

Title of the paper: Coronary Artery Bypass Graft Surgery patient education: A systematic review

1. Introduction

Cardiovascular diseases (CV) are defined as diseases and injuries of the cardiovascular system, which include the heart and the blood vessels (veins and arteries) throughout the body and within the brain. Coronary Artery Bypass Graft (CABG) is a common surgical treatment for cardiovascular disease. Globally, on average one in every five hundred individuals annually undergo a CABG procedure. ¹ Patient education post-CABG is an essential component of nursing care aimed at assisting patients in caring for themselves at home, following discharge from hospital. ²⁻⁴ Education provides patients with the information required to understand their condition, surgery, and recovery; to prevent and manage post-surgical symptoms; and to decrease/reduce hospital readmission, morbidity and mortality rates. ⁵⁻⁸ Studies have investigated CABG patient education interventions in producing changes in knowledge and performance of self-care behaviours and symptom frequency. ^{5, 7-10} Results indicated minimal effects of education on self-care knowledge and compliance with self-care instructions, ¹⁰ physical functioning, ⁵ specifically, mobility, ambulation, and body care/movement, and symptom frequency. ⁷ While these findings demonstrated the effects of CABG patient education on the intended outcomes, they fall short of elucidating the specific approach, mode of delivery, and dose of educational interventions that are associated with desired outcomes. Knowledge of the most effective educational interventions' approach, mode of delivery, and dose is required to guide practice. Such knowledge will direct the design and implementation of education in day-to-day practice, in the most effective and efficient way.

This systematic review was conducted to address the clinically relevant question: What approach, mode, and dose is most effective in producing changes in CABG patient education? ¹¹ The specific objectives were: 1) to describe the approach to education, mode of delivery, and

dose used in providing CABG patient education; and 2) to explore the extent to which variability in outcome achievement is associated with differences in the elements of educational interventions. The target population included adult patients who underwent CABG procedures.

2. Conceptual definition

In this section, the variables of interest to the systematic review are defined at the conceptual level. These definitions guided the specification of criteria for selecting the studies and facilitated data extraction. They were derived from theories and models relevant to patient education and self-care. The variables are categorized into elements of self-care educational interventions and outcomes of education.

2.1. Elements of CABG educational intervention

Patient education post-CABG refers to the communication of information¹² about the performance of self-care behaviours. The goals of CABG patient education are to ensure that the individual has the appropriate knowledge required to perform self-care behaviours in the home environment; to reduce the occurrence of post-CABG symptoms and complications; and to enhance recovery and overall quality of life.¹³ In general, CABG patient education covers topics related to: medication management, activity performance, nutrition, signs and symptoms of complications, and pain management.^{14, 15}

The elements of CABG educational interventions include the approach to education, mode of delivery, and dose. Conceptually, approach to education involves the general strategy for communicating the information to patients. Education can be given in two approaches: standardized and tailored or individualized. Standardized CABG education encompasses the provision of information pertaining to a pre-selected set of topics determined by health care professionals to be of relevance to CABG self-management. The nurse discusses all topics with

the patient. Individualized CABG education consists of providing information on topics selected by the patient. The nurse discusses the topics that patients deem to be relevant to their specific health situation.¹² Mode of delivery encompasses the medium and format for providing CABG patient education. Medium is the process through which education is delivered, and includes: 1) contact with the health care professional through face-to-face or phone interactions; 2) written resources available such as brochure or pamphlet, or on-line; and 3) audio-visual materials in the form of audiotape or videotape.¹² Format refers to how the education is offered, that is, one-on-one or group discussion.¹² Dose is defined as the level at which an intervention is given.¹¹ It is operationalized in terms of the number of sessions during which education is provided.

