

Title of Article:

An examination of the post-discharge recovery experience of patients who have had heart surgery

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Abstract

Background: Although resources to promote recovery following Coronary Artery Bypass Graft (CABG) and Valve Replacement (VR) surgery are provided, over a quarter of all patients are being readmitted to hospitals with post-operative complications experienced during the first 3 months of recovery. A possible reason for the high rate of readmission following heart surgery is the quality of patient engagement in the performance of self-care behaviours. In particular, patients who have had CABG and/or VR may not be fully engaged in the required self-care behaviours during their first 3 months of recovery. **Research Question:** This review was conducted to address the clinically relevant question: What is the post-operative recovery experience of the individual who has had CABG and/or VR?. **Methods:** A review of studies that examined the post-operative recovery experience of patients who had CABG and/or VR was conducted. **Results:** Findings suggest the type of post-operative complication identified during the first 3 months of recovery following Coronary Artery Bypass Graft (CABG) and Valve Replacement (VR) was either cognitive or cardiac in nature. As well, the number of self-care behaviours patients engage in during their hospital discharge was slightly less than the number of behaviours patients performed while in hospital.

Conclusion and Relevance to Clinical Practice: As close to half of the sample reported some form of cognitive impairment within the first 3 months following surgery, it is possible that this impairment may have influenced the type and number of self-care behaviours performed. Therefore, further research is needed to determine the best time to educate patients during their recovery following hospital discharge.

1.0. Background

Cardiovascular disease consists of a group of conditions affecting the structure and functions of the heart (Center for Disease Control (CDC) 2006). It is one of the most common chronic diseases, which if managed effectively, can lead to improved health (CDC). Coronary Artery Bypass Graft (CABG) and Valve Replacement (VR) are the most common surgical treatments for cardiovascular disease. Despite their advantages, CABG and VR result in changes in the physical and psychological functioning of individuals within the first three weeks following surgery (Cebeci & Celik 2008). These changes include an increase in fluid retention; fluctuations in heart rate and rhythm; increase in feelings of nervousness; and the presence of symptoms such as fatigue, dyspnea, pain, and muscle soreness (Barnason et al. 2000).

These functional changes are of significance, as patients are spending less time in hospital due to the gradual decrease in the length of hospitalization (Cardiac Care Network (CCN) 2007). This leads to reduced access to healthcare providers, requiring patients to become more engaged in the self-management of their condition throughout all stages of their recovery.

Within the current in-patient Cardiovascular Surgical (CVS) setting, education is provided for all patients who have had CABG and/or VR (Jaarsma et al. 2000). The intended outcome of these education programs is the increased performance of self-management behaviours following discharge. The delivery of education generally occurs 24-48 hours pre-hospital discharge (Beckie 1989, Moore 1994, Moore & Dolansky 2001, Fredericks 2009) and involves presenting standardized information that addresses: medication management, healthy heart diet, activity, signs and symptoms of infection,

incision care, and complications (Winslow 1986, Public Health Agency of Canada 2008). As well, approximately half of all CABG and/or VR patients are referred to Cardiac Rehabilitative programs (Grace et al. 2006). The average length of time for involvement in these programs is 2 weeks. The intended outcome for Cardiac Rehabilitation is lifestyle modification following heart surgery (Grace et al.).

In Canada, although resources to promote recovery are made available, over a quarter of all CABG and/or VR patients are being readmitted to hospitals with post-operative complications experienced during the first 3 months of recovery. The most common causes of readmissions are post-operative infections (28%) and heart failure (18%) (Hannan et al. 2003). The rate of hospital readmission for CABG and/or VR is one of the highest across the nation and has significant implications for health care resource utilization, continuity of care across the system, and exacerbation of underlying cardiac condition. A possible reason for the high rate of readmission following heart surgery is the quality of patient engagement in the performance of self-care behaviours. In particular, patients who have had CABG and/or VR may not be fully engaged in the required self-care behaviours during their first 3 months of recovery. The purpose of this review was to identify the specific behaviours patients who have had CABG and/or VR engage in, during their recovery, in order to guide efforts at developing a self-management intervention that will reduce post-operative infections and the onset of heart failure resulting in a decline in hospital readmission rates. It is anticipated that the creation and use of a self-management intervention will lead to improved health for those individuals living with cardiovascular disease.

