational brochure that they independently reviewed Data Collection and Outcomes: • Review conducted based on PRISMA guidelines	• Majority (84.2%) of studies included structured information with pre-designed screens where Pts. reviewed screens in sequential order ○ 75% of structured interventions showed minimal effect • 3 studies used tailored interventions where Pts. could	Quality Rating: Medium • 73.7% of the studies were of low methodological quality • Did not examine grey/unpublished on non-English literature

	• Used EPHPP quality assessment tool • Searched >3 databases; English studies only • 2 nurse researchers reviewed articles	select a topic of interest ○ Lead to significant increases in SCBs ($p<.05$) • Web-based interventions lead to performance of more SCBs compared to control group ○ $p= .03$ • >5hrs spent engaged in web-based education vs. 1.2hrs on booklet education	
Author(s): Martorella et al. (2012) Study Design: RCT Title: Web-based nursing intervention for self-management of pain after cardiac surgery	N: 60 Pts. undergoing first-time open sternotomy procedure surgery (CABG, Valvular or combination) Setting: Single hospital in Montreal, Canada Intervention Group (SOULAGE-TAVIE): 30 Pts. • Usual care including an educational pain pamphlet • 30-minute web-based preoperative pain session containing reflective activities and tailored educational messages via a virtual nurse, animations, story and text	• Intention-to-treat analysis Intervention Group: • Did not experience less intense pain • Significantly less pain interference with breathing/coughing ○ $p = .04$ ○ Severe pain interference for 15% of	Strength of Design: Strong Quality Rating: High • Single hospital, limits generalization • Difficult to separate the impact of the web sessions vs. the in-person booster sessions

	○ Algorithm caused some of the delivered education to change based on real-time answers provided by Pt. selecting responses on a laptop • 2 brief face-to-face postoperative sessions (1st = 2 days after surgery and 2nd = 3 days after surgery) <u>Control Group</u>: 30 Pts. • Usual care including an educational pamphlet and usual postoperative follow up <u>Data collection and outcomes</u>: • Questionnaires via blinded RAs at the time of admission from day 1 to day 7 after surgery • Baseline demographics, presence of preop chronic pain and psychological well-being assessed (via Hospital Anxiety & Depression scale) • Validated tools to collect: Pain Intensity (NRS); Pain Interference (BPI); Pain Barriers (BQ-II); Pain catastrophizing (PCS) • Analgesic consumption and med/surg assessment via chart review	intervention group compared to 44% of control group • Significantly fewer pain related barriers ○ Intervention mean = 10.6; Control mean = 15.8 ○ p= .02 • Intervention group consumed more opioid medication • 31.2mg vs. 18.8mg (p= 0.01)	• Misclassification bias possible through possible contamination during boosters • Principal investigator delivered booster sessions (not blinded) • Uniformity but results could be related to a single practitioner's care

Author(s): Melholt et al. (2018) Study Design: UCBA Title: Cardiac patients' experiences with a telerehabilitation web portal	N: 109 cardiac Pts. with ischemic heart disease or HF or underwent CABG/valve surgery Setting: Recruited from cardiology unit at a university-associated hospital, Denmark Intervention: • Access to the ActiveHeart telerehabilitation web portal for 3 months • Contains text, videos, pictures related to cardiac disease, treatment, side effects, and advice for informal caregivers; info around diet, alcohol, exercise, smoking cessation, healthy lifestyle maintenance, and who to contact in adverse events Data Collection and Outcomes: • Completed self-administered questionnaires before and after use of portal regarding demographics, use of technology, seeking health info and experience of using ActiveHeart • Likert-style questionnaires developed by researchers and validated in Pt. testing	• 49 Pts. completed questionnaires (45% response rate) • Reported portal was easy to use and understandable • All Pts. reported that family members used the portal • eHealth literacy skills increased during the trial period ○ p= 0.005	Strength of Design: Weak Quality Rating: Medium • Lacks randomization • Lacks control groups • Over half of the Pts. had missing data; could lead to bias as those who did not answer questionnaires may not have found website useful • Single hospital

Author(s): Moore et al. (2001)
 	
Study Design: RCT
 	
Title: Customized computer home support improves
	N: 107 Pts. post CABG (mean age 64 yrs.)
	
	Setting: Single hospital, Mid-West United States
	
	HeartCare Intervention:
		HeartCare Group
		• Experienced fewer symptoms
		  ○ p= .025
		• Less physical dysfunction
		  ○ p=.022
			Strength of Design: Strong
			
			Quality Rating: Medium

recovery of CABG patients	• Time relevant information delivered via Web-TV regarding how to manage physical, emotional, and social recovery
	  o Wk. 0-2: incision care, adverse symptoms, postoperative precautions
	  o Wks. 3-6: improving independence and tolerance of ADLs
	  o Wks. 7-12: strategies for returning to social, recreational and work activities
	  o Wks. 13-26: Long term healthy lifestyle maintenance
	• Ability to email nurses and receive peer support from discussion forums.
	
	<u>Comparison Group:</u>
	• Audio-tape program with discharge instructions
	
	<u>Data Collection and Outcomes:</u>
	• Compared physical dysfunction, symptoms, family functioning and cardiac risk behaviours and depression levels
	• Assessed at wks. 1, 4, 13 and 26
	• Controlled for sources of confounding
		• Less depression
		  o $p < .001$
		
		• No differences in family functioning or cardiac risk
			• Limited info available on data collection procedures
			• Single location in U.S. difficult to generalize

<u>Author(s):</u> Scherrer-Bannerman et al. (2000)	N: 72 Pts. on waiting list for cardiac surgery Setting: Vancouver, Canada <u>Intervention Group:</u>	• Large improvements found in 5 HSQ areas but authors attributed to surgery not intervention	<u>Strength of Design:</u> Moderate <u>Quality Rating:</u> Low

Study Design: CBA Title: Web-based education and support for patients on the cardiac surgery waiting list	• Received access to educational website based on printed manual typically provided to Pts. • Content: basics of heart disease, types of heart surgery, hospital stay, post-discharge care • Website included graphics, interactive features, option to email nurses, and links to resources Control Group: • Received usual education through printed manual Data Collection and Outcomes: • Mixed methods • Self-administered baseline and post-test surveys and Health Status Questionnaire-12 (HSQ) • Interviews conducted with intervention Pts. and focus group with control Pts.	• Site reported to be easy to use but limited use of interactive features (i.e. contact nurse) • Both groups reported increased knowledge • Intervention Pts. significantly less anxious about surgery and reported enlarged social support system after intervention	• Potential sampling bias since Pts. volunteered • Small sample size • Validity of tools and outcome data (p-values or statistics) not provided
van der Meij et al. (2016) Study Design: Systematic Review Title: Effect of perioperative e-health interventions on the postoperative course	N: 33 articles, 27 unique studies; Pts. who underwent any type of surgery • Majority= cardiac studies (n=9) Interventions: • Any type of e-health intervention delivered perioperatively (RCT or non-randomized) that replaced or complemented usual perioperative education • Educational or supportive websites (ESW) to provide info about surgery, recovery process, positive reinforcement or tailored rehab program	• 66.7% of ESW interventions had positive effects on Pts. in physical and psychosocial areas • 77.7% of interventions for cardiac Pts. had a positive effect on one or more outcomes • No studies found higher rates of	Quality Rating: Medium • Most studies had a low or medium risk of bias • Excluded grey and non-English literature • Heterogeneity between studies makes it difficult to pool results

	• Telemonitoring, telerehabilitation or teleconsultation interventions also included Data Collection and Outcomes: • Conducted search in accordance with Prisma guidelines • Three reviewers assisted with study selection • Outcomes: physical health, mental health/anxiety; cost, return to work, satisfaction, length of hospital stay	complications in intervention groups • 92.6% of studies reported at least an equal or positive effect of the e-health intervention compared to usual care Conclusion: • E-health interventions more often lead to improved clinical outcomes compared to usual face-to-face education/care	
Author(s): Westlake et al. (2007) Study Design: NRCT Title: Evaluation of a web-based education and counseling pilot program for older	N: 80 Pts. with HF (≥ 60 yrs.) Setting: Outpt. HF clinic, California, United States Intervention Group: 40 Pts. • Pts. volunteered; no previous internet experience required • Web-based HF modules that provided education regarding HF and symptom management; included email capability to contact fellow study HF Pts. and clinical nurse specialists; external links to video content as well as measurement trackers	• Majority had computers in home but only 25% reported having navigated web • Both control and intervention groups experienced increases in perceived control and physical component of QoL	Strength of Design: Strong Quality Rating: Medium • Possible selection bias as Pts. volunteered and retrospective selection of controls

heart failure patients	• Program based off of booklet usually provided in the clinic • 12 wk. access to modules and program <u>Control Group</u>: 40 Pts. • Retrospectively age/sex matched to intervention Pts. • Usual HF care including paper-based HF booklet <u>Data collection and outcomes</u>: • Baseline questionnaires conducted orally by RA • Pts. completed same questionnaires in written formats at 3 month clinic follow up visit • Validated instruments used to measure: QoL (SF-12) and perceived control (Control Attitude Scale)	<u>Intervention group:</u> • Mental health component of QoL showed significant increase overtime compared to a decline in control group o p= <.0001 • Significant improvement in perceived control at 3 month compared to control group o p= .001	• Lacks randomization • Lacks sufficient power • Small sample size limits generalizability

Appendix B: Environmental Scan Report

Development of an Internet-Based Perioperative Education Resource for Adult Patients Experiencing Open Sternotomy Cardiac Surgery: Environmental Scan Report

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Currently, more than 33 million Canadians have access to the internet and people increasingly use the internet to educate themselves on health issues (Government of Canada, 2019; Guo, 2015). Open sternotomy cardiac surgeries, which includes Coronary Artery Bypass Grafts (CABG) and/or valvular procedures, require that patients participate in extensive surgical preparation as well as adopt complex medication and recovery regimens following surgery. The practicum site, a busy cardiac surgery centre in Southwestern Ontario, primarily relies upon the provision of verbal perioperative education to patients from the time of presurgical consultations to the time of discharge, typically in single, didactic sessions between the patient and care provider. Unfortunately, anxiety, pain and large amounts of verbal information provided just prior to major transitions such as surgery or discharge from hospital represent barriers to knowledge retention (Fredericks et al., 2010; Lim et al., 2010). Verbal teaching is supplemented with some paper-based resources, however, patients and health care professionals at the practicum site explain that these materials are outdated, repetitive and disjointed between different areas of cardiac care.

A patient's inability to recall and implement vital perioperative self-management instructions can lead to preventable complications and poor patient outcomes. Therefore, the use of the internet presents a formative opportunity to provide accessible, flexible and individualized perioperative cardiac surgery education to patients and families (Fredericks et al., 2015). Furthermore, patient engagement technologies, like online education systems, are supported in the Enhanced Recovery After Cardiac Surgery Society's (2017) expert recommendations as a method to improve patient knowledge, compliance and outcomes. However, an internet-based perioperative education resource

does not presently exist for adult patients who undergo open sternotomy cardiac surgery at this practicum site. The overarching goal of this practicum project is to develop an internet-based perioperative education resource that provides a comprehensive overview of the cardiac surgery patient pathway, highlights patient recovery goals and delivers essential self-care and recovery management education. In order to develop a resource that is effective at delivering education and grounded in the learning needs of patients who experience open sternotomy cardiac surgeries, it is a necessary step to perform an environmental scan. In doing so, valuable perioperative cardiac surgery patient education resources that are currently available can be reviewed and utilized to inform the content and design of an internet-based education resource for the practicum site.

Objectives of the Environmental Scan

The purpose of conducting this environmental scan was to examine the resources currently provided to patients experiencing cardiac surgery at the practicum site as well as the internet-based education resources available to patients who undergo cardiac surgery at other locations. These perioperative educational resources were assessed for educational content, design and layout. Ultimately, the findings of this environmental scan will be used to guide the development of an internet-based perioperative education resource for adult patients experiencing cardiac surgery at the practicum site.

Methods

To begin, the written perioperative education resources utilized for patients experiencing cardiac surgery at the practicum site were scanned for content. The existing paper-based materials provided at the practicum site will be used as the basis for the creation of the internet-based perioperative education resource as it contains pertinent

context with respect to specific hospital routines and postoperative processes. Subsequently the content, layout, and design of four perioperative cardiac surgery education websites from other institutions were also thoroughly examined. These institutions included: St. Mary's Hospital (Kitchener, Ontario), University Health Network (UHN) (Toronto, Ontario), University of Ottawa Heart Institute (UOHI) (Ottawa, Ontario), and the Society of Thoracic Surgeons. These websites were selected as they represent comparable healthcare institutions that provide open sternotomy cardiac surgeries in Ontario, as well as the organization that represents cardiothoracic surgeons through provision of current research, education and best practices.

As mentioned, the existing paper-based materials at the practicum site and websites from other institutions were independently examined for educational content, as well as resource design and layout. Detailed notes regarding each resource were maintained in a word document. Content analysis was completed on the documented findings and common themes were derived with respect to resource content, design and layout. As the development of an internet-based perioperative education resource is considered to be a quality improvement project, a formal review by an ethics board was not warranted based on the results of the completed Health Research Ethics Authority (2011) screening tool (Refer to Appendix B1). Data files were kept in the writer's confidential folder within a password protected computer. Subject matter utilized for the development of this internet-based perioperative education resource received appropriate credit and citation where necessary.

Outcomes of the Environmental Scan

Current Education Resources at the Practicum Site

At the practicum site, various paper-based education resources are available to patients both pre and postoperatively. The available resources, such as pamphlets or small booklets, provide limited information about the hospital, cardiac surgery intensive care and ward units, surgical preparation, postsurgical patient goals and discharge (Hamilton Health Sciences, 2009; 2017). The major written resource, entitled *Path to Recovery After Heart Surgery* (Hamilton Health Sciences, n.d.) is heavily relied upon in the postoperative environment at the practicum site. This 60-page booklet is typically provided for all patients to review postoperatively while in hospital and to use as a resource after returning home. This booklet is fairly comprehensive with respect to postoperative recovery learning needs as it contains information on the following topics: follow-up appointments, what to expect after surgery, nutrition, delirium, exercise, medication, incisions, swelling, constipation, sleep, emotions, diabetes, smoking cessation, cardiac rehabilitation, and when to call for help. The booklet design hosts large font, lots of white space and some pictures. However, the order of presented information appears to be illogical and is not easy to follow. Of the paper-based resources that were found and examined, education regarding preoperative preparation and procedures was minimal while information with respect to the cardiac surgery itself as well as heart disease and anatomy was entirely lacking. Additionally, upon completion of the environmental scan of existing resources, it was evident that many of these paper-based resources contained information that was not supportive of current practices, repetitive and lacking a high degree of integration between the various resources and areas of

cardiac care. Keeping in mind the weaknesses and areas of improvement required in these paper-based perioperative resources, they do contain some valuable information that is specific to the local context and practices of the practicum site. Therefore, it is necessary to utilize these existing paper-based education resources, specifically the postoperative booklet, as a guide for the development of certain content within the internet-based perioperative education resource.

It is worthy of mention that the paper-based resources provided to patients at the practicum site are available on the institution's website in a document format. However, patients must currently be able to independently search for these resources on the website through the patient education library, which is not necessarily an intuitive process. Thus, the education that is available for patients on the healthcare institution's website is not only difficult to access but also outdated and non-interactive. Presently at the practicum site, a centralized hub of internet-based cardiac surgery specific education does not exist for patients experiencing cardiac surgery. Therefore, it was essential to examine internet-based education resources from other locations that provide cardiac surgery.

Internet-Based Education for Cardiac Surgery

The websites of four institutions that deliver education for patients experiencing cardiac surgery were examined. These institutions represent three major cardiac surgery centres within the province of Ontario, as well as an organization that is dedicated to improving the lives of patients who live with cardiothoracic diseases through research and education (Society of Thoracic Surgeons, 2019). The findings of the internet-based segment of the environmental scan are presented in the sections that follow.