2.2. Outcomes of education

Three outcomes of education are of interest to this systematic review: self-care knowledge, self-care behaviour, and symptom experience. These outcomes represent the anticipated consequences of education as advanced in models of patient education¹² and self-care.¹⁶ They were investigated in several studies.^{5, 7, 17}

Self-care knowledge is defined as a body of facts and principles that is learned through life experience, or is taught. Knowledge is enhanced through educational interventions and is made visible immediately through cognitive indicators such as recall of information.¹² Patient education post-CABG focuses on self-care knowledge, which refers to information regarding strategies for engaging in post-CABG self-care behaviours during the early post-operative period (3 weeks post-CABG).^{18, 19} Self-care knowledge is operationalized as the correct identification of self-care information pertaining to fluid and food intake, activity performance, management of drug therapies, and recognition and response to signs and symptoms indicative of post-CABG complications.

Self-care behaviour refers to the performance of self-care strategies to promote the management of behaviours within the home environment .²⁰ The self-care strategies include: management of fluid intake, nutrition and symptoms; engagement in personal hygiene and usual physical activity; taking medications as prescribed; and monitoring the development of and managing CABG complications such as difficulty breathing and fluid overload.

Symptoms are “subjective experiences reflecting changes in a person’s bio-psychosocial function, sensation, or cognition.”²¹ Symptoms that are commonly experienced post- CABG include: pain, dizziness, difficulty breathing, nausea, edema, sleep disturbances, and mood alterations.²¹ Symptom experience is operationalized as the perceived severity of any of these subjective experiences.

3. Methods

3.1. Design

A systematic review of studies that evaluated the effectiveness of CABG patient education was conducted to address the two objectives. The definitions of the variables of interest guided the specification of key terms used to search databases, the specification of criteria for selecting studies, and the extraction of pertinent data. Effect sizes were computed for each category of outcomes and when pertinent data were reported, and compared across elements of CABG educational interventions.

3.2. Selection criteria

Studies were included in the systematic review if they met the following selection criteria: 1) the sample represented adult (≥ 18 years) patients who have recently undergone a CABG procedure; 2) the educational intervention involved the provision of post-operative self-care CABG information; 3) the outcomes assessed were related to self-care knowledge, self-care

behaviour, and symptom experience; and 4) the study report was published in English between 1986 and 2008. Studies that utilized experimental or randomized clinical trial (RCT), quasi-experimental designs, or non-experimental designs were included in the systematic review. Results of meta-analyses yielded that the effect sizes of experimental and quasi-experimental studies are comparable ²².

3.3. Search strategies

The search for relevant studies used the following databases: CINAHL, MEDLINE, PUBMED, EMBASE, COCHRANE, and HEALTH STAR. The keywords used in the search were: discharge plan, CABG, self-care management, education, teaching, CABG education, CABG teaching, heart surgery education, and heart surgery teaching. Searches were limited to adult population, English language, and 1986-2008 periods. Reference lists of studies retrieved were examined for additional studies that investigated CABG patient education. A total of 38 articles were found to have addressed CABG patient education and published between 1986 and 2008. Of these, 13 articles were excluded because 1) the reported study evaluated psycho-educational CABG interventions (61.5 %), or 2) described CABG educational frameworks or policies guiding practice (38.5 %). A total of 25 studies met the selection criteria and were included in the systematic review ^{9, 10, 18, 20, 21, 23-41}.

3.4. Data extraction

Data were extracted on study characteristics, elements of educational intervention, and outcomes of education. The definitions presented earlier guided the development of a coding scheme to facilitate data extraction from each article and to assign numeric values to the extracted data.

3.4.1. Study characteristics

The following information was gathered about each study: year of publication, country in which the study was done, study design (quasi-experimental and experimental), sample size (total, and for each study group), number and type of study groups (control or comparison; and treatment or two treatment groups), and patient population was included. These data were used for descriptive purposes.

3.4.2. Elements of educational intervention

Approach to education: was categorized as standardized or individualized. Information on approach to education was obtained from the article's sections describing the nature of the intervention and/or the procedure for delivering it. Interventions that consisted of handing patients written resources, having patients watch a videotape or listen to an audiotape, and discussing with patients a pre-selected set of topics, were categorized as standardized education. The same content on CABG self-care was reviewed by all patients. Interventions that addressed individual patients' learning needs, either through discussion with health care professional or computer-assisted instructions, were considered as individualized education.