2.0. Research Question

This review was conducted to address the clinically relevant question: What is the post-operative recovery experience of the individual who has had CABG and/or VR?

The specific objectives were: 1) to determine the type of behaviour post-operative CABG and/or VR patients engage in during their recovery; 2) to describe the type and number of post-operative infections, onset of heart failure, and rate of hospital readmissions experienced during the recovery period, and 3) to examine the relationship between number of behaviours performed, number of post-operative infections, and rate of hospital readmissions during the recovery period. The target population included adult patients undergoing CABG and/or VR surgery.

3.0. Conceptual Framework

In this section, the variables of interest to the review are defined at the conceptual level. These definitions guided the specification of criteria for selecting the studies and facilitated data extraction. The variables are categorized into elements of behaviours performed following surgery, post-operative infection, heart failure, and hospital readmission.

3.1. Behaviours performed following surgery

Behaviours performed following surgery are initiated by the individual and performed on their own behalf in order to promote recovery (Orem 2001). The process involved in behaviour performance is characterized by self-care which involves the selection and performance of treatment strategies to maintain functioning, prevent the onset of complications (i.e. infections and/or heart failure), and/or to reduce the rate of hospital readmissions (Orem 2001).

3.2. Post-operative Infections

Post-operative infections occur in about a quarter of all heart surgery patients (Fasken et al. 2001). They can range from minor skin infections that are treated with antibiotics to major sternal infections requiring longer hospitalizations, removal of the sternum, or rehospitalization. The most common areas for infection following heart surgery are sternal wound and/or donor site (Fasken et al. 2001).

3.3. Heart Failure

Heart failure is the result of any cardiac disorder that impairs the ability of the heart to deliver adequate cardiac output during exercise or rest; and is typically seen in about 20 % of the population. The damaged area in the heart muscle becomes hypokinetic, leading to cellular death, which is then replaced by scar tissue during the repair process. This process is defined as remodeling. The non-elastic scar tissue eventually thins and dilates resulting in ventricular remodeling (Al-Radi et al. 2003, Sim et al. 2003). Significant ventricular remodeling causes symptoms of heart failure, which include: dyspnea, fatigue, fluid retention, and exercise intolerance (Al-Radi et al., Sim et al.).

There are two groups of patients who develop symptoms of heart failure. The first group includes: those individuals who have experienced a Myocardial Infarction (MI) or invasive procedure (i.e. heart surgery) in one particular area of the heart. This results in thinning and dilation of the affected-related area, thereby placing excessive stress on the remaining heart muscle. These individuals average 20 % of the entire heart failure population, and tend to develop heart failure within days following the MI or invasive procedure (Canadian Cardiovascular Society 2003). The second group comprises those individuals who have idiopathic cardiomyopathy, which are cardiac disorders of an

unknown origin. Idiopathic cardiomyopathy affects global ventricular function and is not restricted to one segment (Hagege et al. 2003).

Compared with other major disease states, heart failure is associated with one of the highest number of days spent in hospitals, and the third highest number of patients affected (Tsuyuki et al. 2003). It is the most common cause of hospitalization in people over the age of 65 (Tsuyuki). Morbidity, including hospital readmissions is substantial; almost one-third of all hospital admissions are readmissions, with one-fifth of patients (over 14,000) being admitted two or more times, placing a severe strain on the Canadian health care system (Tsuyuki, Canadian Heart Failure Network 2009).

As the number of individuals affected with heart failure continues to rise, there have been dramatic increases in its associated health care costs. Health care expenditures for the treatment of this illness have escalated to over one billion Canadian dollars annually for inpatient care (Bentkover et al. 2003, Canadian Cardiovascular Society 2001). This is approximately 3 % of the Canadian health care budget (Federal Support for Health Care 2008).

