

L'effet de l'anxiété sur les résultats d'apprentissage post-PAC

Suzanne Fredericks, Souraya Sidani et Daniel Shugurensky

Les patients ayant subi un pontage aortocoronarien (PAC) requièrent des interventions éducatives ayant pour objectif d'aider à leur rétablissement et de prévenir les complications chirurgicales postopératoires. Toutefois, l'efficacité de ces interventions est discutable, le stress lié à l'hospitalisation pouvant entraîner une augmentation de l'anxiété capable d'affecter leur réussite. L'objet de la présente étude était d'examiner la relation entre l'anxiété et la réussite d'apprentissage, le recours aux comportements d'autosoins et la gestion des symptômes. Un modèle de corrélations descriptives a été employé, ce qui incluait un échantillon de commodité. Les résultats montrent des corrélations statistiquement significatives entre l'anxiété et les résultats recherchés. Les implications sur la pratique seront de réaliser les interventions éducatives aux moments de faible anxiété.

Mots clés : anxiété, comportement d'autosoins, gestion des symptômes

The Effect of Anxiety on Learning Outcomes Post-CABG

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Post-operative coronary artery bypass graft (CABG) patients require educational interventions to support recovery and prevention of surgical complications. However, the effectiveness of these interventions is questionable, as stress related to the hospitalization process can result in increased levels of anxiety that may impact on the success of the education. The purpose of this study was to examine the relationship between anxiety and the achievement of knowledge, use of self-care behaviours, and management of symptoms. A descriptive correlation design was used, which included a convenience sample. Results indicate statistically significant correlations between anxiety and the outcomes of interest. Implications for practice include provision of educational interventions at times when anxiety levels are low.

Keywords: Anxiety, descriptive design, CABG patient education, self-care behaviour, symptom management

Introduction

Cardiovascular diseases are defined as diseases and injuries of the cardiovascular system, which includes 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. In Canada each year, an average of one in every one thousand individuals undergoes a CABG procedure (Canadian Institute for Health Information, 2001). Usually, patient education programs are provided just prior to hospital discharge to support recovery and prevention of surgical complications. The effectiveness of these programs is questionable, however: The stress related to the hospitalization process can result in increased levels of anxiety that may affect the success of the educational initiative.

During hospitalization, the CABG patient is inundated with laboratory tests and procedures, the introduction of numerous caregivers, and adaptation to frequent changes in physiological state following surgery (Wheby & Brenner, 1999). These stressful events, along with the environmental factors associated with hospitalization, such as increased noise, unfamiliar surroundings, and lack of privacy, can lead to increased anxiety (House & Stark, 2002). Anxiety can interfere with the effectiveness of education by altering one's ability to be attentive and to retain informa-

tion (Grayson, 2000). Grayson reasons that if patients are unable to retain educational content, they will have no stored information upon which to draw in order to engage in the desired self-care behaviours or therapies after discharge. Yet these self-care behaviours are critical to the patient's symptom management and recovery.

The effect of anxiety on knowledge, self-care, and symptom experience has not been extensively examined in a CABG population. The potential impact of anxiety on learning suggests the need for continued examination of anxiety and its relationship to CABG patients' knowledge of self-care behaviours, adoption of self-care behaviours, and symptom experience. Identification of the extent to which anxiety influences learning has implications for the design of educational interventions and the timing of their implementation following surgery. The purpose of this study was to examine the relationship between anxiety and the achievement of outcomes expected of educational interventions in patients who have undergone CABG surgery.

Literature Review

Patient teaching usually takes place during hospitalization, 24 to 48 hours prior to discharge (Marshall, Penckofer, & Llewellyn, 1986; Moore, 1996; Moore & Dolansky, 2001; Steele & Ruzicki, 1987). Beckie (1989), Moore (1996), Moore and Dolansky (2001), and Weaver and Doran (2001) report moderate levels of anxiety in all hospitalized patients, assessed 24 to 48 hours before discharge. These authors argue that the presence of anxiety just prior to discharge may interfere with learning, as suggested in various studies (Beckie, 1989; Feshbach & Loeb, 2003; Rosenstein, 2003).