Medium: for providing CABG education was coded as face-to-face contact with health care professionals, phone contact with health care professional, distribution of written resources (such as brochure, pamphlet, booklet) for patients to review on their own, and combination of different media for providing education (such as phone contact with health care professional, and distribution of written resources).

Format: for delivering education was coded as 1) individual, involving one person at a time, which could take place when interacting with the health care professional, or when patient reviews written and audio-visual materials, and 2) group, involving several persons interacting with the health care professional or watching a videotape.

Dose: was indicated by the total number of sessions for providing education and was categorized into: one session versus two or more sessions.

3.4.3. Outcomes of education

The specific outcomes of interest, that is, self-care knowledge, self-care behaviour, and symptom experience were assessed with self-report measures capturing 1) the percentage of correct responses to items inquiring about patients' understanding of CABG and management, 2) performance of strategies in which patients are expected to engage in, and 3) perceived symptom severity, respectively. For each of these outcomes, the following data were extracted: 1) whether or not post-test comparisons showed statistically significant differences between the study groups. These data were coded into 0 = no significant differences and 1 = significant differences 2) the mean and standard deviation reported for each study at the first post-test. These data were used to compute the post-test effect size for each outcome investigated in individual studies.

4. Data analysis

Descriptive statistics were utilized to 1) delineate the characteristics of the studies included in this systematic review, 2) describe the characteristics of patients comprising the sample selected across studies, and 3) indicate elements of educational intervention frequently implemented across studies (objective 1). For the outcomes of interest, the effect size was computed by subtracting the mean of the control or comparison group from the mean of the experimental group and dividing the difference by the standard deviation of the comparison group.²² Due to the small number of studies that provided the data required to compute the effect size, it was not appropriate to use inferential statistics to explore differences in outcomes in relation to elements of educational interventions (objective 2). Therefore, results pertaining to

objective 2 are presented in terms of the number of studies yielding statistical significance between-group differences and the mean effect size on the respective outcomes.

5. Results

5.1. Study characteristics

The 25 studies that met the inclusion criteria involved 6039 participants. The studies were conducted in the United States (88.0 %), Canada (4.0 %), and Europe (8.0 %). More than half (60.0 %) of the studies used a quasi-experimental design to evaluate the effectiveness of CABG educational interventions, while 28.0 % of the studies used an experimental design, and 12.0 % used a non-experimental design. Most studies (80.0 %) contained one experimental and one control group, while 12.0 % of the studies used two experimental and one control group, and 8.0 % used a single treatment group.

5.2. Elements of educational interventions

All reports that used standardized only (n = 14, 56.0 %), individualized only (n = 7, 28.0 %), and combined studies (n = 4, 16.0 %) contained a usual care component that consisted of standardized teaching. A combined mode of delivery that included face-to-face contact with a health care professional, phone contact, and the distribution of written resources were used by 21 (47.7 %) studies. Delivery of educational interventions through face-to-face contact with a health care professional was used by 17 (68.0 %) studies, while 8 (32.0 %) used written resources. Twelve (48.0 %) studies were delivered on an individual basis, while 13 (52.0 %) studies did not provide information detailing how they were implemented. Eleven (25 %) studies contained interventions that were provided in more than one session.

5.3. Characteristics of the participants

In all of the studies, the sample consisted of patients ≥ 50 years of age. For 88.8 % of the studies, the sample was comprised mainly of men, while in 68 % of the studies, most participants had less than or equal to high school education.

5.4. Outcome achievement relative to intervention elements

Table 1 presents the number of studies that provided data to compute post-test effect size and the mean (range) effect size for each outcome. The results are summarized for each educational intervention element.