St. Mary's Hospital (Kitchener, Ontario)

The website serving this cardiac surgery program is easy to navigate and contained several interactive features. These features include the ability to select topics about surgical preparation, types of cardiac surgery, the care team and tools for recovery. Through this, patients have the opportunity to decide what is of most importance for them to learn, based on the specific point they are at in their cardiac surgery trajectory. There are several videos embedded throughout the webpages pertaining to surgical preparation, cardiac surgery procedures and returning home. These videos contain in-depth and comprehensive information that support the education that is also provided through a booklet that patients can download. The preoperative video provides education regarding the cardiac surgery team, managing health and dealing with complications prior to surgery, preparing for surgery, information about the surgery, care practices after surgery, possible complications in hospital, exercise and activity restrictions, and methods to enhance recovery. The recovery video contains information regarding making arrangements before discharge, pain, medications, protecting the sternum, depressive feelings, sleep, bowel habits, incisions, exercise, and follow-up appointments (St. Mary's General Hospital, n.d.). Within each section of the website, there is also written information, complimented with pictures that discuss waiting for surgery (i.e., waiting at home, or waiting in hospital), blood management and medications. There are also links to uploaded documents with pertinent cardiac surgery-related education such as care for heart valves, symptoms after surgery and the institution's cardiac surgery guide (St. Mary's General Hospital, n.d.). Finally, external links are available for additional

resources such as International Normalized Ratio measurement trackers and a health education library.

University Health Network (UHN) (Toronto, Ontario)

This website contains various webpages that overview how the heart works (including an interactive diagram), information pertaining to the patient's hospital stay and the various hospital units, what to bring to hospital and the cardiac team (UHN, 2015; UHN, 2019a). There are also links to two videos which overview preparation for cardiac surgery and recovering from heart surgery. Additionally, the website for this cardiac surgery program contains a multitude of links to written content on webpages as well as uploaded documents pertaining to types of cardiac surgeries, heart disease, smoking cessation, discharge preparation and postoperative precautions. The main feature of this institution's website is a surgical guide where patients can click through the various points in the perioperative care trajectory and written education is provided at each step. These steps include: information about the operation, preadmission visit, day before the operation, day of the operation (with a link to a separate intensive care unit education page), recovery at home, follow-up appointments, and information about who can be contacted at the surgical hospital with issues or questions (UHN, 2019b).

University of Ottawa Heart Institute (UOHI) (Ottawa, Ontario)

This cardiac surgery program website, much like the UHN website, contains menus in which patients can select topics of interest which lead to separate webpages with written content and documents or printed guides which can be downloaded. This

website provides education pertaining to the various cardiac surgery procedures performed, steps to take prior to admission and on the day of admission, as well as information regarding hospital practices and directions (UOHI, 2019a). There is also in-depth postoperative recovery education delivered through the website, which includes information pertaining to: postoperative precautions, caregiver tips, managing incisions, postoperative complications, medication management, nutrition, exercise, and follow-up instructions (UOHI, 2019b). This website contains videos and slideshow presentations which overview logistics of the hospital admission and surgery as well as heart anatomy. Additionally, there are links to institution affiliated webpages that provide further information about nutrition, such as a low salt diet, physical activity and sexual health, as well as returning to work (UOHI, 2019c). Finally, there is also content regarding resources and support groups for caregivers as well as information surrounding patient support groups (UOHI, 2019a).

Society of Thoracic Surgeons

This organization provides a web-based cardiac surgery guide that patients can independently navigate. The website possesses easy-to-read font and attractive colours and contains different topics for patients to gain further information depending on their interests or learning needs. These topics surround what occurs prior to surgery (e.g., reasons for surgery, preoperative tests, planning for surgery), the day of surgery (e.g. general anaesthesia, types of surgery, how surgery occurs) and after heart surgery (e.g., what to expect in hospital, returning home) (Society of Thoracic Surgeons, 2019a). There is also a link to a comprehensive postoperative brochure entitled *What to expect after*

heart surgery (Society of Thoracic Surgeons, 2019b). This brochure, accessible by internet and available for print highlights what is 'normal' after heart surgery, incisional care, medication information, complication and symptom management, exercise guidelines, nutrition education, and cardiac rehabilitation information.

Summary of Environmental Scan

The environmental scan conducted at the practicum site revealed that the major source of education for patients experiencing cardiac surgery is through paper-based booklets provided by the healthcare team. These paper-based education resources provide some good content with respect to local surgical preparation procedures, hospital and postsurgical routines as well as self-management and recovery. However, much of the education provided in these paper-based resources does not align with current perioperative care practices at the practicum site and they are completely devoid of essential information related to heart disease, anatomy, surgical procedures and processes, the perioperative pathway, as well as patient connection. Additionally, paper-based resources are less effective in providing interactive features and contributing to patient knowledge retention in comparison to internet-based education sources (Fredericks et al., 2015). Although these paper-based resources are available in document formats in the patient education library on the institution's website, they are currently difficult to locate and are not affiliated with the cardiac surgery program section of the website. While paper-based education resources provide an alternative mode for obtaining and viewing education when uploaded to a website, there is still limited opportunity to appeal to the various styles of adult learning and limited ability to include interactive features.

Therefore, the use of interactive webpages that patients can independently navigate provides an excellent outlet for which adult patients experiencing open sternotomy cardiac surgery can locate education that pertains to their individual learning needs (Fredericks & Sidani, 2008; Fredericks et al., 2015).

The examination of websites from organizations that support internet-based cardiac surgery education demonstrates the need to include interactive features, such as videos, diagrams and external links to enhance written content and consolidate patient learning. Each website affiliated with a cardiac surgery institution had an easy-to-access, centralized learning area, which contained cardiac-specific education and associated links that would be relevant for patients to review throughout their entire cardiac surgery journey. This information was easy to locate, as it was directly on the webpage and patients were not required to search for the information they desired. All four websites provided a multitude of approaches to attract and maintain learner attention while providing comprehensive information for the cardiac surgery trajectory in its entirety, from prior to the operation to recovery after leaving the hospital. Although these internet-based resources also contained written content and brochures or booklets that could be viewed online or downloaded, these websites were also designed in such a manner that allowed a patient to independently and easily navigate through a wide variety of topics pertaining to cardiac surgery and recovery regimens. These features of the internet-based perioperative education resources delivered by other healthcare institutions improve the ability of patients to access and retain the wealth of information required surrounding open sternotomy cardiac procedures in comparison to paper-based resources alone.

Conclusion

Internet-based education resources provide a means to bolster patient knowledge and confidence as well as support positive interactions with the healthcare system and postoperative recovery (Fredericks et al., 2015; Pietrzak et al., 2014; van der Meij et al., 2016). The environmental scan proved to be a beneficial exercise to inform the development of an internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery at the practicum site. The content, layout and design elements of existing websites from other healthcare institutions will serve as a guide for the development of the internet-based perioperative education resource for the practicum site. The environmental scan established the need for patients to access information through simple routes and for the inclusion of interactive features when designing internet-based education resources through the use of videos, links to additional resources and diagrams. The existing paper-based materials for patients experiencing cardiac surgery from the practicum site require some updates to reflect current practices and additions in order to become truly comprehensive to the perioperative process. However, these paper-based education resources can be used to provide a deeper understanding of not only the content that must be included but also local contextual elements that need to be included in the internet-based resource. As the practicum site currently lacks a comprehensive internet-based perioperative education hub for patients experiencing cardiac surgery, ascertaining how other cardiac surgery institutions deliver essential self-management education via their websites enhances the development process of a local education resource.

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Appendix B1

Health Research Ethics Authority Screening Tool

	Question	Yes	No
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review	❒	✓
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?	❒	✓
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. **IF NO** to both questions, continue to complete the checklist.		
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	❒	✓
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?	❒	✓
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?	❒	✓
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?	❒	✓
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?	❒	✓
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		**0**	**7**
8.	Are many of the participants in the project also likely to be among those who might potentially benefit from the result of the project as it proceeds?	✓	❒
9.	Is the project intended to define a best practice within your organization or practice?	✓	
10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	✓	❒
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	✓	❒
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?		✓
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		**4**	**1**
	SUMMARY • the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).		

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at: http://www.hrea.ca/Ethics-Review-Required.aspx.

Appendix C: Consultation Report

Development of an Internet-Based Perioperative Education Resource for Adult Patients Experiencing Open Sternotomy Cardiac Surgery: Consultation Report

Lindsay Femiak

Memorial University of Newfoundland

Currently, more than 33 million Canadians have access to the internet and people increasingly use the internet to educate themselves on health issues (Government of Canada, 2019; Guo, 2015). Open sternotomy cardiac surgeries, which include Coronary Artery Bypass Grafts (CABG) and/or valvular procedures, require that patients participate in extensive surgical preparation as well as adopt complex medication and recovery regimens following surgery. The practicum site, a busy cardiac surgery centre in Southwestern Ontario, relies primarily on the provision of verbal perioperative education for patients from the time of presurgical consultations to the time of discharge, typically in single, didactic sessions between the patient and care provider. Unfortunately, anxiety, pain and large amounts of verbal information provided just prior to major transitions, such as surgery or discharge from hospital represent barriers to knowledge retention (Fredericks et al., 2010; Lim et al., 2010). This verbal education is typically supplemented with a few paper-based resources, however, patients and health care professionals at the practicum site explain that the paper-based materials are outdated, repetitive and disjointed between different areas of cardiac care. A patient's inability to recall and implement vital perioperative self-management instructions can lead to complications and poor patient outcomes, most of which are preventable (Fredericks et al., 2015; van der Meij et al., 2016).

Therefore, the use of the internet presents a formative opportunity to provide accessible, flexible and individualized perioperative cardiac surgery education to patients and families (Fredericks et al., 2015). Furthermore, patient engagement technologies, like online education systems, are supported in the Enhanced Recovery After Cardiac Surgery Society's (2017) expert recommendations as a method to improve patient knowledge,

compliance and outcomes. However, an internet-based education resource does not presently exist for patients who undergo cardiac surgery at this practicum site. The overarching goal of this practicum project is to develop an internet-based perioperative education resource that provides a comprehensive overview of the cardiac surgery patient pathway, highlights patient recovery goals and delivers essential self-care and recovery management education. In order to develop a resource that is effective at delivering education and grounded in the learning needs of patients who experience open sternotomy cardiac surgeries, it was a necessary step to collaborate with patients, colleagues and various stakeholders through a comprehensive consultation process. In the following report, the methods utilized to conduct the consultations with key informants will be outlined and the feedback as well as information obtained from the informants will be highlighted. Lastly, the implications of these findings for the development of an internet-based perioperative education resource will be discussed.

Objectives of the Consultations

The consultation process took place over the course of several weeks and was guided by the following five objectives:

1. Explore perceptions of the perioperative educational resources for patients undergoing cardiac surgery that are presently available at this practicum site.
2. Identify the content that would be most important to include in an internet-based perioperative education resource for cardiac surgery patients.
3. Examine the benefits and challenges of delivering perioperative education resources for patients undergoing cardiac surgery via the internet.

4. Determine the institution's policies and procedures for developing, implementing and evaluating an internet-based perioperative patient education resource supported by the institution's website.
5. Understand the strengths, challenges and development process used by colleagues at other healthcare institutions that have implemented internet-based education resources for patients undergoing cardiac surgery.

Consultation Methodology

Ethical considerations

As the development of an internet-based education resource is considered to be a quality improvement project, a formal review by an ethics board was not warranted based on the results of the completed Health Research Ethics Authority (2011) screening tool (Appendix C5). Data files were kept in the writer's confidential folder within a password protected computer. Verbal consent was obtained from patients and key informants prior to participating in consultations and participants were notified that their insights will be shared in a manner that is respectful and maintains confidentiality. Patient identifiers were not used on questionnaires.

Setting and Sample

The practicum site, as mentioned, is a major cardiac surgery centre located in Hamilton, Ontario, Canada. This busy cardiac centre performs hundreds of open sternotomy cardiac surgeries on an annual basis and is heavily engaged in research, education and leveraging digital health technologies. The practicum consultations primarily took place on the Cardiac Surgery Unit where patients are cared for not only

preoperatively, but also typically return to the unit within 12 to 18 hours of surgery, after a period of monitoring in an intensive care unit.

Patient Consultations

As the internet-based education resource is intended to be designed for patients experiencing cardiac surgery, it was of the utmost importance to engage patients in the consultation process. Access to patients on the Cardiac Surgery Unit was obtained from the practicum site contact, the clinical manager of the surgical unit. Patients on the Cardiac Surgery Unit were provided with an informative letter regarding the practicum project and the reason for consultation (Appendix C1). This letter was processed through a web-based readability formula to ensure the writing level was appropriate for patient comprehension. The writer approached patients to further explain the project and determine interest in participating in the consultation process. Once verbal consent was obtained, the writer proceeded to complete a semi-structured consultation questionnaire (Appendix C1). A volunteer, convenience sample of eight patients who had recently experienced open sternotomy cardiac surgery constituted the patient sample.

Clinical Nurse Leaders at the Practicum Site

In order to determine the strengths and challenges of the current education delivery process and implementing an internet-based perioperative education resource at the practicum site, key informants who oversee the cardiac surgery program were consulted. This consultation process included interviewing the clinical manager of the Cardiac Surgery Unit, as well as the director of the entire cardiovascular program at the practicum site. These informants not only manage both pre and postoperative patient care

but also coordinate the future directions and quality improvement plans of the cardiac surgery program. These informants were contacted either in person or in writing via email in order to arrange an in-person consultation interview (Appendix C2). Once verbal consent was obtained, the writer proceeded to complete the consultation questionnaire (Appendix C2).

Provincial Clinical Leaders in Cardiac Care

To determine the strengths and challenges of developing and implementing an internet-based education resource at a healthcare institution, it was vital to seek the insights of other cardiac surgery centres that had already executed this type of education platform. The healthcare institutions were selected based on the fact that they represent major cardiac surgery centres in the province of Ontario and the internet-based educational resources provided through these institutions were reviewed in the environmental scan. The informants from other cardiac centres held different roles dependent on the institution, but all were involved with the development or maintenance of the internet-based education resources for patients experiencing cardiac surgery at their sites. These informant roles included clinical managers of cardiac surgery departments, as well as clinical educators and Advanced Practice Nurses functioning within cardiac care programs. Dependent on the informants' preferences, correspondence for these consultations was completed by telephone or email. After initial contact was made with the informant through the use of a letter explaining the project and reason for consultations, an agreed upon time was arranged to complete a telephone consultation (Appendix C3). A volunteer, convenience sample of professionals at two other cardiac

centres (St. Mary's General Hospital, Kitchener, Ontario and University of Ottawa Heart Institute, Ottawa, Ontario) agreed to participate in the completion of consultations.

Web Content Specialist

As a means to understand the policies and processes for developing, implementing and evaluating an internet-based perioperative education resource on the healthcare institution's website a web content specialist at the practicum site was consulted. The website development team was contacted via email using an informative letter regarding the practicum project and the reason for consultation (Appendix C4). After the initial response and consent from a web content specialist, a time was arranged for a telephone conversation in order to complete the consultation questionnaire (Appendix C4).

Data Collection and Analysis

Permission was obtained from the key informants to participate in the interviews and for the writer to record detailed notes during the interviews. The questions asked during the interviews can be found in the consultation tools located in Appendices C1 through C4. The notes taken during the interviews were typed into a word document and constitute the data obtained from the consultations. Conventional content analysis was used to analyze the data collected during the consultations. The word document created from the detailed notes was reviewed for common themes in response to the semi-structured interviews. A coding system was used to identify specific words in the text that informed the identification of the key concepts emerging from the data analysis. Key concepts were then labelled and grouped into common themes. These themes are considered to be key findings from the consultations.