Beckie (1989) investigated the relationship between CABG patients' level of knowledge of self-care behaviours and anxiety during the first 6 weeks after discharge. Anxiety was assessed using Spielberger's (1995) State Anxiety Scale. Beckie found a statistically significant inverse relationship between participants' level of knowledge, assessed after exposure to educational intervention, and anxiety scores in the control group ($r = -0.61, p < 0.05$) and the experimental ($r = -0.31, p < 0.05$) group. She states that the findings support the theoretical proposition that anxiety has a negative impact on knowledge acquisition.

The effect of anxiety on learning has also been assessed in university students. Rosenstein (2003) evaluated the effects of anxiety on learning outcomes (specifically, knowledge of content covered in class) in 400 first-year psychology students. The author began by administering the Mandler-Sarason Test Anxiety Questionnaire (TAQ) as a means of anxiety arousal. Anxiety was assessed using the Palmer Sweat Index. The

participants were then given an educational intervention that consisted of lectures from their psychology class. Post-teaching, the students' levels of knowledge and anxiety were assessed. Results indicated that higher levels of anxiety were related to lower levels of knowledge ($r = -0.79$, $p < 0.01$).

Feshbach and Loeb (2003) also assessed the effect of anxiety on knowledge retention in first-year psychology students ($N = 45$). A design similar to that used by Rosenstein (2003) was employed, in that anxiety was aroused using the Mandler-Sarason TAQ and evaluated using the Taylor Scale, then a teaching intervention was delivered, followed by assessment of knowledge and anxiety. Similar results are reported, with higher levels of anxiety inversely related to lower levels of knowledge ($r = -0.68$, $p < 0.01$).

Although the studies differed in context, target population, design, and measures, the results are consistent. They indicate that anxiety interferes with learning, where highly anxious persons gain minimal knowledge following an educational intervention. The extent to which this inverse relationship between anxiety and knowledge is applicable to patients who have had CABG surgery was investigated in the present study.

Study Framework

The concepts of interest for this study include patient education, self-care knowledge, self-care behaviours, symptom experience, and anxiety. The conceptual definitions of each concept and the proposed relationships among them are presented based on the results of an integrative review of the theoretical and empirical literature.

Rankin (2001) defines patient education as the “communication of information to enact change in knowledge, performance of self-care behaviours, and physical functioning” (pp. iv–v). Patient education provides the patient with information that can be used to enhance self-care knowledge, promote self-care behaviours, and improve symptom experiences (Orem, 2001; Rankin, 2001; University of California Symptom Management Group [UCSMG], 1994). In the present study, patient education was given to patients who underwent surgery. The intervention covered information that patients needed in order to manage their condition following discharge from hospital. The specific topics addressed included complications, activities, medication, symptom management and control, and psychological symptoms.

The expected outcomes of the educational intervention were self-care knowledge, adoption of self-care behaviours, and improved symptom experience. Rankin (2001) defines knowledge as a body of facts and principles that are learned through life experiences or are taught.

Knowledge is enhanced through educational interventions and is manifested by cognitive indicators such as recall or self-report of information (Rankin, 2001). In the present study, knowledge pertained to self-care, such as how to prevent complications, engaging in appropriate activities, preventing the onset of symptoms, and practising proper nutrition. It was hypothesized that patients would demonstrate an increase in self-care knowledge following exposure to the intervention, as reported in the literature (Beckie, 1989; Moore, 1996; Moore & Dolansky, 2001).

Orem (2001) describes self-care as “the practice of behaviours that individuals initiate and perform on their own behalf in maintaining or enhancing their health” (p. 35). For Orem, self-care encompasses self-reported actions that “contribute in specific ways to human development and health” (p. 37). It is a process involving selection and implementation of treatment strategies to enhance or maintain functioning, or to alleviate or prevent the onset of symptoms, and evaluation of treatment strategies to determine whether to continue with the intervention, stop treatment, or adopt a new strategy. Orem states that before patients can engage in these behaviours they must have knowledge of how to do so; the length of time required for an individual to transform the information gained through self-care instruction into deliberate action varies between immediately and 1 week post-teaching. In the present study, the following self-care behaviours were of interest: deep breathing and coughing exercises, walking and climbing stairs, care of surgical incisions, medication administration, interaction with physician, salt and fluid restriction, and symptom management. A small increase in use of these behaviours was expected after delivery of the intervention.