5.5. Approach to education

Of the 4 studies that evaluated the effects of CABG education on self-care knowledge, 3 (75 %) investigated individualized and 1 (25 %) standardized approach to education. Statistically significant differences between the comparison and experimental group in post-test self-care knowledge were reported in all of the studies involving individualized and in the one study involving standardized approach to education. In these studies, the experimental group reported higher knowledge gain at post-test than the comparison group. On average, the effect size for self-care knowledge was larger for individualized than standardized approach to education.

Only 13 studies were concerned with self-care behaviour as an outcome of CABG education. Of these 8 (61.5 %) implemented individualized and 5 (38.4 %) standardized approach to education. In half (50 %) of studies using an individualized and 40 % using a standardized approach, a significant difference was found between the study groups favoring the experimental group. The mean effect size was larger for individualized as compared to standardized education.

Of the 7 studies that examined the outcomes of symptom experience, 4 (57.1 %) investigated individualized and 3 (42.8 %) standardized approach to education. Statistically

significant differences favoring the experimental group in post-test symptom experience were reported in 50 % of the studies involving individualized and 66.7 % of the studies involving standardized approach to education. The mean effect size was larger for individualized than standardized education.

5.6. Mode of Delivery - Medium

Of the 3 studies that focused on self-care knowledge, 1 (33.3 %) investigated interventions delivered using combined media and 2 (66.7 %) evaluated interventions delivered via face-to-face contact with a nurse. Statistically significant differences (i.e. higher score in experimental group) between the comparison and experimental group in post-test self-care knowledge were reported in all of the studies involving combined media and all of the studies involving face-to-face contact with a nurse. The mean effect size was larger for educational materials delivered through combined media than face-to-face contact.

Only 10 studies were concerned with self-care behaviour as an outcome of CABG education. Four (40 %) studies contained interventions delivered through combined media and 6 (60 %) evaluated interventions delivered via face-to-face contact with a nurse. Statistically significant between group differences in self-care behaviours were reported in all of the studies involving combined media and 16.7 % face-to-face contact. The mean effect size was larger for the delivery of education through combined media than face-to-face contact.

Five studies focusing on the outcome of symptom experience. All (100 %) examined interventions delivered through combined media. Statistically significant between group differences in symptom experience were reported in 60 % of the studies involving the use of combined media. These studies reported a moderate mean effect size.

5.7. Mode of delivery - Format

The 4 studies that evaluated the effects of CABG education on self-care knowledge were delivered on a one-to-one basis. One (25 %) study reported statistically significant differences, favoring the experimental group, with a moderate effect size.

All 13 studies concerned with self-care behaviour as an outcome of CABG education evaluated interventions given on a one-to-one basis. Of these, only 2 (15.3 %) reported statistically significant between group difference with a small effect size.

In the 7 studies that evaluated the effects of CABG education on symptom experience the interventions were delivered on a one-to-one basis. Four (57.1 %) studies reported statistically significant differences with a small effect size.

5.8. Dose

In the 3 studies concerned with the outcome of self-care knowledge that evaluated high (> 1 session) dose educational interventions, all (100 %) reported statistically significant between group differences in self-care knowledge and contained a moderate effect size. No studies with the outcome self-care knowledge that evaluated low (1 session) dose educational intervention were found.

In the 11 studies investigated self-care behaviour as an outcome of CABG education; all (100 %) included high dose interventions. Statistically significant between group differences in self-care behaviours were reported in 36.2 % of these studies. A small effect size reported.

In the 6 studies that evaluated symptom experience, all (100 %) contained high dose interventions. Statistically significant differences between the comparison and experimental group in symptom experience were reported in 66.7 % of the studies involving high dose interventions with a moderate effect size.