Results of the Consultations

Patients Experiencing Cardiac Surgery

Eight patients who had recently experienced open sternotomy cardiac surgery were consulted on the Cardiac Surgery Unit. The sample was comprised of an equal number of males and females, with an average age of 66 years and a range of 55 to 76 years of age. The consultation interviews typically ranged from 20 to 30 minutes in length and concluded when the consultee and writer felt there were no further points of discussion to be noted. The majority of the patients who were consulted reported that they had access to the internet at home (n=6) and had independently looked for health education online prior to hospitalization. The information they had previously sought via the internet pertained to three major categories, which included: information about their upcoming surgery, symptoms they were experiencing preoperatively (e.g., swelling, shortness of breath) and medications.

The majority (n=6) of patients had already read all of the printed education materials (including preoperative resources) in their entirety or had at least begun to read through some of the materials provided in hospital postoperatively. For the two patients who had not yet begun to review any education materials postoperatively, major reasons were cited as an unawareness that paper-based materials were available, feeling too overwhelmed or tired in hospital to examine the written education or finding the written material too difficult to understand. For those that had at least started to read through the existing paper-based materials, patients reported they found the information was clear and easy to understand. A common theme that arose through the consultations was that patients felt the postoperative booklet was fairly comprehensive and that they gained

answers to many of their questions or concerns. Lastly, multiple patients also commented on the use of pictures as part of the exercise directions, which was reported to be helpful and improved clarity.

There were many commonalities that also arose when patient consultees discussed improvements that were warranted in existing paper-based patient education materials. To begin, the paper-based postoperative materials display a five-day progress chart highlighting the recovery milestones that should occur on each day in hospital. Many patients reported they either felt discouraged with their progress as they had not reached the milestones according to that timeline or confused as patients reported that many of the recovery checkpoints occurred earlier than indicated on the chart. Many patients felt that the days should be removed from this image and updated to show only the expected milestones that should be achieved prior to discharge and these should also be reflective of current institutional practices. Patients that read the paper-based materials reported that there was a paucity of information pertaining to incisional care and how to manage certain symptoms or issues that may arise after discharge. Lastly, almost all of the patient consultees explained that they could not find any education materials from the practicum site that thoroughly explained their surgery, the process they would go through, cardiac anatomy or disease, and wanted more preoperative information on a whole, including explanatory diagrams or videos about the surgical procedure.

These findings validate the notion that in general, patients can consume and appreciate the content in the existing paper-based education materials and find that the content provides good answers to many of their questions. However, the patient

consultations also indicated that symptom management, patient perioperative pathway and preoperative information, specifically information surrounding cardiac disease, anatomy and the surgery itself, is undeniably lacking.

Of the patients who were consulted, there was a resounding, “yes” or “definitely”, from all eight patients when asked if they would access internet-based perioperative education provided through the hospital’s website. This was an interesting finding considering that not all of the patients had access to internet at home. These patients without internet access (n=2) independently reported that if internet-based education existed they would access the information through the internet at their place of employment or through a family member who had access to the internet. Patients reported that internet-based perioperative education would increase their personal sense of preparedness and comfort because they could access the information before starting surgical preparation or consultations and could continue to use the information after their cardiac surgery. There were a variety of responses when asked what information would be of most importance for patients to see in the internet-based perioperative resource, highlighting the extensive learning needs that exist for patients who experience cardiac surgery. However, common themes included: a step-by-step guide to the hospital admission process, preoperative information (e.g., heart anatomy, why surgery is required, surgical procedure explained, what to bring to hospital), common feelings and/or experiences following surgery, postoperative precautions and exercise, medications, and symptom management (i.e., what to do and who to call if certain issues

arise). Many patients also spoke to the need for explanatory diagrams (e.g., of the heart or exercises), as well as the use of videos to show hospital or cardiac surgery procedures.

Clinical Nurse Leaders at the Practicum Site

Separate in-person consultations were conducted with the clinical manager of the Cardiac Surgery Unit as well as with the director of the cardiovascular program at the practicum site. Both consultees had been in their respective positions for several years and have profound awareness of not only the needs of patients who experience cardiac surgery but also the future directions and innovations of the cardiac surgery program itself. Consultations with these individuals were approximately 20 minutes in length and time was flexible to allow the individuals to exhaust all of their thoughts for each question. To begin, consultees were asked to consider the strengths of the current perioperative education resources for patients experiencing cardiac surgery. Interestingly, both the manager as well as the director found few strengths with the paper-based education materials, explaining that the information within these resources is good but improvements are definitely required. The other notable strength was cited as the area in the current *Path to Recovery After Heart Surgery* (Hamilton Health Sciences, n.d.) postoperative manual, where patients can write down their goals and questions. The manager and director identified numerous challenges with the current perioperative education resources, primarily surrounding deficiencies with paper-based materials. These weaknesses included: excess use of paper, expense associated with printing, use of storage space, and waste caused by the fact that paper is easily damaged. Both individuals also explained that the existing materials are definitely outdated and changes are not

easily made to paper-based resources. Finally, those consulted discussed that the existing paper-based resources lack integration and cohesion between various cardiac care departments, which leads to provision of repetitive or incorrect and outdated information to patients and family members experiencing cardiac surgery.

As a result of this discussion, it became quite clear that both the clinical manager and program director were very supportive of the development of an internet-based perioperative education resource for patients experiencing open sternotomy cardiac surgery. Furthermore, both believed that the use of the practicum site's existing website would be the best place to present cardiac surgery-specific education. These individuals rationalized that the use of the internet to provide perioperative education is an ideal way to leverage existing technology and capitalize on the increasing acceptance of technology among the aging population. The program director also highlighted that internet-based education resources not only allow for improvements and updates to be easily made but also provide consistency and standardization in the education that is delivered and the method through which that education is provided. The main challenges that the manager and director foresaw with respect to implementing internet-based perioperative education resources pertained to accessibility. First, this related to ensuring that awareness about the availability of an internet-based education resource is brought to patients and family members through various forms of advertising. Advertisement of the new education platform would have to occur to ensure high-levels of education uptake. Secondly, accessibility pertained to ensuring that the website is easy to use and navigate for people of all technological capabilities. Another key challenge that consultees emphasized was

the importance of finding the appropriate person to consistently review and update the internet-based education resource and the time that might be required for that process.

Finally, the clinical manager and director of the cardiovascular surgery program at the practicum site discussed the content they each felt would be most pertinent to include in an internet-based perioperative education resource. Ultimately, both parties stated that the content should primarily be derived from the consultations conducted with patients experiencing cardiac surgery. In their personal perspectives, however, the consultees also identified that education specific to the surgical procedure, indications for surgery, surgical outcomes, and preoperative information is currently lacking in paper-based education resources at the practicum site and this prevents patients from making fully-informed decisions. Furthermore, the clinical manager and program director discussed that education should be provided to help patients consider postoperative needs and begin participation in discharge planning preoperatively. These insights underscore the belief of the consultees that internet-based education has the ability to assist patients in feeling prepared not only for surgery but also for discharge and could streamline recovery trajectories.

Provincial Clinical Leaders in Cardiac Care

A group telephone consultation occurred with the cardiac surgery clinical manager and Advanced Practice Nurses from the cardiac surgery and cardiology departments at the University of Ottawa Heart Institute. A separate telephone consultation occurred with the cardiac surgery clinical educator from St. Mary's Hospital. Internet-based education resources for patients experiencing cardiac surgery had been implemented for numerous

years in Ottawa, while the team at St. Mary's Hospital had only recently launched their internet-based resources in the past three years. In both cases, the internet-based education for these cardiac centres was developed to serve the needs of patients experiencing cardiac surgery. The consultees from both sites explained that patients were asking for internet-based content, speaking to the rise of computer literacy amongst the aging population. The need to more effectively prepare patients for cardiac surgery was also cited as a reason for developing internet-based perioperative education resources, which also ensured that patients had access to reliable and current information. Additionally, consultees mentioned that presurgical clinics delivered an overwhelming amount of verbal information in a single session. Therefore, the use of the internet to deliver education served not only as an adjunct to verbal information but also as a space that patients could continuously refer to prior to surgery, while in hospital and following discharge from hospital. Finally, consultees from both cardiac centres highlighted that internet-based education resources enhanced the consistency and standardization of education delivery as opposed to education delivered solely through individual, nurse-led teaching practices.

At both cardiac centres, the internet-based education resource was developed through combined clinical team and patient involvement. At St. Mary's Hospital, clinical staff, including nurses were involved in the creation and enforced the implementation of the internet-based patient education resources. The Advanced Practice Nurses and clinical manager at University of Ottawa Heart Institute explained that the design, implementation and evaluation process is constantly ongoing. A multidisciplinary team of content experts at this cardiac centre was formed consisting of: a lead physician from cardiology and

cardiac surgery departments, dietician, occupational therapist, physiotherapist, social worker, psychologist, diabetic clinician, pharmacist, and cardiac rehabilitation clinician. The content experts from each field develop the necessary education pieces for patients experiencing cardiac surgery and review the information annually to ensure current information and best practices are reflected in the website content. Communication and quality specialists from this cardiac centre also review all patient education materials to ensure consistent and standard phrasing is used in each education resource. All content is also electronically reviewed through a readability engine to ensure the reading level of education materials is at or below an eighth-grade level. Lastly, consultees from both sites discussed the importance of having patients and family members involved in the evaluation of web-based education resources in order to enhance clarity and make changes to improve accessibility. The clinical teams at Ottawa Heart Institute completed this by speaking with their patient alumni members, examining patient satisfaction through studies and calling patients at home following discharge to assess if there are any continued gaps in knowledge. User uptake can also be captured and measured from the institution-associated websites so that clinical teams can further understand the amount of time being spent on certain webpages, what users are clicking on and which resources are being most frequently accessed.

A common theme the consultees at both cardiac centres highlighted was that the use of internet-based perioperative education resources for patients experiencing open sternotomy cardiac surgery improved patient preparedness. The videos available on the institutions' websites improve familiarity and reduce anxiety about what can be expected

even before patients arrive to the hospital. Additionally, the consultees pointed out that patients and family caregivers can use internet-based resources preoperatively to prepare mentally for what can be expected postoperatively and can also proactively prepare the home based on the patient's postsurgical needs. The consultees also discussed that the use of the internet to deliver education prevents patients who are seeking cardiac surgery education from being misinformed by poor quality websites. This ultimately improves not only accessibility to accurate and local education but also the patient's ability to make informed decisions. Finally, the consultees at both cardiac surgery centres commonly referenced aspects of adult learning when discussing the strengths of internet-based education. Consultees explained that the implementation of resources on the institutions' websites has allowed patients to access education repetitively and throughout the entirety of the cardiac surgery trajectory, as well as in the comfort of the space in which they desire to learn.

The major challenges of internet-based resources that consultees at both cardiac centres discussed pertained to accessibility. This included patients who could not consume internet-based education due to lack of computer literacy skills or entire lack of access to computer or internet services. Additionally, the majority of internet-based education resources currently provided by these cardiac centres are primarily provided in English or French, which poses an accessibility challenge for patients or caregivers who read or speak a different language. Finally, the consultee from St. Mary's hospital discussed that internet-based education may be less interactive in comparison to in-person teaching sessions, which could leave some questions unanswered for patients. The

consultees further explained that this highlights the importance that internet-based education resources must be used as an adjunct to verbal perioperative teaching and resources should include contact information in the event that questions arise.

The content that consultees from both cardiac centres identified would be most important to include in an internet-based perioperative education resource for patients experiencing open sternotomy cardiac surgery was congruent with the topics outlined by the literature review and patient consultations. These topics included preoperative, postoperative and preventative education. The consultees discussed that preoperative information should explain what patients can expect when they come to hospital and how to prepare before surgery. Postoperative education should include recovery information, hospital routines and estimated length of stay or expected recovery milestones. Finally, the consultees at the Ottawa Heart Institute emphasized the importance of including cardiac disease education, as this information refers to creating and maintaining a healthy lifestyle prior to the need for surgical intervention and after cardiac surgery occurs.

Web Content Specialist at the Practicum Site

The consultation with the web content specialist enabled identification of the procedures, special considerations and data collection capabilities of internet-based education provided through the practicum hospital's website. Currently, education materials on the website are found in the form of uploaded documents that are the same as the paper-based materials provided to patients and must be found through searching the patient education library on the website. The creation of education on the institution's website for a specific care program, such as cardiac surgery, is a relatively new procedure

for the practicum site and has only been trialed by the website designers for a few small clinics or hospital programs. However, the web content specialist who was consulted was able to provide information about the procedures that should be followed if more comprehensive perioperative education was to be included as part of the Cardiac Surgery Unit section of the website.

If an internet-based resource was developed for patients experiencing cardiac surgery and supported by the institution's website, a specific planning guide and template must be followed to ensure cohesiveness among the website pages. The web content specialist also indicated that those who create the patient education to be displayed on the website must present the content to clinical managers or program directors for approval. This educational content would then be overviewed by web content specialists who provide suggestions for revisions and further direction to ensure accessibility standards are achieved. The content would then be trialed on the institution's website to allow for user testing and feedback. This website information must also be evaluated by the clinical teams who developed the education on, at minimum, an annual basis. When developing website content, the specialist explained that there are several considerations that should be assessed. The consultee identified that educational content should be provided on the institution's website itself and not through links to microsites. Additionally, it was mentioned that highly interactive models and features should be avoided as some people could have difficulty accessing and consuming interactive formats. Accessibility was also identified as a major consideration, which should include: simple language, short sections clearly identified by subheadings and abbreviations should be spelled out. Lastly, the web

content specialist highlighted that the educational content should be free from bias or product endorsement and should be reflective of best or current practices in the cardiac surgery program.

The final area of discussion during consultation with the web content specialist was with regards to the information that could be tracked and collected after implementing the educational resources on the institution's website. The specialist explained that both high-level and very detailed information can be assessed. This includes the amount of time users are spending on each webpage, the types of information that they are accessing (i.e., webpages or uploaded documents) and what users are clicking on when they access various webpages (e.g., emails, phone numbers, external links). With the knowledge gained in consultation with the web content specialist, the importance of continuous evaluation of the efficacy, clarity and ease-of-use of internet-based perioperative education resources became quite evident.

Summary of Consultation Findings

The consultation process revealed valuable insights with respect to the content and development process of an internet-based perioperative education resource for patients experiencing open sternotomy cardiac surgery. Furthermore, the strengths and weaknesses of existing paper-based resources at the practicum site as well as the benefits and challenges of internet-based education were brought to light. Those who were consulted, including patients experiencing cardiac surgery along with the clinical management leaders of the cardiac surgery program identified their strong support for the development and use of an internet-based education resource for the practicum site. Both

parties also agreed that crucial education is currently lacking in existing paper-based resources, including preoperative preparation, cardiac anatomy and disease as well as surgical process education, and thus must be integrated into the internet-based resource, along with postoperative symptom and medication management education.

The consultations conducted with members of clinical leadership positions at two other prominent cardiac centres echoed the importance of including preoperative, postoperative and preventative patient education in internet-based perioperative education resources. The consultations with these clinical managers, clinical educators and Advanced Practice Nurses provided detailed insights into the development, outcome and evaluation processes of internet-based education resources that have already been implemented at other centres. Design and assessment of the education resource must be a continuous process that includes the efforts and knowledge of an entire interdisciplinary team, where patient engagement is vital. The internet-based resources provided by these cardiac centres have been well received by patients and families, with consultees citing improvements in preparedness and reductions in anxiety. The consultees from other cardiac surgery centres also identified the continuous work that must be done to enhance accessibility of internet-based resources. Finally, the web content specialist from the practicum site added to the consultation process by identifying the specific strategies and procedures that must occur during the development process in order to maximize accessibility of the internet-based education and adherence to institution-wide standards. Going forward, the findings derived from this consultation process will be used to further inform the content and development of an internet-based perioperative education resource for adult patients experiencing open sternotomy cardiac surgery at the practicum site.