The University of California Symptom Management Group (UCSMG, 1994) defines symptoms as “subjective experiences reflecting changes in a person’s bio-psychosocial function, sensation, or cognition” (p. 272). The way in which symptoms are experienced is influenced by how the patient perceives them and the frequency of the experience. Perception of symptoms is described as whether an individual notices a change from the way he or she usually feels or behaves, which generally occurs over the course of 1 to 2 weeks (UCSMG). Patients who have had CABG surgery often report fatigue, trouble sleeping, shortness of breath, chest and body pain, constipation, edema, nausea, and dizziness within 1 week post-discharge. However, it was proposed that the severity of the symptoms would be low to moderate after the educational intervention, which informs patients about strategies for managing symptoms.

Anxiety has been defined as “a state characterized by subjective, consciously perceived feelings of apprehension and tension, accompanied by activation of cognitive impulses that block judgment of various situations” (Spielberger, 1995, p. 17). This blocked judgement serves to impede the

process of learning and of engaging in specific behaviours (Orem, 2001). Patients' level of anxiety varies across settings and experiences. The individual's perception of anxiety is assessed via self-report (Rankin, 2001; Spielberger, 1995). Anxiety has been assessed at various points throughout the course of an individual's recovery. Beckie (1989), Moore (1996), Moore and Dolansky (2001), and Weaver and Doran (2001) report moderate levels of anxiety in CABG patients 24 to 48 hours prior to discharge. In addition, Rankin (2001) states that knowledge levels are significantly reduced in the presence of heightened levels of anxiety. This proposition is supported empirically by three studies assessing the effects of anxiety on learning, specifically knowledge retention (Beckie, 1989; Feshbach & Loeb, 2003; Rosenstein, 2003).

Based on the relevant literature, it was proposed that patients' level of anxiety, reported prior to exposure to the educational intervention, is (1) negatively associated with low levels of self-care knowledge and use of self-care behaviours, and (2) positively related to symptom experience following the intervention.

Methods

Design

This study was part of a large randomized clinical trial evaluating the effectiveness of an individualized patient education intervention, delivered by telephone 1 to 2 days pre- or post-discharge, in enhancing CABG patients' knowledge of self-care behaviours, adoption of self-care behaviours, and symptoms experienced (Fredericks, Sidani, Watt-Watson, & Shugurensky, under review). Institutional Review Board Approval was received from three institutions: the University of Toronto, the University Health Network, and Ryerson University.

For this study, data obtained at pretest and post-test were analyzed. At pretest, which took place 1 to 2 days prior to delivery of the intervention, data were collected on anxiety and the three outcomes: self-care knowledge, use of self-care behaviours, and symptoms experienced. Post-test data were collected within 1 week after implementation of the intervention. The change scores from pretest to post-test were used to represent achievement of the outcomes. The change scores were then correlated to the anxiety scores measured just prior to delivery of the intervention.

Intervention

The intervention used in the larger study consisted of an individualized patient education program. The intervention was administered verbally over the telephone by a research nurse trained in its delivery using one-

on-one nurse-patient interaction. Delivery began with an assessment of the patient's learning needs, addressing such topics as complications, activities, medication, symptom management, and psychological symptoms. The assessment began with the client being contacted by the research nurse, via telephone, at a prearranged time. The nurse introduced herself by giving her name, her position (research nurse), the name of the study, and the purpose of the call. She then asked if the patient had any questions about the purpose of the call. If questions arose, she responded appropriately. The nurse then read the instructions for the learning needs assessment questionnaire selected for the study. This was followed by completion of the questionnaire over the telephone by the patient. Patients were asked to rate the degree to which they perceived the topics on the questionnaire as important for learning. Any topic identified as important or very important for learning was discussed with the patient. Depending on the topic identified, the nurse used the educational material contained in the post-discharge intervention (developed for the study based on an extensive critical review of available evidence) to discuss the behaviours that the patient needed to adopt to enhance his or her symptom experience and recovery. If all topics were identified by the patient as important or very important, all content areas of the intervention were discussed. The average length of time for delivery of the intervention, if all topics were identified as important or very important, was 20 to 30 minutes.