Discussion and Application

The results of this systematic review showed larger effect sizes for CABG patient education in which the content was individualized, and given in a combination of media on an individual basis, and in more than one session. This design of educational intervention was beneficial in that it produced moderate improvement in CABG knowledge and performance of self-care behaviour, and decline in the number of self-care symptoms experienced. These findings are consistent with those of studies conducted by Guruge ⁴² and Suls and Wan ⁴³ who examined pre-operative patient education and reported statistically significant differences in knowledge and self-care behaviour performance between patients who received individualized teaching and those who received standardized education. As well, Fredericks, Guruge, and Sidani ⁴⁴ reported similar findings in their study which examined the effects of the elements of educational characteristics on knowledge, behaviour, and symptom frequency. Fredericks et al., ⁴⁴ also reported statistically significant differences between patients who received educational interventions through combined media, on a one-to-one basis as oppose to the use of one medium in a group setting. Thus, the results reinforce theoretical assumptions ¹² for the individualization of educational content, use of multiple means for delivering education, provision of education on an individual basis, and in multiple sessions.

These findings are consistent with those of studies conducted by Guruge ⁴² and Lauer et al., ⁴⁵ in that they report individualized/tailored interventions are most effective than standardized educational programs. Standardized patient education involves the nurse being responsible for the selection and identification of areas that he or she perceives is important for the patient to learn, while individualized patient education involves patients selecting the topics that they deem to be relevant to their specific health situation. ¹³ Hence, patients' perceived learning needs are assessed prior to the delivery of patient education materials.

Furthermore, the use of multiple media is consistent with Suls and Wan's⁴³ who found that education provided in both written and audiovisual format was most effective in producing changes in patient's knowledge and behaviour performance. Examples of multiple media include: contact with a health care provider through face-to-face or phone; written materials such as brochures and pamphlets; and audiovisual (e.g. watch a videotape or listen to audiotape).¹²

Implications for Nursing

Bandura's theory of self efficacy is strongly related to these findings. Self- efficacy is defined as the confidence an individual possesses to successfully perform specific activities.⁵³ Self efficacy is the belief individuals have regarding the ability to perform behaviours and is found to have a correlation to health behaviour changes and maintenance.⁴⁶⁻⁴⁸ Self-efficacy is found to be a good predictor of self-care behaviour performance following cardiac surgery, with daily activities increasing between nine to twelve weeks after hospitalization.⁴⁹⁻⁵² According to self-efficacy theory, various sources of information may influence a person's self-efficacy: a) performance accomplishment, b) verbal persuasion, c) vicarious experience, and d) physiologic and psychological reactions.⁵³ Thus, increased feelings of efficacy will enhance the probability of initiating and maintaining healthy behaviours.⁶ Further theoretical exploration is required to continue to determine the relationship between self efficacy and post-CABG behaviour performance.

As well, future research should examine the effect of multifaceted patient educational interventions in enhancing self-care knowledge, self-care behaviour performance, and symptom experience. That is patient educational interventions that are individualized, delivered using multiple media sources, on an individual basis, and in more than one session should be designed and evaluated to determine their effectiveness in enhancing patient outcomes.

It is important to note, that as this is a systematic review, which has extensively examined the CABG patient education literature, data from only 25 studies were incorporated into this analysis resulting in a very small sample size. This is a direct result of inconsistency in reporting of study findings. Future research aimed at examining the effects of CABG patient education in producing changes in self-care knowledge, self-care behaviour performance, and symptom experience should be consistent in the reporting of measures of central tendency, variability, confidence intervals, probability values, and obtained scores. This will assist in the conduct of future systematic reviews. As well, identification of the time when teaching is provided (pre or post-operative) and the setting in which the education is received should be examined as these factors may influence the outcomes achieved. Fredericks (2009) noted that the characteristics of the education, specifically the time when education is provided and the setting in which it is received can influence outcomes of interest ⁵⁴.

Furthermore, the findings suggest that nurses should individualize the educational information being provided to patients in order to meet their needs, in which they deem to be relevant and important. Thus, conducting assessments and evaluating the patient's learning needs prior to delivery of the education materials is important to effectively educate and meet the needs of patients. This is consistent with studies conducted by Marshall, Penchkofer, and Llewellyn ⁷ who report that operative success of coronary revascularization are limited unless the patient understands and will adhere to the prescribed diet, exercise, and medical regimen after surgery.

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