3.4. Hospital readmission

Approximately, 25% of all heart surgery patients are readmitted to hospital for either heart failure or infections (Fasken et al. 2001). Factors associated with readmission relate to age, gender, culture, marital status, socioeconomic status, severity of illness, and medical diagnosis (Fasken et al.).

4.0. Methods

4.1. Study Design

A review of studies that examined the post-operative recovery experience of patients who had CABG and/or VR was conducted to address the study objectives. These objectives were used to guide the specification of key terms to search databases, the specification of criteria for selecting studies, and the extraction of pertinent data. As this is was review, there were no anticipated ethical issues.

4.2. Sample

Studies were included in the review if they met the following selection criteria: 1) the sample represented adult (≥ 18 years) patients who underwent CABG and/or VR surgery, 2) the outcomes assessed were related to type of behaviour performed during recovery period, 3) contained data related to the development of post-operative infections, heart failure, and hospital readmission rates; and 4) the study report was published in English between 2000 and 2010. Studies that used non-experimental, experimental or randomized clinical trial (RCT), and quasi-experimental designs involving two groups (experimental and comparison) were included in the review.

4.3. Search strategies

The search for relevant studies was performed using the following databases: CINAHL, MEDLINE, PUBMED, EMBASE, COCHRANE, and HEALTH STAR. The keywords used in the search included: recovery phase, post-operative, CABG, VR, post-surgical, post-operative infections, heart failure, and behaviour performance. Reference lists of studies retrieved were examined for additional studies that addressed the post-operative recovery period of patients who had a CABG and/or VR.

4.4. Measurement of outcome

The following information was gathered about each study: year of publication, country in which the study was conducted, study design (non-experimental, quasi-experimental, or experimental), sample size (total, and for each study group), and number and type of study groups (control or comparison and treatment, or two treatment groups). With regards to behaviour performed, the type and number of behaviour was extracted. As well, the following data was also extracted: the type and number of post-operative infections (sternal wound or donor site), presence of heart failure (yes/no), and hospital readmission rates (number of patients readmitted and length of time between hospital discharge and readmission). These data were used for descriptive purposes.

4.5. Planned analyses

Descriptive statistics was used to 1) delineate the characteristics of the studies included in this review, 2) determine the type and number of behaviours patients post-CABG and/or VR engage in during their recovery, 3) determine the type and number of post-operative infections, presence of heart failure, and rate of hospital readmissions experienced during the recovery period, and 4) examine the relationship between behaviours performed and the number of post-operative infections and rate of hospital readmissions.

5.0. Results

5.1. Study Characteristics

The 92 studies that met the inclusion criteria involved 54,367 participants. The studies were conducted in the United States (63.0 %: 58 studies), Europe (31.5 %: 29 studies), and Canada (5.4 %: 5 studies). Approximately three quarters (73.9 %: 68 studies) of the studies used descriptive designs to identify the type of behaviours

performed, the number of post-operative infections, presence of heart failure, and rate of hospital readmissions experienced during the recovery period, while 18.4 % (17 studies) of the studies used quasi-experimental designs, and 7.6 % (7 studies) used experimental designs.

5.2. Study Participant Characteristics

Across the studies, the average age of the study participants was 64.9 (SD = 3.5) years. In the majority of the studies, the sample was mainly white (86.9 %: 80 studies), married (73.9 %: 68 studies), male (92.3 %: 85 studies), with at least a high school diploma (75 %: 69 studies). In 94.5 % (87 studies) of the studies, the sample had less than or equal to high school education. Over half (67.4%: 62 studies) of the study participants were retired. Over three quarters (78.2 %: 72 studies) of the study participants reported having at least 5 co-morbid conditions. The most frequently reported co-morbid conditions were diabetes (89.1 %: 82 studies), hypertension (79.3 %: 73 studies), hyperlipidemia (76.1 %: 70 studies), peripheral vascular disease (34.8 %: 32 studies), and Chronic Obstructive Pulmonary Disease (33.7 %: 31 studies).