Setting and Patient Population

The setting for the study was a cardiovascular surgical (CVS) unit at a university-affiliated teaching hospital in a large Canadian city. The accessible population comprises approximately 1,500 CABG patients per year. These individuals undergo CABG surgery accompanied by one to four grafts. Patients also undergo combined surgeries in which a CABG procedure is performed in unison with a ventricle repair. The average length of stay in the unit is 5 days. The average age is 68 years. The male/female ratio is 3 to 1. The patients are ethnically diverse. Approximately 70% of the accessible population met the eligibility criteria.¹

Sample

Patients who met four eligibility criteria were invited to take part in the study: (1) underwent CABG surgery for the first time, with no additional surgical procedures (such as valve replacement or repair, Maze procedure, pacemaker insertion, stent insertion, or procedures related to stem cells);

¹The figures in this paragraph were obtained from the Department of Cardiovascular Surgery, University Health Network, in September 2003.

(2) literate in English; (3) oriented as to time, place, and person; (4) have access to a telephone.

Dunstan and Riddle (1997) and Wang, Fennie, He, Burgess, and Williams (2003) state that the more an individual has experienced an event or treatment the greater his or her likelihood of having been exposed to a patient teaching intervention related to the topic. Hence, second- or third-time CABG patients will have additional self-care knowledge, obtained through experience and previous hospitalization, which will confound the effects of the intervention under investigation in the study. Selection of individuals who have experienced only one CABG reduces random heterogeneity of the participants on the outcomes of knowledge, thereby increasing the power to detect significant intervention effects (Cook & Campbell, 1979). The identification of patients who had recently undergone CABG surgery for the first time was determined in consultation with the unit nurse, physician, or manager.

Individuals who are unable to speak the language in which the education is being provided and are cognitively not oriented to person, place, or time will not benefit from an educational intervention, as they will not be able to understand the information being presented. Hence, only patients literate in English and cognitively alert and oriented were considered. Identification of these characteristics was determined in consultation with the unit nurse, physician, or manager. Participants had to have access to a telephone.

Convenience sampling, whereby available consenting patients entered into the study until the desired sample size is reached, was used. The number of patients who consented to take part in the large randomized clinical trial was 150. Of these, 20 dropped out of the study, yielding a 13.3% attrition rate. In total, 130 patients completed the pretest and post-test data. This sample size was adequate to detect a moderate-to-high correlation (≥ 0.60) between anxiety and self-care knowledge, setting the alpha at 0.05 and the beta at 0.80 (Cohen, 1988). A moderate-to-high correlation was anticipated based on theoretical evidence (Redman, 1997) and empirical evidence (Beckie, 1989; Colagiuri, Colagiuri, deBlieck, & Naidu, 1994; Jaarsma et al., 2000; Wright, Kravitz, Kaplan, & Meyers, 2001).

Measures

Demographic data were obtained using standard questions. Established instruments were employed to measure the concepts of interest. However, since these instruments were being used for the first time in the CABG patient population, their content validity and reliability were evaluated as part of the large randomized clinical trial. Self-care knowledge was

measured using the 15-item Knowledge Inventory developed by McHugh-Schuster, Wright, and Tomich (1995). The Inventory assesses patients' knowledge of self-care strategies to be implemented at home for managing incision and chest pain, nausea, vomiting, fatigue, sleep disturbance, constipation, and edema/water retention, as well as taking medications and engaging in usual activity. The total score represents the number of correct responses to the 15 items. A maximum score of 15 indicates knowledge in all areas of self-care. The higher the score, the greater the CABG patient's knowledge of self-care behaviours. McHugh Schuster and colleagues state that the Inventory was reviewed by three cardiac rehabilitation professionals (nurses and exercise physiologists) for clarity, content, and face validity. They report an internal consistency reliability coefficient of 0.71. In the present study, the content validity index (CVI), representing the percentage of items rated as relevant or very relevant by at least 80% of the participants, was 100%. The internal consistency reliability coefficient was 0.64 at pretest. The rather low coefficient was due to minimal variability of participants' responses to the item.

Self-care behaviours were measured using the Revised Heart Failure Self-Care Behaviour (RSCB) scale developed by Artinian, Magnan, Sloan, and Lange (2002). This scale is a 29-item, self-report, Likert-type scale describing behaviours that patients with heart failure must engage in, to some degree, in order to regulate their own functioning. The behaviours relate to management of post-operative CABG complications, incision and chest pain, nausea, vomiting, fatigue, sleep disturbance, constipation, edema/water retention, emotional reactions, and self-care strategies for medication administration. Participants are asked to indicate how often they engaged in each of these behaviours in the preceding few days on a scale ranging from *none of the time* (0) to *all of the time* (5). The total score is calculated by summing the scores across items. It ranges from 0 to 145. Higher scores indicate more frequent use of self-care behaviours. Artinian et al. report that content validity (CVI = 0.86) was demonstrated through evaluation by a panel of experts, including two nurse practitioners and two self-care experts. They also state that the tool demonstrated convergent validity, as evidenced by a positive correlation between a tool assessing self-care behaviours and the RSCB scale and internal consistency reliability (Cronbach's alpha coefficient = 0.8).