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Appendix C1

Consultation of Patients Experiencing Cardiac Surgery

Information Letter for Patients

Dear Sir or Madame,

My name is Lindsay, I am a Registered Nurse working in the cardiac surgery department. I am studying for my Master of Nursing degree and I am interested in what patients need to know when they are having heart surgery and managing their recovery.

I know that heart surgery can be a challenge and you may have many questions before and after your surgery. I am interested in developing new ways for you to learn about your surgery so we can help you make a full recovery.

I would like to talk with you about the education you may have already received about your surgery. I would also like to talk with you about using the internet to help you learn about your surgery.

Your name will not be shared with anyone and your answers to these questions will only be used to make patient education better on our unit. This should only take about 10 minutes of your time. I can answer any questions you might have at any time. This will not affect your care in any way and you can stop at any point, for any reason.

Thank you for your time and I wish you the best of luck in your recovery!

Best Regards,

Lindsay Femiak

Registered Nurse, BScH, BScN

Consultation Tool for Patients Experiencing Cardiac Surgery Date : Age of consultee:	
Guiding Questions	**Discussion Points**
Have you read any of the written pamphlets or booklets about your heart surgery given to you by the hospital or the preop clinic? If not, would you like to review the materials now?	
If no, is there a reason why you have not looked through them at this time?	
If yes, what did you like about them?	
Could the pamphlets or booklets be improved? If so, how?	
Do you use the internet? If yes, how do you access the internet (e.g., home computer, tablet, mobile phone)	
Have you ever looked for health information on the internet?	
If there was a website with all of the information you needed to know before and after your heart surgery do you think you would you use it?	
If yes, what kinds of information would be most important for you to have on the website?	
Any further thoughts that you would like to discuss today?	

Appendix C2

Consultation of Clinical Nurse Leaders at the Practicum Site

Dear [Insert name of Clinical Manager here],

My name is Lindsay Femiak, I am a Registered Nurse in the cardiac surgery program. I have a profound interest in improving patient education and the recovery experience. I am currently studying towards my Master of Nursing degree and working on a project surrounding the learning needs of patients experiencing cardiac surgery.

Specifically, I would like to further understand your thoughts pertaining to the strengths and challenges of the ways in which education is currently delivered to patients at this institution. I would also like to seek your insights on the development of an internet-based perioperative education resource for patients experiencing cardiac surgery that could be presented on this institution's website.

If you are willing, I would like to arrange a time to be able to speak with you, either in-person or by phone. Our discussion should take no longer than 30 minutes and will be used for the sole purpose of informing the development of an internet-based perioperative education resource.

At your earliest convenience, I would be very appreciative if you could provide me with a date and time that would work for you to have this discussion. If you have any questions about the purpose or goals of this practicum project, please do not hesitate to contact me.

Sincerest thanks for your consideration,

Lindsay Femiak

Registered Nurse, BScN, BScH

Consultation Tool for Clinical Nurse Leaders at the Practicum Site Name of Consultee: Position: Date:	
Question	**Discussion Points**
What are the strengths of the current education resources for patients undergoing cardiac surgery?	
What are the challenges with the current education resources?	
What do you think about an internet-based perioperative education resource for cardiac surgery patients?	
What would be the challenges of an internet-based education resource?	
What are your thoughts on using the institution's website to deliver an internet-based perioperative education resource for cardiac surgery patients?	
What content would be most important to include in an internet-based perioperative education resource for cardiac surgery patients?	

Appendix C3

Consultation of Provincial Clinical Leaders in Cardiac Care

Dear [Insert name of Patient Educator here],

My name is Lindsay Femiak, I am a Registered Nurse in the cardiac surgery program at Hamilton Health Sciences. I have a profound interest in improving patient education and the recovery experience. I am currently studying towards my Master of Nursing degree and working on a project surrounding the learning needs of patients experiencing cardiac surgery.

Specifically, my goal is to develop an internet-based perioperative education resource for patients experiencing cardiac surgery that could be provided through the institution's website. Recently, I have been searching the internet for healthcare institutions that offer patient education pertaining to cardiac surgery on their website. In my search, I found that [insert name of institution] provides excellent internet-based education and resources for patients who will or have already experienced a cardiac surgery procedure.

As I hope to develop a similar internet-based tool for patient education, I would like to ask for your insights to further understand the development and implementation process that your institution undertook to create and promote this resource. If you are willing, I would ask to arrange a time at your earliest convenience to speak with you by phone. Our discussion should take no longer than 30 minutes and will be used for the sole purpose of informing the development of an internet-based perioperative education resource. If you have any questions, please do not hesitate to contact me.

Sincerest thanks for your consideration,

Lindsay Femiak

Registered Nurse, BScN, BScH

Consultation Tool for Provincial Clinical Leaders in Cardiac Care Consultee Name and Position: Institution Name: Date: Year internet-based education resource was created?	
Question	**Discussion Points**
Why did you develop an internet-based education resource?	
What process did you use to design, implement and evaluate this resource at your hospital?	
Have you evaluated this internet-based education resource? If so, how? e.g. patient uptake, satisfaction	
What have been the strengths of the internet-based education resource at your hospital?	
What have been the challenges of the internet-based education resource at your hospital?	
What content would be most important to include in an internet-based perioperative education resource for cardiac surgery patients?	

Appendix C4

Consultation of Website Content Specialist for the Practicum Site

Dear [Insert name of Institution's Website Content Specialist here],

My name is Lindsay Femiak, I am a Registered Nurse in the cardiac surgery program at Hamilton Health Sciences. I have a profound interest in improving patient education and the recovery experience. I am currently studying towards my Master of Nursing degree and working on a project surrounding the learning needs of patients experiencing cardiac surgery. Specifically, my goal is to develop an internet-based perioperative education resource for patients experiencing cardiac surgery that could be provided through this institution's website.

As I hope to utilize the institution's website as the platform to present this education to patients experiencing cardiac surgery, I would like to ask for your insights to further understand the policies and procedures that may surround the development and implementation of this resource on the website. If you are willing, I would ask to arrange a time at your earliest convenience to speak with you in-person or by phone. Our discussion should take no longer than 20 minutes and will be used for the sole purpose of informing the development of an internet-based perioperative education resource. If you have any questions, please do not hesitate to contact me.

Sincerest thanks for your consideration,

Lindsay Femiak

Registered Nurse, BScN, BScH

Consultation Tool for Website Content Specialist at the Practicum Site Name of Consultee: Date:	
Question	**Discussion Points**
What are the policies or procedures for developing and implementing a patient education resource that would be available on the institution's website?	
Are there any special considerations when developing a patient education resource for the institution's website?	
Can website usage information be tracked via the institution's website? If so, what information could be collected?	

Appendix C5

Health Research Ethics Authority Screening Tool

	Question	Yes	No
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review	❒	✓
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?	❒	✓
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. **IF NO** to both questions, continue to complete the checklist.		
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	❒	✓
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?	❒	✓
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?	❒	✓
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?	❒	✓
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?	❒	✓
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		**0**	**7**
8.	Are many of the participants in the project also likely to be among those who might potentially benefit from the result of the project as it proceeds?	✓	❒
9.	Is the project intended to define a best practice within your organization or practice?	✓	
10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	✓	❒
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	✓	❒
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?		✓
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		**4**	**1**
	SUMMARY • the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).		

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at: http://www.hrea.ca/Ethics-Review-Required.asp

Appendix D: The Internet-Based Perioperative Education Resource for Adult Patients Experiencing Open Sternotomy Cardiac Surgery

Development of An Internet-Based Perioperative Education Resource for Adult Patients Experiencing Open Sternotomy Cardiac Surgery: The Resource and Module

Lindsay Femiak

Memorial University of Newfoundland

Cardiac Surgical Unit (5 South)

The Cardiac Surgical Unit (5 South) cares for patients who had or are going to have:

- open heart surgery (also called coronary artery bypass surgery)
- heart valve replacement or repair surgery

Immediately after your heart surgery, you will go to the Cardiac Intensive Care Unit (ICU-West). The next day, or whenever you are ready, you will come to the Cardiac Surgical Unit (5 South). You will stay on 5 South for the remainder of your hospital stay.

Understanding Your Heart & Heart Surgery

Getting Ready For Heart Surgery

After Heart Surgery: Recovery in Hospital

After Heart Surgery: Recovery at Home

Connecting With Other Patients

Cardiac & Vascular Care

AORTIC VALVE CLINIC
CARDIAC ARRHYTHMIA UNIT
CARDIAC AMBULATORY CENTRE
CARDIAC HEALTH & REHABILITATION CENTRE
CARDIAC AND VASCULAR INTENSIVE CARE UNIT (ICU WEST)
CARDIAC SURGICAL UNIT (5 SOUTH)
CARDIOLOGY & VASCULAR SURGERY UNIT (4 WEST)
CORONARY CARE UNIT
HEART INVESTIGATION UNIT
LIPID CLINIC
THROMBOSIS CLINIC (MCMASTER & HAMILTON GENERAL)

Contact Us

Hamilton General Hospital
237 Barton St E
Hamilton, ON L8L 2X2

Level 5, South Wing

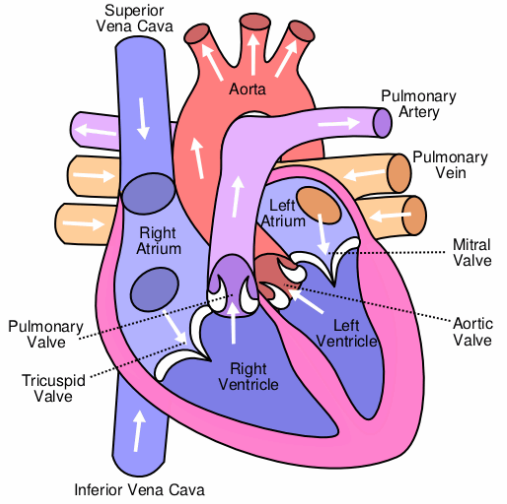
Call: 905-521-2100 ext. 46500

Helpful Links & Resources

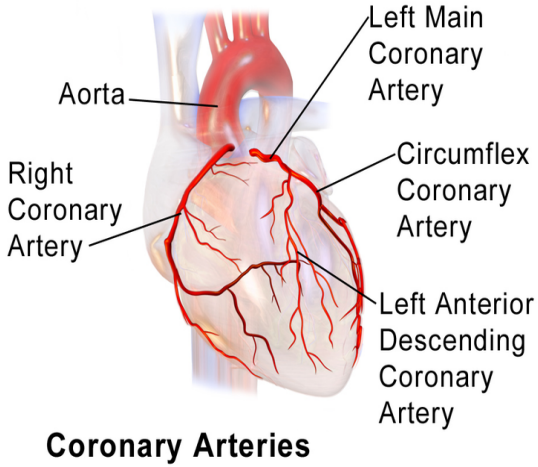
Contact Information & Acknowledgements

Understanding Your Heart & Heart Surgery

The heart is a muscle that pumps blood throughout your body. There are 4 chambers in the heart. The two upper chambers are called atria and the two lower chambers are called ventricles. Valves separate each of the chambers and direct the proper flow of blood through the heart. Blood provides oxygen and nutrients to your cells. Blood travels through the coronary arteries to supply oxygen and nutrients to your heart.



(Wapcaplet, 2005)



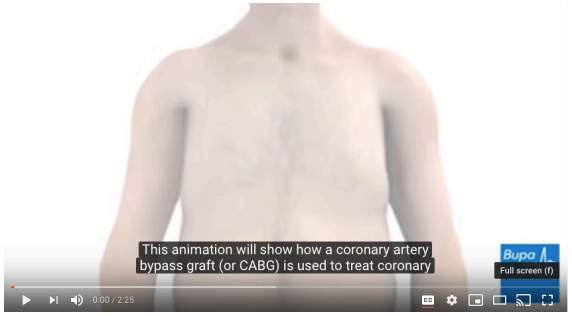
(Blausen, 2013)

Coronary artery disease is when the coronary arteries become blocked from a buildup of cholesterol fat, commonly known as plaque. The buildup of plaque can make your arteries become hard and stiff. Plaque and hard coronary arteries cause less blood to be delivered to your heart. This may cause you to feel chest pain or tightness, chest discomfort, shortness of breath and jaw or shoulder pain.

Heart valve disease is when a valve in your heart does not work properly. The heart valve may not open or close properly. If this happens, blood has a hard time flowing into and out of your heart. When the blood is not able to move through the heart smoothly, it may cause shortness of breath or fluid build-up in the lungs.

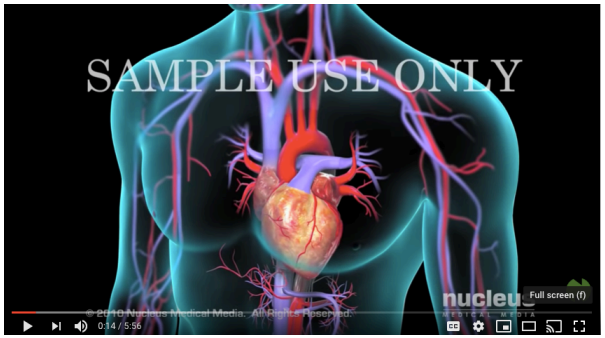
Different heart surgeries can be done to help you feel better and improve the symptoms caused by coronary artery and/or heart valve disease. These surgeries include coronary artery bypass graft surgery and heart valve surgery. Some people may require both bypass graft surgery as well as valve surgery.

Coronary artery bypass graft surgery (CABG) is an operation in which a healthy artery or vein is taken from your chest, arm or leg. The artery or vein taken from your chest, arm or leg (also known as a graft) is used to make a new pathway around the blocked or narrowed artery in your heart and this new pathway improves blood flow to your heart. Your surgeon will discuss with you the number of blockages you have in your heart and the number of arteries or veins that will be used as grafts in the surgery.
You can watch an animation of the CABG surgery by clicking on this link: https://www.youtube.com/watch?v=vw6OKJu07NE



(Bupa Healthcare UK, 2013)

Heart valve surgery is when one or more heart valves are repaired or replaced. Repair means that the valve is fixed to help it work better. If a valve cannot be repaired, it may be replaced with either a tissue or mechanical valve. Your surgeon will talk to you about his/her plans for repairing or replacing your valve. You will be given a heart valve card after surgery with details about the type of heart valve the surgeon used for your heart.
You can watch an animation of valve surgery by clicking on this link: https://www.youtube.com/watch?v=5jLfPlQBYuw



(Nucleus Medical Media, 2011)

Getting Ready for Heart Surgery

Urgent or Emergency Surgery

If you need heart surgery immediately or urgently, you will be admitted to hospital before your surgery. Sometimes, you will be transferred from another hospital to Hamilton General Hospital a few days before your surgery so that you can be monitored closely. Nurses will insert an intravenous (IV) line in your arm so that medications can be given. When you are in hospital you may have the following tests done:

- Electrocardiogram (ECG): shows your heart rhythm before surgery.

- Echocardiogram (ECHO): checks to see how well your heart and heart valves are pumping and checks the flow of blood through the heart.
- Chest X-ray: shows the size, shape and condition of your heart and lungs before surgery.
- Bloodwork: provides information on your blood type, your blood cells, electrolytes, and how well your kidneys are functioning.

Scheduled Surgery

Your heart surgery may be scheduled ahead of time. If this occurs, most people do not have to come to hospital until the day of their surgery. You will be seen in a clinic before your surgery ("Preop clinic"). Your heart surgeon's secretary will contact you with information about attending the preop clinic and to plan your surgery date.