Among the studies, post-operative complications were reported. The most common complications include delirium (33.7 %: 31 studies), short term (last up to 2 weeks) memory loss (32.9 %: 30 studies), atrial fibrillation (32.8 %: 30 studies), depression (26.0 %: 24 studies), anxiety and stress (28.9 %: 27 studies), heart failure (16.3 %: 15 studies), pain (14.1 %: 13 studies), myocardial infarct (12.7 %: 12 studies), and respiratory problems (11.0 %: 10 studies). On average, post-operative complications lasted between 2 (SD = 1.1) to 45 (4.1) days.

5.3. Characteristics of the Hospital Experience

Participants, as identified across studies, had an average length of stay in intensive care of 49.1 (SD = 51.48) hours and an average length of stay on the post-operative recovery unit of 8.6 (SD = 3.9) days. The average number of infections during the hospitalization period was 5.4 (SD = 4.0).

5.4. Characteristics of the Home Recovery Experience

Hospital readmission rates were 16 % (SD = 7.1 %), with an average of 30 (SD = 3.9) days at home before readmission. The majority (90.2 %) of readmissions were to hospitals, while 4.3 % of study participants were readmitted to a rehabilitation facility. Across the studies, the reason for readmission related to stroke (16.5 %), heart failure (13.3 %), and respiratory problems (12.9 %). The average number of infections during the home recovery experience was 7.2 (SD = 3.1).

5.5. Number and Type of Self-Care Behaviour Patients Engage in during their Recovery

On average patients performed 4 (SD = 1.4) self-care behaviours during their hospitalization and 3 (SD = 1.9) self-care behaviours following hospital discharge. The three most frequently performed self-care behaviours patients engage in during their hospitalization include deep breathing and coughing exercises (98.4 %: 90 studies), use of incentive spirometer (96.7 %: 89 studies), and complying with physicians orders (76.2 %: 70 studies). The three most common self-care behaviours patient engage in after their hospital discharge were deep breathing and coughing exercises (89.0 %: 82 studies), medication administration (85.0 %: 78 studies), and medication management, in particular refilling prescriptions on time (63.7 %: 59 studies).

5.6. Relationship between Behaviours Performed and the Number of Post-Infections and Rate of Hospital Readmissions

Statistically significant relationships were identified between the number of self-care behaviours performed and number of post-operative infections ($r = -0.185$, $p = 0.04$), the number of self-care behaviours performed and the rate of hospital readmission ($r = -0.198$, $p = 0.00$), post-operative infections and rate of hospital readmission ($r = 0.150$, $p = 0.02$). Additional findings include statistically significant results related to length of stay in hospital and number of infections ($r = 0.909$, $p = 0.03$) and length of stay in intensive care units and length of stay in hospital ($r = 0.982$, $p = 0.00$).

6.0. Discussion

The type of post-operative complication identified was either cognitive or cardiac in nature. Fasken et al. (2001) reported that approximately half of all cardiovascular surgical patients experience a cardiac related event or symptom and/or some form of short term dementia, delirium, or memory loss following heart surgery. This may be due to the heart-lung bypass machine (Walzer et al. 1997). The process involved in preparing the heart for surgical intervention involves pumping blood through the heart-lung machine, which will allow the heart to remain at rest. The process of rerouting the blood may harm blood cells resulting in clots. As well, it may cause inflammation, which could injure the brain resulting in mental changes which could last between 3 to 12 weeks after surgery. The first three weeks following surgery is a critical time in which symptoms such as pain, infections, nausea, vomiting, and edema tend to occur. If patients are experiencing short term memory loss, during this period of time, then they will not be able to apply any of the strategies suggested to them during health care teaching sessions to manage symptoms present. Thus, attempting to educate patients in the immediate post-operative period has several barriers which need to be considered.