In the present study, the RSCB scale showed content validity (CVI = 100%) and internal consistency reliability (Cronbach's alpha coefficient = 0.79).

Symptoms were assessed using the Symptom Inventory developed by Artinian, Duggan, and Miller (1993), which is a 19-item self-report checklist that measures symptoms commonly experienced during the post-CABG recovery period. These symptoms include tiredness, trouble

sleeping, trouble breathing or shortness of breath, chest pain, chest incision pain or discomfort, leg incision pain or discomfort, shoulder, back, neck, or abdominal pain/discomfort, incision redness, increased tenderness at incision site, constipation, edema or swelling in arms and legs, nausea, anxiety, feeling emotionally drained, vomiting, shortness of breath, dizziness, and irregular heartbeat. Participants are asked to describe the frequency of a given symptom during the previous week (1 = *not at all*, 2 = *once*, 3 = *rarely*, 4 = *sometimes*, 5 = *often*, 6 = *usually*, 7 = *always*). The total score is calculated by summing the item scores. It ranges from 20 to 140, with a higher score indicating greater frequency. Artinian et al. report an internal consistency reliability coefficient of 0.78. They report that content validity for this tool has been demonstrated; however, they do not describe the process through which the instrument's content validation was conducted. In addition, the authors state that construct validity is supported by a positive correlation between the symptom inventory and another tool that assesses symptoms similar to those experienced by CABG patients.

In this study, CABG patients rated the Symptom Inventory as content valid (CVI = 100%). This instrument also demonstrated high internal consistency reliability (Cronbach's alpha coefficient = 0.92).

Anxiety was assessed using Spielberger's (1995) State Anxiety Scale, a 20-statement scale that identifies feelings. Participants respond using a four-point scale ranging from *not at all* to *very much so*. The total scale score ranges from 20 to 80, with a high score representing high levels of anxiety (Spielberger, 1995). The scale is reliable (internal consistency reliability coefficient ranging from 0.83 to 0.92 and a test-retest reliability coefficient ranging from 0.16 to 0.54) in a CABG population (Beckie, 1989; Spielberger, 1995). The low test-retest reliability coefficient was expected for this scale, as it reflects the changes in anxiety over time (Spielberger, 1995). Beckie (1989) reports acceptable content validity using a panel of cardiovascular experts to assess the relevance of each item to the CABG population; however, she does not provide specific data to support this claim. Furthermore, Beckie reports convergent validity (Pearson $r = 0.81$) with a similar unidentified instrument that assesses anxiety for the tool when used with a CABG population.

This instrument demonstrated acceptable internal consistency reliability (Cronbach's alpha coefficient = 0.84) in CABG patients who participated in the study.

Procedures and Data Collection

Patients who met the eligibility criteria were approached, within 24 to 48 hours of admission to the CVS unit, to participate in the study. The unit staff were provided with the inclusion criteria and were asked to use

these in identifying eligible patients. Staff members used a standardized script to inform eligible patients about the study and ask if they wished to hear more about it. The researcher approached patients who expressed an interest in hearing more, to describe the study in detail, answer any questions, and obtain written consent.

Pretest data related to the outcomes were collected once consent was obtained (24–48 hours after admission to the CVS unit) via face-to-face interaction. Data on number of bypasses and comorbidity were obtained from the patient's chart. Completion of the pretest instruments took between 20 and 30 minutes. Anxiety data were collected at pretest. Three weeks after delivery of the intervention, patients received the post-test instruments for assessing the outcomes by mail.

Data Analysis

Descriptive statistics (i.e., measures of central tendency and dispersion) were used to characterize the sample in terms of demographic and illness-related characteristics. The Pearson correlation coefficient was used to examine the relationships between anxiety levels measured at pretest and the change score reflecting changes, between pretest and post-test, in self-care knowledge, use of self-care behaviours, and symptom experience. Change scores were computed as the difference between the data collected at time two (1 week post-intervention) and time three (3 weeks post-intervention).