(Hamilton Health Sciences, 2019)

Preop Clinic Location: West End Clinic, 690 Main St. W, Hamilton
Phone Number: 905-521-2100 Ext. 75564 or Ext. 74667

What should you bring to your preop clinic appointment?

- Your current medications (in their original containers). This includes: prescription, non-prescription, insulin, inhalers, vitamins and herbal supplements
- Your health card and group insurance information
- A snack (the appointment may take 2-4 hours)

Important: You do not need to fast for this appointment.
Eat and drink as you normally do.

At the preop clinic, you will be seen by an anaesthesiologist (a doctor who monitors you during surgery and provides medication to make sure you are asleep during surgery). At your preop clinic appointment, the anaesthesiologist will ask you questions about your past medical history and go through your medications with you. He or she will give you important information about the medications to take leading up to your heart surgery and which ones must be stopped ahead of time. Nurses at the preop clinic will also provide you with instructions on how to shave and scrub your body properly before surgery and what to do the day and night leading up to your surgery.

At your appointment you will also have the following tests done:

- Electrocardiogram (ECG): shows your heart rhythm before surgery.
- Bloodwork: provides us with information on your blood type, your blood cells, electrolytes, and how well your kidneys are functioning.

How To Prepare Yourself And Your Home Before Surgery

Before your surgery, it is important to think about the things you may need to have ready when you come home from the hospital. If possible, it is important to notify a family member or a friend that you are having heart surgery. You will need to

have someone give you a ride home on the day that you are discharged and it is good to have family or friends around to check in on you from time to time while you recover at home.

Other things to consider:

- Is your bedroom on the ground level of your home or upstairs? Although you should be able to climb stairs after your heart surgery, it may be good to organize furniture on your main floor so that you have a place to rest when you come home
- Consider asking a friend or family member to watch any pets while you are in the hospital and for a few days after you come home
- Making meals ahead of time that can be frozen and easily reheated when you come home

What To Bring To Hospital

- List of all medications that you are taking at home
- Glasses and/or hearing aids
- Shoes or slippers that fit and are supportive (you may require larger shoes after surgery due to swelling in your feet)
- CPAP machine if required
- Bra if required (without an underwire)
- Toiletries (hairbrush, toothbrush, toothpaste)
- Pajamas or loose-fitting pants
- Music and headphones and/or books
- Loose clothing to wear when discharged home

If you are in hospital the day before your surgery, your personal items can be taken by your family members or friends on the morning of surgery, or they can be secured in a locker room on the Cardiac Surgery Unit (5 South). If the items are secured in the locker room, they will be returned to you when you come back to 5 South after your surgery.

Night Before Surgery

If you are in the hospital the night before surgery: the nurses will instruct you to and/or assist you with shaving the hair on your chest, arms, groin, and legs as well as scrubbing your body with a special cleaning solution. You will do this again in the morning.

If you are at home the night before your surgery: follow the instructions given to you at the preop clinic about shaving and scrubbing your body.

> *Important:* DO NOT eat or drink anything starting at midnight the night before your surgery. DO NOT eat or drink anything the day of your surgery. This includes chewing gum or sucking on hard candies.

Do not eat or drink anything after midnight. If you have been instructed to take medication the morning of your surgery by the anaesthesiologist at the preop clinic or by the nurses/doctors at the hospital, you may do so with small sips of water.

Arriving At The Hospital

When you arrive at Hamilton General Hospital on the day of your surgery, please stop by admitting (head to your right when you come in the main entrance) to let us know that you are here. You will then go to the Same-Day Surgery Unit

where you will be met by a team who will do the final preparations for your surgery. Nurses will insert an intravenous (IV) line in your arm so that medications can be given.

You can view, download and print a map of the hospital grounds by clicking here.
You can learn more about Hamilton General Hospital, such as how to get here or where to eat and stay by clicking here.

Your Healthcare Team

Before your surgery you will meet some of the members of your heart surgery team, which includes:

- Your surgeon (Surgeons at Hamilton General Hospital: Dr. Chu, Dr. Dyub, Dr. Lamy, Dr. Semelhago, Dr. Whitlock, Dr. Zhang)
- Surgical residents (doctors who are training to be surgeons)
- Anaesthesiologist (a doctor who monitors you during surgery and provides medication to make you sleep during surgery)
- Perioperative specialists (cardiologists, internists and other doctors who assist in your care before and after surgery)
- Physician assistants
- Nurses

After surgery you ***may*** also meet the following healthcare team members:

- Physiotherapists
- Occupational therapists
- Registered dietician
- Speech language pathologists
- Social workers

Day Of Surgery

If you are in hospital the day before your surgery : you will perform a second body scrub, your blood sugar will be checked by pricking your finger and you will receive IV fluids on the morning of your surgery. A porter (person who transports patients throughout the hospital), will assist you on to a stretcher and take you down to the 3rd floor where the operating rooms are located. Your family may come with you to the 3rd floor.

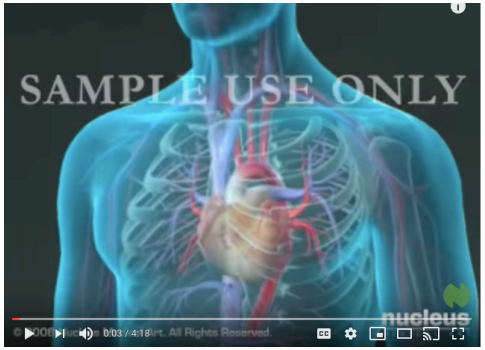
When you arrive to the 3rd floor, you and your family will be taken into a holding room. Here, you will meet nurses and an anaesthesiologist. Your surgeon and/or surgical residents will see you and review the heart surgery with you. The nurses will show your family or friends to the waiting room and provide further instructions about how/when your family will receive updates about how the surgery is going.

When your surgical team is ready, you will be taken into the operating room. The anaesthesiologist will begin giving you medications through your IV to put you to sleep and prevent pain. A breathing tube will be inserted into your mouth to

help you breathe during surgery and a catheter will be inserted into your bladder to drain urine (pee) during surgery and afterwards.

Your surgery may take anywhere from 3 to 6 hours. During your surgery, you may be placed on a machine that acts as your heart and lungs to keep blood and oxygen flowing through your body while you are asleep. Temporary drainage tubes will be placed in your chest to drain any blood or fluids that collect after surgery. Temporary wires may also be placed on your heart muscle that can be used to speed up your heart rate if it slows down too much after surgery. Your sternum (chest bone) will be closed with strong wire that will stay in forever. The incisions on your skin will be closed with sutures that dissolve over time and a special glue to keep the incision closed. Stitches or staples that will be removed days after your surgery may also be used.

To learn a bit more about what happens during Coronary Artery Bypass Graft Surgery, watch the video below.
https://www.youtube.com/watch?v=3Nf6Q2skGOM&t=179s



(Nucleus Medical Media, 2009)

When your surgery is complete, you will still be asleep. You will be taken to the Intensive Care Unit (ICU West). Here, the team of specially trained doctors and nurses will help you to slowly wake up after surgery and remove your breathing tube when you are breathing well on your own.

After Heart Surgery: Recovery in Hospital

Cardiovascular Intensive Care Unit (ICU- West)

Family members may use the phone outside the doors to the ICU to call in to the nurses and team in the ICU-West. They will let family or friends know if their loved one is able to have visitors at that time, or if they should check back at a later time. After surgery, you may not remember family or friends visiting you in the ICU-West, as you may be sleepy for a while.

The day after your surgery, or whenever you are ready, you will be transferred to the Cardiac Surgery Unit (5 South).

For more information about the ICU-West, click here.

Cardiac Surgery Unit (5 South)

5 South is a unit dedicated to patients who experience heart surgery. You will stay here until you are discharged home or transferred to a hospital closer to your home.

When you arrive to 5 South you will be attached to a heart monitor that you can carry around with you. There is a nurse at the nursing station who is always watching your heart rhythm and will notify the team if there are any changes.

Nursing shift hours are 7am to 7pm and 7pm to 7am. You will notice that the nursing station becomes very busy around shift changes.

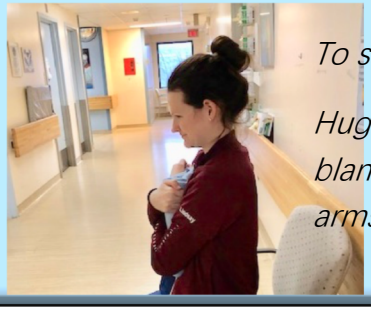
Visiting hours are open to any time of day or night. We ask that you kindly limit visitors at the bedside if staying overnight. There is also a sunroom at the end of the hall where patients and families can sit and talk or watch television.

How will I feel after surgery?

Following heart surgery, it is normal to see, hear or feel:

- Very tired and weak
- A sore or dry throat. This is from the breathing tube you had during surgery. Try sucking on ice chips to relieve discomfort.
- Your heart beating in your chest, more often when you lay in bed.
    - You should NOT feel your heart beating very fast or pounding (palpitations). Tell your nurse if you feel dizzy or short of breath. The heart monitor you wear will alert staff if your heart rhythm is irregular. If you are having an irregular heart rhythm, you will receive medication to treat this.
- Pain in your incisions. You may also feel, burning, itching, numbness, or tingling in your incisions.
- Swelling in your hands, legs, ankles and feet.
- 'Clicking' coming from your chest bone. This is your chest bone (sternum) shifting as it heals. This should happen less and less with time. If it does not, or it increases speak with your surgeon.

Important: This is why you must support your chest when you cough or sneeze after heart surgery. It is also important to get in and out of bed and chairs the way you are taught in hospital and avoid movements or activities that could stop your chest from healing properly.



To support your chest:

Hug a pillow, rolled up blanket or simply cross your arms across your chest.

- If you had an artery taken from your left chest to use for your bypass surgery (Left Internal Mammary Artery), you may feel numbness or pain in your left chest, over your heart. This pain should get better with the use of pain medication.
- It is normal to have a lump at the top of your chest incision. This is from swelling when your chest bone is brought back together. This will go down over time.
- Constipated for the first 2 to 3 days after surgery. You should have your first bowel movement within 4 days. Do not try to strain or force the bowel movements to occur.
- Shortness of breath with activity. This should get better with slowing down or sitting down. Tell your nurse if you are short of breath when resting or laying in bed. Practice the deep breathing and coughing exercises that the physiotherapist or nurse will teach you.
- Trouble sleeping. The ward is busy and noisy. Try taking naps when you can. You may also bring ear plugs.
- Forgetful and unable to think clearly. Heart surgery can be a stressful time. This will likely pass.
  It can take 4 to 6 weeks until you begin to feel like yourself again.

Delirium

Delirium is a sudden state of confusion. It *may* occur after an operation and is more common in the elderly. This confusion often clears in a few days or sometimes weeks. You may continue to have problems with memory or thinking after you leave the hospital. If you develop delirium your healthcare team may place you in a high observation hospital room so you are closer to staff and to ensure your safety.

Signs of Delirium	• Unable to remember where you are • Unable to pay attention • Feeling or acting restless or upset/agitated • Seeing or hearing things that are not there

	• Confusion can come and go throughout the day/night
Causes of Delirium	• Sometimes medications, infection or being in the hospital • Memory or thinking problems before surgery • Illness • Dehydration • Problems with seeing or hearing
How to Prevent or Treat Delirium	• Your healthcare team will try to figure out what is causing the delirium, changes to some medications can help sometimes Family can help by: • Promoting rest and sleep at proper times of day, sometimes people can get their days and nights confused while in hospital. Limit distractions and overstimulation. • Encourage hydration and healthy eating: family is welcome to bring food from home if desired and can assist with eating at meal times • Encourage activity and discourage immobility. Encourage family member to sit up and walk during the day as tolerated. • Encourage use of hearing aids and glasses if needed • Remind family member of the date, time and why they are in the hospital. Arrange for family to visit or bring in pictures, talk about current events, and play games that require thinking or concentration.

Pathway to recovery after heart surgery

Goals to meet before you go home

Pain Management	• Do not let the pain build up or get ahead of you • Ask for pain medication when you need it • Let your nurse know if the pain is severe or if you need stronger pain medication • After a few days you will need less pain medications to feel comfortable
Activity	• Do deep breathing and coughing exercises, support your chest (see here) • Do exercises (Refer to exercises in the *Recovery At Home* section) • Get in and out of bed with the bed in a flat position • Work up to sitting in a chair for each meal • Walk with a nurse or physiotherapist until you are told you can walk with family or on your own • Get up to the bathroom independently, if cleared by nurse or physiotherapist • Walk with friends or family in the hallway, if cleared by nurse or physiotherapist • Walk 3 times a day in the hallway • Practice stairs with a physiotherapist if needed for home • Prior to home, you will be independent in walking with no assistance
Nutrition	• You will be started on a No Added Salt diet • Family can bring meals in from home if you prefer
Bowel and Bladder	• When you arrive on 5 South from ICU, you will still have a urine catheter • The catheter will be removed and your urine will be measured • You will start to pass gas • You will receive stool softeners or laxatives a few days after surgery if no bowel movement
Bathing	• You will have help with bathing at the bedside and become independent with bathing a few days after surgery

	• Family can assist with bathing
Sleep in Hospital	• Difficulty sleeping in hospital is common after surgery • Let the nurse know if you are having trouble sleeping, are experiencing strange or vivid dreams or hallucinations • Balance napping and exercise during the day to promote sleep at night
Care Activities	• You will have the pacing wires removed, an electrocardiogram (ECG) and chest x-ray prior to going home • Let the nurse know of any concerns about going home, including barriers you think may affect your ability to recover at home. • Ask the nurse for the estimated time of your discharge • Arrange to have someone pick you up on your discharge day • Have a friend/family member bring a wheelchair from the main entrance of the hospital on your day of discharge and bring it to your hospital room

You can download or print copy of this chart by clicking here.

Leaving hospital

Everyone's recovery in hospital is a little different, some people may require a little more time in hospital before they can return home. Some people, depending on the type of heart surgery, may be able to go home as early as two days after surgery.

On the day you are set to be discharged from hospital:

- Have a family member or friend bring a wheelchair from the main floor to your hospital room
- The nurse will go over your discharge prescription medications and follow up appointments
    - Please see a copy of your discharge prescription for a reminder of your follow up appointments
- If you are on warfarin to prevent blood clots, the nurses or doctors on the blood clot team will see you before you go home to give you information about how to take this medication at home and the bloodwork you will need.
- If the doctors, physiotherapists, or occupational therapists have said that you will require home care when you return home, you may see a home care coordinator in hospital before you are discharged
- Make sure you or a family member pick up your prescription medications on the way home. If you prefer, you may pick up your medication at the pharmacy in the hospital on the main floor. Please speak with your nurse so this can be arranged ahead of time.

Please note: Discharges can occur any day of the week and at any time of day.

Patients who had a HEART VALVE surgery: Make sure you receive your temporary valve card before you leave hospital. This card has information about your heart valve. A permanent card will be mailed to your home.

Follow-Up Appointments	
Family Doctor	• Please see within 1-2 weeks after discharge • Patient/family member must arrange this appointment
Cardiologist	• Please see within 3-4 weeks after discharge • Patient/family member must arrange this appointment

	• If you do not have a cardiologist, please ask your family doctor to refer you to one
Cardiac Surgeon	• Your surgeon's secretary will call you with an appointment date/time • This appointment is usually 6-8 weeks after surgery
Cardiac Rehabilitation	• The rehabilitation centre that you were referred to will call or send a letter to your home with instructions about attending a cardiac health program • You usually start these programs 6-8 weeks after surgery
Other Appointments: Please see the last page of your discharge prescription to find out if your healthcare team has arranged for you to see other specialists after you are discharged.	

Important: If you had a **HEART VALVE** surgery, always call your surgeon before having dental, bowel or bladder procedures, and/or if you have any signs of infection.