Findings also point to patients spending on average 2 days in the ICU and 8.6 days on the CVS unit, while having just over 5 infections during their hospitalization. The average number of days spent on the CVS unit as reported in this study, is higher than the average number of days cardiovascular patients spend on a CVS unit in Canada. The Canadian average is 4.3 days (Eisenberg et al. 2005). The higher than average number of days spent in hospital, as reported in this review, may be reflective of the large number of studies that were conducted in the United States (US). In the US, patients typically pay for health care services (Eisenberg et al.). Heart surgery patients pay 83% more for heart-bypass surgery than Canadians, due to higher medicine and labor costs (Eisenberg et al.). The average bypass-procedure costs \$20,673 in the U.S. and \$10,373 in Canada. Medical treatment costs Canadian patients less because the government manages the health-care system, keeping costs lower. Therefore, in the US, wealthier individuals tend to undergo CABG and/or VR and will pay to stay longer in hospitals so as to access health services.

The effect of longer stays in hospitals is beneficial in that patients have increased access to healthcare workers. However, increased length of hospitalizations can result in higher rates of infection, as noted in findings from this review. This result is consistent with Rebollo et al. (1996) findings which indicate hospital stays following heart surgery averaging more than 6 days, can lead to the development of surgical site infections, pneumonia, urinary tract infections, deep surgical site infections (under the incision), and bacteremia. As well, the older the patient (age > 65 years of age), the higher the risk for the development of infections and exacerbation of existing chronic condition, which can have significant implications for the economic costs associated with the health care

system. Thus, health care organizations may consider encouraging patients to go home earlier, thus reducing their likelihood for the development of infections and aggravation of existing condition.

The average rate of hospital readmissions and reasons for readmission identified in this review is similar to what has been reported in the literature (Bardell et al. 2003). The number of self-care behaviours patients engage in following hospital discharge was slightly less than the number of behaviours patients performed while in hospital. This may be due to patients not remembering how to perform specific behaviours. About half of the studies included in this review reported some form of memory loss or delirium in samples following surgery, which may have contributed to patients not remembering discharge focused self-care education information. Follow-up education during the discharge period is needed to reinforce pre-discharge teaching, as well as address recovery concerns, which may lead to increase performance in self-care behaviours, resulting in a decrease in infections, the incidence of heart failure, and hospital readmissions.

7.0. Relevance to Clinical Practice and Nursing Implications

This study focused on the experience of the surgical patient following hospital discharge. Due to the increase in readmission rates within 3 months of hospital discharge, there appears to be a relative lack in continuity of care from the time of hospital discharge, to the first 12 weeks of recovery. This lack of continuity of care has resulted in the onset of new co-morbid conditions (e.g. heart failure) and/or exacerbation (e.g. infections) of existing chronic condition (cardiovascular disease).

As, one of the goals of primary health care is to coordinate functions to ensure continuity and ease of movement across the system (<http://www.hc-sc.gc.ca/hcs-sss/prim/about-apropos-eng.php>), patients need to have continued access to health information from the institution in which they received their surgical procedure. This access should be made available to the patient during the first 12 weeks of their recovery and should be tailored to reflect the individual needs of the patient and their specific recovery status. Thus, the provision of health resources could be delivered by an advanced nurse practitioner (APN), whose area of specialty is cardiovascular surgery. A telephone advice line can be established that focuses only on recovery related issues following cardiovascular surgery and managed on an individual basis by each institution that has a CVS program. Prior to hospital discharge, patients and their families can be informed of the telephone advice line and encouraged to use this resource if any challenges are encountered during the first 12 weeks of recovery. The APN would have access to patient's files to be able to assist in the delivery of health information. The effectiveness of this telephone based intervention can be evaluated for effectiveness in reducing post-operative infections, the onset of heart failure, and hospital readmission rates.

Continued investigation is also needed to understand the reasons why patients engage in specific self-care behaviours following hospital discharge (i.e. deep breathing and coughing exercises, medication administration, and medication management, in particular refilling prescriptions on time). Behaviours related to activity and nutrition was not consistently performed during the post-hospital discharge period. Focus groups are needed to understand patients' reasons for selecting specific behaviours. As well, further

investigation to determine the most appropriate time in which to teach patients is required, as close to half of the studies reported some form of memory loss or delirium across samples. Thus, nurses may be required to engage in patient education sessions at multiple points in time over the course of the individual's recovery following hospital discharge.

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