Results

Demographic Profile and Health Status

The participants had an average age of 63.4 years ($SD = 9.3$) and were predominantly married (84.0%), male (80.0%) high school graduates (58%). Most participants had three bypass grafts and three comorbid conditions. The most frequently reported comorbid conditions were high blood pressure, high cholesterol, diabetes, arthritis, and visual impairment.

Outcomes Measured at Post-test

Anxiety scores were found to be moderately high at pretest ($mean = 34.78$, $SD = 19.80$). Results indicate a statistically significant inverse correlation between anxiety and change in knowledge ($r = -0.185$, $p = 0.033$) and self-care ($r = -0.275$, $p = 0.001$) and a statistically positive correlation between anxiety and change in symptom frequency ($r = 0.498$, $p = 0.000$). These change scores were correlated with the pretest anxiety scores.

Discussion

The general characteristics of the sample were similar to those of the accessible and target populations (Beckie, 1989; Marshall et al., 1986; Moore, 1996; Moore & Dolansky, 2001; Steele & Ruzicki, 1987; Weaver & Doran, 2001). Moderate levels of anxiety were reported at pretest. The hospitalization process for the CABG patient, which is characterized by laboratory and diagnostic tests and procedures (routine chest X rays and daily blood work); the introduction of numerous caregivers; adaptation to frequent changes in physiological state; and environmental factors associated with hospitalization, such as increased noise, unfamiliar surroundings, and lack of privacy, are possible explanations for the moderate anxiety scores reported at pretest (House & Stark, 2000). Hence, the moderate levels of anxiety were consistent with expectations and with previous findings in similar and different patient populations (House & Stark, 2000).

As well, self-care knowledge scores and use of self-care behaviours increased from pretest to post-test, while symptoms decreased over time, reinforcing the notion that increased levels of anxiety impact on knowledge acquired, behaviours adopted, and symptoms experienced.

Inverse moderate correlations between anxiety at pretest and self-care knowledge and self-care behavioural change scores and a moderate positive correlation with symptoms experienced were also identified. Therefore, with increased anxiety there is minimal gain in knowledge after education delivery, minimal use of appropriate self-care behaviours, and an increase in the presence of symptoms 3 weeks after discharge. These findings are consistent with those of Beckie (1989), Moore (1996), Moore and Dolansky (2001), and Weaver and Doran (2001), who report similar correlations between anxiety and knowledge, self-care, and symptoms.

Practice and Research Implications

Moderate to high levels of anxiety were present at pretest and influenced outcome achievement. Health educators are encouraged to be cognizant of the presence of anxiety prior to teaching and the potential negative effect of anxiety on knowledge retention, self-care behaviour, and symptom experience. Specifically, nurses are encouraged to assess patients' anxiety levels prior to conducting educational sessions. If moderate or high levels are evident prior to teaching, implementation of the educational session could be postponed until anxiety levels have been reassessed and are low. Alternatively, psycho-educational interventions could be implemented, whereby the patient's psychological/emotional (i.e., anxiety) status is assessed and addressed prior to teaching. This type of interven-

tion combines health education with behavioural counselling (Rankin, 2001). The health education component could focus on the nature of anxiety and the counselling component on behaviours tailored to manage anxiety. Specific behaviours to manage anxiety include breathing activities, exercise, and meditation (Rankin, 2001). This type of intervention can help to decrease anxiety prior to self-care education and enhance the patient's acquisition of knowledge (Rankin, 2001).

Future research could focus on determining the most appropriate time to implement CABG educational interventions. Such interventions are usually delivered prior to hospital discharge (Beckie, 1989; Moore & Dolansky, 2001; Wheby & Brenner, 1999). Since the hospitalization process has been found to be characterized by moderate levels of anxiety, which serves to impede knowledge acquisition, behavioural change, and the management of symptoms, an alternative time for the delivery of CABG educational interventions should be evaluated in terms of effectiveness in producing the outcomes of interest. A randomized clinical trial could be carried out to compare the effectiveness of a CABG educational intervention delivered at two different times (e.g., 48 hours pre-discharge and 48 hours post-discharge). The findings could be used to draw up best practice guidelines for the timing of CABG educational initiatives.

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