After Heart Surgery: Recovery at Home

Medications

When you are discharged home, it is important to fill your prescription on the day that you are discharged to ensure that you do not miss any doses of your medications. Below is a chart that explains some of the medications you may have to take after your heart surgery, the numbers follow the same order on your discharge prescription.

1. Antiplatelet/Anticoagulants • Prevents blood clots by preventing platelets from sticking together • Reduces risk of another heart attack • You may require more than one type of this medication • If you are on Warfarin, follow the directions given to you by the blood clot team in hospital *Examples: Aspirin (ASA), Plavix (Clopidogrel), Warfarin*	7. ACE Inhibitor / Angiotensin II Receptor Blocker • Treatment for heart failure • Lowers blood pressure • Improves blood flow to the heart • Delays and prevents kidney damage from diabetes *Examples: Ramipril, Quinapril, Perindopril /* *Valsartan, Candesartan, Losartan*
2. Analgesics (Pain Medication) • It is important to take pain medication to help with your healing • Take pain medication before pain becomes too severe *Examples: Hydromorphone (Dilaudid), Acetaminophen (Tylenol)*	8. Diuretic and Potassium Supplements • Removes excess fluid from the body which reduces swelling and lowers blood pressure • Diuretics may cause potassium levels to drop. You may be given potassium supplements to maintain normal potassium levels • These medications are usually only prescribed for 1-2 weeks. It is important to speak with your family doctor when you go for your follow up visit to see if you will need more of these medications *Examples: Furosemide (Lasix) and Micro K*

3. Acid Reduction Agents • Decreases acidity of stomach acid • Take for 1 month to reduce risk of stress ulcers after surgery *Examples: Pantoprazole, Rabeprazole*	9. Supplements (Iron) • Helps your body make blood • Take with food to avoid upset stomach; can cause constipation/diarrhea; can make stool black • Take with Vitamin C to increase iron absorption *Examples: Ferrous Gluconate, Ferrous Fumarate, Ferrous Sulphate*
4. Beta Blockers • Slows down heart rate and can lower blood pressure • Helps treat and prevent angina (chest pain/tightness) and prevent heart attacks • Treatment for heart failure *Examples: Metoprolol, Bisoprolol, Atenolol*	10. Lipid Lowering Agents • Lowers total cholesterol and LDL cholesterol (bad cholesterol) • Lowers triglycerides • Increases HDL cholesterol (good cholesterol) *Examples: Atorvastatin, Rosuvastatin, Pravastatin*
5. Calcium Channel Blockers • Lowers heart rate and blood pressure • Helps prevent and treat angina • Keeps heart beat in a regular rhythm	11. Diabetic medications • Your diabetes medications may be slightly adjusted at discharge based on you blood sugars in hospital • You should continue follow-up with your family doctor to ensure your blood sugars are well controlled

Examples: Amlodipine, Diltiazem	*Examples: Metformin, Sitagliptin, Empagliflozin, Lantus, Humalog*
6. Antiarrhythmic agents • Helps keep your heart beat in a regular rhythm *Example: Amiodarone*	12. Other Medications • This section may include previous medications and/or new medications started in hospital • Some home medications may be stopped - your family doctor may restart them if needed

Managing your medications

Many of your medications may change after surgery. It is important to know what medications you are taking, why you are taking them and when you are supposed to take them. Speak with your healthcare team in hospital, your pharmacist or your family doctor if you have any questions.

Important: Unless specifically directed by your healthcare team in hospital or your pharmacist, you should put all of your old medications aside when you return home so that you do not confuse them with the medications you have been prescribed after heart surgery.

Here are some tips to help you manage your medications after heart surgery:

- Do not stop taking a medication without speaking to a healthcare professional (such as family doctor or nurse practitioner). Even if you start to feel better, you may need to continue taking the medication to stay well.
- Follow the directions on your medication bottles for how often and the time of day to take medications.
- Use a pill organizer or blister pack (made at your pharmacy) to help keep track of your pills.
- When a pill bottle says '0 repeats', this does not always mean that you stop taking the medication when the bottle is empty. You must visit or speak with your family doctor to see if this medication needs to be reordered.
- Keep an up to date list of medications with you at all times.
- If you feel strange side effects after taking medications, such as dizziness or nausea, speak with your pharmacist or healthcare professional about the next steps you should take.
- Get rid of any medications that you no longer use. Return them to your pharmacy for safe disposal.

Important: Monitor your blood pressure and heart rate at home. Write down the numbers at least once or twice a day. Bring these numbers with you to appointments with your family doctor, cardiologist or heart surgeon so they can see whether the medications are working properly or if something should be changed.

You can download and print a copy of a blood pressure and heart rate tracking sheet by clicking here.

Pain control

It is normal to have pain after surgery. It can take weeks for the pain to go away but should get better over time. Too much pain will slow down your recovery and make it difficult to sleep and be active.

Tips for managing your pain:

- Take pain medication when you are in pain and before the pain becomes too severe
- Follow directions on the label of pain medication bottles for how much and how often you can take the medication
    - You can usually take pain medication every 4 to 6 hours
- Pain medications can take 1 hour to start working
- If pain medication makes you feel dizzy or dopey, take less the next time you need it.
    - If you feel dizzy, sit or lie down until you are no longer dizzy. Then get up slowly.
- Do not drink alcohol, drive or operate heavy machinery while taking pain medication
- Narcotic pain medication can sometimes cause constipation. See tips in the next section to manage constipation
- Call your family doctor if you have increased pain that does not get better after taking pain medication

Constipation

Constipation is when stools become hard to pass. It is important that you do not strain or push too hard when you try to have a bowel movement as this can cause dizziness or fainting.

Signs of constipation:

- Your stomach feels bloated, firm or full
- You are not hungry and are nauseous
- You feel the urge to have a bowel movement, but nothing happens or the stool is very hard

Tips for managing constipation:

- Drink lots of water (1 ½ to 2 litres or 6 to 8 cups per day)
- Eat high fibre foods such as prunes, whole grains, fruits, and vegetables
    - Try drinking warm prune juice

- Being active and walking can help maintain regular bowel habits
- Keep a diary of your bowel movements for the first few weeks after surgery
- If you have not had a bowel movement for 2 days, take a medication for constipation
    - You can buy stools softeners and laxatives over-the-counter at your pharmacy or grocery store
    - Start with stool softeners (example: docusate sodium) to help prevent constipation. It can take 1 to 4 days for your stools to become easier to pass.
    - Laxatives (examples: Sennakot, polyethylene glycol) help you to push stool out. These may cause cramping and can take 6 to 12 hours to work. If used too often, they can cause your bowels to become weak and lazy.

Need help to quit smoking?

Quitting smoking can drastically improve your health. ANY type of smoking product (e.g., cigarettes, pipes, chewing tobacco, marijuana, pipes) can cause heart diseases along with many other diseases.

Quitting smoking takes time and it can often take people several attempts to finally quit. Do not give up!

Tips to help you quit:

- Plan other ways to deal with stress such as exercise or hobbies
- Medications such as nicotine patches, sprays, and gum are available over-the-counter at your pharmacy, which you can get without a prescription to help your chances of quitting. Your doctor can help you select which medication might help and can also prescribe medications to help if needed.
- Practice deep breathing, delay urges to smoke, find distractions (e.g., housework, music, reading, or exercise), and stay away from situations that make you want to smoke (e.g., alcohol or other people that smoke)
- Most cardiac rehabilitation programs offer classes and groups to help you quit smoking.

(Solims, 2019) via Unsplash

You can ask staff in hospital for resources that you can read to help you quit smoking or you can click here to access the resources online through the patient education library.

Other resources to help you quit smoking:

- Smokers' Helpline https://www.smokershelpline.ca/
- Hamilton Quits Smoking http://www.hamiltonquitssmoking.com/HPHS.html
- Family doctor, nurse practitioner, public health nurse, dentist, pharmacist

Swelling and Incisions

Swelling in your feet and ankles is normal after surgery and can take several weeks to decrease. You may see this swelling increase throughout the day and decrease when you elevate your feet or overnight when you sleep.

(Hellman, 2011)

Tips to manage swelling:

- Elevate your feet when you rest
- Do not cross your legs
- Walk and do your feet, ankle and leg exercises every day (see the exercises in the *Recovery at Home* section)
- Wear support stockings (you can purchase these at your pharmacy or have them specially made)
- Do not stand in one position for a long time

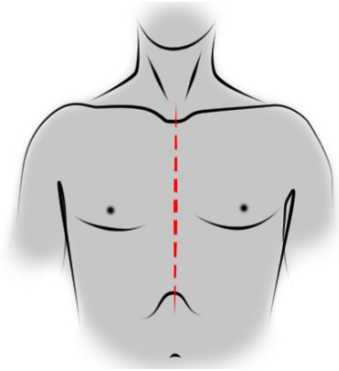
  If you gain 5 pounds (2 to 3 kg) over 2 to 3 days or have increased shortness of breath call your family doctor because this may mean your body is holding onto fluid

Important: Use a scale to weigh yourself every day. It is best to do this in the morning before you eat and after you use the bathroom.

You can download and print a copy of a weight tracking sheet by clicking here.

Taking Care of Your Incisions

Your incisions should be dry and have no open areas. Itchiness is a sign that your incisions are healing! It can take 6 to 8 weeks for your chest bone and incisions to heal but can take longer.



(Stockholm, 2016)

It is normal to:

- Have bruising, soreness, numbness and itching on or around your incisions
- Have a lump at the top of your chest incision
- Hear or feel 'clicking' coming from your chest bone. This is your chest bone (sternum) shifting as it heals. This should happen less and less with time. If it does not, or it increases speak with your surgeon.
- Have clear drainage from your incisions. This should decrease each day.
- See clear, thin string (sutures) coming from your incisions. These will fall out on their own or dissolve over time.
- Leave hospital with your incisions open to air. If you leave hospital with a bandage on some of your incisions, it is important to change these bandages each day until there is no longer any drainage.

Preventing infection:

- Keep your incisions clean! Gently cleanse the incisions with warm water and mild soap daily.

- Do not scrub your incisions. Pat them dry with a clean towel or gauze.
- Do not have baths. Have warm showers with your back to the water.
- Do not use lotion or creams on incisions unless prescribed by your doctor or heart surgeon.
- Do not pick at any scabs. Allow them to fall off on their own.

Signs of infection:

- Redness on or around the incision
- Incision is warm or hot to touch
- New or increased pain at the incision site
- Increased drainage, bleeding, pus, or swelling in your incisions
- Fever (temperature above 38°C or 100°F), chills, flu-like symptoms

Important: If you have signs of infection call your family doctor, nurse practitioner or visit a walk-in clinic right away.

Healthy Eating After Surgery

Your body requires healthy food so that it can continue to use energy to help you heal and recover. It is normal to have a poor appetite after surgery but this should improve with time.

Here are some tips for healthy eating after surgery:

- Eat food with protein (includes: fish, chicken, turkey, legumes, nuts and seeds, milk/milk products)
- ½ of your plate at meals should be vegetables or fruit. Choose dark green, red and orange colours more often.
- If you are having difficulty eating full meals, have snacks in between meals
- Stay hydrated by drinking lots of fluids, such as water, juices or tea

- You may also try nutritional supplement drinks that can be purchased in most grocery stores or pharmacies
- Eat less salt and sodium: these can cause high blood pressure, heart failure and kidney disease. You can reduce your sodium intake by:
    - Eating less processed or convenience foods that are high in sodium
    - Eating less processed meat
    - Comparing sodium in food products. Read the labels and choose items with less sodium
    - Having restaurant and take-out food less often
    - Replacing onion, garlic, and celery salt with the fresh product.
- Have no more than 2 cups of coffee per day for the first month after surgery or longer. If you have a racing heart (palpitations) limit your caffeine intake.
- Alcohol can react with your medications. It is best not to drink alcohol until you have recovered from heart surgery. Talk to your doctor or surgeon about how much alcohol is okay for you.

(Sharma, 2011)

If your appetite is not improving and you are losing weight, contact your family doctor.

When you attend cardiac rehab, there may also be dietician services offered there. Inquire with the staff about seeing a dietician while you attend the program.

Diabetes

Blood sugar targets

- Before meals: 4.0 to 7.0
- 2 hours after meals: 5.0 to 10.0

After heart surgery, your blood sugars may seem higher than normal for a day or two, however they should regulate soon after surgery. After your surgery, high blood sugars may slow down healing and increase your chance of infection.

Best ways to maintain healthy blood sugars:

- Eat a heart healthy diet
- Doing regular physical activity
- Taking your diabetes medications as directed
- Checking your blood sugars as directed

You can find more information about proper diet and diabetes by looking through the resources in the 'Resources' section or by typing in 'Diabetes' to the Patient Education section of the hospital's website.

Sleep and Emotions

It is normal to have irregular sleeping patterns after surgery. You may find you cannot sleep at night or may find you need to have naps during the day. Both are normal and it will take time to return to your regular sleeping habits.

Tips to help you sleep:

- If you are in pain when you try to sleep, try taking pain medication 15 to 30 minutes before bed
- Use pillows to sleep more upright or a recliner chair if you find it easier to breathe or more comfortable
- Decrease your daytime naps overtime as you feel stronger
- Your family doctor can prescribe or recommend medications if you need help to sleep

(Hutton, 2015) via Unsplash

Heart surgery affects your body and it can also affect your **emotions**. It is normal to feel overwhelmed, cry easily, feel angry, anxious, sad, or frustrated and have difficulties concentrating. These emotions can change from day to day for months after surgery.

To manage your emotions:

- Get plenty of rest and nap if needed
- Allow others to help you with tasks such as cooking, cleaning and shopping
- Talk to friends, family members or healthcare professionals about how you are feeling!

Precautions After Surgery

It is important to give your chest bone and incisions time to heal after surgery. Follow these rules for 6 to 8 weeks after surgery to allow your body to heal properly.

Do Not:

- Lift, push or pull anything heavier than 10 pounds or 4.5kg
- Drive a car or other motorized vehicles until your surgeon gives you permission
- Do work above the level of your head (e.g., cleaning out cupboards, hanging decorations)
- Garden, cut grass, or shovel snow or dirt
- Vacuum
- Use a sauna or hot tub due to extreme heat. Talk to your doctor for guidelines
- Swim for at least 3 months
- Take a bath until your incisions are healed (wait at least 6 weeks). Take a shower or sponge bathe instead
- Strain or hold your breath
- Climb stairs as a form of exercise. Climb stairs only as needed. If you have trouble breathing while climbing stairs, stop and climb more slowly
- Golf or row or do activities that require repetitive arm movements. Ask your surgeon or physiotherapist when you can return to these activities

Do:

- Hug a pillow or rolled up blanket when you cough to support your chest
- Walk on flat surfaces instead of steep hills
- Avoid going out in windy weather and extreme temperatures
- Keep items close by to avoid bending or reaching

Exercise

Exercising and slowly increasing your daily physical activity are important steps to healing after heart surgery. Exercising and good posture help your lungs to expand more fully and allow your chest bone and muscles to heal in the proper position. Your physiotherapists, occupational therapists and/or nurses will teach you proper exercises while in hospital.

The exercises you learn in hospital will help your posture and prevent muscle and joint stiffness. You can download and print a copy of the exercises you learned in hospital by clicking here.

Important: Repeat each exercise 3 times. Do all of your exercises 2 times per day. Continue the exercises for 6 weeks. Don't forget to walk every day too!

Tips:

- Keep your shoulders back and your chin level straight. Remind yourself to have good posture while doing your daily exercises.
- Warm up and stretch before exercising
- You should be able to increase activity as pain decreases
- If you feel dizzy, sit or lie down until you are no longer dizzy and then get up slowly
- You can use exercise bikes and treadmills. Start with low tension and low inclines
- Try to increase your walking distance or time a by a little every few days. Walk with someone the first few times when walking outside
    - Start by walking the distance you walked in hospital and repeat that 5 to 6 times per day
    - As you increase your distance, decrease how often you walk

(Adeoye, 2017) via Unsplash

Stop Exercising If:

- You feel dizziness, or faint
- You feel palpitations, unusual heart beats or a racing heart
- You have trouble breathing
- You feel nauseous

Note: If this happens, rest for 10 minutes. If the feeling does not go away, call your family doctor or go to your nearest emergency department.

Sex

Sex can be a difficult topic for people to talk about. It is important to talk about your feelings or fears with a trusted partner or healthcare professional. Your heart works harder during sex, so it is important to give your heart time to recover after heart surgery.

3 to 4 weeks after heart surgery, or when you can climb 24 stairs without chest pain or trouble breathing, it is usually safe to have sex. Avoid positions where you use your arms to hold yourself up.

Ensure if you develop pain or begin to have trouble breathing that you stop what you are doing. Rest, take pain medication if needed and ensure the feeling goes away.

(Moura, 2019) via Unsplash

Cardiac Rehabilitation

4 to 6 weeks following your surgery, you should receive a phone call or letter in the mail from a Cardiac Rehabilitation program close to your home. These programs are designed to help you safely exercise, get stronger and decrease the chance of heart problems in the future.

(Beck, 2019) via Unsplash

Each program may be slightly different, but most programs should:

- Provide you with an exercise program made specifically for your needs
- Allow you to learn exercises from specialized exercise coaches
- Provide education and support about healthy eating
- Provide stress management classes and/or support to quit smoking
- Allow you to meet other people who are also living with heart disease or have had heart surgery

When To Get Help

When and Who to Call for Help	
Continue to watch if you have	• Shortness of breath that relieves with rest • More pain but goes away with pain medication

	• Tiredness or low motivation • A cough with clear, white, or yellow phlegm • Increased swelling in your ankles, which decreases with elevation or overnight
Call your **Family Doctor** if you have	• Gained 5 pounds (2 to 3 kg) over 2 to 3 days • Swelling in your feet that is worse in the morning and does not decrease with rest or elevation • More shortness of breath or shortness of breath even after resting • Weakness or dizziness • Pain that does not go away with medication • Bleeding- nose bleeds, bloody stools, red urine • Increased drainage, redness or swelling from your incisions • Incision has opened • Fever and chills with temperature above 38°C (100°F) • Flu-like symptoms
Call **911 or go to Emergency Department** right away if you have	• Severe shortness of breath that will not go away • Chest pain that does not go away with medication (and does not feel like it is coming from your incision) • Fast or irregular heartbeat, racing heart that makes you feel dizzy or sick • Fainted

You can download or print a copy of this sheet by clicking here.

Test Your Knowledge

You can test your knowledge about your recovery after heart surgery, as well as who and when to call for help by going through the presentation shown below. Click here to start!

Note: The presentation above is best viewed with Google Chrome or Safari.

Connecting With Other Patients

We understand that heart surgery can be a time of stress, life changes and nervousness. Some people find that talking to other people who have already experienced heart surgery can help them to not only get ready for surgery but also recover and maintain healthy lifestyles for the years to come after heart surgery.

(Marshall, 2016) via Unsplash

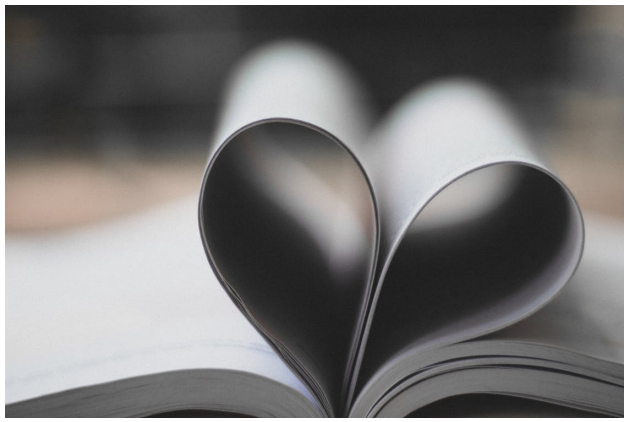
Here at Hamilton General Hospital, we have a group known as *Heart to Heart.* This is a group of volunteers who have already gone through a heart surgery and want to help others get through and thrive beyond this experience.

There are options to connect with others by phone, email, or in person. There are also group meetings, education sessions, activities and events throughout the year where you can learn from others and share experiences.

Please speak with the healthcare team at the hospital to receive further information about participating in *Heart to Heart.*

Helpful Links & Resources

Looking for more information? Click on the links below.



(Rahul, 2018) via Pexels

Path to Recovery After Heart Surgery Booklet (Hamilton Health Sciences, n.d.)
Link: https://www.hamiltonhealthsciences.ca/wp-content/uploads/2019/08/PathToRecoveryAfterHeartSurg-trh.pdf

The Society of Thoracic Surgeons Website
Link: https://ctsurgerypatients.org/before-during-and-after-surgery

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Contact Information & Acknowledgements

Do you have questions? Please, ask away! We are happy to answer.

Heart Surgeon Offices		
Heart Surgeon's Name	Secretary's Name	Phone Number
Dr. Chu	Kathy	905-521-2100 Ext. 44413
Dr. Dyub	Jessica	905-521-2100 Ext. 44967
Dr. Lamy	Patti	905-521-2100 Ext. 40325
Dr. Semelhago	Alma	905-521-2100 Ext. 44410
Dr. Whitlock	Jerusha	905-521-2100 Ext. 40306
Dr. Zhang	Kim	905-521-2100 Ext. 44653

Cardiac Surgery Unit (5 South): 905-521-2100 Ext. 46500
Cardiac Intensive Care Unit (ICU-West): 905-521-2100 Ext. 46300

Clinical Manager: 905-521-2100 Ext. 44819

Patient Experience: 905-521-2100 Ext. 75240

We would like to thank the clinical leadership staff in the cardiac surgery programs of St. Mary's General Hospital and the University of Ottawa Heart Institute for taking the time to guide us in developing these online resources for our patients.

(Hedger, 2017) via Unsplash

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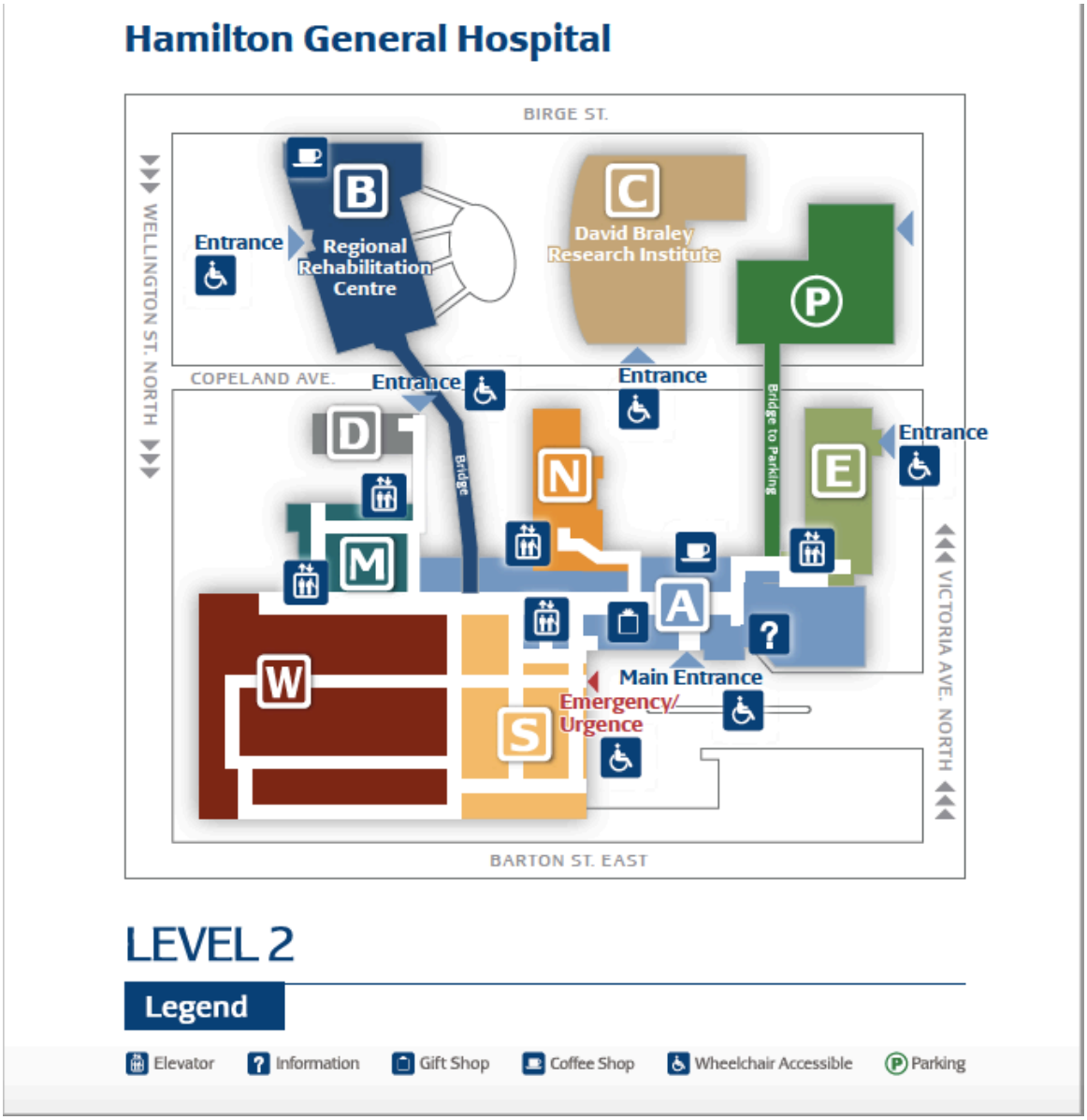
Appendices

Appendix D1: Hamilton General Hospital Map



Source: Hamilton Health Sciences (n.d.). https://www.hamiltonhealthsciences.ca/wp-content/uploads/2019/05/Floor_Plan_HGH.pdf

Appendix D2: Goals

Goals to meet before you go home	
Pain Management	• Do not let pain build up or get ahead of you • Ask for pain medication when you need it • Let your nurse know if the pain is severe or if you need stronger pain medication • After a few days you will need less pain medications to feel comfortable
Activity	• Do deep breathing and coughing exercises, support your chest (see here) • Do exercises (Refer to exercises in the *Recovery At Home* section) • Get in and out of bed with the bed in a flat position • Work up to sitting in a chair for each meal • Walk with a nurse or physiotherapist until you are told you can walk with family or on your own • Get up to the bathroom independently, if cleared by nurse or physio • Walk with friends or family in the hallway, if cleared by nurse or physio • Walk 3 times a day in the hallway, if cleared by nurse or physio • Practice stairs with a physiotherapist if needed for home. Prior to home, you will be independent in walking with no assistance
Nutrition	• You will be started on a No Added Salt diet • Family can bring meals in from home if you prefer
Bowel and Bladder	• When you arrive on 5 South from ICU, you will still have a urine catheter • The catheter will be removed and your urine will be measured • You will start to pass gas • You will receive stool softeners after surgery or laxatives a few days after surgery if no bowel movement
Bathing	• You will have help with bathing at the bedside and become independent with bathing a few days after surgery • Family can assist with bathing
Sleep in Hospital	• Difficulty sleeping in hospital is common after surgery • Let the nurse know if you are having trouble sleeping, are experiencing strange or vivid dreams or hallucinations • Balance napping and exercise during the day to promote sleep at night
Care Activities	• You will have the pacing wires removed, an electrocardiogram (ECG) and chest x-ray prior to going home • Let the nurse know of any concerns about going home, including barriers you think may affect your ability to recover at home. • Ask the nurse for the estimated time of your discharge • Arrange to have someone pick you up on your discharge day • Have a friend/family member bring a wheelchair from the main entrance of the hospital on your day of discharge and bring it to your hospital room

Appendix D3: Blood Pressure and Heart Rate Tracking Sheet

Take your blood pressure (BP) and heart rate (HR) two times per day, around the same time each day. Record your blood pressure and heart rate in the chart below and bring this sheet with you to your healthcare appointments.

Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR
Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR	Date Morning BP HR Afternoon BP HR
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Appendix D4: Weight Diary

Weigh yourself each day for 6 weeks.
Remember the best time to weigh yourself is in the morning before you eat and after you have gone to the bathroom.
Use the notes section to write down how you are feeling (e.g., good, tired, short of breath, more/less swelling, etc.)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:
Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:
Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:
Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:
Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:
Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:	Date: Weight: Notes:

Appendix D5: Postoperative Exercises

These are the exercises you learned in hospital.
Continue to do these at home for 6 weeks after your heart surgery.

Important: Repeat these exercises 3 times.
Do each set of exercises 2 times each day.

Exercise 1

Stand or sit. Place both hands on your belly, exhale to contract your belly.

Do 10 deep breaths every hour while you are awake. Then do 2 to 3 coughs.

Hug a pillow, rolled up blanket or simply cross your arms across your chest to support it.

Exercise 2

Sit or stand with good posture. Keep your face pointing forward and tip your ear to right shoulder. Repeat to the left side.

Exercise 3

Sit or stand with good posture. Turn your head to the right, repeat to the left side.

Exercise 4

Sit or stand with good posture. Raise both arms and lower both arms. Repeat.

Exercise 5

Sit or stand with good posture. Pull right elbow and arm across chest gently. Repeat with left elbow and arm.

Exercise 6

Begin with shoulder relaxed, then bring your shoulders up (hunch) toward your ears.

Exercise 7

Sit in a chair with your knees bent as shown. Lift your right foot off floor, slowly lower. Repeat with left foot.

Exercise 8

Sit on the edge of a bed or chair. Straighten right knee fully. Repeat with left knee.

Exercise 9

Sit in a chair with feet touching the floor. Push your toes down and lift your heel. Repeat with other foot.

Exercise 10

Sitting in a chair, keep your heel on the floor and raise the toes up as high as possible. Repeat with other foot.

Appendix D6: When to Get Help

When and Who to Call for Help	
Continue to watch if you have	• Shortness of breath that relieves with rest • More pain but goes away with pain medication • Tiredness or low motivation • A cough with clear, white, or yellow phlegm • Increased swelling in your ankles but decreases with elevation or overnight
Call your **Family Doctor** if you have	• Gained 5 pounds (2 to 3 kg) over 2 to 3 days • Swelling in your feet that is worse in the morning and does not decrease with rest or elevation • More shortness of breath or shortness of breath even after resting • Weakness or dizziness • Pain that does not go away with medication • Bleeding- nose bleeds, bloody stools, red urine • Increased drainage, redness or swelling from your incisions • Incision has opened • Fever and chills with temperature above 38°C (100°F) • Flu-like symptoms
Call **911 or go to Emergency Department** right away if you have	• Severe shortness of breath that will not go away • Chest pain that does not go away with medication (and does not feel like it is coming from your incision) • A fast or irregular heartbeat, racing heart that makes you feel dizzy or sick • Fainted

Appendix D7: Module Sample Slides

Link to full module https://prezi.com/view/qaPTXu0MWzKAG0n4FsGz

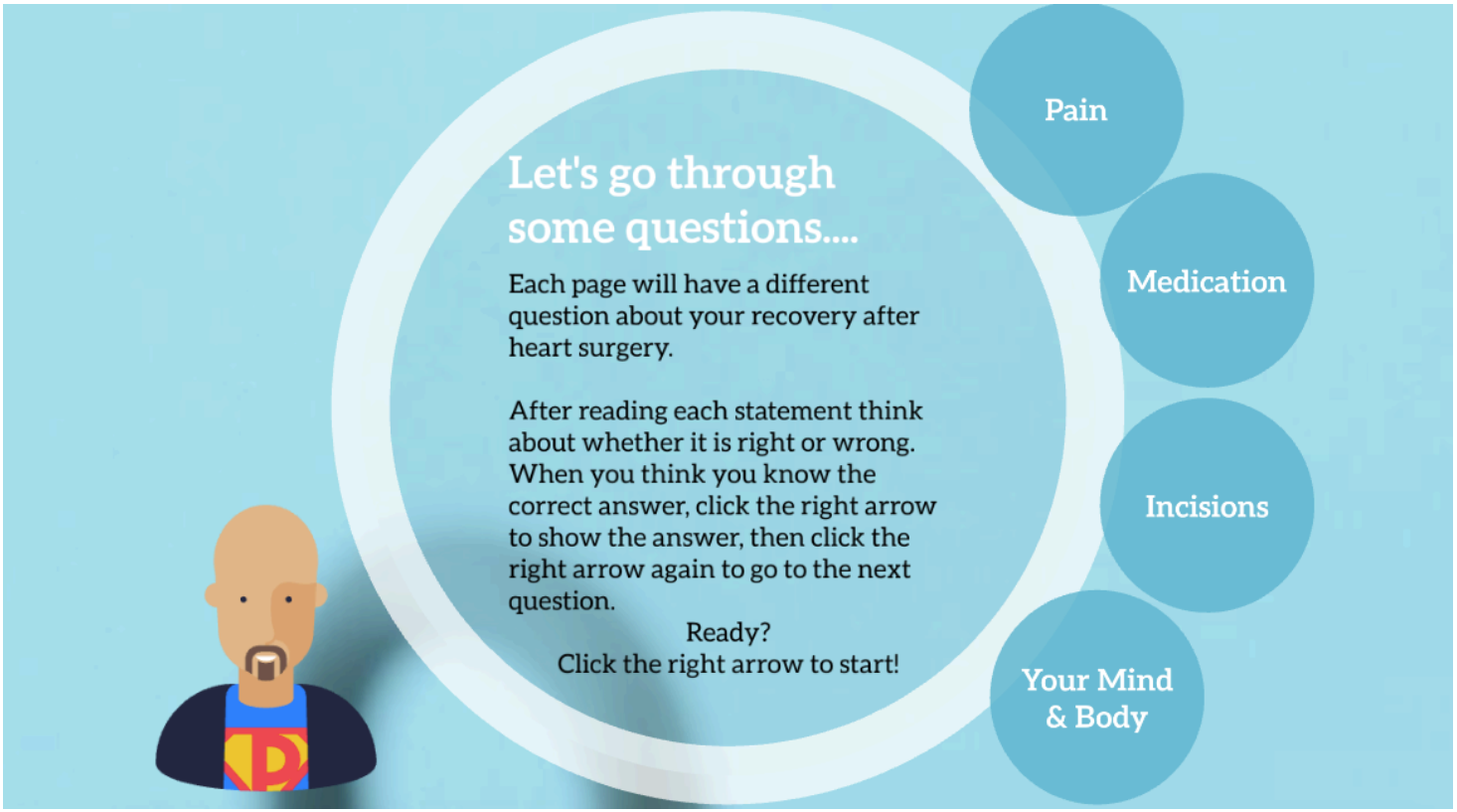
Welcome!

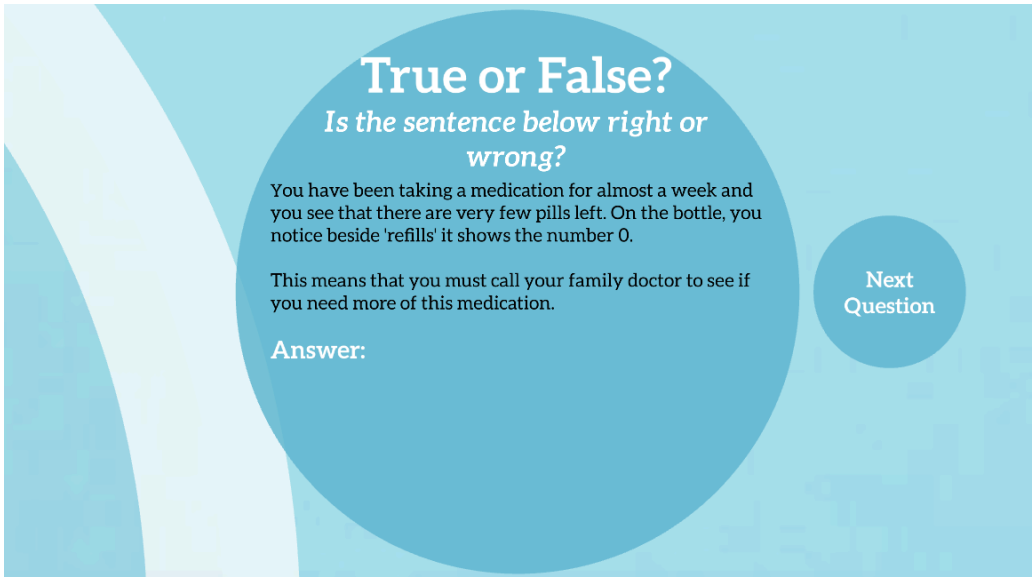
We're glad you're here.

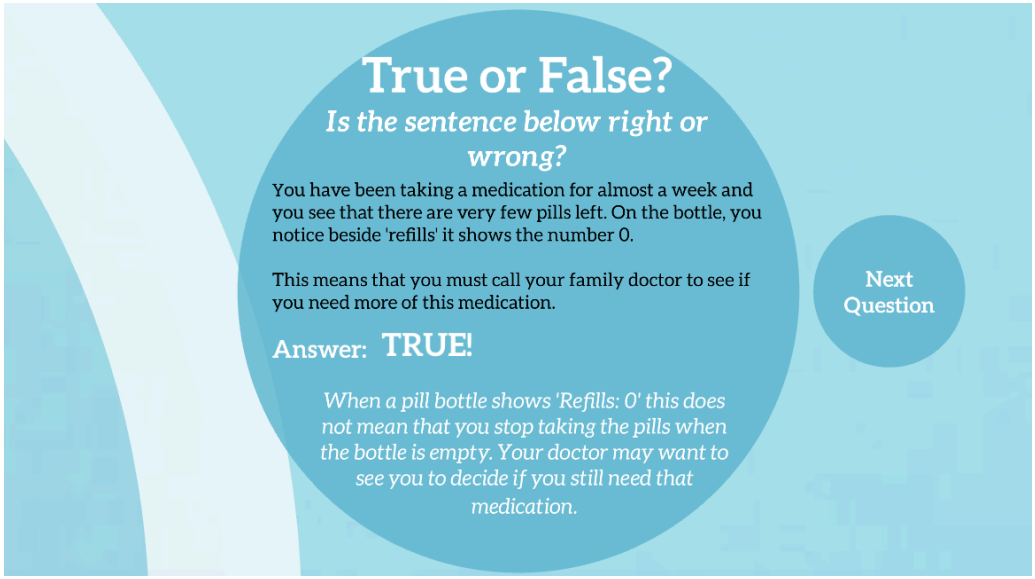
Heart surgery can cause many different feelings and life changes. It is normal to have lots of questions.

This module will help you learn more about your recovery after heart surgery.

To move the the next page, click the **right arrow** on the bottom of the screen or push the right arrow key on your keyboard.


Let's go through some questions....
Each page will have a different question about your recovery after heart surgery.
After reading each statement think about whether it is right or wrong. When you think you know the correct answer, click the right arrow to show the answer, then click the right arrow again to go to the next question.
Ready?
Click the right arrow to start!
Pain
Medication
Incisions
Your Mind & Body


True or False?
Is the sentence below right or wrong?
You have been taking a medication for almost a week and you see that there are very few pills left. On the bottle, you notice beside 'refills' it shows the number 0.
This means that you must call your family doctor to see if you need more of this medication.
Answer:
Next Question


True or False?
Is the sentence below right or wrong?
You have been taking a medication for almost a week and you see that there are very few pills left. On the bottle, you notice beside 'refills' it shows the number 0.
This means that you must call your family doctor to see if you need more of this medication.
Answer: TRUE!
When a pill bottle shows 'Refills: 0' this does not mean that you stop taking the pills when the bottle is empty. Your doctor may want to see you to decide if you still need that medication.
Next Question


True or False?
Is the sentence below right or wrong?
Even if it is blowing snow, windy, or really hot outside I should still go for a walk outside because it is important to walk everyday.
ANSWER:
Next Question
True or False?
Is the sentence below right or wrong?
Even if it is blowing snow, windy, or really hot outside I should still go for a walk outside because it is important to walk everyday.
ANSWER: FALSE!
Although it is important to try to walk at least once a day after heart surgery, walking in extreme weather or temperatures can be bad. Try to plan your walks during times of day when it is cooler (e.g morning or late evenings) or when it is not icy or windy. Malls or indoor walking tracks are also great spots to walk when outside weather is poor.
Next Question


Let's go through some questions....
Each page will have a different question about your recovery after heart surgery.
After reading each question look at each possible answer. When you think you know the correct answer, click the right arrow to show the answer. Then click the right arrow again to go to the next question.
Ready?
Click the right arrow to start!
Pain
Incisions
Breathing
Weird Feelings


What should I do?
I'm having more pain in my leg incision today than usual. My incision feels like its burning and pulling. But, I rested with my foot up, took my pain medication and the pain went away. What do I do?
a) Keep an eye on it for now.
b) Call my family doctor.
c) Call 911 or go to the nearest emergency department.
Next Question
What should I do?
I'm having more pain in my leg incision today than usual. My incision feels like its burning and pulling. But, I rested with my foot up, took my pain medication and the pain went away. What do I do?
a) Keep an eye on it for now.
b) Call my family doctor.
c) Call 911 or go to the nearest emergency department.
Next Question
Answer: a) Keep an eye on it for now.
Pain in your incisions and muscles after heart surgery is normal. As you increase your activity you may feel more pain. Stay ahead of your pain by taking pain medication. If your pain goes away with pain medication, keep an eye on things for now.


What should I do?
After a week of being home from hospital after surgery, I feel like I'm having a bit more trouble breathing over the past few days and it takes a few minutes for my breathing to get better after resting. I also noticed that my ankles and feet are more puffy and the swelling did not get better over night or when I rest with my feet up. What do I do?
a) Keep an eye on it for now.
b) Call my family doctor.
c) Call 911 or go to the nearest emergency department.
Next Question
What should I do?
After a week of being home from hospital after surgery, I feel like I'm having a bit more trouble breathing over the past few days and it takes a few minutes for my breathing to get better after resting. I also noticed that my ankles and feet are more puffy and the swelling did not get better over night or when I rest with my feet up. What do I do?
a) Keep an eye on it for now.
b) Call my family doctor.
c) Call 911 or go to the nearest emergency department.
Next Question
Answer: b) Call my family doctor.
Sometimes fluid can build up in your lungs or legs after heart surgery and your body can have a hard time getting rid of the extra fluid. It is a good idea to go to the family doctor or walk in clinic if you feel more short of breath or see more swelling than usual. Your medication may need to be changed.

What should I do?

After going to the bathroom, I started feeling this pounding in my chest, like my heart was racing. My heart still feels like it is racing even after sitting down. I'm starting to feel dizzy. What do I do?

a) Keep an eye on it for now.

b) Call my family doctor.

c) Call 911.

What should I do?

After going to the bathroom, I started feeling this pounding in my chest, like my heart was racing. My heart still feels like it is racing even after sitting down. I'm starting to feel dizzy. What do I do?

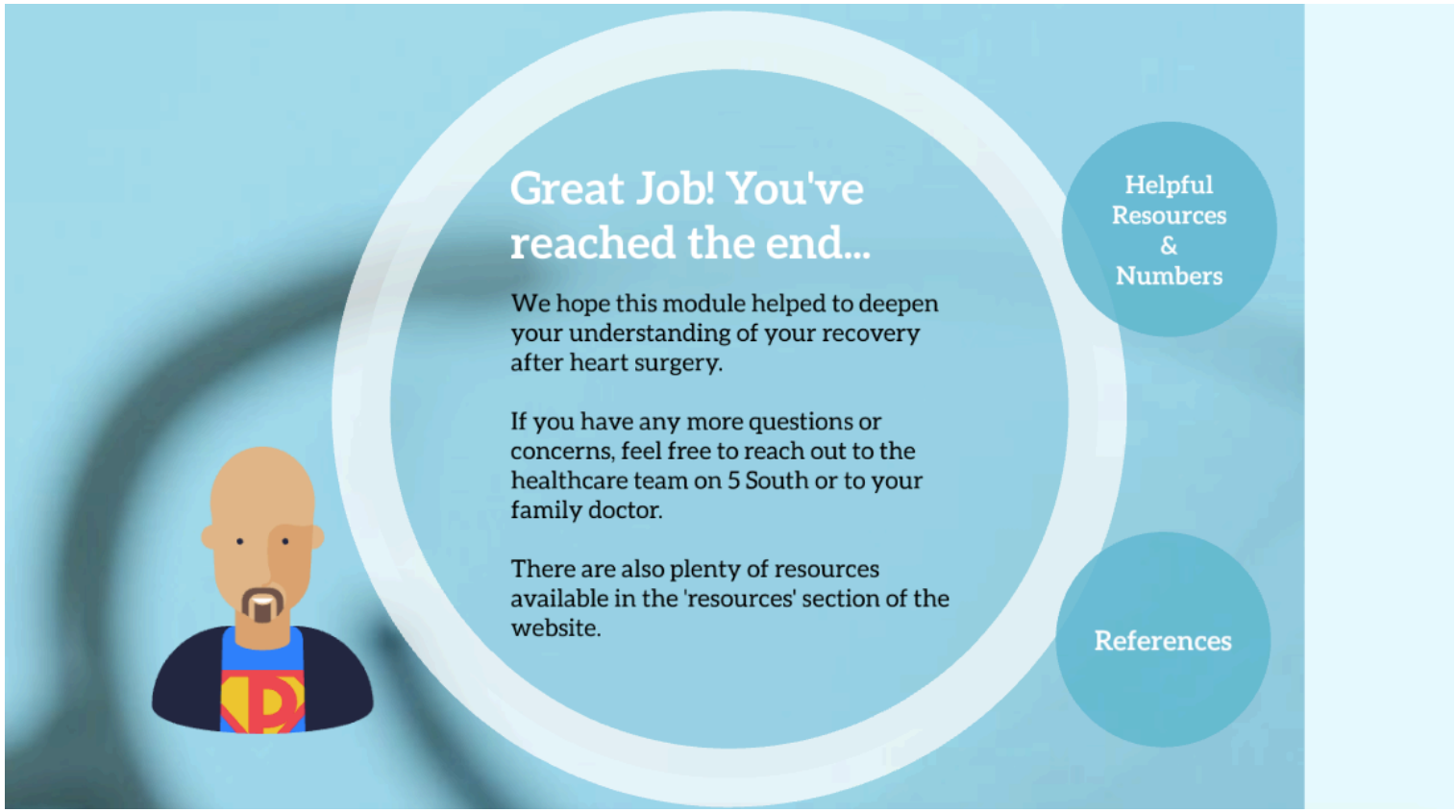
a) Keep an eye on it for now.

b) Call my family doctor.

c) Call 911. 

Answer: c) Call 911.

From time to time you may feel your heart race or pound in your chest (also known as palpitations) after heart surgery and this is normal. But, if your heart continues to race and you are feeling dizzy, short of breath or unwell, it is important to get to a hospital as soon as possible.


Great Job! You've reached the end...
We hope this module helped to deepen your understanding of your recovery after heart surgery.
If you have any more questions or concerns, feel free to reach out to the healthcare team on 5 South or to your family doctor.
There are also plenty of resources available in the 'resources' section of the website.
Helpful Resources & Numbers
References